Midia Gas Development FEED Study

ESIA Report

Black Sea Oil & Gas SRL

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1 INTRODUCTION

1.1 Background

Black Sea Oil & Gas S.R.L. (BSOG) is the titleholder (together with Petro Ventures Resources SRL and Gas Plus International BV) and operator of petroleum exploration, development and exploitation blocks XIII Pelican and XV Midia, Contract Area B (XV Midia Block), located on the continental shelf of the Romanian Black Sea. The Ana and Doina reservoirs lie in XV Midia Block of the western part of the Black Sea, some 110 km to the east of Constanta, Romania, in water depths of approximately 70 – 85 m (Figure 1.1).

1.2 The Midia Gas Development Project

BSOG intends to develop the Midia Gas Development Project (MGD Project / Project) to produce and process gas from the Ana and Doina discoveries offshore, and route it to export to consumers within Romania and/or the region.

The MGD Project proposal consists of the following: (i) drilling of four development wells at the Ana field and one at the Doina field (production wells); (ii) installation of a small normally unmanned platform to house the wellheads and minimum facilities at the Ana field (Ana Platform); (iii) a subsea gas production system at the Doina field (Doina Subsea); (iv) a 18 km 16″ pipeline routing the gas from Doina subsea to the Ana platform (Ana-Doina pipeline); (v) an upstream gas transmission pipeline for the routing of the gas to the gas treatment plant (GTP) located onshore (Ana Platform – GTP pipeline) consisting of 121 km of subsea pipeline (offshore segment of the pipeline) and 4.5 km of onshore pipeline (onshore segment of the pipeline); and (vi) the GTP. The landfall of the offshore segment of the pipeline is located in the Vadu area, Corbu Commune, Constanta County.

The treated gas from the GTP will be injected into the national natural gas transmission system (NTS) operated by TRANSGAZ via a connection point and metering station located within the GTP. A schematic drawing of the proposed development is shown in Figure 1.2.

Both the Ana and Doina fields have high methane content (>99 mole%) with minimal contaminants. The fields are predicted to have an overall production life of 10 to 15 years with a predicted peak production capacity of 3.115 million standard cubic metres per day (MMSCMD). This nominal capacity is equivalent to a yearly average of 2.83 MMSCMD. The planned first gas production date for the Ana and Doina fields is Quarter 1 of 2021.

1.3 The Applicant

BSOG is a Romanian-based independent oil and gas company, targeting exploration and development of conventional oil and gas resources. The company's current portfolio is made up of one offshore concession covering two blocks on the continental shelf of the Romanian Black Sea, namely Blocks XIII Pelican and XV Midia, Shallow Water Area (Midia Block), totalling almost 4,200 km^2. MGD Project is aimed at putting into production the Ana and Doina gas discoveries. Further successful exploration may add new resources from the other prospects and leads in Midia Block.

BSOG operates the two blocks (on the basis of a 65% interest) and makes up the titleholder of the concession together with its partners Gas Plus International BV (15% interest) and Petro Ventures Resources SRL (20% interest). BSOG is looking to fulfil its mandate of developing its existing assets in the Black Sea and pursue further opportunities in Romania as well as in the region.

BSOG is owned by the Carlyle Group (90% shareholding) and the European Bank for Reconstruction and Development (EBRD; 10% shareholding).

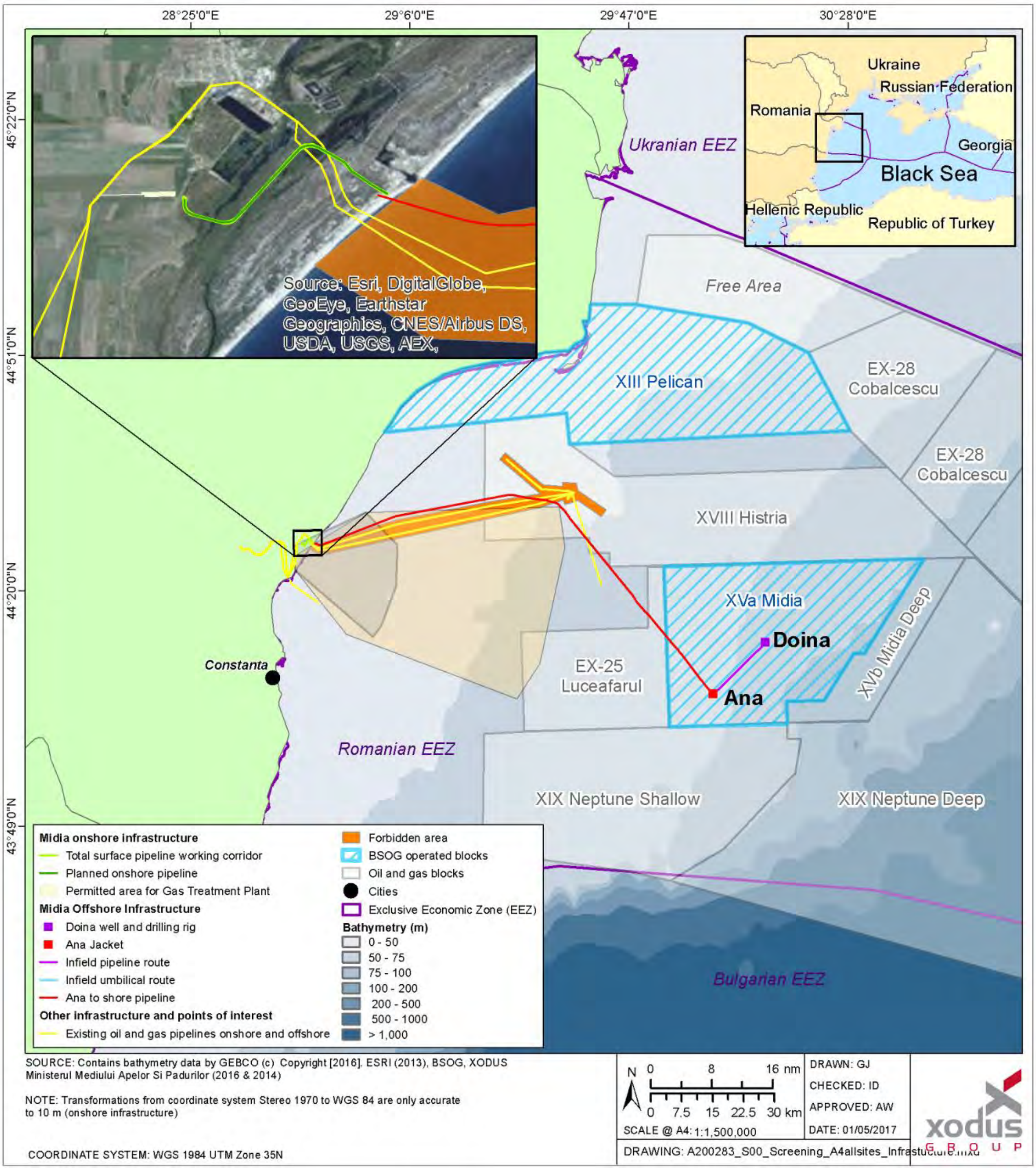


Figure 1.1 Location of Midia Gas Development

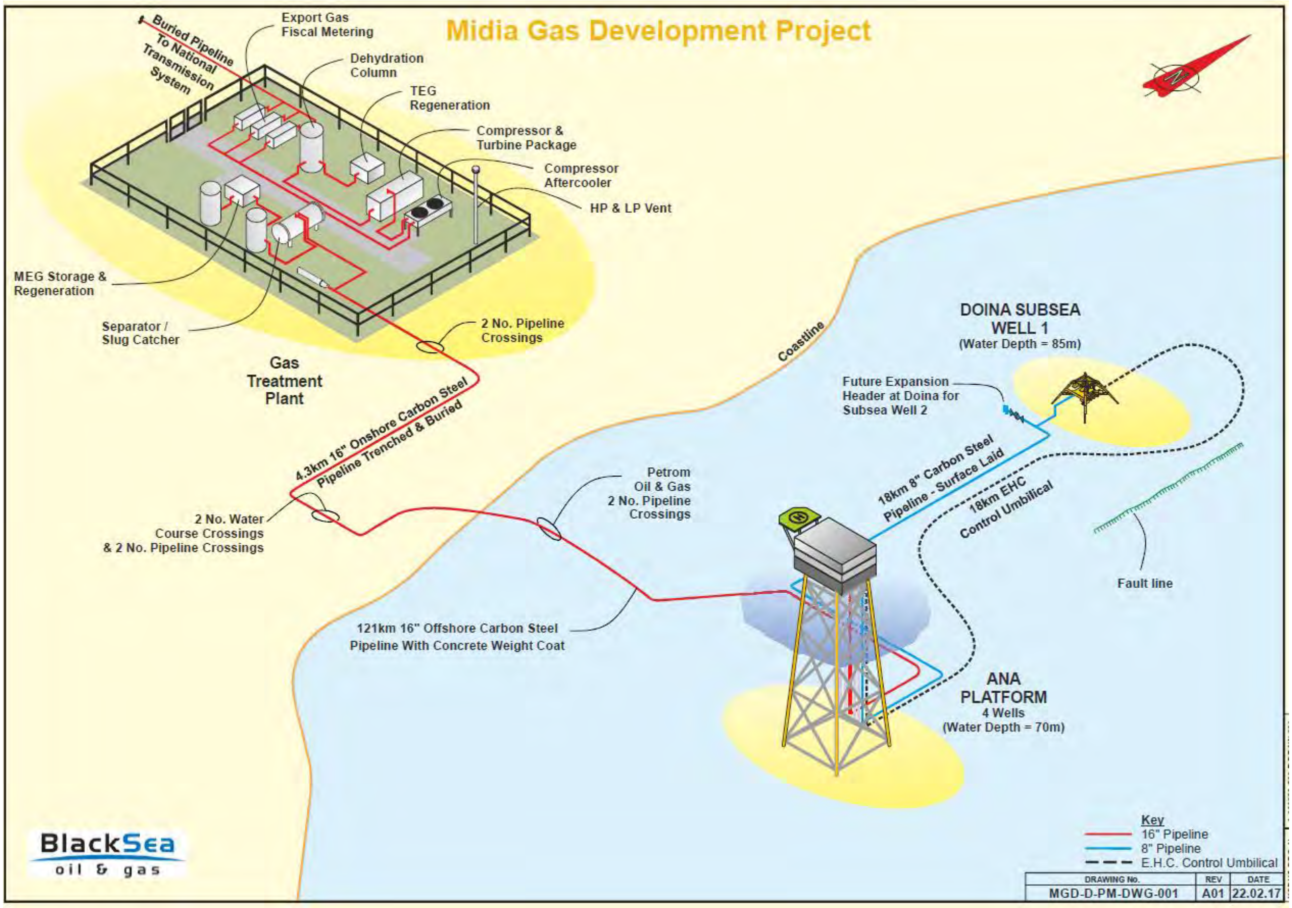


Figure 1.2 Schematic of Selected Concept for Midia Gas Development

1.4 Purpose of this ESIA Report

As described further in Chapter 2, conducting an Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) is a requirement for the MGD Project. BSOG carried out such tasks in relation to MGD Project for both the onshore and offshore components.

Due to permitting restrictions under national legislation, for permitting purposes MGD Project has been divided into: **(i) the Offshore Component**, namely: the production wells, Ana Platform, Doina Subsea, Doina Subsea to Ana Platform pipeline, and the offshore segment of the Ana platform – GTP pipeline, and **(ii) the Onshore Component**, namely: the onshore segment of the Ana platform – GTP pipeline and the GTP. From a permitting perspective, at the date of issue of this Report, only the EIA and AA permitting process for the GTP has been concluded. The EIA and AA permitting processes for the Offshore Component and for the onshore segment of the pipeline are ongoing. It should be noted that each of the EIAs builds on the cumulative impact assessment, to be addressed in a consolidated manner in the last EIA to be issued.

Strategic Environmental Assessments (SEA), which also included the corresponding AAs, have been conducted for the relevant Onshore Components, with relevant Romanian legislation being observed in this respect.

Building on the SEAs, EIAs and AAs, BSOG prepared a consolidated MGD Project EIA and further has conducted this Environmental and Social Impact Assessment (ESIA) to meet the requirements of international finance institutions, particularly the EBRD. ESIA is an assessment of the environmental and social impacts and issues of a project. The ESIA process identifies the areas of a Project where potentially significant environmental or social impacts may occur, and outlines mitigation measures or management techniques aimed at reducing or offsetting these effects.

A single ESIA Report has been prepared incorporating the SEA, EIA and AA Reports, together with the socio-economic and social impact assessments required to meet EBRD requirements.

2 REGULATORY AND POLICY FRAMEWORK

2.1 Applicable Romanian Legislation

The main enactments governing oil and gas exploration and production in Romania are the Petroleum Law no. 238/2004 (Petroleum Law) and Government Decision no. 2075/2004 approving the Methodological Norms of application of the Petroleum Law (GD no. 2075/2004). These reflect the implementation of Directive 94/22/EC on the conditions for granting and using authorisations for the prospection, exploration and production of hydrocarbons.

In addition, the specific provisions regulating offshore petroleum activities are captured under Law no. 256/2018 regarding certain measures required for the implementation of petroleum operations by the titleholders of petroleum agreements relating to offshore petroleum blocks (Law no. 256/2018).

2.1.1 Environmental Impact Assessment and key environmental legislation

According to GD no. 2075/2004, exploitation works can only begin after obtaining environmental approval and providing the necessary conditions for the capture of petroleum, disposal of waste water and, if necessary, flaring of the associated gas.

The EIA procedure is governed by:

> Government Decision no. 445/2009 on environmental impact assessment pertaining to certain public and private projects (GD no. 445/2009) - which transposes the EIA Directive 85/337/EEC and the Directive 2003/35/EC providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directive 85/337/EEC;

> Order no. 135/2010 approving the Methodology for the application of the environmental impact assessment for public and private projects (Order no. 135/2010); and

> Directive 2014/52/EU, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

According to GD no. 445/2009, an EIA is mandatory for MGD Project because it will involve (as listed on Annex 1 of the GD) the extraction of oil or natural gas for commercial purposes, where the amounts extracted exceed 500 tonnes/day in the case of petroleum and 500,000 cubic metres/day in the case of natural gases.

Order no. 863/2002 approving the Methodological guides applicable to the stages of the environmental impact assessment framework procedure (Order no. 863/2002) contains the approved methodological guidelines applicable to the three key stages of the EIA framework procedure:

1. Screening;
2. Scoping and Developing the EIA Report (including stakeholder engagement); and
3. Analysis of the EIA Report.

Key Romanian environmental legislation which will be considered (covering both the offshore and onshore components of the Project) includes:

> Law no. 165/2016 on the safety of offshore petroleum operations - which transposes the EU Offshore Safety Directive 2013/30/EU;

> Law no. 188/2018 on limiting the air emissions of certain pollutants generated by combustion installations with medium capacities - which transposes the Medium Combustion Plant Directive 2015/2193;

> Law no. 6/1993 regarding the Romanian acceptance of the MARPOL Convention (73/78).

- Law no. 82/1993 on the establishment of the “Danube Delta” Biosphere Reserve;
- Law no. 17/1990 on the legal regime of internal waters, territorial sea, the contiguous zone and exclusive economic zone of Romania;
- Ordinance no. 18/2016 on the landscape of the spatial marine planning - which transposes Directive 2014/89/EU establishing a framework for maritime spatial planning;
- Emergency Government Ordinance no. 71/2010 on the establishment of the marine strategy framework - which transposes the Marine Strategy Framework Directive 2008/56/EC;
- Emergency Government Ordinance no. 68/2007 concerning the environmental liability with respect to the prevention and repair of environmental damage – which transposes the Environmental Liability Directive 2004/35/EC;
- Emergency Government Ordinance no. 57/2007 on the regime of protected natural areas, the preservation of natural habitats, wild flora and fauna – which transposes Directive 79/409/EEC on the conservation of wild birds, the Habitats Directive 92/43/EEC and Directive 2006/105/EC adapting Directives 73/239/EEC, 74/557/EEC and 2002/83/EC in the field of environment, by reason of the accession of Bulgaria and Romania;
- Emergency Government Ordinance no. 19/2006 regarding the use of the Black Sea’s beach and the control of activities performed on the beach;
- Emergency Government Ordinance no. 195/2005 on environmental protection;
- Emergency Government Ordinance no. 202/2002 regarding the integrated management of the coastal area;
- Government Decision no. 663/2016 setting up the protected natural areas and declaring special protection areas, as integral part of the European ecological network Natura 2000 in Romania;
- Government Decision no. 1284/2007 regarding the institution of bird protection areas as integral part of Natura 2000 European ecological network in Romania - which transposes the Habitats Directive 92/43/EEC;
- Government Decision no. 1076/2004 establishing the procedure for environmental assessment for plans and programs (GD no. 1076/2004) - which transposes SEA Directive 2001/42/EC;
- Government Decision no. 749/2004 regarding the responsibilities, criteria and method of delimitation of the land stripe located in the immediate proximity of the coastal area, for the purpose of preserving the ambient conditions and the patrimonial and landscaping value in the areas close to the shore;
- Government Decision no. 1232/2000 for the approval of the Methodological norms for the implementation of the International Convention on civil liability for oil pollution damage;
- Order no. 46/2016 establishing protected natural areas and declaring the sites of community importance as an integral part of the European ecological network Natura 2000 in Romania;
- Order no. 2701/2010 approving the Methodology for the information and consultation of the public regarding the development or revising of the spatial planning of the territory and zoning plans;
- Order no. 19/2010 approving the Methodological Guidelines regarding the appropriate assessment of potential effects of plans and programs upon protected natural areas of community importance (Order no. 19/2010);
- Order no. 1964/2007 on the institution of the protected natural area regime for sites of community importance as integral part of Natura 2000 European ecological network in Romania - which transposes the Birds Directive 2009/147/EC;

- Order no. 995/2006 approving the list of plans and programs subject to the provisions of GD no. 1076/2004;
- Order no. 117/2006 approving the Guide regarding the applicability of the environmental assessment procedure for plans and programs;
- Order no. 756/1997 approving the Regulation on the assessment of environmental pollution;
- Order no. 536/1997 approving the Hygiene norms and recommendations on the living environment of the population;
- Government Decision no. 763/2015 approving the Plan of Management and associated Regulation of the Danube Delta Biosphere Reserve;
- Government Decision no. 248/2004 for adopting certain measures for the application of Law no. 82/1993 on the establishment of Danube Delta Biosphere Reserve;
- Law no. 59/2016 on the control of major-accident hazards involving dangerous substances (SEVESO III);
- Emergency Government Ordinance no. 196/2005 on the Environmental Fund;
- Government Decision no. 477/2009 establishing the applicable sanctions for failure to comply with the provisions of Regulation no. 1907/2006/EC concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals, establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC;
- Order no. 1030/2009 on the approval of the regulatory health projects location, planning, construction and operation objectives that conducts health risk for the population;
- The Water's Law no. 107/1996;
- Order no. 799/2012 regarding the approval of the normative for the content of technical documentation needed for obtaining water management permits and authorizations;
- Order no. 662/2006 for the approval of the Procedure and competencies for the issuance of water management permits and authorizations;
- Order no. 873/2012 for the approval of the notice Procedure from water management point of view;
- Ordinance no. 43/2000 on the protection of the archaeological heritage and declaring certain archaeological sites as national interest areas Ministry of Culture;
- Law no. 422/2001 on the protection of historical monuments;
- Decision no. 2314/2004 on the approval of the list of historical monuments and missing monuments;
- Order no. 2562/2010 on the approval of the Procedure re the issuance of the authorization to perform archaeological investigation works;
- Law no. 5/2000 on the approval of the Spatial Planning of the National Territory – Section III – protected areas.

Additional pieces of key Romanian legislation will apply to the project ESIA with respect to specific impact areas. These are presented in Appendix A.

2.1.2 Permitting framework

Under Romanian legislation, a construction permit (CP) is required for the execution of the Project (construction works for the infrastructure and the drilling of the wells). While onshore permitting presents no issues, until the enactment of Law no. 258/2018 on 17 November 2018 there was no consistent roadmap providing for offshore permitting. As such, from a permitting perspective, the Project underwent a process in which some areas were not clearly regulated while others were being regulated while the permitting process unfolded. In addition, the novelty of the Project, being the first of its kind to be permitted in the post-communist era, requires the constant development of processes and procedures to accommodate issues.

Therefore, as stated under Section 1.2 above, for permitting purposes, the MGD Project has been divided into the Offshore Component and the Onshore Component. Nonetheless, BSOG's permitting approach, including the ESIA, considers the Project as a whole.

2.1.2.1 Offshore permitting framework

According to applicable legislation, an EIA and AA must be produced for the Offshore Component. The AA and EIA Reports are validated by the granting of an Environmental Permit, which further serves, along with other permits and documentation, the obtaining of the relevant CP. A CP will be issued by the Ministry of Energy for the Ana Platform, subsea infrastructure and gas pipelines to shore and a Drilling Permit from the National Agency of Mineral Resources (NAMR) Permit - in lieu of a CP - will be issued for the development wells. Specific permits which are provided for under Law no. 256/2018 have been or will be obtained prior to the issuance of the CP and Drilling Permit, respectively.

The EIA Report and AA Reports have been prepared and have informed this ESIA Report where relevant.

2.1.2.2 Onshore permitting framework

As for the Offshore Component, the Onshore Component requires an EIA and AA to be produced and validated by the granting of an Environmental Permit which further serves the obtaining of the relevant CP. The onshore environment being highly regulated, several processes are applicable to the Onshore Component, as follows:

1. The GTP has been the subject of an Urban Zoning Plan (in Romanian: "PUZ") and a SEA Report has been prepared alongside an AA Report. Once the SEA Report had been approved, BSOG conducted an EIA process, produced the relevant EIA and AA Reports, and has been granted the Environmental Permit. The other relevant permits required by the applicable legislation and the CP for the GTP have been obtained.
2. The onshore segment of the Ana Platform – GTP pipeline follows the permitting process outlined below:

   2.1 Separate SEA processes for the beach area segment and the remaining segment of the onshore pipeline have been carried out and corresponding SEA and AA Reports have been issued in relation to the Urban Zoning Plan, which have been approved.

   2.2 A single EIA process for the entire onshore segment of the Ana Platform – GTP pipeline started in September 2018 and the Environmental Permit is expected by mid January 2019. The CP for this segment of the pipeline will be issued by the Ministry of Energy, as outlined by Law no. 258/2018.

   In addition to the environmental regulatory documents, the other relevant permits required by the applicable legislation have been or will be obtained prior to the issuance of the CP.

Depending on any future legal enactments, the permitting process will be revised and adjusted in order for BSOG to perform the most adequate and efficient permitting for MGD Project.

2.1.3 Social Impact Assessment – main legal provisions

At the national level, there are no specific requirements for social impact assessment. Nevertheless, some provisions for stakeholder engagement and subsequent impact assessment are included in several regulations and procedures relevant for the Project, including:

- > The Romanian Constitution, which stipulates that "*a person's right of access to any information of public interest cannot be restricted*" and that "*the public authorities, according to their competence, shall be bound to provide for correct information of the citizens in public affairs and matters of personal interest*";
- > Law no. 86/2000, for ratification of the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, signed in Aarhus on 25 June 1998 (Aarhus Convention);
- > Law no. 544/2011 regarding the free access to information of public interest, which defines and details the free access of any person to any piece of information of public interest, which, as a general principle, constitutes one of the fundamental principles of the relationship between citizens and public authorities in accordance with the Constitution of Romania and with the international undertakings ratified by the Parliament of Romania. The law stipulates further that public authorities or institutions will ensure that access to information of public interest shall be done ex officio or upon request, through the intermediary of the department for public relations or through the intermediary of the person appointed for this purpose;
- > Government Decision no. 878/2005 on right to access to environmental information transposes EU Directive 2003/4/CE from 28 January 2003 (on right to access to environmental information and repealing the Directive no. 90/313/CEE), and ensures the right to access environmental information held by or for the public authorities and sets out the conditions, general terms and ways to exercise that right;
- > Emergency Government Ordinance no. 195/2005, related to environmental protection (EGO no. 195/2005), clearly provides that the state recognizes the right of any person to an "ecologically healthy and balanced environment" and for this purpose, the state warrants, inter alia, free access to environment related information, including the right of any person to be consulted during a process of making environment-related decisions *i.e.* legislation, plans and programmes, and the right to access to justice;
- > Further, EGO no. 195/2005 clearly stipulates that the Competent Authority for Environmental Protection together with all other local and central public authorities, if the case, will ensure proper access to information, participation of the public in specific activities related to decisions and access to justice in accordance with the requirements of the Aarhus Convention;
- > Government Decision no. 445/2009 on environmental impact assessment pertaining to certain public and private projects (GD no. 445/2009) states that the relevant information has to be made publicly available by the investor and/or the national authorities during each of the EIA stages. Public consultations and open disclosure of documentation connected with the project have to be carried out and financed by the Investor in close connection with the guidance given by the relevant authority and consistently with the requirements of the relevant Romanian legislation;
- > Order no. 135/84/76/1284/2010 for the approval of the methodology for environmental impact assessment for public and private projects (Order no. 1284/2010), details the necessary stages for the performance of the EIA procedure, as listed under GD no. 445/2009. In this context, Order no. 1284/2010 contains very specific and detailed information on the timing of disclosure of the relevant documents, the method of involving of the interested public, the organisation of public consultation meetings, including but not limited to the way of taking account of the comments raised/amendments proposed by the interested public, for the final EIA documentation;
- > Order no. 2701/2010 on the methodology regarding the mechanism of information and consultation of the public on the occasion of preparing or revising the zonal planning and urbanism plans provides the legal framework for performing the information disclosure and public consultation as a prerequisite for approving any urbanism and zonal planning documents;

- Law no. 52/2003 on decisional transparency in public administration whose provisions enhance the accountability of government towards the citizen and the beneficiary of the administrative decision, and aim to increase the involvement of citizens in decision-making processes of the administrative and legislative drafting process, to enhance transparency across government; and
- Order no. 863/2002 on the approval of the methodological guidelines applicable to the stages of the environmental impact assessment procedure.

2.2 Applicable International Legislation

2.2.1 International conventions and protocols

Romania has ratified both Aarhus and Espoo international conventions as follows:

- United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters 1998, ratified by Law no. 86/2000 (Aarhus Convention); and
- The 1991 UNECE Convention on Environmental Impact Assessment in a Transboundary Context, ratified by Law no. 22/2001 (Espoo Convention).

Compliance with public participation requirements defined by Aarhus Convention will be fully covered by MGD Project through the compliance with Romanian legislation and EBRD standards.

Additional international conventions that will be accounted for comprise:

- Convention on the Protection of the Black Sea against Pollution, 1992, Bucharest, ratified by Law no. 98/1992 and related Black Sea Biodiversity and Landscape Conservation Protocol, ratified by Law no. 218/2011;
- IMO Convention for the Prevention of Pollution from Ships, 1973 and the Additional Protocol from 1978, ratified by Law no. 6/1993 (MARPOL 73/78);
- IMO Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, ratified by Government Ordinance no. 14/2000 (OPRC Convention);
- International Convention on Civil Liability for Oil Pollution Damage, 1992, ratified by Government Ordinance no. 15/2000 (CLC Convention);
- European Convention on the Protection of the Archaeological Heritage, 1992, ratified by Law no. 150/1997 (La Valetta Convention);
- European Landscape Convention, 2000, ratified by Law no. 451/2002 (Florence Convention);
- Convention on the Conservation of European Wildlife and Natural Habitats, 1979, ratified by Law no. 13/1993 (Bern Convention);
- Convention on Biological Diversity, 1992, ratified by Law no. 58/1994 (CBD); and
- Convention on Conservation of Migratory Species of Wild Animals, 1979, ratified by Law no. 13/1998 (Bonn Convention).
- The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), 2001, established under the auspices of the Bonn Convention (UNEP/CMS).

2.2.2 EU Regulations

The following EU Regulations are relevant to MGD Project:

- Regulation (EU) no. 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC;
- Regulation (EU) no. 601/2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council;
- Regulation (EC) no. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) no. 1907/2006;
- Regulation (EC) no. 1907/2006 concerning the registration, evaluation, authorisation and restriction of chemicals, establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (REACH);
- Regulation (EC) no. 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC; and
- Regulation (EC) no. 850/2004 on persistent organic pollutants and amending Directive 79/117/EEC.

2.3 EBRD Policies

The EBRD Environmental and Social Policy (ESP; EBRD, 2014) sets out the Bank's commitments to promote environmentally sound and sustainable development in all its activities. It explains the requirements for environmental and social assessment of projects, including those for which comprehensive Environmental and Social Impact Assessment (ESIA) is needed. There are a number of EBRD Performance Requirements (PRs) which are relevant to MGD Project including:

- PR 1: Assessment and Management of Environmental and Social Impacts and Issues;
- PR 2: Labour and Working Conditions;
- PR 3: Resource Efficiency and Pollution Prevention and Control;
- PR 4: Health and Safety;
- PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement;
- PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- PR 8: Cultural Heritage; and
- PR 10: Information Disclosure and Stakeholder Engagement.

A number of good practice and guidance documents have been considered during this ESIA to ensure that it meets the relevant requirements (including the PRs outlined above) and considers relevant aspects. These include:

- Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning (Hardner *et al*., 2015);
- Good Practices for the Collection of Biodiversity Baseline Data (Gullison *et al*., 2015);
- EBRD Methodology for Assessment of Greenhouse Gas Emissions. Guidance for consultants working on EBRD-financed projects (EBRD, 2010);

- Guidance Note: EBRD Performance Requirement 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources (EBRD, 2016);
- Procedures for Environmental and Social Appraisal and Monitoring of Investment Projects (EBRD, 2015); and
- EBRD specific guidelines that are prepared for supporting clients in implementing the EBRD (2014) ESP. The following guidelines are available at EBRD:
  - Employment
  - Forced labour
  - Children, young people and work
  - Non-discrimination and equal opportunity
  - Workers' accommodation: processes and standards

2.4 Equator Principles, IFC Performance Standards and WBG EHS Guidelines

2.4.1 The Equator Principles

BSOG has been asked to commit to the Equator Principles alongside the EBRD's Environmental and Social Policy and Performance Requirements. The Equator Principles establish a risk management framework, that has been widely adopted by financial institutions around the world, for determining, assessing and managing environmental and social risk in projects funding. Their main purpose is to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making throughout project finance or investment contracts.

The current version of the Principles (EPIII, 2013) comprise the following statements:

4. Review and Categorisation
5. Environmental and Social Assessment
6. Applicable Environmental and Social Standards
7. Environmental and Social Management System and Equator Principles Action Plan
8. Stakeholder Engagement
9. Grievance Mechanism
10. Independent Review
11. Covenants
12. Independent Monitoring and Reporting
13. Reporting and Transparency

Broadly, Principles 1-6 relate to environmental and social risk control, whilst Principles 7-10 are concerned with initial due diligence/ESAP, and encouraging compliance through financial covenants, ongoing performance monitoring and reporting, as well as specific disclosures to both stakeholders and providers of finance.

Although broadly aligned with the EBRD's environmental and social criteria, EPIII introduces some additional obligations which, if relevant to the MGD Project, are addressed in this ESIA. For example, Principle 2 includes a potential need to undertake human rights due diligence; however, BSOG and its consultants do not consider that the MGD Project presents a high risk in relation to human rights issues[1]. However, Annex A on Climate Change: Alternatives Analysis, Quantification and Reporting of Greenhouse Gas Emissions is more directly relevant and is addressed in the relevant sections of this ESIA.

More pertinently, Principle 3 differentiates between 'Designated' and 'Non-Designated' countries. Currently, Romania is identified as a 'Non-Designated' country (see http://equator-principles.com/designated-countries/) so compliance is also required with the relevant IFC Performance Standards and World Bank Group Environmental, Health & Safety (EHS) Guidelines, where their criteria is more stringent than Romanian law or EBRD's criteria.

2.4.2 The IFC Performance Standards

The following 2012 versions of the IFC Performance Standards (PS) are relevant to MGD Project including:

- PS 1: Assessment and Management of Social and Environmental Risks and Impacts (which sets out the IFC requirements for stakeholder engagement)
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety and Security
- PS 5: Land Acquisition and Involuntary Resettlement
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PS 8: Cultural Heritage

Whilst the IFC PS and EBRD PR contents are generally equivalent, there are some differences - some of which are subtle - that also require due consideration in this ESIA. Consequently, although EBRD requirements are the main focus, IFC standards are also considered and, where these differ, the more stringent of them shall be addressed in this ESIA.

2.4.3 WBG EHS Guidelines

These Guidelines are technical reference documents, which broadly define 'good international industry practice' and set specific minimum design and operating standards (such as emissions, discharge or exposure limits) regarding the environment, occupational health and safety, community health and safety, and life cycle impacts including during construction, operation and decommissioning. Stipulated performance levels and measures are "generally considered to be achievable in new facilities by existing technology at reasonable costs".

The General EHS Guidelines are designed to apply to all projects and all sectors, but the detailed requirements can be superseded by sector guidelines, where factors such as facility size, technology and associated impacts merit specific attention. They have a particular relevance to construction-phase impacts, which are not normally addressed in the sector guidelines, and to the environmental impacts of design and operation of 3-50 MWth thermal power plant.

The EHS Guidelines for Offshore Oil and Gas Development were updated and reissued in 2015, to address the safety failings of the Deepwater Horizon loss of containment measures and align with evolving industry technologies. These Guidelines include inter alia information relevant to exploratory and production drilling, development and production activities, offshore pipeline operations, ancillary and support operations, and decommissioning. They also address potential onshore impacts that may result from offshore oil and gas

[1] Review of the US State Department, Bureau of Democracy, Human Rights and Labour, 2017 Country Report for Romania indicated that "the most significant human rights issues included: endemic official corruption; police violence against the Roma community; and violence against LGBTI persons". Moreover, BSOG is committed to policies on *inter alia* anti-corruption, non-discrimination and fair treatment of stakeholders.

activities. The 2007 EHS Guidelines for Offshore Oil and Gas Development are still undergoing revision but set out equivalent performance criteria and recommended impact mitigation measures.

2.5 Black Sea Oil & Gas Policies

In addition to meeting the above requirements, BSOG will complete MGD Project in compliance with its Corporate HSE policies, standards and guidelines, including:

- Environmental Policy;
- Health and Safety Policy;
- Major Accident Prevention Policy;
- HSE Management System Manual and associated elements guidelines;
- HSE Risk Management Standard;
- Management of Change Guideline;
- Whistleblower Policy;
- Risk Management & Lessons Learned Guideline;
- HSE Risk Acceptance Criteria;
- HSE Audit Guideline;
- Management Review & Performance Monitoring Guideline; and
- Plans, Objectives, Targets & Implementation Guideline.

BSOG is certified to ISO 14001:2015 in addition to ISO9001:2015 and OHSAS1800:2007. Additionally, BSOG is developing an Environmental and Social Management System (ESMS) and Corporate Social Responsibility (CSR) procedures specific to MGD Project. As a company commitment, BSOG requires itself to have mechanisms in place to identify, monitor and seek to minimise and reduce water use, air emissions, waste-water discharges and wastes disposal in line with good industry practice including Best Available Techniques (BAT) and Best Practicable Environmental Option (BPEO) and national legislation.

3 THE APPROACH TO ESIA

3.1 Introduction

ESIA is an assessment of the environmental and social impacts and issues of a project. In line with the EBRD Environmental and Social Policy (EBRD, 2014), social impacts are considered to be those on individuals, the community and workers. The ESIA process identifies the areas of a project where potentially significant environmental or social impacts may occur, and outlines mitigation measures or management techniques aimed at reducing or offsetting these effects.

The ESIA for MGD Project has employed a systematic approach to identifying the potential impacts that the Project could have on the environment and on people. The process involved developing a detailed understanding of all stages of the project e.g. proposed construction, operation and decommissioning activities, and of the environmental, social and regulatory context within which the proposed project would be executed.

The potential impacts were identified and evaluated to determine their significance. Where potential impacts are likely to be significant, specific measures are identified to reduce or remove such effects (mitigation measures). The ESIA process also requires the identification of any appropriate monitoring to either confirm impacts predicted by the ESIA and/or demonstrate compliance with legal requirements.

The overall ESIA process is delivered through several stages including:

> ESIA screening and scoping;

> Detailed environmental and social assessment culminating in the production of the ESIA Report;

> Development of an Environmental and Social Management Plan (ESMP) documenting the actions required to address the project's environmental and social impacts and issues; and

> Monitoring of the environmental and social performance of the Project.

Throughout the whole ESIA process, BSOG has conducted stakeholder engagement as described in the project Stakeholder Engagement Plan (SEP) and issued the corresponding yearly Stakeholder Engagement Reports (SER). Further details of the stakeholder engagement process are provided in Section 3.8.

The approach to the impact assessments, and the ESIA methodology described below, has been guided in particular by:

> Relevant Romanian legislation as described in Section 2.1, especially GD no. 445/2009, Order no. 135/2010 and Order no. 19/2010; and

> The requirements of the EBRD Environmental and Social Policy (EBRD, 2014), particularly PR 1 Assessment and Management of Environmental and Social Impacts and Issues, and relevant guidance (see Section 2.3).

3.2 Screening

EIA Screening is the process by which it is determined whether or not an EIA is needed for a proposed project. In Romania, the screening decision is made by the competent environmental authority, utilising information provided by the project owner (applicant) in a 'Presentation Memorandum' for the project in accordance with Order no. 135/2010. The Presentation Memorandum contains technical data about the proposed project and a brief outline of potential impacts. Further details of when an EIA is mandatory are provided in Section 2.1.1.

Depending on the location of the proposed project in relation to Natura 2000 protected areas the Presentation Memorandum is completed with the appropriate information in accordance with Order no. 19/2010. This allows the competent authority to identify the need for an AA process and preparation of corresponding AA Report under the EU Habitats Directive and the EU Birds Directive.

BSOG also undertook an ESIA screening exercise to support the categorisation and risk ranking of the Project and identification of ESIA requirements taking account of the EBRD Environmental and Social Procedure. Consideration was also given to other International Finance Institution requirements, including the IFC Performance Standards, World Bank Guidelines and the Equator Principles. The ESIA Screening Report outlines the main features of MGD Project, the planned construction activities and the key sensitivities within the project area, particularly with respect to biodiversity and conservation, archaeological interests, and users of the sea and land in the project area of influence. The report identifies the relevant PRs to be considered in the ESIA, and the key guidance documents to be followed.

In addition, BSOG conducted a legislative comparison to identify the additional requirements required by the ESIA with respect to Romanian permitting requirements.

3.3 Scoping

3.3.1 Overview

The overall ESIA scoping process informed, and was informed by, the scoping processes required under Romanian legislation as outlined below. It also identified the additional ESIA requirements to meet the EBRD PRs and good international industry practice (GIIP).

An ESIA Scoping Report was produced in June 2017 based on:

- The environmental assessments already conducted or underway for the MGD Project and the associated Romanian scoping processes;
- A review of existing environmental and social baseline data and identification of additional surveys and studies needed to inform the ESIA;
- An Environmental Issues Identification (ENVID) exercise (see Section 3.3.3); and
- The outcomes of stakeholder consultation.

3.3.2 Romanian EIA, SEA and Appropriate Assessment Scoping Processes

Scoping for EIA and AA under Romanian law is a formal process, conducted based on the guidelines and checklists prescribed in Annex 1 of Order no. 863/2002. Subsequently, the environmental authority drafts the Terms of Reference (ToR), based on which the investor prepares the EIA Report and the AA study.

Under the Romanian EIA procedure, EIA Scoping is (as for EIA Screening) conducted by the competent environmental authority, based on information provided by the project owner (applicant) in the 'Presentation Memorandum' for the project in accordance with Order no. 135/2010. At the Scoping Stage, the competent environmental authority advises the project owner of the issues that need to be addressed in the EIA and the required content of the EIA Report. The Presentation Memorandum also allows the competent authority to define the requirements of the AA process under the EU Habitats Directive and EU Birds Directive.

Except for the SEA process for the onshore segment of the Ana Platform – GTP pipeline, in respect of which the competent environmental authority is the Danube Delta Biosphere Reserve Administration (DDBRA), the competent environmental authority for the other components of MGD Project is the Environmental Protection Agency of Constanta (EPA Constanta).

In addition to statutory EIA and AA requirements, the Onshore Component required SEA Reports and accompanying AA Reports to obtain environmental consents for the Urban Zoning Plans prepared by BSOG.

As part of this process, a Presentation Memorandum, a SEA Report and a corresponding AA Report with respect to the non-beach segment of the onshore pipeline was submitted to DDBRA in 2015, providing an overview of the proposed plan, its location in relation to Natura 2000 sites, information on the presence of species and habitats of community interest in the area, and an overview of the potential impacts of the proposed plan on species and habitats of community interest. Mitigation measures for the most significant impacts have been identified and an environmental consent has been issued. Similarly, a permitting process has been conducted for the beach portion of the onshore pipeline and a Presentation Memorandum was submitted to DDBRA, which in turn issued the Framing Phase Decision with no SEA requirement.

3.3.3 Environmental Issues Identification (ENVID)

Potential environmental and social impacts and risks arising from the Project have been identified using information associated with project activities, prevailing environmental and social conditions within the anticipated project area of influence, and professional judgement using experience gained from similar projects undertaken internationally. Following identification of the baseline conditions and development of the proposed project description, a FEED stage ENVID workshop was held on 31st January and 1st February 2017 to identify the potential environmental impacts that might be associated with MGD Project.

ENVID is a tool used to:

- Identify potentially significant environmental impacts at an early stage in a project, to help inform the ESIA process;
- Facilitate the iterative input of environmental considerations to the design and decision-making processes for the project; and
- Provide input to the risk assessments required for design development and technical assurance.

The ENVID process used has been developed by Xodus and draws on a variety of international best practice guidelines. It also met the relevant requirements of BSOG's Risk Management and Lessons Learned Guidelines. The outputs from the ENVID have been used to inform ESIA Scoping and will contribute to the development of an Aspects Register as part of BSOG's ESMS.

An ENVID workshop provides a systematic, team-based approach to identify or confirm the environmental aspect of the project, the potential environmental impacts and risks, and the design requirements or management measures needed to remove or reduce significant impacts to acceptable levels. Although ENVID is mostly focussed on environmental issues, consideration was also given, where possible, to potential social issues. The ENVID workshop covered the following operational areas:

- Wells and drilling;
- Subsea (i.e. Doina Subsea);
- Topsides (i.e. Ana Platform);
- Onshore pipeline and beach crossing (i.e. relevant part of the onshore segment of the Ana Platform – GTP pipeline); and
- The GTP.

Each of the operational areas was reviewed against a range of lifecycle stages and operational conditions (as appropriate to each operational area):

- Transport, construction (including site preparation) and installation;
- Pre-commissioning and commissioning;
- Shut-down and start-up;
- Normal operating modes;
- Abnormal and upset operating conditions;
- Inspection, maintenance and repair;
- Decommissioning; and
- Accidental events (including spills).

Once identified, the potential impacts and risks associated with the MGD Project were assessed to determine their significance, so that measures could be taken to remove or reduce any potentially significant impacts through design or operational measures (mitigation). Impacts and risks with potentially significant consequences were taken forward for more detailed consideration and assessment in the ESIA.

Factors considered during the ENVID included:

- The character, sensitivity and current usage of the environment within the project area of influence;
- The nature and scale of the project activities;
- The likely nature, magnitude and duration of the potential impacts arising from project implementation;
- Sensitivity of the physical, biological and socio-economic receptors and/or resources; and
- The level of confidence in the predictions.

The significance of any potential impact was determined using a risk assessment approach which employs the standard risk assessment philosophy of:

Magnitude of potential impact (consequence) x likelihood of occurrence (frequency/probability) = Risk

The consequence of each impact was considered against the following three drivers:

- **Potential environmental impact (E):** Consideration of potential environmental sensitivities and scientific evidence on potential environmental impacts;
- **Stakeholder concern (S):** Consideration of other users (potential conflict/ concern resolution), interest groups, media and the general public (wider concern), and perceived potential impacts; and
- **Regulatory compliance (R):** Consideration of current and anticipated future legislative requirements.

In order to assess the significance of a potential impact, the overall consequence is combined with the likelihood (frequency/probability) of the potential impact occurring. An additional 'frequency' column is provided to allow assessment of impacts from planned activities. Both significance and likelihood are semi-quantitative representing best judgements on the basis of knowledge and experience available. A worksheet allows a consistent basis for presenting such a broad-based risk assessment. Interpretation of the overall risk in terms of potential impact significance can then be undertaken.

A key output of the ENVID was a high-level assessment of the potential project impacts and an indication of their potential significance. Potential impacts for MGD Project were ranked using the high-level criteria identified in Table 3.1.

Table 3.1 Potential environmental significance rankings

	Environmental risk	Potential impact significance (as defined under the EIA regulations)
Severe	Elevated risk - requires major consideration in design process and/or operational planning	Considered significant
Major	Elevated risk - requires immediate attention and major consideration in design process and/or operational planning	Considered significant
Moderate	Moderate risk - requires additional control measures where possible or management/communication to maintain risk at less than significant levels	Not significant with additional management measures in place
Minor	Minor risk - however will require some management/commitment to maintain risk at less than significant levels	Not significant
Negligible	No risk - no action required	Not significant
Positive	Positive – to be encouraged	Positive impact

3.4 Strategic Environmental Assessment (SEA)

At the time of formal commencement of the ESIA process (towards the end of 2016), BSOG had already conducted a SEA process and accompanying AA process to obtain the approval of the Urban Zoning Plan for the construction of the non-beach segment of the onshore segment of the Ana Platform – GTP pipeline. The SEA Report and accompanying AA Report were submitted to DDBRA in Quarter 3 of 2015 and the corresponding public debate was held on 27 November 2015. The approval of the SEA represented by the issuance of the Environmental Consent was granted in January 2016. A similar procedure has been conducted for the GTP, with the AA Report for the GTP in relation to the corresponding Urban Zoning Plan submitted to EPA Constanta in December 2016 and the SEA Report submitted in March 2017. The public debate of the SEA Report took place on 2 May 2017 and the Environmental Consent was issued in June 2017. Once the SEA Report had been approved, BSOG conducted an environmental impact assessment process and submitted the relevant EIA Report and AA Report, which were validated by EPA Constanta through the issuance of the corresponding Environmental Permit in July 2018. The CP for the GTP was subsequently issued in July 2018. The permitting procedures for the beach portion of the onshore pipeline were carried out in Quarter 1 of 2018 in relation to an Urban Zoning Plan, which was approved in July 2018.

The SEA Reports and AA Reports (beach segment excepted) have informed the present ESIA.

3.5 Regulatory EIAs and Habitats Regulations Appraisal

Included within the environmental part of the overall ESIA process are the various environmental assessments, including EIA and AA.

Two EIA Reports have been prepared for the purposes of the ESIA:

- Offshore EIA in relation to the Offshore Component of MGD Project; and
- Onshore EIA in relation to the Onshore Component of MGD Project.

AA Reports corresponding to the EIAs were also submitted, covering the offshore facilities, the GTP and the onshore pipeline including the beach crossing.

All AA Reports and EIA Reports included a cumulative impact assessment related to the entire infrastructure of MGD Project.

As mentioned above, for permitting purposes the preparation of the EIA and AA Reports was split by BSOG in accordinance with permitting necessities. Nonetheless, the content of the two types of Reports is consistent with each other.

The EIA Reports and AA Reports for the ESIA were prepared in early 2018. All of these environmental assessments form part of the overall ESIA process. BSOG has used these environmental assessments to prepare this ESIA Report incorporating the EIA Reports and AA Reports, together with the socio-economic and social impact assessments required to meet lender (EBRD and/or IFC) requirements.

3.6 MGD Project's Area of Influence

For the purpose of MGD Project, the "study area" or the area of influence (AoI) has been determined as the area of relevance for the environmental and social assessments. The AoI describes the extent over which project impacts are pertinent.

The extent of the AoI differs depending upon the type of impact being considered and the attributes of the potentially affected receptors. It may also extend across administrative or national boundaries, although it is noted in this instance that no transboundary impacts have been identied for this project). In each case, however, the AoI includes all areas within which significant impacts are likely to occur taking into account the physical extent of the proposed works, defined by the limits of land to used (temporarily or permanently) for / by the project and the nature of the baseline environment and manner in which impacts are likely to be propagated beyond the project limits.

For MGD Project, the AoI includes the footprint of all project related activities, namely the location of the Offshore Component, the exclusion zone around Ana Platform (500 m) and the pipeline's route corridor (200 m left and right from the axis of the pipelines), the location of the Onshore Components, the onshore pipeline working strip (which has a width of approximately 20 m and includes room for pipeline installation and for simultaneous vehicle movements) and the corresponding areas of site organization.

Depending on the considered type of impact, a larger area in which a direct or indirect impact on the physical, biological, social or cultural environment might occur was considered. Where different areas are used this is discussed in the respective section of this Report.

3.7 MGD Project Associated Facilities

Associated Facilites (AF) are those facilities or activities which are not part of the envisaged project but whose existence is generated by/exists only in relation to the project. To the extent possible, the potentially significant environmental and social issues related to AF should be considered in the assessment process. AFs may or may not be under the control of the project owner.

For the purposes of MGD Project, the Vadu – T1 pipeline i.e. "Expansion of the NTS through building a natural gas transportation pipeline from the Black Sea gas takeoff point (area of Vadu) to the Transit 1 pipeline (area of Grădina), including power supply for the cathodic protection station at Săcele, groups of valves and installation of sensitive optic fibre in Corbu, Săcele, Cogealac and Grădina communes, Constanta county" carried-out by Transgaz SA has been identified as being an AF (Vadu - T1 pipeline).

The purpose of Vadu -T1 pipeline is to extend the NTS up to the GTP in order to allow the take-over of the gas produced by MGD Project in the NTS. As such, Vadu - T1 pipeline, falls under the scope of Transgaz. It has intially been included in the Ten Year National Gas Transmission System Development Plan 2016 – 2025 and declared a project of national interest via Government Decisiion no. 563/2017, thus being subject to the development process set by Law no. 185/2016 re certain measures for the implementing of national importance projects in the domain of natural gas (Law no. 185/2016). Since November 2017, it has also been included in the List of Projects of Common Interest via Regulation 2018/540 – NSI East Gas, item 6.24.10, 3rd line.

The Vadu – T1 pipeline is a 20-inch underground pipeline having an approximate length of 24.5 km, crossing the AUs of Corbu, Sacele and Gradina. The only above-ground installations are the pig launcher/receiver, isolation valves and cathodic protection. It followed the regulatory process set-out by national legislation, which comprised a full EIA process (AA included) being carried out in 2017 and the Environmental Permit being issued in November 2017. The Ministry of Energy issued the related CP in December 2017.

The AF's impact in relation to MGD Project has been considered in the performance of the MGD Project's cumulative impact assessment, both for the purposes of this Report and for the EIA process carried out for the permitting under national legislation, in order to identify the potential risks and impacts and the corresponding mitigation/management measures required.

3.8 Environmental Baseline Data Gathering

Common to all ESIA activities is a requirement to focus the gathering of baseline data on those elements of the environment that could potentially be affected by the project (the environmental receptors). Baseline data help to inform the assessment of potential impacts and may also provide a basis for future environmental effects monitoring to be conducted as part of environmental management and monitoring programmes. An environmental baseline data gap analysis was undertaken prior to ESIA scoping and involved:

- Collating and reviewing the environmental baseline data available for MGD Project;
- Assessing these data in the context of the requirements of the ESIA process; and
- Identifying any gaps requiring further data collection or interpretation.

Reference was made to GIIP with respect to environmental baseline data, including:

- EBRD Environmental and Social Policy, particularly PR 1 – Assessment and Management of Environmental and Social Impacts and Issues and PR 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources (EBRD, 2015);
- Guidance Note: EBRD Performance Requirement 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- 'Good Practices for the Collection of Biodiversity Baseline Data' (Gullison *et al.,* 2015);
- Guidance Note PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012);
- 'Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning' (Hardner *et al.,* 2015);
- The IFC General EHS Guidelines, EHS Guidelines for Offshore Oil and Gas Developments, and the EHS Guidelines for Onshore Oil and Gas Developments[2]; and
- These guidelines discuss in particular the requirements for baseline air quality assessments and baseline noise assessments with respect to onshore developments, and the requirement for baseline assessment of ambient water quality where discharges to surface waters are planned to take place.

The ESIA process is based on recent environmental baseline data at an appropriate level of detail. It covers all relevant known direct and indirect environmental impacts and risks, and relevant stages of the project e.g. pre-construction, construction, operations, and decommissioning and reinstatement, within the project's AoI.

With respect to biodiversity, EBRD's PR 6 requires the assessment process to characterise the baseline conditions to a degree that is proportional and specific to the anticipated risk and significance of impacts. The baseline assessment must consider (but is not limited to) potential loss of habitat, degradation and fragmentation, invasive alien species, overexploitation, migratory corridors, hydrological changes, nutrient loading and pollution. Of particular importance is the identification of "priority biodiversity features" and "critical habitat". EBRD categorises priority biodiversity features as a subset of biodiversity that is particularly irreplaceable or vulnerable, but at a lower priority level than critical habitat. Priority biodiversity features include threatened habitats, vulnerable species, significant biodiversity features, and ecological structure and functions needed to maintain the viability of priority biodiversity features. Critical habitat, on the other hand, comprises highly threatened or unique ecosystems, habitats of significant importance to endangered or critically endangered species, habitats of significant importance to endemic or geographically restricted species, habitats supporting globally significant migratory or congregatory species, areas associated with key evolutionary processes, and ecological functions that are vital to maintaining the viability of these features (EBRD, 2014).

The environmental gap analysis study concluded that, overall, there is a good body of environmental baseline data available to support the ESIA process with respect to potential impacts on the offshore and onshore environments.

[2] These guidelines discuss in particular the requirements for baseline air quality assessments and baseline noise assessments with respect to onshore developments, and the requirement for baseline assessment of ambient water quality where discharges to surface waters are planned to take place.

3.9 Social baseline data gathering

A Socio-economic Baseline Report prepared by specialist Romanian consultancy Green Partners has been used to inform the ESIA. This involves:

- Reviewing existing social baseline information for the marine and terrestrial components project area (secondary data collection);
- Identifying gaps to inform the ESIA process and meet the relevant performance requirements and guidelines for social impact assessment; and
- Undertaking additional social surveys or studies required to fill gaps identified (primary data collection).

Secondary data were retrieved from official sources, such as:

- Romanian National Institute of Statistics;
- Population and Housing Census, 2011;
- Available Reports at Company level (i.e. Scoping Report, Environmental Studies and Permits, Maps, internal procedures, policies, communication tools);
- Official websites and reports prepared by different ministries (e.g. Ministry of Labour and Social Justice, Ministry of National Education, Ministry of Health, Ministry of Agriculture and Rural Development) or by other authorities such as DDBRA;
- Constanta County School Inspectorate website;
- Mobile Emergency Service in Romania website;
- The official website of Corbu Municipality; and
- The official website of BSOG.

Primary social data collection and analysis involved a socio-economic baseline survey based on meetings and interviews. The project social AoI was defined taking into consideration the following:

- All the facilities, operations, and services owned or managed by BSOG (pipeline, GTP and other above-ground installations) or other associated facilities (construction sites which includes the pipe storage yard) or businesses;
- Main characteristics of the pipeline (length, corridor width, width of the working strip, marsh crossing, road crossings, etc.);
- Villages and households located in the proximity of the pipeline and of the GTP;
- Neighbouring land-owners;
- Areas with existing vulnerability issues already identified by the MGD Project;
- Economic activities in the area (tourism and fishery, other pipelines, industry and agriculture);
- Areas which may be affected by MGD Project-related transportation; and
- Access roads, etc.

A physical (for the onshore only) and also a virtual (via Google Earth map) walk-thorough of the infrastructure was performed in order to determine if households and other assets (such as military areas, fishing routes, etc.), including possible vulnerable groups such as Roma are located along or in the vicinity of MGD Project location.

Primary data collection was conducted through site visits to the location of the Onshore Component of MGD Project and meetings with the following stakeholders: Corbu Municipality, National Agency for Fishing and Aquaculture, DDBRA, Romanian Naval Authority (RNA) and a touristic unit located in Corbu AU.

The meetings were established in order to collect local information on:

- Demographic data;
- Public utilities and Public infrastructure;
- Local traditions;
- Land use and agriculture;
- Tourism;
- Fishing;
- Shipping and navigation;
- Livelihood and other business in the area;
- Knowledge about the project and previous experiences with similar projects.

3.10 Stakeholder consultation

The methodology for consulting with stakeholders on the scope of the ESIA is included in the SEP for MGD Project, as described further in Section 3.13.

EBRD's PR 1, together with PR 10, make it clear that engagement with the project stakeholders is an integral part of the process of assessing the potential environmental and social impacts and issues associated with the project, and developing and implementing procedures for managing and monitoring these impacts and issues (i.e., in the present case, the ESIA process). PR 10 states that the process of stakeholder engagement should begin at the earliest stage of project planning and continue throughout the life of the project. In particular, Clause 22 notes that the client will engage in a scoping process with interested parties and identified stakeholders at an early stage of the ESIA process to ensure identification of key issues to be assessed as part of the ESIA. As part of the scoping process, stakeholders should be able to provide comments and recommendation on a draft SEP and other scoping documents. Also, PR 8 states that consultation with stakeholders and affected communities should be made in the context of cultural heritage issues.

Early stakeholder engagement activities were related mainly to the permitting processes that started in 2014 and are still ongoing, and to the land acquisition process that was finalised in 2016.

The following engagement activities have been undertaken by the BSOG team:

- **Development of the project website** – via this website, the company constantly provides information to all interested stakeholders about the project's development and makes public announcements about key stakeholder decisions, public consultation processes, and decisions related to permitting process;
- **Official letters/correspondence with national/regional/local authorities** – BSOG has participated fully in the various permitting procedures for the components of the Project. These procedures are ongoing and shall expand to cover the elements of MGD Project in its entirety. On-going relevant engagement with many authorities continues throughout this process;
- **Direct meetings** – BSOG has organised and participated at a significant number of meetings with representatives of the various authorities to explain and present the Project. Also, a series of meetings were organised with landowners in the Corbu and Vadu areas to acquire the necessary land for the onshore activities. The land acquisition process was conducted by the BSOG team, without intermediaries. All necessary private land for the onshore activities has now been acquired. The land acquisition process carried out by BSOG was made via direct voluntary negotiations and full disclosure of the acquisition purpose was made in the land transfer deeds. Moreover, the immediate registration

of BSOG, and subsequently of its partners, with the Land Book and with the Tax Direction of Corbu Commune ensured full third-party access to the transfer documents. There are no registered complaints or court cases against BSOG on this matter;

> **Public consultation sessions** – organised in the context of the environmental permitting procedures and urban zoning procedure conducted so far. The public consultation meetings were organised by BSOG with the participation of the competent environmental protection authorities, namely DDBRA and EPA Constanta and the local authority, namely the Local Council and Muncipality of Corbu Commune. Public announcements were made on the websites of these authorities, in national newspapers, on the boards found at the headquarters of the relevant authorities, on BSOG's lands (where applicable) and on BSOG's website. Environmental public debates were held in November 2015 (for the onshore pipeline - non-beach area) and in May and December 2017 for the GTP. Moreover, according to SEA procedure requirements under urbanism requirements of national law, public debates for informing and consulting the public were organised as follows: in February 2016 for the onshore pipeline (non-beach area), in March 2017 for the GTP and in May 2018 for the beach segment of the onshore pipeline. According to the official reports prepared after the public consultation sessions, there was little/no public participation at these sessions; however, comments and questions were raised by an NGO in relation to the EIA Report for the GTP and these were answered in an appropriate and satisfactory manner by BSOG. Public consultation will continue throughout the entire permitting process for MGD Project;

> **Public announcements** – related to public consultations and environmental permitting procedures, posted on the notification boards found at the headquarters of the relevant authorities, on BSOGs lands (where applicable), published in widespread newspapers and published on the company's website;

> **Media coverage** – BSOG has also prepared press releases and media announcements, especially when a project milestone is achieved and whenever a public consultation session was organised; and

> **Internal official reports -** prepared either annually or twice a year for presenting the results of the performance monitoring and evaluation to internal stakeholders and in order to provide meaningful information to all the investors that are supporting BSOG.

3.11 Determination of Impact Significance

3.11.1 Overview

The methods used for identifying and assessing impacts should be transparent and verifiable. In considering impact significance there are certain common policies which should be taken into account. These include:

> Impact magnitude is a measure of the extent of change (based on scale or size of impact, impact duration (temporal change) and geographical extent (spatial extent) combined with frequency (continuous or intermittent). It also takes into consideration nature of the impact (positive or adverse), timing of impact (installation, operation, decommissioning) and the type of impact (direct, indirect, inter-relationship etc.);

> Environmental significance is a value judgement based on professional experience;

> Impact significance requires consideration of magnitude combined with sensitivity, vulnerability and value of the receptor;

> Receptor sensitivity is defined as the degree to which a certain type of receptor is affected by an impact and is based on factual information and scientific knowledge;

> Receptor vulnerability is defined as the degree to which a receptor or system can or cannot accommodate an adverse impact. This is dependent on a number of specific factors such as status

and condition of the receptor population, receptor distribution and abundance and system function combined with impact magnitude;

> It is possible for a receptor to be sensitive to an impact but not vulnerable and vice versa;
> The value or importance of a receptor is based on a pre-defined judgement based on legislative requirements, guidance or policy. In the absence of specific legislative, policy or guidance it is necessary for ESIA technical leads to make an expert judgement on receptor value based on perceived views of key stakeholders, experts and specialists; and
> The sensitivity, vulnerability and value of receptor are combined with magnitude (and likelihood of occurrence where appropriate e.g. accidental events) to arrive at a consequence for each impact based on expert judgment. The significance of impact (in accordance with EIA Regulations) is derived directly from the consequence ranking.

Despite the assessment of impact significance being a subjective process, it is necessary to adopt a defined methodology to define impact magnitude and the sensitivity, vulnerability and value of the relevant receptor in order to ensure that the assessment is as objective as possible and consistent across different topics. However, as the factors under consideration can vary considerably depending on what is being assessed it is also important to acknowledge that there will inevitably be some variation in the process, particularly where there is the potential to impact biological, physical and socio-economic environments.

The overarching methodology used to identify and assess impacts, as well as the significance criteria to be applied, has been developed in accordance with the Romanian EIA Guideline together with GIIP, with reference to the principles and guidance provided by EBRD and other international finance institutions.

Where the assessment of impact on a specific topic required a modified approach (e.g. ecosystem services, which requires the assessment of potential impacts from the perspective of the beneficiaries), the nature and significance of such impacts has been determined using a tailored set of criteria designed for the specific topic – as described separately in the respective impacts section.

The assessment process includes consideration of the following aspects for each topic and potential impact (as described further below):

> Definition of context incorporating consideration of the local sensitivity of the environment, communities and industry; and
> Definition of the intensity of potential impacts considering both the magnitude and duration.

Once context and intensity have been determined, the significance ranking can be determined based on the defined significance matrix.

3.11.2 Overall significance of the impact

The overall significance of impacts was ranked in four categories, Insignificant, Minor, Moderate and Major, taking into account the magnitude of the impact and the importance of the receptor/impact target as shown in Table 3.2. The variables determining the impact magnitude (duration, extinction, reversibility) and the importance of the receptor/impact target were based on experts' assessment.

Table 3.2 Matrix for determining the overall significance of the impact

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="8">Impact magnitude (see Section 3.11.2.1)</th></tr>
<tr><th>High Negative</th><th>Medium Negative</th><th>Low Negative</th><th colspan="2">Negligible</th><th>Low Positive</th><th>Medium Positive</th><th>High Positive</th></tr>
<tr><td rowspan="3">Importance of the receptor/ impact target (see Section 3.11.2.2)</td><td>Low</td><td>Moderate</td><td>Minor</td><td>Minor</td><td colspan="2">Negligible</td><td>Minor</td><td>Minor</td><td>Moderate</td></tr>
<tr><td>Medium</td><td>Major</td><td>Moderate</td><td>Minor</td><td colspan="2">Negligible</td><td>Minor</td><td>Moderate</td><td>Major</td></tr>
<tr><td>High</td><td>Major</td><td>Moderate</td><td>Moderate</td><td>Minor</td><td>Minor</td><td>Moderate</td><td>Moderate</td><td>Major</td></tr>
</table>

3.11.2.1 *Impact magnitude*

The impact magnitude falls within four classes of magnitude: Negligible, Low, Medium, High. The impact magnitude is determined by its duration, extension and reversibility, according to defined criteria for each impact assessment.

3.11.2.2 *Importance of the receiver/impact target*

The impact importance of the receptor falls within three classes as defined below:

> Low - receptor/impact target has low value and/or sensitivity. It did not cause too much worries during impact assessment.

> Medium - receptor/impact target has medium value and/or sensitivity. It caused certain concerns among stakeholders during impact assessment.

> High - receptor/impact target has high value and/or sensitivity. It caused concern among stakeholders during impact assessment.

3.12 Mitigation and Assessment of Potential Residual Impacts

Where potentially significant impacts are identified, mitigation measures must be considered. The intention is that such measures should remove, reduce or manage the impacts to a point where the resulting residual significance is at an acceptable or insignificant level and remain at that level. The three main types of mitigation to be considered include:

> Embedded (measures that are integrated into the project at the design stage);

> Standard practice measures based on specific legislation, regulations, standards, guidance and recognised industry good practice that are put in place to ensure significant impacts do not occur; and

> Additional non-embedded, impact specific, mitigation measures e.g. measures to be implemented / applied through detailed design; additional post consent surveys or studies; development of monitoring programmes; further research; or on-going consultation etc.

BSOG will work to reduce the consequence of the impact or likelihood of an impact occurring through mitigation to address significant residual impacts, addressing stakeholder comments and concerns and applying GIIP.

Residual impacts are those that remain once all options for removing, reducing or managing potentially significant impacts have been taken into account. Ideally, considering relevant mitigation, any residual impact should no longer be significant (i.e. reduced to an acceptable or insignificant level).

However, in some cases a significant residual impact may still remain. Where this is the case, it will be the role of the regulator with necessary advice from statutory bodies, as part of the decision-making process, to determine how the remaining residual impact influences the determination of the consent application.

3.13 Cumulative Impact Assessment

Cumulative and in-combination impacts are an integral aspect of the ESIA process and have been considered for all phases of MGD Project. The ESIA has identified the main on-going and planned activities and projects in the vicinity which, together with MGD Project, need to be considered in assessing potential cumulative or in-combination impacts. These are listed below and illustrated in Figure 3.1:

> PUZ located in the north of the GTP area, namely PUZ - "Introduction in the incorporated area and lotisation for the development of a tourist complex";

> OMV PETROM SA (OMVP) - Midia Terminal, Corbu AU;

> Refinery operated by Rompetrol Rafinare S.A. (Rompetrol Rafinare) located in Năvodari AU;

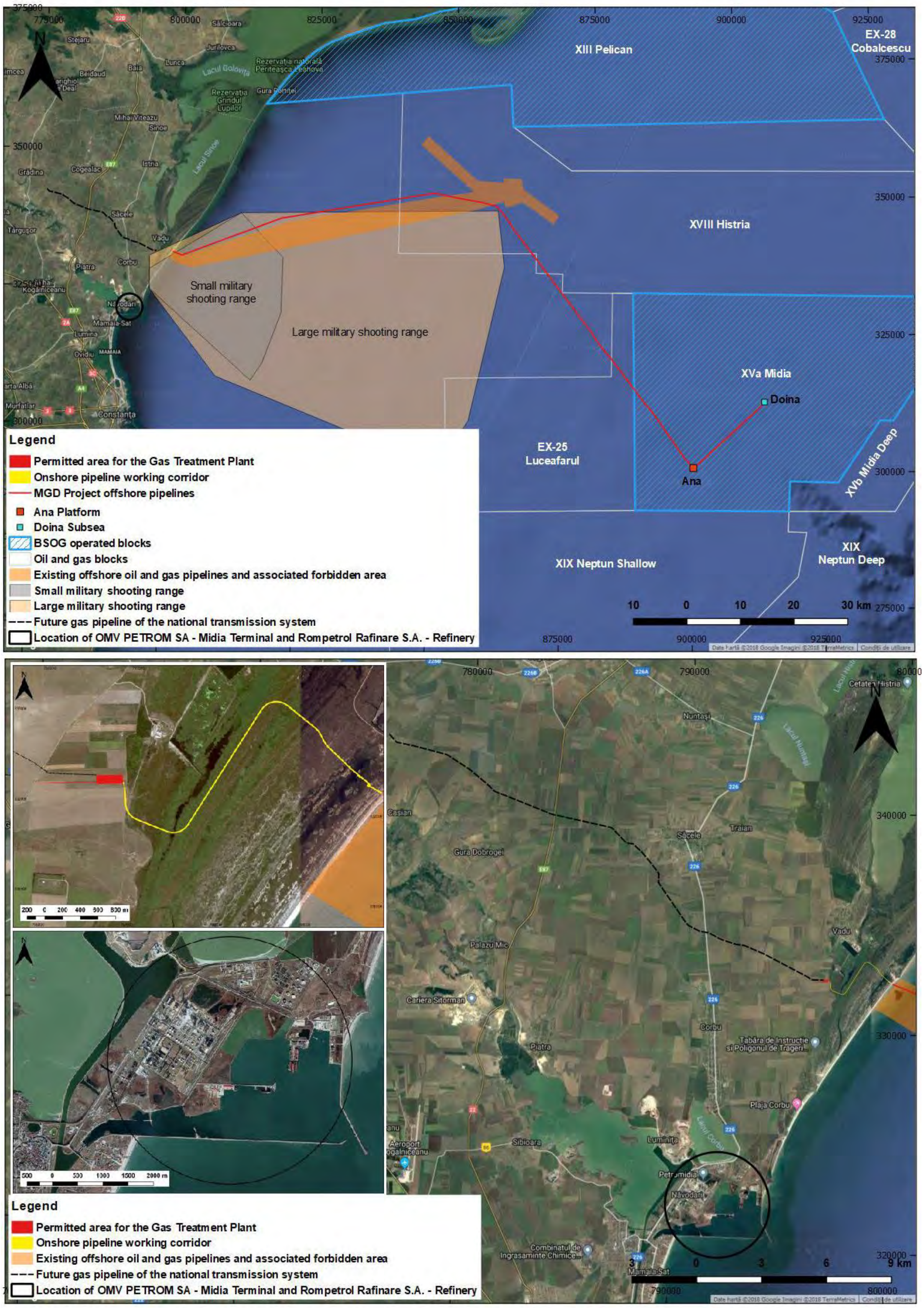
> Naval transportation activities in the Black Sea (transportation routes in the project area);

> The Vadu – T1 pipeline *i.e.* "Expansion of the NTS through building a natural gas transportation pipeline from the Black Sea gas takeoff point (area of Vadu) to the Transit 1 pipeline (area of Grădina), including power supply for the cathodic protection station at Săcele, groups of valves and installation of sensitive optic fibre in Corbu, Săcele, Cogealac and Grădina communes, Constanta county" carried-out by Transgaz SA;

> Marine infrastructure (platform and pipelines for natural gas and oil transportation) of OMVP for the operation of the Lebada facilities; and

> The proposed project for the development of the Neptune Deep gas discovery by Exxon Mobil and OMVP.

The plan proposed for the introduction into incorporated area and separation into lots for the tourism complex could not be found on the internet page of EPA Constanța. However, a project component of this plan was identified: "Construction of agro-touristic pension Ani&Adi – GF+1F+M, leisure arrangement and land fencing in Corbu locality, Corbu commune, Constanța county" respectively. In the presentation memorandum of the project, it is mentioned that the environmental impact caused by its implementation is insignificant. Also, the public announcement on the decision of the stage for the project published by EPA Constanța on 20.12.2016 stipulates that no EIA or Appropriate Assessment (AA) is required for this project. Considering the above-mentioned aspects, this proposed project can be estimated as not having a cumulative impact with the MGD Project.



Data source: Google Maps Images 2018, TerraMetrics 2018, BSOG, Xodus

Figure 3.1 Location of the main on-going and planned activities and projects considered in the cumulative impact assessment

The cumulative impact assessment identified that the MGD Project could generate a negative cumulative impact with sites that perform similar activities, namely the OMVP - Midia Terminal, Corbu AU and the Refinery operated by Rompetrol Rafinare located in Năvodari AU. Considering the relatively long distance between the MGD Project and the two sites (approximately 9 km), the only possibility for cumulative impact is from atmospheric emissions.

Information was analysed on air emissions generated by sources within Rompetrol Rafinare and by sources within OMVP - Midia Terminal. The information was found in public documents and it indicated that the main pollutants released in the atmosphere by the two sites are: particulates, CO, SOx and NOx. Among these pollutants, the SOx pollutants were excluded from the analysis, as the continuous burning installations within the MGD Project (Natural gas treatment plant) do not generate SOx. Particulates were also excluded from the analysis, as the continuous burning installations within the GTP will incinerate only natural gas having low content of particulates and as for the particulates emissions, the limit emission values are stricter, 5 mg/m^3 respectively.

In order to analyse the potential cumulative impact on air quality due to CO and NOx (expressed as NO_2) emissions generated from the three sites, it was considered that a negative impact occurs when the limit values imposed by EGO no. 104/2011 on environmental air quality are exceeded. These limits are:

- 40 µg/m^3 (limit value for a calendar year) and 200 µg/m3 (hourly limit value, which must not be exceeded over 18 times in a calendar year) for NO_2; and
- 10 mg/m^3 (maximum daily value of the average values for 8 hours) for CO.

Taking into account the location of the three sites, potential cumulative impact could occur when the wind blows from NNE and transports emissions from GTP to OMVP - Midia Terminal and the Refinery operated by Rompetrol Rafinare and further away to localities in the SSW or when the wind blows from the SSW direction and transports emissions from OMVP - Midia Terminal and the Refinery operated by Rompetrol Rafinare towards GTP and further away to Vadu village. Insufficient data are available to allow modelling of the dispersion of these pollutants. Also, the relatively large distance between between the sites, would significantly reduce the precision for modelling atmospheric pollution. Therefore, the development of a model was not considered appropriate to support the cumulative impact assessment.

However, in order to establish whether cumulative impact could occur, certain data were analysed. These data were NO_2 and CO values registered between 01.01.2014 and 31.10.2017 by the closest and most representative stations for monitoring air quality in the area of OMVP - Midia Terminal and of the Refinery operated by Rompetrol Rafinare:

- Station CT3: Urban background station, located in Năvodari town – Tabăra Victoria which monitors the average pollution levels inside a suburban area, caused by transportation phenomena originating outside the town and by phenomena taking place inside the town; and
- Station CT6: Industrial station, located in Năvodari town which evaluates the influence of industrial sources upon air quality.

Among the 9,655 valid data entries at Station CT3 and the 10,497 valid data entries at Station CT6 no hourly average values higher than 10 mg/m3 CO were registered. Therefore, the daily maximum value of the average values for 8 hours was not exceeded either, irrespective of wind direction.

Among the 7,204 valid data entries at Station CT3, no hourly average values higher than 200 µg/m3 NO_2 were registered, irrespective of wind direction. Among the 19,129 valid data entries at Station CT6, the hourly maximum value was exceeded for 0.01% of the data entries, which means a number of 2 exceeding values during the analysed time period of 3 years and 10 months (below the value of 18 exceeding values/year, which is allowed). Also, it is important to mention that these exceeding values were recorded when the wind blew from west and not from NE direction, where OMVP - Midia Terminal and the Refinery operated by Rompetrol Rafinare.

The annual limit value for NO_2 was also not exceeded. Validated/non-validated values were recorded between 12.63 µg/m^3 NO_2 and 17.42 µg/m3 NO_2 at Station CT3 and between 12.09 µg/m^3 NO_2 and 21.42 µg/m3 NO_2 at Station CT6 respectively.

The emissions of NO_2 and CO generated by OMVP - Midia Terminal and the Refinery operated by Rompetrol Rafinare did not exceed the limit values imposed by Law no. 104/2011 for any of the representative monitoring stations, that are located at distances of approximately 3 km from these sites.

Thus, the fact that the limit values for these monitoring stations were not exceeded represents a solid argument for assuming that no significant quantities of emissions generated by the two sites can reach the MGD Project area and the area of Vadu village under normal operation conditions. According to the modelling of emission dispersion performed by Xodus Group for the GTP within the MGD Project, the following conclusions resulted: under normal operation conditions for the GTP (use of a gas engine and of a turbine-compresor package), no values exceeding the Romanian standards for air quality are envisaged for emissions of SO_2, PM10, NO_2, CO or benzene. Under abnormal operation conditions for the GTP (use of a diesel generator) values exceeding the quality standard for CO were envisaged, having a frequency of four exceeding values reported within 5 years. It can be therefore stated that the emissions generated by the MGD Project cannot reach either in significant quantities the area of the two sites and of the localities in their S and SSW parts.

In conclusion, no negative cumulative impact upon the air environmental factor will be generated by the MGD Project, by OMVP - Midia Terminal, and by the Refinery operated by Rompetrol Rafinare, respectively. Due to the relatively long distance among the three sites, no cumulative impact will occur upon other environmental factors either.

The MGD Project will have a cumulative impact upon environmental factors together with the NTS pipeline to be built by TRANSGAZ. The cumulative impact was assessed taking into account the conclusions of the EIA Report prepared pursuant to relevant national legislation for the purposes of obtaninig the Enviornmental Permit for the pipeline (called for permitting purposes: ″Extension of NTS by building the natural gas transportation pipeline from point where the gas is taken from the Black Sea (area of Vadu loc., Constanta county) – to the Transit 1 pipeline (area of Grădina loc., Constanta county), including power supply for the cathodic protection station at Săcele, groups of valves and installation of sensitive optic fibre in Corbu, Săcele, Cogealac and Grădina communes, Constanta county”).

The MGD Project will also have a cumulative impact with the offshore infrastructure of Lebada Complex in XVIII Istria Block (production platforms and natural gas and oil upstream transmission pipelines) belonging to OMVP, the proposed Neptun Deep Project in Neptun Deep Block, aimed at putting into production the Domino and Pelican natural gas discoveries belonging to OMVP and EXXON MOBIL as well as with the naval transportation activities in the Black Sea.

These projects have been assessed as part of each of the topic impact assessments to determine how the proposed MGD Project may interact with other existing, on-going and planned projects and activities.

3.14 Dealing with Uncertainties

As part of the ESIA process it is necessary to identify where data gaps and uncertainties remain even after detailed baseline studies (and impact assessments) have been completed as these can influence the results of the ESIA.

While all baseline characterisation and impact assessment work carried out as part of the ESIA is based on best practice and robust scientific data, it is acknowledged that some data gaps and uncertainties could still exist. Where possible, necessary measures have been taken to minimise these data gaps and uncertainties to ensure that they do not affect the robustness of the impact assessment. Where data gaps and uncertainties remain these will be identified, and their implications for the assessment discussed, in the relevant impact assessment chapters.

3.15 Consultation and Disclosure

3.15.1 Overview

Stakeholder engagement is a key element in building strong, constructive and responsive relationships which are essential for the successful management of a project's environmental and social risks and impacts. It aims to inform stakeholders about the potential environmental and social impacts related to the project through appropriate disclosure of information, to ensure their perceptions of the proposed development are as accurate as possible, to consult with them to obtain feedback, and to provide a mechanism for resolving any concerns or complaints they might have.

Stakeholder engagement is important for building strong, constructive and response relationships with all interested and impacted persons/institutions. EBRD's PR 1 requires the identification of the project's stakeholders and the design of a plan for engaging with the stakeholders in a meaningful manner to take their views and concerns into consideration in planning, implementing and operating the project. PR 10 states that national laws and regulations regarding public information disclosure and consultation must always be considered when developing and implementing a project. In the event that national laws are insufficient or there are significant discrepancies between national and PR 10 provisions, then the following principles should be considered:

14. Promoting transparent communication between the project promoter, its workforce, the local communities directly affected by the project, and other interested stakeholders;
15. The involvement of the stakeholders has to be a process free of manipulation, interference, coercion and intimidation;

- The involvement of the stakeholders has to be adapted on the basis of their status, level of influence and interest towards the project. For vulnerable groups, specific actions will be considered to eliminate possible barriers to their participation in the engagement process;
- The involvement of stakeholders is a process which must take place in the early stages of the project, and continue throughout the entire life of the project; and
- Ensuring access to an appropriate, fair complaints management mechanism for stakeholders to submit their questions, concerns or grievances about the project.

3.15.2 Stakeholder Engagement

BSOG has developed a SEP, which is a guiding document that maps the main categories of stakeholders who need to be meaningfully engaged within the development and implementation of a work programme. It focuses on:

- Identification of stakeholders who are likely to be affected by the project;
- Establishment of engagement methods that are suitable for each identified category of stakeholder;
- Documentation of previous engagement activities and stakeholder feedback;
- Development and implementation of the SEP;
- Introduction of the project's grievance mechanism; and
- Monitoring and evaluation of engagement actions.

The SEP prepared for MGD Project sets out the planned programme for disclosure of project information and consultation with stakeholders, as well as the methods for recording and addressing comments and grievances from various stakeholders (outlined in Section 3.15.3 below). The SEP is a 'live' document that will be progressively developed through updated versions in line with the phases of MGD Project. The SEP will be made publicly available on BSOG's website and will also be made accessible to local communities as part of the project information disclosure policy and programme.

The below bullet points highlight the main engagement activities that have been performed in 2017 in terms of engagement with specific stakeholders and public at large:

> BSOG webpage http://www.blackseaog.com/ includes information about our offshore projects and details about the environmental and other permitting procedural steps and outcomes

BSOG offshore blocks, Romanian Black Sea

+ XV Midia shallow block

− Ana and Doina Discoveries

The Ana and Doina gas fields (320 Bcf P50 contingent resources) are of latest Miocene to Dacian age, shallow, marine sandstone (delta-tops) reservoirs some 100 km offshore Romania, in the XV Midia Shallow area.

The Doina Field was discovered in 1995 and Ana in 2007. Both are located along the same fault trend at same reservoir horizon. They have been appraised and are currently being investigated for development.

The potential Midia Gas Development Project (MGD Project) consists of the design and construction of the offshore platforms for the production of gas from the Ana and Doina Discoveries, a gas transmission pipeline (121 km offshore and 5 km onshore), the gas treatment plan located in the Vadu area and a 25 km access pipeline connecting the gas treatment plant to the Transgaz operated NTS.

Announcement on the environmental permit request for offshore subsea pipeline 12.01.2018.

Announcement on the public debate for Environmental Report GTP 27.12.2017.

Announcement on the initial phase decision offshore pipeline 21.04.2017.

Announcement on the initial phase decision for Geotechnical Study for production platform layout.

Announcement on submitting the environmental permit request for Geotechnical Study for production platform.

Announcement on submitting the environmental permit request research activities for gas pipeline route.

Environmental Consent No. 7 of 11.01.2016 for the PUZ Construction of an Underground Gas Transportation Pipeline on the Territory of the Corbu Commune.

Snapshot of BSOG webpage – offshore projects

> Three public debates have been organised where different components of MGD Project (as divided into components for permitting purposes) have been presented and participants have been consulted about the main impacts associated with these elements. The public debates have been properly advertised both at national and local level, via different newspapers, information panels of the local authority and on the onshore sites, the website of EPA Constanta and BSOG webpage.

  - The meetings were focussed as follows:
    - 1 public debate for consulting on the preparation of the urban planning document for the GTP
    - 1 public debate for consulting on the strategic environmental assessment process for the GTP
    - 1 public debate for consulting on the environmental impact assessment process for the GTP

- 1 public debate for consulting on the preparation of the urban planning document for the onshore pipeline
- 1 public debate for consulting on the strategic environmental assessment process for the onshore pipeline
- 1 public debate for consulting on the preparation of the urban planning document for the beach segment of the onshore pipeline

o Participants at these events have expressed their support to our project and had no comments on the presented materials. Minutes of the Meetings from all the public debates are available upon request.

Public Debate – 27th of December 2017

> Three regulatory approval meetings with the representatives of the National Committee for Costal Area. The meetings aimed at presenting and getting the approval for the urban planning zone for the onshore pipeline, GTP and for the EIA Report for the GTP as per the requirements of EGO no. 202/2010. The National Committee of the Costal Area includes 42 members, representatives of national authorities, ministries, local municipalities and county councils of Tulcea and Constanta, 5 NGOs, research and scientific institutions.

Meeting of the National Committee for Costal Area

> BSOG is also implementing a Corporate Social Responsibility (CSR) programme that aims at strengthening the relationship with the representatives of local community impacted by our projects.

The CSR programme included, in 2017 11 actions, most of them organised together with the representatives of one local NGO from Corbu. BSOG's contribution was visible at local level via ensuring support to different cultural events and for supporting vulnerable persons.

- Representatives of BSOG have participated in several high-level meetings with national authorities (including the Prime Minister of Romania). Also, they have been actively engaged via reviewing and offering technical support for the development of specific national legislation or different sectoral strategic and operational documents.

Meeting with the Prime Minister of Romania

BSOG envisages organising two public meetings in 2018 as part of the national environmental approval procedure for both on-shore and off-shore activities.

The ESIA disclosure process will run in parallel with the environmental permitting process. Thus, the public meetings will be good opportunities for disclosing the ESIA package as well. BSOG will also publish the full ESIA both in English and Romanian languages on its website.

3.15.3 Grievance Mechanism

The objectives of the BSOG grievance mechanism are to ensure that all stakeholder grievances are promptly and effectively addressed, in a fair and transparent manner, throughout the Project lifetime. All complaints will be investigated to confirm their validity and to ensure that all accepted grievances are dealt with in a correct and prompt manner; where relevant, corrective actions will be implemented to prevent any recurrence of problems.

The following grievance mechanism elements are anticipated:

- Grievance forms / and a compliant/suggestion box will be available in the mayor's office at the Corbu Municipality. Anyone interested in any aspect of the project can lodge a concern or complaint there during opening hours. The BSOG community engagement manager will collect them once per week and all complaints / concerns will be registered and transmitted to Project Implementation Unit (PIU);
- A direct phone number and email address for the BSOG community engagement manager will be provided to all interested parties for enabling them to contact BSOG's representatives whenever necessary (please see the *Stakeholder Engagement Plan, Annex 1. Contact list – grievance mechanism*). In addition, a user-friendly online complaints system on the BSOG's website will allow electronic submission that can be easily filled in by any interested party;
- Direct meetings with representatives of local communities where they can raise their complaints and/or suggestions, verbal complaints, etc.;
- All stakeholders are also able to deliver complaints personally, by post, e-mail, web site or facsimile.

All valid complaints received via the aforementioned channels will be processed and registered by PIU in a dedicated grievance register, which will include the following information:

- Date lodged by complainant or date received by PIU;
- Contact details of complainant;
- Assignment of responsible person / department for investigating the compliant, checking its validity and addressing the issue and its causes;
- Formal acknowledgement of receipt of grievance forms (not required for online submissions);
- Definition of actions needed to investigate and/or resolve the grievance (including direct contact with complainant to obtain further information) and set target date for proposed resolution;
- Communication of proposed solution (or alternatively, why a complaint is being rejected);
- Feedback from the complainant as to whether the proposed solution is/is not acceptable;
- Results/details of further PIU actions, complainant satisfaction or potential next steps; and
- Close-out date.

PIU will make all reasonable efforts to address the complaint upon acknowledgement of the grievance, progress chasing with the responsible person / department if actions are overdue and escalating any major problems to senior management. Stakeholders will be informed about the proposed corrective/restorative actions and follow-up of corrective action within 30 working days upon acknowledgement of the grievance.

If the complainant is not satisfied with the solutions proposed / implemented by the PIU to address the grievance, he/she may seek other legal remedies in accordance with the legal framework of Romania.

4 ALTERNATIVES CONSIDERED

4.1 Introduction

The assessment of possible locations and design concepts for MGD Project started as early as 2008 and was based on technical, environmental, socioeconomic and cultural heritage criteria, with the aim of identifying a technically feasible option with the least environmental, socioeconomic and cultural heritage impact. Once the location had been identified, it was validated/endorsed by the relevant authorities.

A concept engineering study was conducted during 2016 to examine alternative concepts for developing the Ana and Doina fields and to select the preferred concept. FEED was conducted from Quarter 4 of 2016 to Quarter 2 of 2017.

Note: it is common in ESIA to consider a 'do nothing' approach, where the decision not to progress a project is considered. Athough the 'do nothing' approach would avoid the potential for residual negative impacts as assessed in this report, it would not see the MGD Project executed. As a result, the economic benefit to local and national stakeholders, as well as the energy security it would bring, would not be realised. On this basis, the 'do nothing' approach was rejected.

4.2 Location of the pipeline corridors and GTP

In an early concept study conducted for BSOG (previously called Midia Resources, a subsidiary of Sterling Resources) by RSK (2008), the initial location considered for the gas pipeline landfall lay approximately 12 km to the south of the currently proposed site, in the area of Cape Midia (in Romanian: "Capu Midia") – Appendix B to the present Report. The offshore pipeline route associated with this landfall lay to the south of the offshore military firing range area belonging to the Capu Midia Military Unit.

At the initial stage, the company considered as an option for the MGD Project to comprise the pipeline from the GTP to the transit lines - *the closest connection point with NTS pipeline suitable for taking over the MGD Project gas* as well. The route options for such a pipeline were assessed in 2014 by the company and are presented in the Route Appraisal Report - Appendix C to the present Report. After engaging with Transgaz in 2015, this option was aborted as the connection pipeline between the GTP and the transit lines became the scope of Transgaz as shown in Section 3.7 in the present Report.

Further development of the location options was influenced by various constraints including:

- The requirements of the General High Staff;
- The presence of the onshore military bases and their firing polygons (both onshore and offshore);
- The existing Rompetrol pipelines, their safety and protection areas, and landfall to the Rompetrol Rafinare's Refinery, Constanta County;
- Establishing land ownership and securing the necessary land areas;
- The presence of designated environmental protected sites; and
- The presence of features both offshore and onshore that posed practical limitations to onshore pipeline routing

The main objection to original plans came from the General High Staff, requiring the offshore pipeline to be routed around to the north of the offshore firing ranges, and to lie as close as feasible to the north of the existing OMVP pipelines.

Further limitations to a southern route, and various landfall options to the south of the one initially considered, were posed by the existence of Capu Midia Harbour, the location of the Rompetrol Rafinare's Refinery, and the presence further to the south of major tourism areas *i.e.* Năvodari Commune.

In addition, it appears that the offshore approach to the original landfall site was obstructed by the presence of a large outcrop of limestone bedrock that would have posed a significant engineering challenge.

One of the location options considered for the GTP was a Rompetrol brownfield site available near its refinery, which used to host an asbestos production facility. However, the necessary environmental remediation works for this option presented a very high risk to the MGD Project. Inland, potential routes for the connection pipeline were limited, among others, by the presence of the Corbu lakes. Setting the GTP in the vicinity of the OMVP – Midia Terminal, situated in the land area between the sea and the lakes, would have restricted options for the connection pipeline route to the transit lines. Options would have been limited to either a sub-lake crossing (this would have involved the obtaining of crossing rights from the Romanian authorities – owners of the lake bottom and from the concessionary for the water body itself) or an additional route length of 11 km across the fields to the north, circumventing Corbu Village.

The northern offshore pipeline route requested by the General High Staff (and by implication a landfall further to the north) altered the issues governing routing and landfall location. Key aspects were now as follows: to find a location on the territory of a single Commune *i.e.* Corbu AU, valid ownership title to the land, coupled with willingness to grant easement rights or to sell at a reasonable price, sufficient clearance from the onshore restricted areas of Capu Midia Military Unit, and from other obstructions such as a small forest area and Rompetrol’s waste water ponds.

Stakeholder and BSOG requirements for a GTP site included a flat area of land in a position with sufficient height above sea level, more than 1,000 m from military boundary fences, and to be outside existing protected areas, forested areas and away from water courses. In addition, securing land at a reasonable price was problematic. The final site selection for the GTP was based on avoidance of impacts on local biodiversity in the nearby Natura 2000 sites ROSPA0031 Danube Delta and Razim-Sinoie Complex and ROSCI0065 Danube Delta.

4.3 Concept identification and selection

A wide range of concepts was identified and screened down to two development schemes:

- Dry gas scheme
  - A converted jack-up rig supporting an offshore processing facility located at Ana, receiving and supporting production from a subsea tieback from Doina, compressing and dehydrating the gas, and treating the produced water for disposal overboard.
  - A 12” pipeline to transport the dehydrated gas to an onshore gas processing plant.
  - An onshore gas plant providing pig receiving facilities and metering of the gas before transfer to the gas transmission system at 55 barg.
- Wet gas scheme
  - An offshore minimum-facilities, normally unattended wellhead platform located at Ana, receiving and supporting production from a subsea tieback from Doina.
  - A 16” pipeline to transport the gas to an onshore processing plant. This pipeline is continuously dosed with monoethylene glycol to prevent hydrate formation.
  - An onshore gas plant providing pig receiving facilities, separation, compression, tryethilene glycol dehydration and metering of the gas before transfer to the gas transmission system at 55 barg, and providing monoethylene glycol regeneration, storage and loading facilities.

The two schemes were then assessed in detail. Areas which received particular attention were:

- Pipeline size selection, and optimisation of steel vs. concrete weight coating for on bottom stability;
- Hydrate management and hydrate inhibitor selection for each scheme;
- Compression stages and size of turbine driver;

- Jack-up conversion scopes, including foundation requirements for the dry gas scheme;
- Options for provision of a wellbay structure for the dry gas scheme offshore facility at Ana; and
- Landfall/shore approach options.

The key criteria identified for the project were to minimise capital and operating expenditure, to minimise the cost and requirements for decommissioning, and to minimise project risk in terms of operability and schedule.

Following analysis, the wet gas scheme was judged to best meet the project aims and was therefore selected. Additionally, it was considered that the wet gas scheme provides good opportunity for future expansion in the event of other discoveries in the area and provides a reduced risk profile for health and safety issues for operational staff versus the Dry Gas Scheme.

4.4 Design decisions

Environmental considerations have been incorporated into the overall decision-making processes, which have also been informed by BAT studies as required. Key decision areas were around:

- Detailed pipeline routing within the selected corridors - The final onshore pipeline route was selected to minimise impacts on local biodiversity. The corridor within which the offshore pipeline would be routed was selected in order comply with stakeholder requirements, to minimise pipeline length (and hence both cost and impacts to seabed), to avoid the protected areas in the region, as well as avoiding known ordnance and known seabed features such as debris, boulders, anchor scars, spud can depressions, ship wrecks etc;
- Doina to Ana pipeline and associated umbilical - An option evaluation was carried out to assess the potential protection options, including surface laying, trenching, concrete coating, and umbilical piggybacking. The evaluation concluded the optimum option is to surface lay both the pipeline and umbilical, with a steel-only pipeline (i.e. no concrete coating) and the umbilical laid close to the pipeline to minimise the risk of umbilical snagging/dragging by fishing gear. The pipeline wall thickness has been sized to ensure protection from trawl gear impact;
- Installation methods for the onshore pipeline and shore crossing, including the use of open ditch and horizontal drilling;
- Disposal of water-based drilling fluids (also termed water-based muds; WBM) and cuttings drilled with WBM – The main options considered were i) containment and transfer to shore for treatment and disposal; and ii) discharge to sea. Other potential options for the disposal of drill cuttings and muds are containment followed by injection into a dedicated disposal well offshore or injection into the annular space of a gas production well. No suitable well is available for disposal of cuttings, and drilling of a dedicated disposal well was discounted because the additional environmental impacts and risks associated with drilling such a well (including atmospheric emissions, deposition of tophole cuttings on the seabed, interactions with other sea users and risk of diesel spill) would outweight the benefits of not discharging bottom-hole cuttings from five wells. In addition, there are technical challenges associated with both of these methods, as well as the potential for damaging the gas reservoir or impacting the drilling of future wells. From the feasible options considered, discharge to sea was selected as the preferred option because of the increased environmental and safety risks of handling and onshore disposal. Following cleaning on the drilling rig, the cuttings and residual WBM will be discharged overboard in line with standard industry practice. The impacts from such discharges are assessed in the ESIA and the required controls identified; Alternatives for design of the Ana platform – For example, an alternative to equipping the platform with a helideck was the use of a 'walk-to-work' vessel which would take personnel from shore to the platform. This was deemed to be a more expensive alternative due to the costs as well as increased atmospheric emissions in comparison to using helicopters; and
- Power generation offshore and onshore – For example, various alternatives to the diesel driven generators on the Ana platform were considered, including the potential use of solar power, a

combination of solar and wind power, gas turbines, thermopile/thermoelectric and organic ranking cycle. Following completion of the offshore power generation BAT study, the use of diesel driven generators was selected as it was the most reliable and well understood in the offshore environment.

5 THE PROPOSED DEVELOPMENT

5.1 Project overview and schedule

The overall field layout for the MGD Project is shown below in Figure 5.1.

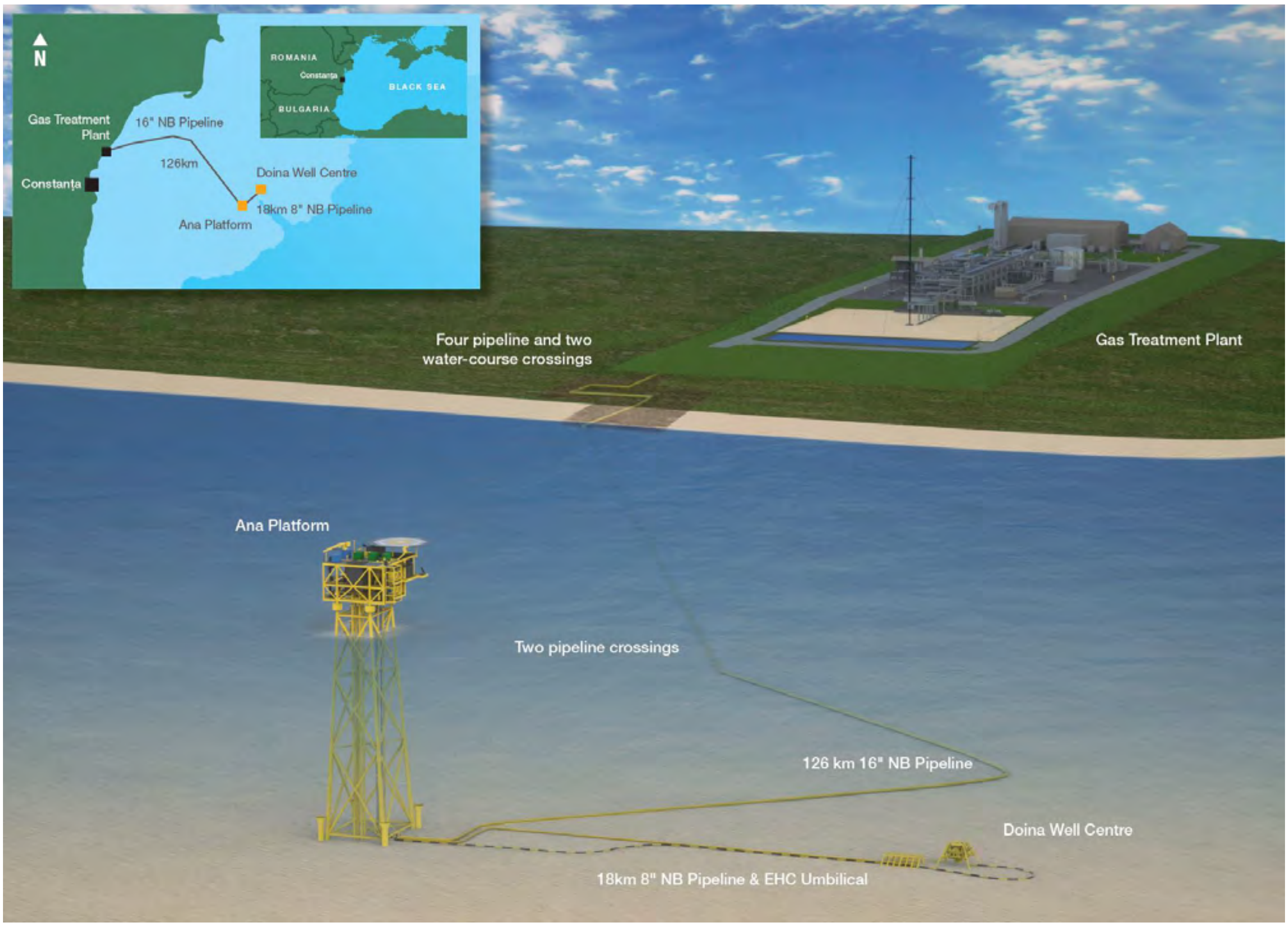


Figure 5.1 Overall Field Layout for Midia Gas Development

The facilities required for the development can be summarised as follows:

> Ana Platform: small normally unmanned platform with four platform wells, pipework fully rated to well closed-in tubing head pressure, cold vent, power generation, helideck, chemical storage and injection pumps for MEG, temporary refuge, lifeboat, facilities to enable temporary installation of pig receivers and pig launchers, and minimal other facilities;

> Doina Subsea: one production well and a subsea gas production system controlled via an electro-hydraulic-chemical (EHC) umbilical from the Ana Platform;

> Ana-Doina pipeline: 18 km 16-inch pipeline routing the gas from Doina subsea to Ana platform, continuously inhibited against hydrates with monoethylene glycol (MEG) delivered through the umbilical;

> Ana Platform - GTP Pipeline: 16-inch carbon steel upstream gas transmission pipeline for the routing of the gas to the GTP located onshore, consisting of 121 km of subsea pipeline (offshore segment of

the pipeline) with a landfall in Vadu area, Corbu Commune, Constanta County, and 4.5 km onshore pipeline (onshore segment of the pipeline), continuously inhibited against hydrates with MEG;

> Onshore GTP: pig receiver, slug catcher/separator, single stage turbine driven compressor (with scrubbers and aircooled aftercooler), triethylene glycol (TEG) dehydration of gas, fiscal metering, MEG regeneration and storage, control room, power generation, utilities, cold vent, etc.

The gas produced via MGD Project will be injected into the NTS via a 25-km pipeline to be built by TRANSGAZ.

Fabrication of the new offshore and onshore facilities is expected to begin in Quarter 4 2019 and continue through construction, installation and commissioning. Drilling of the development wells at Doina and Ana will commence Quarter 2 2021 with first gas expected to be produced in Quarter 4 of 2021.

5.2 Ana Platform

5.2.1 General description

The Ana platform will be a normally unmanned installation (NUI), hosting four wells, located in a water depth of 70 m relative to lowest astronomical tide (LAT), 109 km from shore. The jacket will be a 4-legged, x-braced steel structure with one pile per leg, attached via skirts (Figure 5.2). Mud-mats will also be installed in order to provide stability and assist in offshore installation.

The platform will import production from the Doina subsea production system and mix it with Ana production prior to routing the combined production fluids to the Ana to GTP subsea pipeline.

The topsides will host production support facilities for the Ana and Doina fields, including diesel driven power generators, cold vent, chemical storage and injection pumps for MEG / corrosion inhibitor (CI), temporary refuge, local equipment room, lifeboat, facilities to enable temporary installation of pig receivers and launchers, crane, a helideck, control and safety systems, telecommunication system and minimal other facilities.

The platform is designed to be started up, controlled and shut down from the onshore GTP control room with minimal requirement for intervention by offshore personnel (limited to re-start of the platform following an emergency shutdown and bunkering of fluids to the platform).

The platform topsides systems are arranged over the following three levels:

> Cellar deck (14.5 metres above LAT), hosting the Ana wellheads, Doina import riser reception facilities, Ana to GTP pipeline facilities, space for temporary pig launchers/receivers, MEG injection pumps and subsea support systems including a hydraulic power unit (HPU) and a topsides-umbilical-termination-unit;

> Mezzanine deck (19.5 metres above LAT), hosting the local equipment room, MEG storage tank, production manifold (with multiphase meter), bunkering station, DIFFS drains tank and escape lifeboat (totally enclosed, motor propelled survival craft – TEMPSC); and

> Weather deck (26.5 metres above LAT), hosting the helideck, power generation facilities, diesel storage, nitrogen storage, crane and deck integrated fire fighting system (DIFFS) facilities.

Figure 5.2 Ana platform schematic. The platform is oriented with “platform North” being rotated 30° clockwise from true North as shown in Figure 5.3.

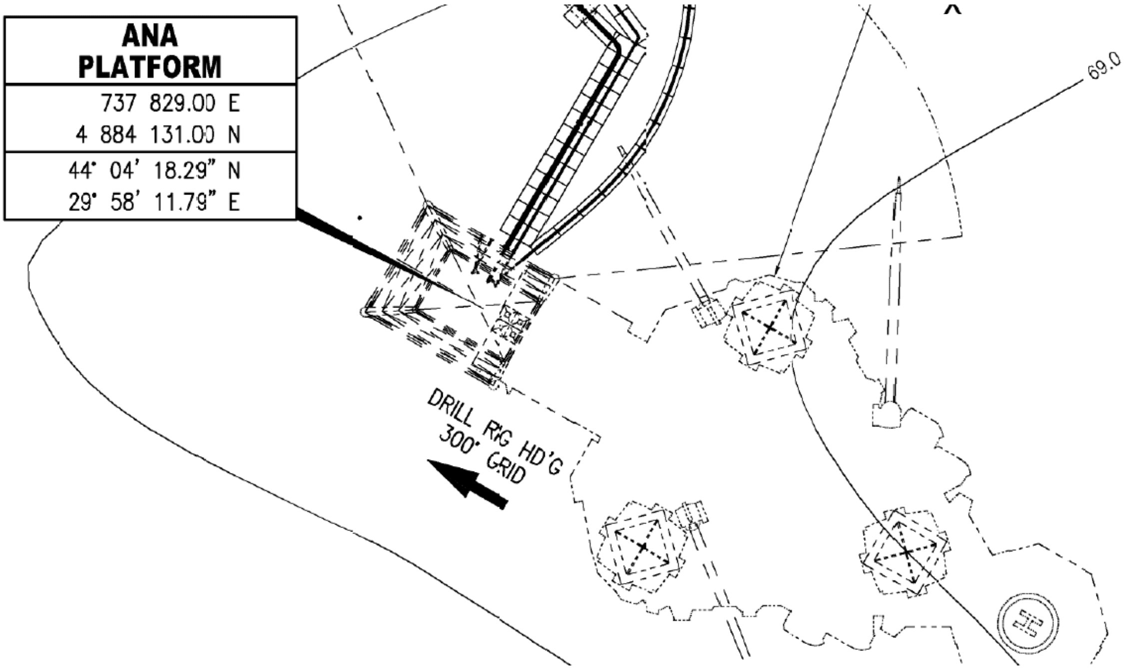


Figure 5.3 Ana wellhead platform orientation

The platform has been designed so that each of the four sides will accommodate separate specific functions, as follows:

- North face: pipeline and umbilical access to the platform;
- East face: drilling rig access to the platform;
- South face: boat access to platform; and
- West face: helicopter access to platform and escape craft egress from platform.

5.2.2 Main Processing Systems

The main processing systems on the Ana platform comprise:

- Four Ana wellheads/Xmas trees;
- Wet gas metering and sand detection for each Ana well flowline;
- Import facilities from the Doina subsea production system, including a wet gas flowmeter;
- Production manifold to mix Ana and Doina production;
- Multiphase measurement system for the combined Ana and Doina production system; and
- Injection facilities to the Ana Platform to GTP pipeline.

All of the above systems are constructed from carbon steel and are designed for a maximum pressure of 130 barg (to match the design pressure of the MEG injection facilities).

5.2.3 Auxiliary Processing Systems

The auxiliary processing systems on the Ana wellhead platform comprise:

- MEG/corrosion inhibitor storage and injection facilities that route to each individual Ana wellhead (both upstream and downstream of the Xmas tree's wing valve) and to the Doina umbilical; and
- Manual depressurisation facilities to a platform cold vent that enable depressurisation of either the entire topsides or the Doina import facilities. The system is also designed to enable depressurisation of the Ana to Doina and Ana Platform to GTP pipelines if required under emergency conditions.

5.2.4 Utility Systems

The utility systems on the Ana Platform comprise:

- Diesel fuelled power generators (complete with in-unit fire protection), each sized for 100% of operating load when the platform is unmanned;
- Uninterruptible power supply for back up power supply to essential safety systems;
- Diesel powered crane;
- Diesel storage for the power generation and crane systems;
- Nitrogen purge system for the MEG storage tank and diesel storage tank using nitrogen quads;
- Hydraulic power unit for powering all on-off actuated valves on the platform (topsides and wells) and for providing hydraulic power to the Doina umbilical. The HPU is a closed loop system; however, small quantities of hydraulic fluid ('Pelagic 100') will be discharge on each occasion that Doina wellhead valves are actuated – amounting to approximately 2 litres per valve actuation. These discharges will only occur during well shut down, which will happen very infrequently e.g. during annual maintenance events;
- Nitrogen-pressurised deck integrated fire-fighting system (DIFFS) for the helideck, including associated drains tank;
- MEG and diesel bunkering systems;
- Integrated control and safety system (ICSS) for control of the platform; and
- Telecommunications system to link the platform ICSS to the GTP control room (troposcatter main system with a back-up VSAT system).

There is no provision for a potable water supply system or general firewater system on the platform. Water will be bunkered as required from supply boats to replenish the DIFFS water storage tank following activation of that system. Drinking water and chemical toilets will be carried on by operating personnel.

5.2.5 Overall Safety Philosophy

The overall safety philosophy for the Ana Platform is based around three main facts:

- The production fluids cannot form hydrocarbon liquids under any foreseen operating or upset conditions;
- The "process-wetted" parts of the production systems are all designed for a pressure that exceeds the maximum pressure that can be experienced during operation (i.e. 130 barg versus a maximum closed in tubing head pressure of 105.4 barg and a MEG injection system design pressure of 130 barg) and are limited in inventory (circa 0.5 tonnes of hydrocarbon gas); and
- The platform does not need to be manned during normal operation or to enable normal start-up or shutdown of the facilities. Manning is only required for fabric maintenance, bunkering of MEG, diesel,

nitrogen or recovery from a major unplanned shutdown (e.g. after confirmed detection of fire on the platform).

The above three facts lead to a very simple safety philosophy:

- In the event of an emergency being detected (e.g. confirmed fire or gas), all sources of hydrocarbons (e.g. wells and pipelines) will be isolated but there will be no automatic depressurisation;
- When all of the hydrocarbon sources are isolated, the hydrocarbon inventory is very small and, if a leak does occur, it will vent and disperse to atmosphere rapidly. Even if the leak were ignited, it would quickly self-extinguish due to a lack of fuel;
- Apart from the helideck and power generators, no fixed active firefighting facilities are provided. Firewater/foam is known to be ineffective when fighting gas fires (the only significant fires that can exist in the process on the platform);
- The helideck will be provided with a DIFFS and the power generation set enclosures will be provided with an inert gas fire suppression system (carbon dioxide or nitrogen based);
- Minimal process drainage will be provided on the platform (restricted to systems to cater for rain water and local drip pans for equipment items that have potential for small leaks);
- A full Automated Information System (AIS) supported by Digital Selective Calling (DSC) will be provided on the platform to guard against the possibility of ship collision;
- A fire/blast wall will be provided between the processing systems and the local equipment room/emergency shelter and escape facilities. Passive fire protection will be provided for the pipeline emergency shut-down valves (ESDVs) to minimise the potential for escalation of any topsides releases to a large-scale release from risers; and
- Fire and gas detection will be provided by way of fire-detecting CCTV cameras and acoustic gas detectors in the process area. Air inlet gas detection will be provided for the local equipment room and power generation packages. Optical smoke detectors will be provided in the local equipment room;

If an incident or event occurs during the limited periods where the platform is manned, the order of priority for offshore evacuation and escape to sea shall be as follows:

- Helicopter: Preferred means of evacuation if present at the platform (likely to be unusual);
- TEMPSC: Primary means of evacuation;
- Life raft: Secondary means of evacuation; and
- Direct entry to sea (via descent devices): Tertiary means of evacuation.

At least two separate and diverse routes leading to the TEMPSC are provided from all areas of the facility.

5.3 Jacket Installation

The jacket and topsides will be transferred from a fabrication shore base using a barge and support vessels. Both the barge and the sheerleg crane will be anchored while on site; all anchors used in platform installation are expected to be located within the 500 m safety zone around the platform. Several of the vessels to be used during the installation process, including the dive support vessel (DSV) and standby vessel, will be dynamically positioned (DP). The Ana jacket will be lifted from its barge (by the sheerleg crane) and lowered into to water until it floats. The crane will then connect to the upending slings, following which the jacket legs will be flooded as determined by the upending analysis. Following upending, the jacket will be positioned and lowered until the bottom of the jacket rests on the seafloor. Each of the four legs will then be secured to the seabed by a single pile driven by a subsea hydraulic hammer.

5.4 Pipelines and subsea infrastructure

5.4.1 General description

The Doing Subsea production system comprises (Figure 5.4):

- One wellhead and Xmas tree at Doina, complete with sand monitoring facilities;
- An 8-inch, 18 km surface laid carbon steel pipeline with no concrete coating linking the Doina wellhead to the Ana Platform (termed the Doina to Ana pipeline);
- A valve station at the Doina end of the Ana – Doina pipeline to enable future extension of the pipeline to an additional Doina well or other discoveries in the area. Note that the valve station can also be used as a tie-in for a subsea pig launcher/receiver;
- An electro-hydraulic-chemical (EHC) umbilical linking the Ana Platform to the Doina well, that provides electrical power, control, hydraulic power and MEG (mixed with corrosion inhibitor) to the Doina well; and
- A 16-inch, 126 km surface laid carbon steel pipeline with concrete coating for stability linking the Ana Platform to the GTP, including a 4.5 km section of buried onshore pipeline. The pipeline shore crossing will be installed by horizontal directional drilling.

All process-wetted parts of the system are designed to 110 barg, which exceeds the maximum pressure that can realistically be experienced within the system (i.e. well closed in tubing head pressure of 105.4 barg).

The hydraulic and MEG cores within the umbilical are designed for higher pressures as appropriate to their systems.

MEG and corrosion inhibitor will be continuously injected into the Doina to Ana and Ana to GTP pipelines for most of their operating life to minimise the potential for hydrate formation and protect against corrosion.

Pipeline design has taken into account pressure containment, trawl gear impact and on-bottom stability.

5.4.2 Main Processing Systems

The main processing systems for the subsea production system are the Doina wellhead, the Ana – Doina pipeline and the Ana Platform - GTP pipeline.

All of these systems are constructed from carbon steel due to the low corrosion potential of the Ana and Doina fluids and will generally operate at pressures significantly below their design pressure (maximum anticipated steady state operating pressure of circa 70 barg compared to a design pressure of 110 barg).

During later field life, the operating pressure of the system will drop significantly and there will be no requirement for MEG or corrosion inhibitor injection for the final few years of field life.

There is no requirement identified for operational pigging of the system for liquids management. Operational pigging could be considered at the very end of field life to marginally increase recoverable reserves, but it is likely that this will not be economically justifiable.

The export pipeline includes a hot tap tee to accommodate future developments.

Facilities will be provided to enable temporary pig receivers to be installed in the event that pigging is required of the Doina to Ana and the Ana to GTP pipelines.

5.4.3 Auxiliary Processing Systems

The MEG/corrosion inhibitor injection system provides continuous MEG injection the Doina to Ana and Ana to GTP pipelines. The system is sized conservatively to handle significantly higher water production rates than are predicted within the current base production profile.

5.4.4 Utility Systems

The utility systems comprise:

- Electric power for the Doina subsea Xmas tree, provided via the EHC umbilical between Ana and Doina;
- Control signals for the Doina subsea Xmas tree, provided via the EHC umbilical between Ana and Doina; and
- High pressure and low pressure hydraulic power for the Doina Subsea Xmas tree, provided via the EHC umbilical between Ana and Doina.

5.4.5 Overall Safety Philosophy

The overall safety philosophy for the subsea production system is simple and can be summarised as follows:

- All process-wetted parts are designed for a pressure in excess of the maximum that can realistically be experienced in the system (i.e. design pressure of 110 barg compared to a maximum closed in tubing head pressure of 105.4 barg);
- There is a very small theoretical risk of overpressure if sufficient MEG were injected into the system to completely fill the pipelines (highly unlikely as the overall project MEG inventory is significantly less than the pipeline volume). This is mitigated by the installation of a high-pressure trip on the Xmas tree that stops MEG injection upon activation;
- The Doina wellhead will be provided with a structure to protect against overtrawl fishing;
- The surface laid pipelines are designed to withstand fishing loads likely within the area;
- The umbilical installation method (trenched) is sufficient to protect the umbilical against fishing loads likely within the area; and
- Concrete mattress protection (which also serves as protection against dropped projects) is provided for spools and pipelines in proximity to the Doina Xmas tree and the Ana Platform.

A safety analysis has concluded that there is no justification for installing subsea isolation valves or a beach isolation valve on any of the pipelines within the subsea production system.

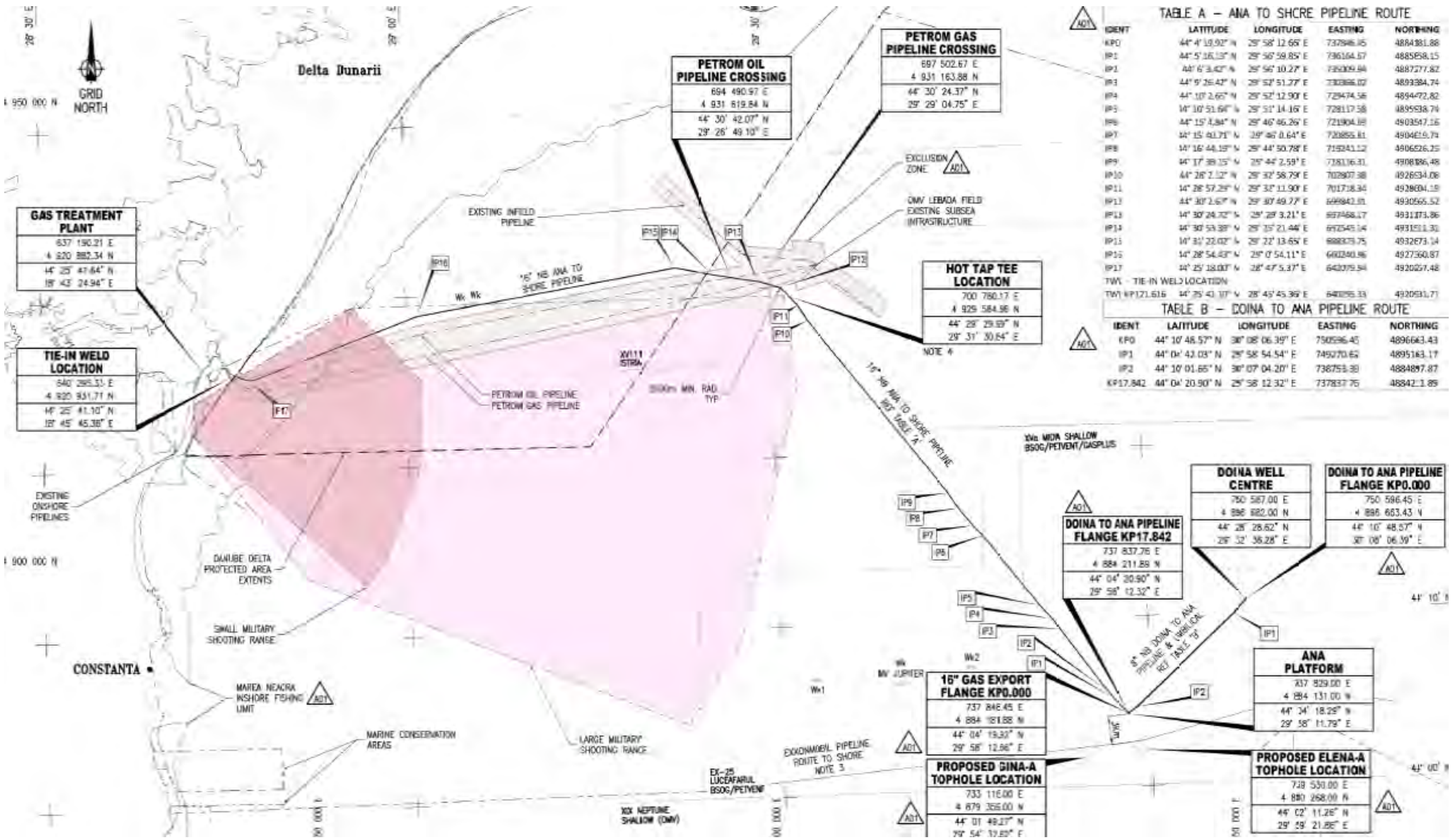


Figure 5.4 Overall Field Layout for Midia Gas Development

5.4.6 Pipeline and infrastructure installation

5.4.6.1 Offshore

A combination of laying, trenching and dredging will take place to install these pipelines. There will be a number of vessels in the field during installation ranging from small survey vessels up to and including pipe lay/construction vessels.

The Ana-Doina pipeline (18 km) and offshore segment of the Ana Platform – GTP pipeline (121 km) will be surface laid onto the seabed, with concrete mattresses for protection at pipeline crossings. Installation of both offshore pipelines will be performed by the S-lay technique. The initial stage of pipelay from the shoreline out to Ana will use an anchored lay barge, due to DP vessels not being able to operate in the shallow water depths adjacent to the shore.

An umbilical providing hydraulics, chemicals, power and communications to the Doina subsea development will also be installed between the Ana Platform and the Doina well. This will be trenched alongside the Ana to Doina pipeline.

Additionally, all the Xmas trees and wellheads will be protected by a 'fishing friendly' structure to prevent damage from fishing interaction.

To facilitate tie-in to the surface facilities, flanged tie-in spools will be required at the Ana Platform and at Doina Subsea.

5.4.6.2 Onshore

Along the onshore 4.5 km segment of the Ana to GTP pipeline (Photo 5.1), the 16" carbon steel pipeline will be trenched and buried, except for the beach area crossing (Photo 5.2) which will be acheived via horizontal directional drilling (HDD). The underground pipeline will cross BSOG's private lands, the beach (public property of the Romanian State) and roads and marshes (public property of Corbu Commune) (Figure 5.5).

Photo 5.1 Route portion of the underground onshore pipeline (view from west towards east)

Photo 5.2 Landfall area (view from south towards north)

The HDD shore crossing involves drilling a bore from onshore to offshore. A reaming tool will be used to ensure the bore path has sufficient internal diameter for the pipeline. The pipeline construction commences on a barge and the pipeline is pulled through the bore to the onshore tie-in weld location. At its pop-out location offshore, a pre-trenched section will be required which will be backfilled following pipeline installation, to ensure the pipeline is buried for the full extent of the nearshore region.

The onshore pipeline crosses beneath four existing onshore pipelines:

> The upstream 16-inch gas and 12-inch oil pipelines of OMVP (which the Ana to GTP pipeline also crosses offshore); and

> Two 32-inch water disposal pipelines of ROMPETROL.

Each of the pipeline crossings will be built in accordance with the local pipeline crossing design requirements, essentially requiring the Ana to GTP pipeline to cross beneath the existing pipelines encased within an outer sleeve.

For the trenched sections, the topsoil will be retained and reinstated after the pipeline is installed. The pipeline will be buried and will be periodically monitored by a walk-over survey.

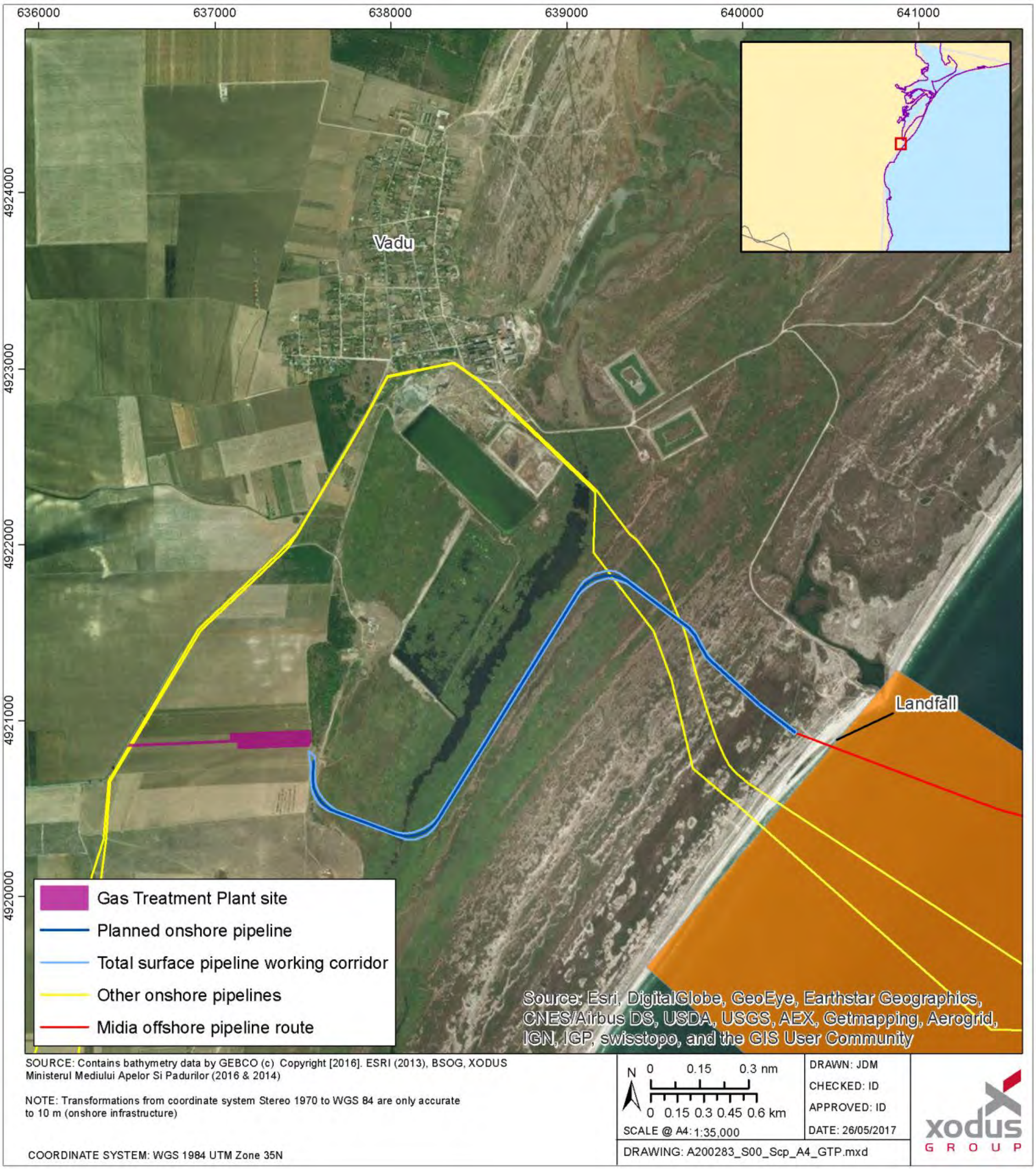


Figure 5.5 Onshore layout of MGD Project

The activities to be carried-out during the construction stage of the onshore pipeline are detailed below and represent the maximum extent of the activities to be performed.

a) Construction of the site management area (site compound located in the area of the GTP):
    - Construction materials transportation (sand, gravel, concrete slabs, pipes and fittings, sanitary installations, electric cables and equipment);
    - Set up access roads;
    - Removal of vegetal soil layer at container locations;
    - Vegetal soil storage;
    - Removal of backfill layer at container locations;
    - Backfill storage;
    - Set up container locations;
    - Equipment transportation (containers, welding generators, hand tools, accessories, power generators, pipeline launchers, supports, beetles, excavators, bitumen smelter, heating and heat treatment equipment, NDE equipment, telecom equipment, computers, printers, scanners, office furniture, ecological toilets etc.);
    - Equipment handling (unloading);
    - Containers installation;
    - Set up open spaces for materials, tools and equipment storage;
    - Electric power connection from the grid or start up electric power generators;
    - Installation of temporary electric lighting system;
    - Installation of electric power supply system;
    - Installation of gas supply system (if needed);
    - Installation of water supply;
    - Storage of equipment, tools, accessories in containers; and
    - Waste collection and segregation & removal.

b) Delimitation of the pipeline route:
    - Site survey and location of pipeline route coordinates;
    - Stake installation; and
    - Marking and stake-out the temporary access road for construction (the road will be part of the working corridor).

c) Set up temporary access road for construction (the road will be part of the working corridor):
    - Removal and storage of vegetal soil layer; and
    - Drainage of temporary floodable areas (if applicable).

d) Handling, storing and transporting tubular material:
    - Road transportation (truck + trailer or special trailer) to the storage area in the site management area;
    - Unloading using cranes (independent or from the truck);
    - Storage on wooden supports, stacked;

- o Loading using cranes on the trailer (special trailer);
- o Transportation to the installation place (approximately 8 km); and
- o Unloading using cranes (independent or from the truck) and arranging the pipelines along the route, on wooden supports.

e) Digging the open trench for the pipeline:

- o Marking out the pipeline route using stakes;
- o Detection and marking of underground obstacles;
- o Transportation of the excavator from site compound to the trench location;
- o Removal and storage of vegetal soil layer next to the trench;
- o Digging the open trench in the areas free of any obstacles at the pipeline dimensions (Figure 5.6) and storing filling layer on the opposite side of the trench;
- o Manual digging in the area of the obstacles, to the depth prescribed for under crossing;
- o Trench consolidation where depth exceeds 1.5 m;
- o Laying the sand damping layer;
- o Arranging works in the trench according to the pipeline (ballasting the pipeline when the pipeline is not procured already with ballast, installing sacrificial anodes for cathodic protection, installing fibre optic cable, constructing soil “legs” etc.); and
- o Transportation of the excavator from the location.

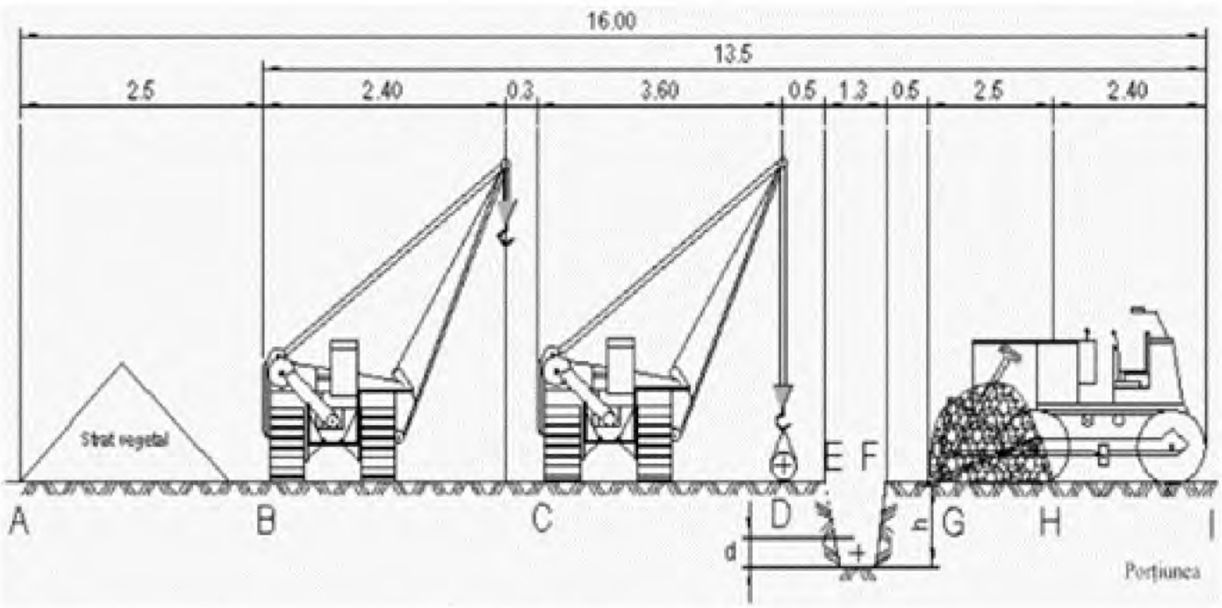
f) Installing the pipeline:

- o Tying the pipeline to the hook of the launcher with a textile band;
- o Installation of the pipeline in the trench;
- o Connection of pipeline sections by welding them end to end in the trench;
- o Checking and cleaning the chamfer;
- o Fixing the pipeline in the installation position;
- o Pre-heating;
- o Manual end-to-end welding;
- o Post-welding thermal treatment (tempering);
- o Non-destructive testing of the welding line;
- o Insulation of the welding line as contractile collar;
- o Testing the insulation using Isotest (remedy if necessary);
- o Preparation of the pipeline for connection to the cathodic protection system; and
- o Connection of the pipeline to the cathodic protection system.

g) Covering the trench and terrain reinstatement:

- o Transportation of the excavator and/or the bulldozer to the location;
- o Covering the pipeline with a 15 cm thick strained back-fill layer using the excavator and/or the bulldozer;
- o Filling the trench with back-fill according to the method statement foreseen by the design documentation; and

o Laying down vegetal layer at the depth specified by the design documentation.



Segment	Segment's specification	Lenght of segment
TOTAL VOLUME OF THE EXCAVATION 6,19 m³/ml of which: VEGETAL SOIL VOLUME (hs = 30 cm, L = 13,5 m) = 4,05 m³/ml VOLUME OF THE EXCAVATION (bottom of the trench) = 2,08 m³/ml		
A-H	Working corridor width and installation of the pipeline, of which:	16 m
A-B	Segment used for the storage of vegetal soil	2,5 m
B-C	Segment required by the moving launcher	2,7 m
C-D	Segment required by the launcher	3,6 m
D-E	Safety segment	0,5 m
E-F	Pipeline trench	1,3 m
F-G	Safety segment	0,5 m
G-H	Segment used for the storage of back-fill	2,5 m
H-I	Work space required for manipulating the bulldozer	2,4 m

NOTE: The "h" depth of the trench is equal to the frost depth, according to STAS 6054-77, to which the diameter "d" of the pipeline is added.

Figure 5.6 Working corridor layout for the installation of a 400 mm - 500 mm diameter pipeline

h) Crossings:

Undercrossings in open trench (for existing OMVP pipelines):

- o Detecting underground obstacles, e.g. pipelines, cables, using detection equipment or test holes, and marking above ground obstacles (road, railway, irrigation channel, minor water route);
- o Installing the pipeline in open trench by manual digging;
- o Reinforcing the walls of the trench in the under-crossing area;
- o Installation of the crossing protection sleeves;

- Installation of the pipeline through the crossing protection sleeves ;
- Connection of pipeline sections by welding them end to end in the trench;
- Checking and cleaning the chamfer;
- Fixing the pipeline in the installation position;
- Pre-heating;
- Manual end-to-end welding;
- Post-welding thermal treatment (tempering);
- Non-destructive testing of the welding line;
- Insulation of the welding line as contractile collar;
- Testing the insulation using Isotest (remedy if necessary);
- Sealing of the protection pipe ends;
- Installation of venting and breathing systems at the under-crossing;
- Installation of the under-crossing markings;
- Preparation of the pipeline for connection to the cathodic protection system; and
- Connection of the pipeline to the cathodic protection system.

Undercrossings by horizontal directional drilling (for Balta Mare and Balta de Mijloc):

- Detecting below ground obstacle – pipeline, cable - (using detection apparatus or by sampling holes) or by marking obstacle situated above ground (road, railway, irrigation channel, minor water route);
- Setting up the terrain for installation of the drilling equipment;
- Transporting, unloading and setting up the drilling installation on the location together with related installations (preparation of the drilling mud, storage of drilling poles, storage of detritus);
- Execution of the pilot drill;
- Enlarging the drilled tunnel;
- Consolidation of drilled tunnel or tubing the well with protection pipe;
- Application of the mechanical protection layer on the pipeline;
- Installation of the pipeline into the protection pipe, simultaneously with connecting the sections by end-to-end welding and insulating the welding lines;
- Testing the insulation using Isotest (remedy if necessary);
- Sealing of the protection pipe ends;
- Installation of the venting and breathing systems of the under-crossing;
- Installation of the under-crossing markings;
- Preparation of the pipeline for connection to the cathodic protection system; and
- Connection of the pipeline to the cathodic protection system.

Undercrossing by horizontal directional drilling (for the beach area):

- Detecting below ground obstacle at the connection location and along the pipeline section route;

- o Setting up the terrain for installation of the drilling equipment;
- o Transporting, unloading and setting up the drilling installation on the location together with related equipment (preparation of the drilling mud, storage of drilling poles, storage of detritus). A typical site layout is illustrated in Figure 5.7;
- o Execution of the pilot drill;
- o Enlarging the drilled tunnel;
- o Consolidation of drilled tunnel or tubing the well with protection pipe, if necessary;
- o Application of the mechanical protection layer on the pipeline;
- o Installation of the pipeline into the protection pipe (if necessary) and pulling it by barge to the sea. Simultaneously the pipeline sections will be connected by end-to-end welding and the welding lines will be insulated;
- o Testing the insulation using Isotest (remedy if necessary);
- o Sealing of the protection pipe ends;
- o Installation of the venting and breathing systems of the under-crossing;
- o Installation of the under-crossing markings;
- o Preparation of the pipeline for connection to the cathodic protection system;
- o Connection of the pipeline to the cathodic protection system; and
- o Transportation of the drilling installation and associated equipment from the location.

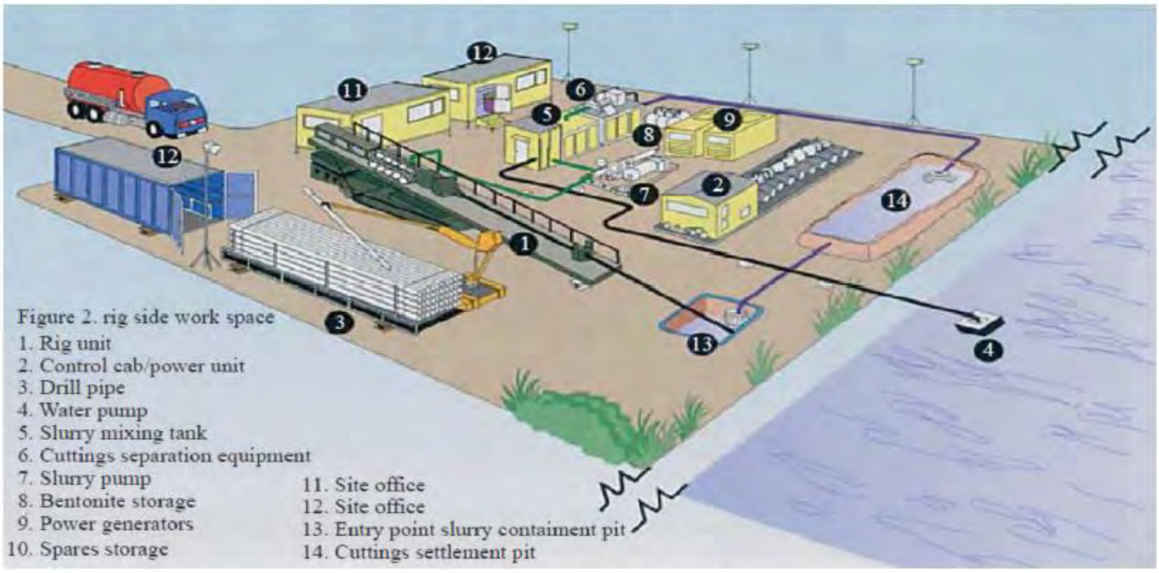


Figure 5.7 Typical Onshore Rig Site Layout

Crossing standing water bodies by pipeline ballasting (most likely option):

- o Detection and marking of locations of underground obstacles;
- o Establishing the crossing corridor;
- o Transportation of dragline excavators to the location;
- o Digging the open trench with dragline excavators;

- o Connection of the pipeline section by end-to-end welding and installing ballast according to the project (point or continuous ballasting);
- o Transportation of the winch to the location;
- o Pulling the pipeline from the opposite bank simultaneously with connecting the pipeline sections as described above;
- o Connection of the ballasted section with the remaining pipeline;
- o Transportation of the winch from the location; and
- o Transportation of dragline excavators from the location.

Crossing standing water bodies by pipeline ballasting (most unlikely option):

- o Detection and marking of locations of underground obstacles;
- o Establishing the crossing corridor;
- o Transportation of dragline excavators to the location;
- o Digging the open trench with dragline excavators;
- o Connection of the pipeline section by end-to-end welding and installing ballast according to the project (point or continuous ballasting);
- o Transportation of the barge on the location and launching it in the water; Fixing the end of the section on the barge;
- o Hauling the barge from the opposite bank simultaneously with connecting the pipeline sections as described above;
- o Connection of the ballasted section with the remaining pipeline; and
- o Transportation of the barge from the location.

i) Installation of the fittings and accessories – (if necessary);

- o Transporting fittings/accessories on the location;
- o Unloading at the assembling/installation location;
- o Preparing the assembling point between the pipeline and fitting/accessory;
- o Assembling the fitting/accessory to the pipeline; and
- o Non-destructive testing of the assembly.

j) Pipeline connection to upstream block valve:

- o Execution of the flanged connection between pipeline and block valves or execution of the golden welds between pipeline and the block valves; and
- o Waste collection and segregation & removal.

k) Integrity and running check of all fittings, instruments, accessories along the pipeline:

- o Visual inspection of all visible fittings, instruments and accessories;
- o Performing tests, where applicable; and
- o Waste collection and segregation & removal.

l) Cleaning the pipeline:

- o Installation of temporary pig stations at the ends of the pipeline;
- o Transportation of the pig on the unloading location;

- o Introduction of the pig in the pig launching station;
- o Launch of the pig;
- o Receiving the pig in the pig receiving station;
- o De-pressuring the system;
- o Removal of the pig from the pig receiving station;
- o Removal of debris from the pig receiving station;
- o Collecting debris;
- o Loading debris in vehicles and transporting them to dedicated facilities;
- o Loading the pig in vehicles; and
- o Transportation of the pig from the location.

m) Testing the pipeline:

- o Insulating testing sections and sealing the pipe ends;
- o Installing the hydraulic/pneumatic testing device;
- o Pressurise pipeline section in stages, to leak test value as indicated in the commissioning and leak test procedure;
- o Pipeline depressurisation;
- o Elimination of leak causes;
- o Final pressuring at testing pressure;
- o Maintain pressure for the prescribed time as indicated in the leak test procedure;
- o Pipeline depressurisation;
- o Water discharge, in the case of hydraulic testing; and
- o Cleaning (drying) the pipeline by pig run (see “Cleaning the pipeline”).

n) Road reinstatement:

- o Laying and compacting filling layers according to design documentation specifications;
- o Levelling and compacting the filling layer; and
- o Waste collection and segregation & removal.

o) Decommissioning site organisation:

- o Dismantling electrical, gas and sanitary installations;
- o Loading and transportation of: equipment, tools, accessories, materials;
- o Dismantling the containers and ecological toilets;
- o Loading and transportation of containers and ecological toilets;
- o Removal of the gravel bed;
- o Laying down and compaction of backfill as specified by the design documentation;
- o Laying down of vegetal soil as specified by the design documentation; and
- o Waste collection and segregation & removal.

5.5 Gas Treatment Plant

5.5.1 General

The purpose of the GTP is to receive raw production from offshore, and then treat the gas to ensure that it meets the specifications required for export.

The GTP also processes the water/MEG received from the subsea production system and facilities are provided within the GTP control room to control the entire MGD Project facilities from a single location.

The GTP is located approximately 2.5 km from the shoreline on arable land and will be connected to athe NTS via a new transmission gas pipeline that will be constructed and operated by TRANSGAZ.

The overall plot size for the GTP is 300 m × 100 m, arranged east-west with the hydrocarbon processing equipment and cold vent disposal systems to the east of the site and the control room and support facilities to the west of the site as shown in Figure 5.8 and Figure 5.9.

The GTP will be located in the immediate vicinity of a false acacia forest and is estimated not to exceed the height of the forest (about 10-11 m), except for the gas discharge stack. The stack is 50 m high and approximately 1 m in diameter.

5.5.2 Main Processing Systems

As summarised in Figure 5.10, the main processing systems of the GTP comprise:

- Slug catcher: Designed to handle a peak gas rate of 3.115 MMSCMD at a pressure of 25 barg with a maximum liquids handling rate equal to full pipeline displacement of liquid at a pigging speed of 0.5 m/s (203 m^3/hr) and a liquid slug volume allowance of 35 m^3. It will have a design pressure of 72 barg and will be constructed from carbon steel;
- Compressor suction scrubber: Designed to handle a peak gas rate of 3.115 MMSCMD at a pressure of 25 barg. It will have a design pressure of 72 barg and will be constructed from carbon steel;
- Gas turbine driven compressor: Single stage compressor designed to handle a peak gas rate of 3.115 MMSCMD at a suction pressure of 25 barg and a discharge pressure of 58 barg, with an ambient air temperature of 30°C (lower than site maximum ambient air temperature of 38°C on the assumption that reduced performance at very high ambient temperatures is acceptable). The compressor is also designed to be re-wheeled to enable the suction pressure to be reduced to 13 barg at a gas rate of 0.9 MMSCMD while maintaining a discharge pressure of 58 barg. Design pressure of 72 barg;
- Compressor aftercooler: Designed to handle full compressor flow recycle (3.8 MMSCMD) at 58 barg and cool the gas down to 45°C with an ambient air temperature of 35°C (lower than the site maximum ambient air temperature of 38°C on the assumption that reduced performance at very high ambient temperatures is acceptable). It will have a design pressure of 72 barg and will be constructed from carbon steel;
- Compressor discharge scrubber: Designed to handle a peak gas rate of 3.115 MMSCMD at a pressure of 57 barg. It will have a design pressure of 72 barg and will be constructed from carbon steel;
- Triethylene glycol (TEG) dehydration column: Designed to handle a peak gas rate of 3.115 MMSCMD at a pressure of 57 barg and deliver dehydrated gas with a water dew point of -15°C at 50 barg. It will have a design pressure of 72 barg and will be constructed from carbon steel; and
- Gas fiscal metering package: Designed to handle a peak gas rate of 3.115 MMSCMD at a pressure of 40 to 55 barg. This package will measure volumetric flowrate, water dew point and composition and will provide calculated mass flowrates and energy flowrates.

Upstream of the slug catcher, facilities will be provided to enable a pig receiver to be installed.

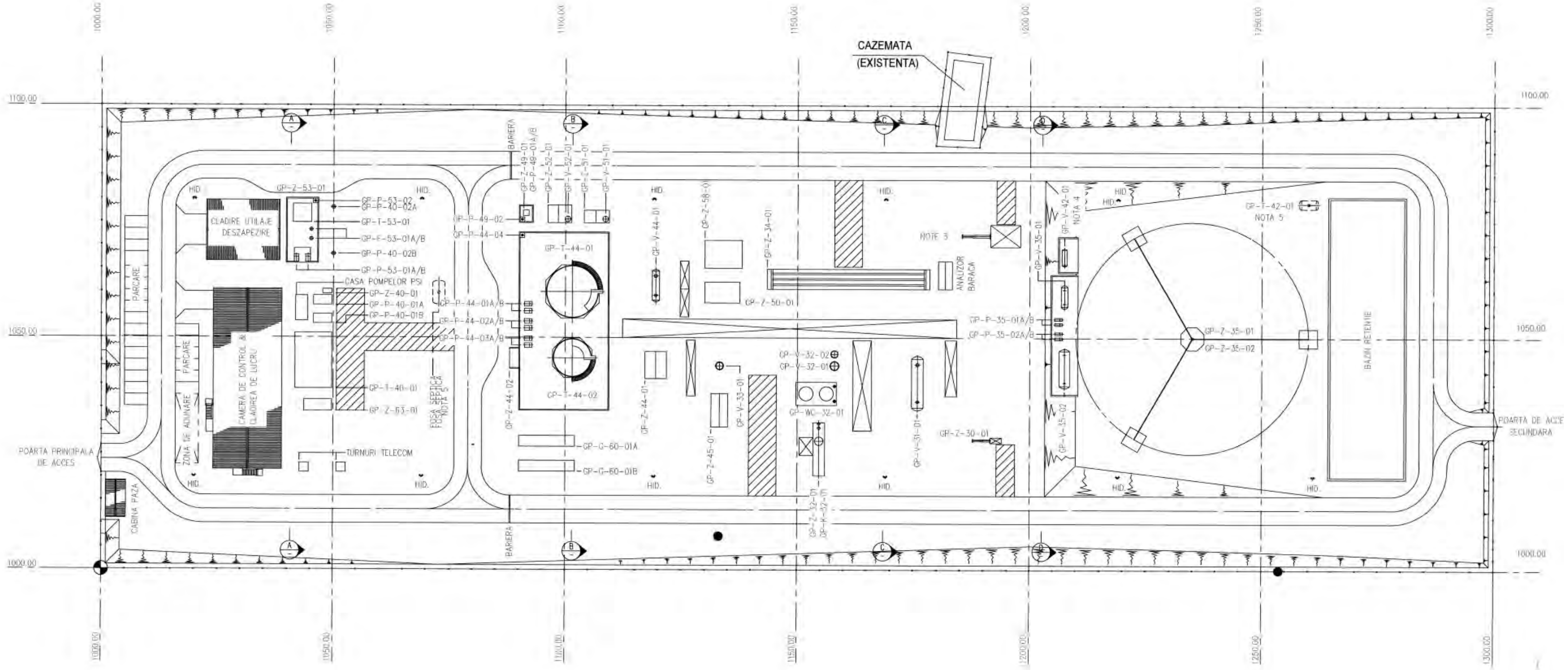


Figure 5.8 GTP site plan

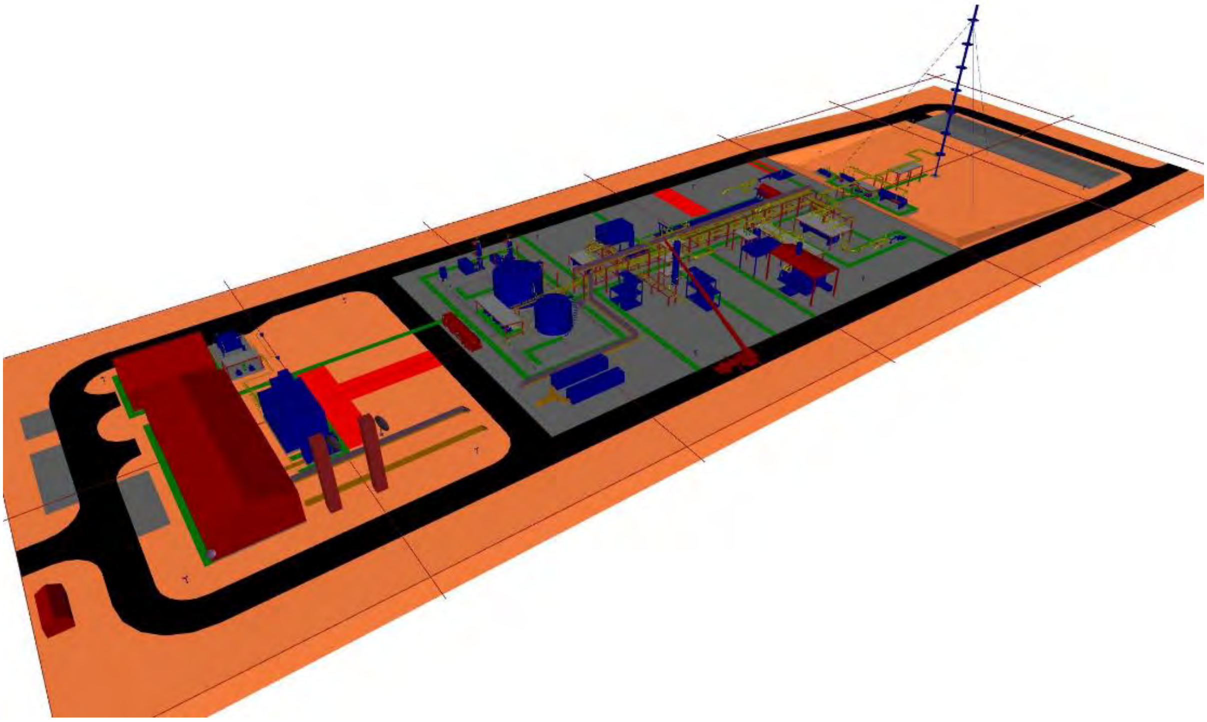


Figure 5.9 Schematic layout of GTP

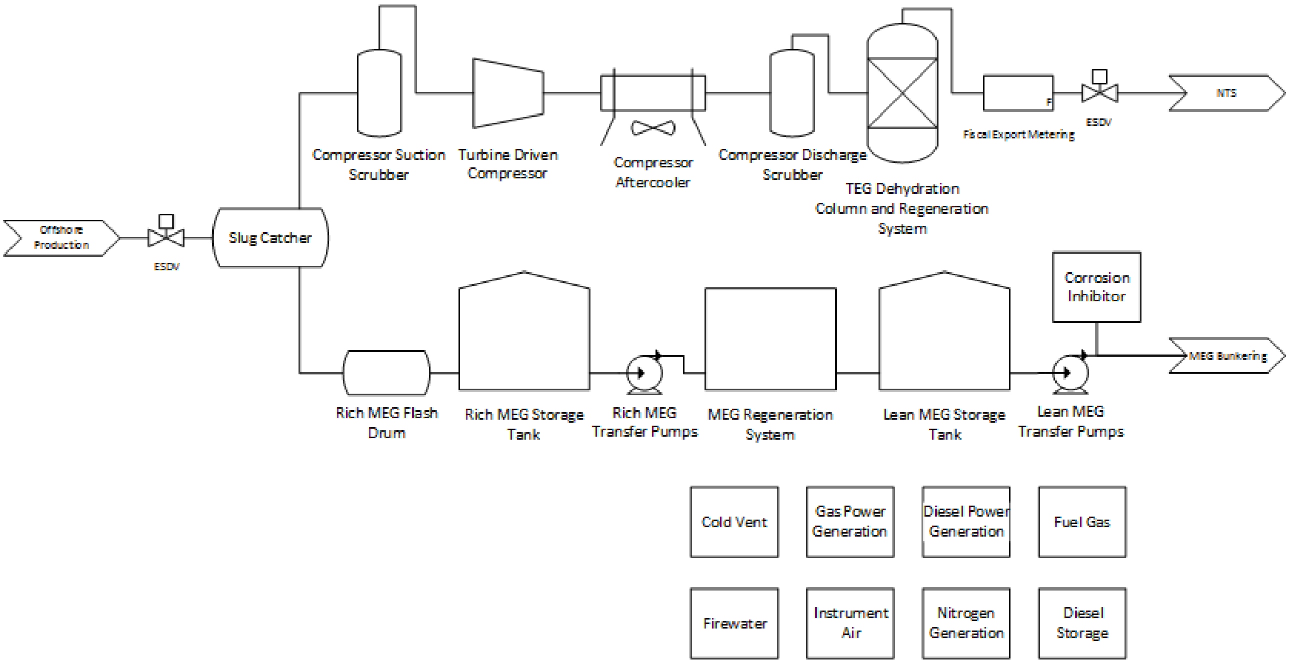


Figure 5.10 GTP Processing Scheme

5.5.3 Auxiliary Processing Systems

The auxiliary processing systems of the GTP will comprise:

- Rich MEG flash drum: Designed to handle a peak rich MEG drainage rate of 203 m^3/hr from the slug catcher and to de-gas the liquids prior to feeding them to the Rich MEG Storage tank. It will have a design pressure of 10 barg and will be constructed from carbon steel;
- Rich MEG storage tank: Designed to provide 500 m^3 of rich MEG storage. It will have a design of 0.07 barg and will be constructed from carbon steel;
- Rich MEG transfer pumps: Designed to transfer up to 18.5 m^3/d rated flowrate of rich MEG to the MEG regeneration package. It will have a design pressure of 3.5 barg and will be constructed from carbon steel;
- MEG regeneration package: Designed to process rich MEG of varying concentrations to produce 4.8 m^3/d of MEG with a concentration of 80% MEG and 20% water by weight (i.e. 200% of the maximum steady state MEG injection rate for the offshore hydrate inhibition system). Water removed from the rich MEG will be vented directly to atmosphere as steam;
- Lean MEG storage tank: Designed to provide 220 m^3 of lean MEG storage (200% of the offshore lean MEG storage volume). It will have a design pressure of 0.07 barg and will be constructed from carbon steel;
- Lean MEG loading facility: Designed to load 30 m^3/hr of pre-mixed MEG and corrosion inhibitor into road tankers. It will have a design pressure of 3.5 barg and will be constructed from carbon steel;
- Corrosion inhibitor storage and injection facility: Designed to store and pump small volumes of corrosion inhibitor into the lean MEG loading facility; and
- TEG regeneration package: Designed to regenerate the TEG used to dehydrate the gas system. It will be constructed from carbon steel. Water removed from the TEG will be vented directly to atmosphere as steam.

5.5.4 Utility Systems

The utility systems of the GTP comprise:

- Main power generation: Two gas fuelled power generators, each sized for 100% of the maximum electrical load for the GTP;
- Back-up power generation: One diesel fuelled power generator, sized for 100% of the maximum electrical load for the GTP. The back-up power generator will not normally run but will be started in the event that one or both of the main power generators trips. The back-up power generator would also be used to “black start” the GTP in the event that fuel gas is not available for the main power generators;
- Fuel gas: One fuel gas conditioning package consisting of a fuel gas knock out drum, fuel gas heater and individual routing valves plus metering for all consumers. The fuel gas package can take feeds from either downstream of the TEG dehydration column or from the slug catcher gas outlet. During normal operation, the fuel gas electrical heater will provide 20°C superheat above saturation for all fuel gas consumers;
- Cold vent: A high pressure cold vent system is provided for the safe disposal of process gases during an emergency or overall GTP shutdown situation. The vent system collects relief/blowdown sources from across the GTP and routes them to a knock out drum for removal of any liquids prior to venting gas to atmosphere via an elevated vent stack. The height of the vent stack is sufficient to ensure that, in the event of vent gas ignition, the radiation levels at the GTP fence line are below those recommended by major oil and gas operators worldwide. During normal operation, the vent will be

continuously purged with nitrogen to prevent air ingress. A low pressure cold vent is also provided to handle operational and emergency vents from low pressure sources (having design pressure lower than 17.5 barg, such as the rich MEG flash drum). The low-pressure system collects these sources and routes them to a knock out drum for removal of any liquids prior to venting gas to atmosphere alongside the high-pressure vent tip. The low-pressure vent will also be continuously purged with nitrogen during normal operation to prevent air ingress to the system;

- Instrument air: An instrument air package is supplied to provide clean, dry air to the GTP for instrument and control purposes as well as plant air. The package will supply the onsite nitrogen generation package;
- Nitrogen: A nitrogen generation package is supplied to provide clean, dry nitrogen to purge the vent systems and certain vessels/tanks (e.g. rich MEG flash drum, rich MEG storage tank and lean MEG storage tank);
- Firewater: A firewater system is supplied, comprising a 500 m³ storage tank, two diesel driven firewater pumps (each sized for 1900 litres/minute of firewater) and an underground ring main with hydrants spaced approximately every 50 m around the perimeter of the GTP. In addition, a chemical dosing system will be provided to minimise the potential for biological growth within the firewater tank;
- Diesel: A diesel storage and supply system is supplied to provide diesel to the back-up power generator and firewater pumps;
- Closed drains: A closed drains system is provided to collect small operational drains from processing equipment (e.g. scrubber liquid drains);
- Open drains: The open drainage system collects drainage, washing water, storm water from all areas, including that of the liquid separator, the compression system and the fuel gas module. Also, it may collect other fluids from utility areas, such as oils, diesel, MEG, TEG and chemicals. The open drainage is collected in a main pipeline collector located underground and directed into a storage basin equipped with a separator designed to remove hydrocarbons. Separated hydrocarbons will be collected and removed periodically for treatment and disposal by qualified and authorised contractors. Following analysis, the water is transferred into the retention pond; and
- Fresh water: Two fresh water pumps are provided to pump water from a local aquifer to the firewater storage tank and the grey water systems within the GTP control buildings. Note that it is not intended that this water is used for drinking water or for food preparation. Bottled water will be provided onsite for these purposes.

5.5.5 Overall Safety Philosophy

As with the Ana Platform, the overall safety philosophy for the GTP is simple and is driven to provide as much inherent safety in the design as is practical. This simplicity is aided by the fact that the production fluids cannot form hydrocarbon liquids under any foreseen operating or upset conditions.

In addition to this, the hydrocarbon inventory of the GTP is estimated to be circa 8 tonnes, which is below the relevant Romanian law threshold limit for “lower tier” sites, so the GTP is not considered to be a site that needs to comply with the EU’s Control of Major Accidents and Hazards (COMAH) requirements.

Regardless of this, the site has been designed in line with the requirements of COMAH legislation.

The layout of the GTP has been developed to minimise potential for escalation of any incidents and provide “safety by distance” between permanently manned areas and the GTP in the event of the leak:

- The GTP layout ensures adequate open natural ventilation;
- High pressure hydrocarbon containing equipment is located as far away as is practical from the permanently manned areas of the site *i.e.* the control room building;

- The prevailing wind direction (from the north) is considered in the equipment layout as hydrocarbon containing equipment is located downwind of potential ignition sources;
- The temporary pig launcher/receiver facilities are orientated away from hazardous equipment and locations typically occupied by personnel;
- The vent stack is located at a suitable distance from equipment and personnel occupied areas and is at a sufficient height to ensure that heat loads resulting from an accidental ignition of the vent are within acceptable limits; and
- The equipment is laid out to minimise the impact of projectiles in the highly unlikely event of an explosion.

A basic fire and gas detection system is provided, and the system will be self-diagnostic. As the GTP is an open plant dealing with over 99% methane gas, there will be limited potential for significant gas cloud build up.

Infra-red line of sight gas detectors will be supplied around the perimeters of the process area, which has been segregated into fire zones. Upon activation, the detectors will alarm only as the GTP open layout presents challenges to reliable detection. An operator will need to decide whether or not to initiate emergency shutdown or emergency depressurisation following a gas detector alarm initiation. Upon activation of emergency depressurisation system, the GTP will be depressurised to a maximum pressure of 6.9 barg or 50% of design pressure (whichever is lower) within 15 minutes.

Flame detection is not provided for in the general process areas due to the difficulty in detecting fires in such an open site and the very low likelihood of ignition. A small number of infra-red flame detectors will be located near the TEG regeneration reboiler and at any fired heater areas. CCTV cameras will be provided for the site, which would allow operators to visually confirm whether there is a fire in the process area.

Air inlet gas detection will be provided for the control room, compressor turbine, main power generators and air compressor and optical smoke detectors will be provided in the control room building.

5.5.6 GTP construction

The GTP will be constructed within a permitted area on land owned by BSOG, which lies approximately 2.5 km from Vadu village (see Figure 5.5). It is estimated that two roads are to be improved near the GTP.

The GTP will be surrounded by a fence and trees will be planted around the perimeter. The site will be manned 24 hours a day.

5.6 Drilling

5.6.1 Reservoir

Ana and Doina are dry gas reservoirs, > 99% methane, with no condensate. There is a common gas composition across the XV Midia Block and no hydrogen sulphide (H_2S) is anticipated.

Drilling of the production wells is expected to commence in Quarter 2 of 2021. Drilling and completion of the Ana wells is expected to take approximately 120-160 days, while that at Doina will take approximately 35-55 days including the rig mobilization, rig inter-well move and rig demobilization.

5.6.2 Drilling rig

The drilling rig to be used is expected to be a cantilever jack-up with three legs, *GSP Uranus*, which has previously worked in the Black Sea. A jack-up drilling rig consists of a buoyant steel hull that can raise and lower itself on a number of legs (often usually three or four) and on which the drilling deck is cantilevered out to on one side Figure 5.11). The buoyant steel hull enables floating of the unit and all attached drilling machinery to any location, either at an existing platform or in open water. Once on location the hull can be raised to the required elevation above the sea surface; if drilling through an existing platform, the cantilevered drilling deck can be positioned directly over the platform’s well slots. The legs of such units are typically fitted with enlarged footings (termed spud cans) to provide stable support, distribute the rigs load evenly on the seabed and to limit penetration into the seabed as the hull is jacked up. Jack-up rigs are generally not self-propelled and rely on sea going tugs or heavy lift ships for transportation to and from the drilling locations.

Figure 5.11 Examples of jack-up drilling rigs (in image to right, the rig is cantilevered over a small platform)

5.6.3 Well operations

Four wells will be drilled in the Ana field through the Ana Wellhead Platform once it has been installed. Positioning of the MODU is generally undertaken in two stages. The rig will enter the Ana platform 500 m safety exclusion zone and the legs pinned on the seabed at a stand-off location close to its final position, on the platform's east side. At this moment the MODU is connected to three vessels in three different points. The rig's legs will then be unpinned from the sea bed, allowing the MODU to be slowly moved and pulled into its final position.

Once in the final position, the rig will pin down its legs on the seabed and raise the hull to the desired elevation above the platform structure and stay in this working position untill all four wells are drilled and the production completions have been installed.

On completion of the Ana wells, the rig will jack down into the water, connect to the three vessels system and raise the legs off the sea bed. The jack-up rig will then be moved to the Doina field under sea-going tow and positioned atthe single Doina subsea well location.

5.6.4 Well design

The four Ana wells will be designated Ana-100, -101, -102 and -103, and the Doina well as Doina-100. The Ana-100 well and the Doina-100 well will be drilled vertically, while the others will be deviated to around 45-50 degrees of inclination.

Each well will be drilled in four sections, the diameter of each being successively reduced with depth. The drilling process uses a drill string; this is a long section of drill pipes connected together terminating in a drill bit, which is rotated by a top drive from surface to drill down through the seabed and formations beneath (Figure 5.12). Through a central bore in the drill string, a mixture of water, potassium chloride, calcium carbonate and other chemicals, known as drilling mud or drilling fluid, is pumped into the well to keep the drill bit cool and lubricated and to aid in the suspension and removal of the drilled foramtion cuttings. A key role of the drilling fluid is also to maintain the hydrostatic pressure while drilling. Further information about the functions of drilling fluids, and the fate of used drilling fluids and cuttings, is given in Section 5.6.5.

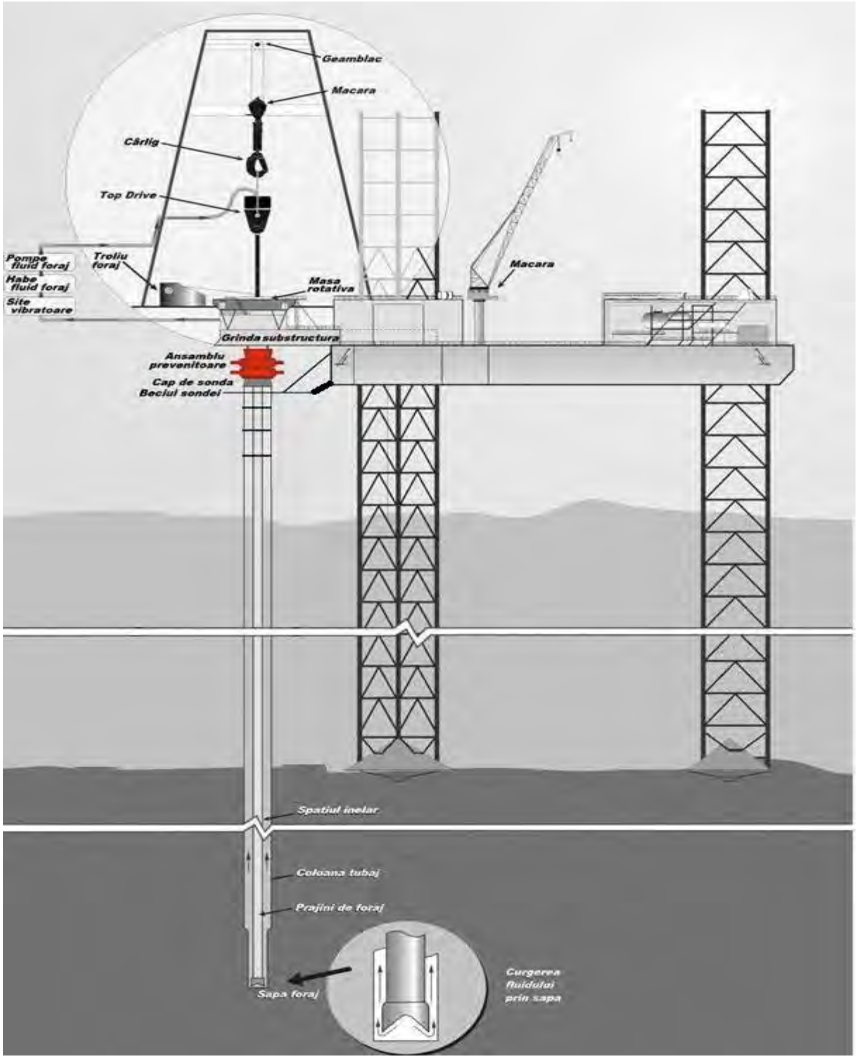


Figure 5.12 Generic diagram of the well and of the drilling installation

For the four platform wells at Ana, the first section of each well (the tophole section) will be of 30" outside diameter and will be formed by hammer-piling a 30" diameter steel conductor pipe into the seabed as deep as it will go. This is expected to reach approximately 140 m total vertical depth subsea (TVDSS) or 70 m below the seabed. Once installed, the conductor will be cut at the Ana platform cellar deck level and cleaned out using a 26" drill bit. The tophole section for all four platform wells will be prepared in this manner as a batch process prior to drilling the lower sections for any of these wells.

The deeper sections of each well, 17½", 12¼" and 8 ½" will then be drilled through the conductor and steel casings (13⅜", 9⅝") installed and cemented in each section, to provide stability to the well and prevent the transfer of fluids either from the well into the surrounding formations or vice versa.

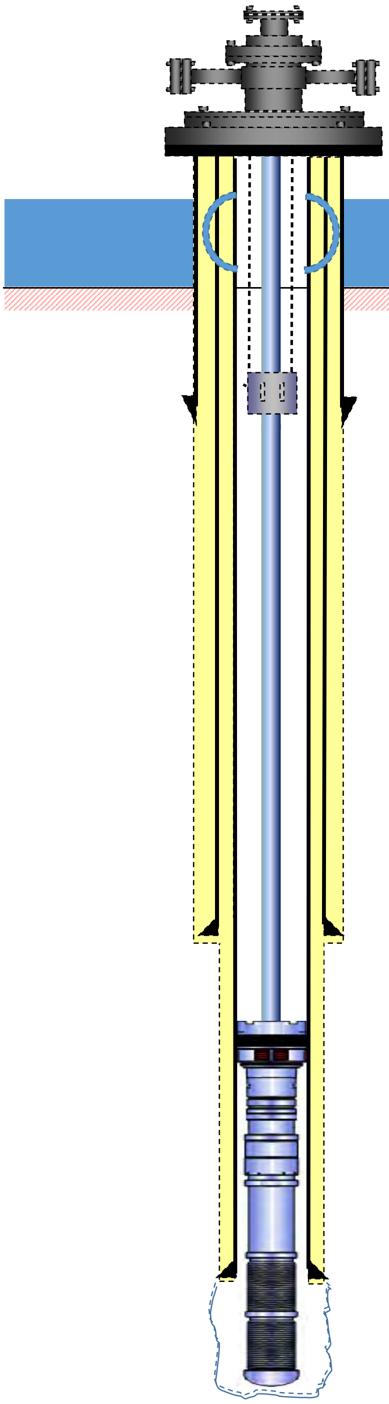
A diverter system will then be installed on the 30" conductor pipe before drilling the 17 ½" section. For Ana-100, the 17½" hole will be drilled with an 8½" pilot hole initially, and then reamed out to 17½" diameter. The 13⅜" steel casing will then be run into the hole and cemented in place and a wellhead installed together with a 13 5/8" surface blowout preventer (BOP) system. For the other three Ana platform wells, the process will be similar except that no initial 8 ½" pilot hole will be drilled in the 17½" section.

The objective for all wells is to set the the 9⅝" casing shoe at the top of the hydrocarbon-bearing reservoir, estimated to be between approximately 1,109 and 1,120 m TVDSS. A hole of 8½" diameter and 25-35 m in length will then be drilled and under-reamed to 16" diameter beneath the 9⅝" casing, to allow for the installation of an open hole gravel pack[3] system as the primary means to produce the gas from the reservoir.

Schematic figures representing the two broad well types planned at the Ana platform location are shown in Figure 5.13 below.

[3] A type of sand-control completion in which the gravel pack screen is packed off in an open hole section with no casing or liner to support the producing formation.

Ana-100 Well Schematic



	MDBRT	TVD	TVDSS
Rotary Table	0.00 m	0.00 m	40.50 m
Weather Deck	14.00 m	14.00 m	26.50 m
Top of Conductor	25.90 m	25.90 m	14.60 m
MSL	40.50 m	40.50 m	0.00 m
Water Depth = -73 m			
Seabed (Mud line)	113.50 m	113.50 m	73.00 m
30" Conductor (hammered)	180 m	180 m	-140 m
13 3/8" Surface Casing 17 1/2" hole	450 m	450 m	-410 m
TOC Tail 9 5/8"	840 m	840 m	-800 m
9 5/8" Production Casing 12 1/4" hole	1,140 m	1,140 m	-1,100 m
8 1/2" open hole x 16" under ream	1,174 m	1,174 m	-1,134 m

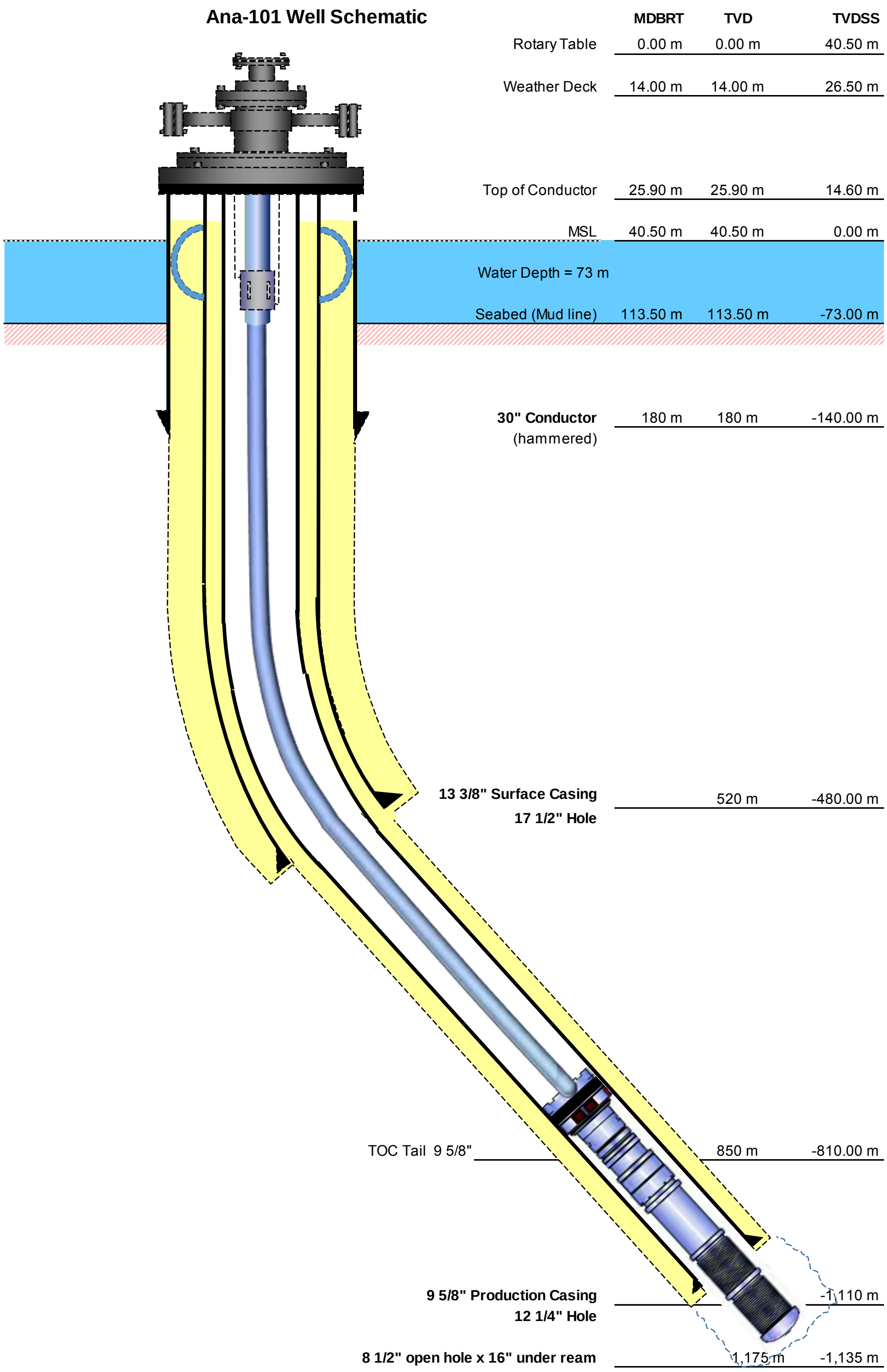


Figure 5.13 Schematics representing well design at the Ana platform (top: Ana-100 vertical well; bottom: Ana 101 deviated well to rig)

At Doina, well design will be similar to that at Ana, with slight changes due to differences in water depth (83 m at Doina, compared to 73 m at Ana) and the depths of the subsurface formations. One vertical well is envisaged at Doina initially (Doina-100). The 30” conductor will be installed to around 150 m TVDSS; this will be the support for the subsea wellhead system.

The deeper sections of the Doina-100 well, 12¼" and 8½”, will then be drilled through the conductor and steel casings (13⅜", 9⅝") installed and cemented in each section. As for the Ana-100 well, the 17½" section will be drilled initially with an 8½" pilot hole, and then enlarged out to 17½" diameter. Before drilling the 8½’’ hole, a surface diverter (BOP) system will be installed. The 13⅜" steel casing will be fitted with a 13⅝” drill through High Pressure subsea wellhead assembly with dummy 20” x 30” wellhead adapter system. Once the 13⅜” casing has been cemented in place, the surface diverter (BOP) system will be removed and a 16" riser pipe will then be installed to make the connection from the 13⅝” high pressure subsea wellhead up to the drilling rig, where a 13⅝” blowout preventer (BOP) system will be installed.

The objective for this Doina well is to set the the 9⅝" casing shoe above the top of the hydrocarbon-bearing reservoir, estimated to be at 1,094 m TVDSS (+/-2m). An open hole of 8½" diameter and 15-25 m length will then be drilled beneath the 9⅝" casing, to allow for the installation of an open hole gravel pack[4] system as the primary means to produce the gas from the reservoir.

A schematic figure representing the well design planned at the Doina location is shown in Figure 5.14.

[4] A type of sand-control completion in which the gravel pack screen is packed off in an open hole section with no casing or liner to support the producing formation.

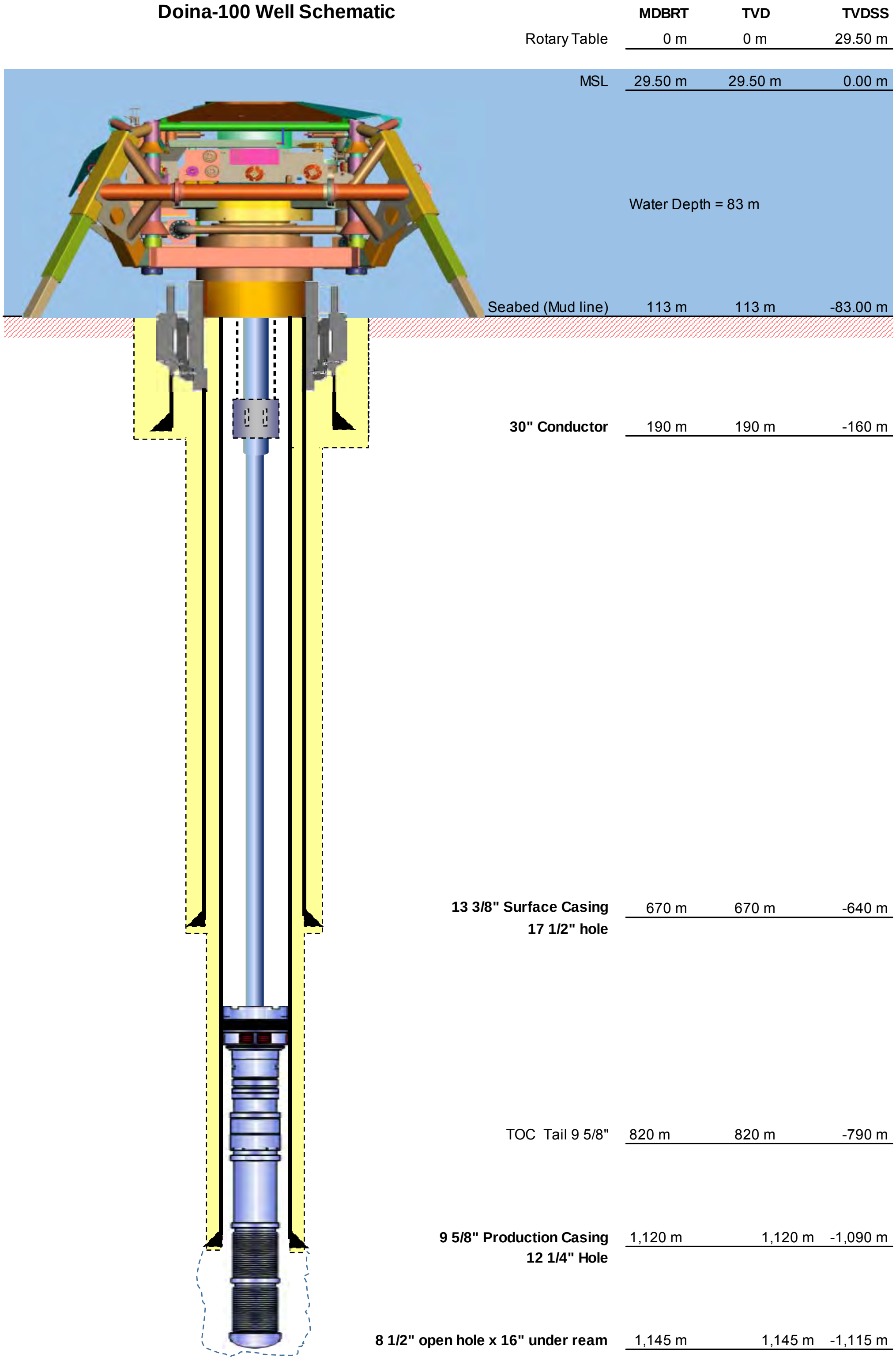


Figure 5.14 Schematic representing well design at the Doina location

5.6.5 Drilling fluids and cuttings

Drilling fluids (commonly called ‘drilling muds’) are essential in the drilling process and fulfil a number of critical functions, including:

- Maintenance of downhole hydrostatic pressure above the formation pressure to avoid formation fluids flowing into the wellbore (also called “a kick”);
- Removal of drilled formation rock cuttings from the drill bit to permit further drilling and transporting cuttings to the surface cuttings handling equipment;
- Lubricating and cooling the drill bit, bottom hole assembly and drilling string; and
- Deposition of an impermeable mudcake on the walls of the well bore, which seals and stabilises the open hole formations.

Drilling fluids can consist of various fluid and particulate materials including weighting agents and other water, brine, solid particulates and chemicals to achieve the required weight, viscosity, gel strength, fluid loss control and other characteristics to meet the technical requirements of drilling and completing the well. Generally, drilling fluids can be divided into two categories based on their base fluid types:

- Water-based mud (WBM), where the base fluid is water or brine; and
- Oil-based mud (OBM), where the base fluid is an emulsion of water droplets distributed within an oil.

WBM and OBM have very different properties, and the choice as to which of these broad types is used is mainly dictated by the geological properties of the formations through which the well is to be drilled. Since at least a proportion of the cuttings resulting from drilling, together with associated drilling fluid, is typically discharged to the marine environment, the environmental effects of such discharges (and associated regulations) are also a factor in drilling fluid selection and design. In general, the use and discharge of WBM is widely permitted, since the fluid and its chemical individual particulate constituents are mostly water-soluble and biodegradable and therefore more easily diluted and dispersed in seawater. The use and discharge of OBM is much more tightly controlled, to the extent that discharges are effectively banned unless stringent conditions on the treatment of used cuttings and reduction of their oil content can be met.

As outlined above, drilling fluids are pumped down into the well through a central annulus in the drill string. They emerge at the bottom of the hole around the drill bit and rise through the well bore annulus, carrying the drilled cuttings to surface. If there is no casing or conductor and riser to the drilling rig (as is often the case when drilling top hole sections), the mixture of cuttings and drilling fluid would spill out from the top of the well directly onto the surrounding seabed. With a riser in place however, the drilling fluid circulates within a closed system and brings the cuttings up to the rig where they can be put through a mechanical cleaning process that includes the us of equipment such as shale shaker screens, centrifuges, desanders, desilters and hydro cyclones. These separate the drilling fluid from the drilled rock cuttings so that the fluid can be re-usedand recycled downhole in the ongoing drilling process, while the cleaned cuttings (with extremely small amounts of adhering drilling fluid) are discharged to the open sea through a caisson from the drilling rig.

For all wells drilled during the MGD project, it is planned to use only WBM (KCl-Polymer); see Tables 5.1 and 5.2. Because the five wells to be drilled are relatively close together and have similar geologies, the requirements of the drilling fluids will be broadly similar for each well; however, the type of WBM and its associated physical and chemical fluid and particulate properties will differ for each well section. All fluid and chemicals to be used will be selected based on their technical specifications and environmental performance. The drilling fluid contractor shall select the chemicals to be added into the drilling fluid according to environmental minimal impact criteria. Most of the components of the drilling fluid to be used will be classed as PLONOR, meaning ‘Pose Little Or No Risk’ to the environment. Any drilling fluid additives with substitution warnings (those chemicals additives that contain hazardous substances to the marine environment and their use and/or discharge and or listing as selected for phase-out) will be avoided and not used. The cementing slurries to be used to cement the casing strings into place have not yet been determined but will contain class G cement and other chemicals which will be selected following BSOG’s chemical management and selection policyand in compliance with the above criteria for minimal environmental impact.

Table 5.1 Quantity of drilling fluid and cuttings discharged while drilling Ana wells

Component	Well section			
	30" conductor cleaning	17½" (including 8½" pilot hole for Ana-100)	12¼"	8½" and under-reaming to 16"
Mud/fluid (name)	Seawater plus bentonite sweeps	KCl polymer	KCl polymer	KCl polymer
Fate of cuttings/fluid	Discharged via drilling rig caisson	Discharged via drilling rig caisson	Discharged via drilling rig caisson	Discharged via drilling rig caisson
Total mud discharge per section for 4 wells (m^3)	**73.8**	**158.1**	**210.6**	**16.1**
Total cuttings discharge per section for 4 wells (tons)	**191.8**	**410.9**	**547.5**	**41.8**

Table 5.2 Quantity of drilling fluid and cuttings discharged while drilling Doina well

Component	Well section			
	30" (including 8½" pilot hole)	17½" (including 8½" pilot hole)	12¼"	8½" and under-reaming to 16"
Mud/fluid (name)	Seawater plus bentonite sweeps	KCl polymer	KCl polymer	KCl polymer
Fate of cuttings/fluid	Discharged directly at seabed	Discharged via drilling rig caisson	Discharged via drilling rig caisson	Discharged via drilling rig caisson
Total mud discharge per section for 1 well (m^3)	**35.4**	**60.8**	**27.1**	**2.6**
Total cuttings discharge per section for 1 well (tons)	**92.1**	**158.2**	**70.4**	**6.7**

5.6.6 Cementing and other chemicals

Each casing string will be cemented into place to provide a structural bond and an effective seal between the casing and rock formation. will be cemented to sea bed levelCement slurries volumes to be used will be calculated such that the cement pumped will remain in the well. To limit any discharge of cement slurry, it is anticipated that all cement will be mixed as required (meaning no discharges of excess cement mixes) and therefore no major discharges to sea and only minimal discharges should only routinely occur during the washing down and cleaning of the cementing pump after cementing operations.

All cementing additives and chemicals to be used within the cement slurries will be selected based on their technical specifications and environmental performance. Most will be classed as PLONOR, and any additives and chemicals with substitution warnings (those chemicals that contain hazardous substances to the marine environment and their use and/or discharge and which are selected for phase-out) will not be used. The cementing additives and chemicals to be used have not yet been determined but will be selected in accordance with BSOG's chemical management and selection policy.

5.6.7 Well clean-up and testing

Each well will be cleaned up by scraping the 9⅝" casing and displacing the drilling fluid to KCl brine.

A drill stem well clean up and production rate test (DST) will be conducted at Ana-100 and Doina-100 wells. This is a procedure for isolating and testing the pressure, permeability and productive capacity of a geological formation during the drilling and completion of a planned production well. The test is an important measurement of pressure and flow behaviour at the drill stem of the producing formation and is a valuable way of obtaining information on the formation fluid and establishing whether a well has found a commercial can sustain continuous production at a stable rate from the hydrocarbon reservoir. A DST temporary surface well testing system will be positioned on the drilling rig, and the well then opened and flow gradually increased to the maximum achievable sand-free rate (expected to be 25 MMSCF/d). The flow duration at the maximum rate will be in the region of 48 to 72 hours. The gas produced over this period will be flared through the temporary surface well test facilities on board the jack up drilling rig. The Ana-101, Ana-102 and Ana-103 wells will not be tested.

Following the well clean up and production testing, completion and removal of the drilling rig BOP stack and riser and installation of a production Xmas tree, the well will be handed over to the production team. For the Ana platform wells, the Xmas trees for the four wells will be located on the Ana platform cellar deck, while for the Doina well the Xmas tree will be located at the seabed.

5.7 Field Life and Decommissioning

The majority of the proposed facilities shall have a minimum design life of 15 years, whereas the design life of the offshore infrastructure and pipelines will be 20 years.

When the beneficial life of the facilities, both onshore and offshore, comes to an end a detailed Decommissioning Plan will be prepared in line with the technology available at the time. The Decommissioning Plan will be developed in consultation with the relevant regulatory authorities and will be fully compliant with legislation and GIIP in place at the time.

Currently, the overall decommissioning philosophy is anticipated to be as follows:

- The Ana and Doina production wells will be plugged and abandoned at the end of field life with cement plugs be set across the reservoir sections, across casing shoes and in the conductor casing after has been removed 13 3/8'' and 9 5/8'' casing, and the conductor casing cut below the seabed;
- The jacket piles will be cut below the level of the seabed;
- The Ana Platform topsides and jacket will be designed to enable complete removal and transport to shore for dismantling and recycling of components or re-use elsewhere;
- The Doina Subsea wellhead/Xmas tree and associated pipeline termination structures/spools will be designed to enable complete removal and transport to shore for dismantling and recycling of components or re-use elsewhere;
- The Ana-Doina pipeline will be cut, cleaned and left *in situ*;
- The umbilical supplying services from the Ana Platform to the Doina Subsea wellheads will be cut, cleaned and left *in situ*;
- The Ana Platform - GTP pipeline will be cut, cleaned and left *in situ*; and
- The GTP will be fully dismantled and its components removed for re-use, recycling or disposal. Following dismantling, the onshore landscape will be restored to its original condition as far as is possible.

The final decommissioning strategy MGD Project will depend on a number of factors including:

- The availability of suitable technology; and
- The potential environmental, safety and cost of decommissioning methods at the end of field life.

> The ultimate intention is to leave the offshore seabed, beach landfall site and onshore land in such a condition that no risk will be posed to the environment, other sea users or to onshore stakeholders.

6 ENVIRONMENT DESCRIPTION

6.1 Introduction

This section provides a description of key elements of the offshore and onshore environments in which the MGD Project will be sited and operating, as a baseline against which any environmental impacts can be assessed. Data sources are quoted and referenced as necessary throughout, but key data sources including studies specially commissioned by BSOG to inform the EIA process and this ESIA Report are also highlighted.

6.2 Offshore

The key data sources used to inform the baseline description of the offshore environment include:

- Environmental Impact Report prepared to support 3D seismic survey in Block XV Midia (RMRI, 2016);
- BMT ARGOSS study on Metocean conditions around the MGD Project commissioned by BSOG (BMT ARGOSS, 2017);
- Environmental Baseline Survey and Habitat Assessment Reports commissioned by BSOG from the 2016 survey which covered the Ana and Doina fields, infield pipeline and pipeline from Ana to shore (MG3 and RPS 2017a and 2017b). These are further supplemented by the field survey reports prepared by MG3 directly following the survey (MG3, 2016a – i); and
- Commercial fisheries study undertaken my NMRID on the relevant information regarding the performance of fishing activities in the northern area of the Romanian seaside between Constanta and Sf. Gheorghe (NMRID, 2016).

6.2.1 Physical Environment

6.2.1.1 Bathymetry

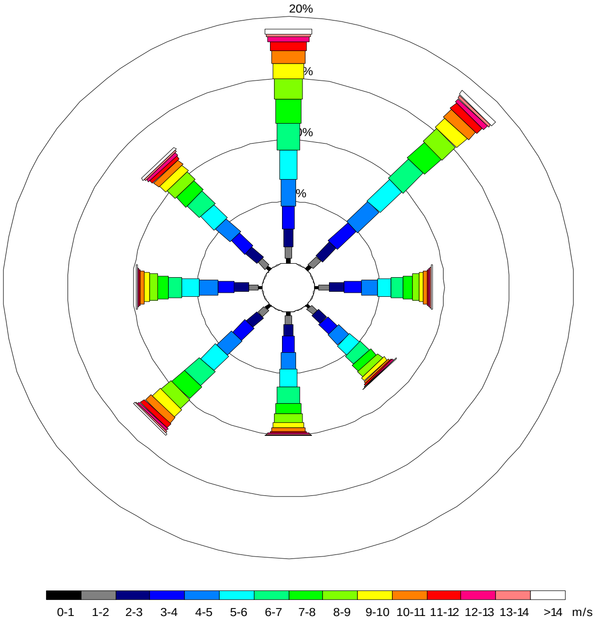
The Black Sea is a large almost landlocked body of water with a maximum water depth of approximately 2,200 m. The north-western part of the Black Sea off Romania and Ukraine has a wide continental shelf, upon which the proposed MGD Project is located. Water depths at MGD Project location range from 87 m around Doina, shoaling gradually to approximately 75 m at the Ana Platform location along the infield pipeline route. Water depths then gradually decrease towards the shore along the pipeline route to reach the beach landfall at 0 m.

6.2.1.2 Weather/meteorology

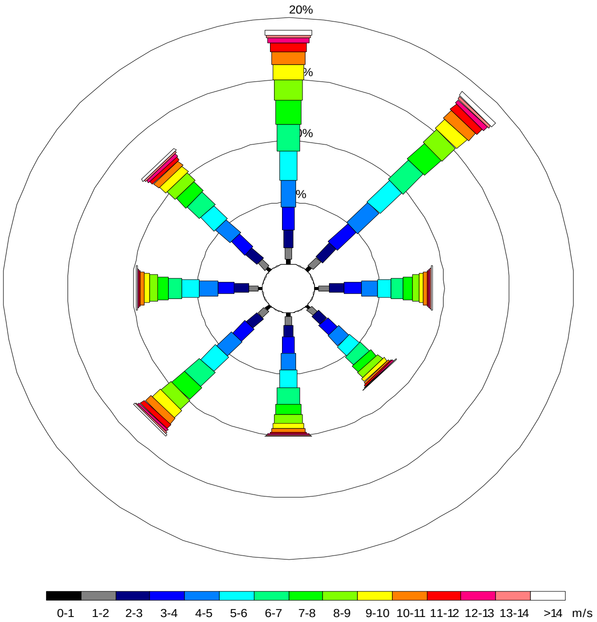
Metocean criteria have been collated for the offshore environment surround MGD Project by BMT ARGOSS (2017). Data indicates that winds can also come from all directions around the Doina and Ana locations throughout the year, but that they predominate from the north, north east and south west (Figure 6.1). In the summer months (July – September) the main wind directions are from the north and north east.

The metocean data indicates that waves, predominantly wind-driven, can also come from all directions but that at Doina and Ana locations waves prevail from the north east and east. However, this does vary throughout the year and waves from the south west can dominate during January (Figure 6.2).

Wind rose for Doina-Ana for all year



Wind rose for Doina-Ana for all year



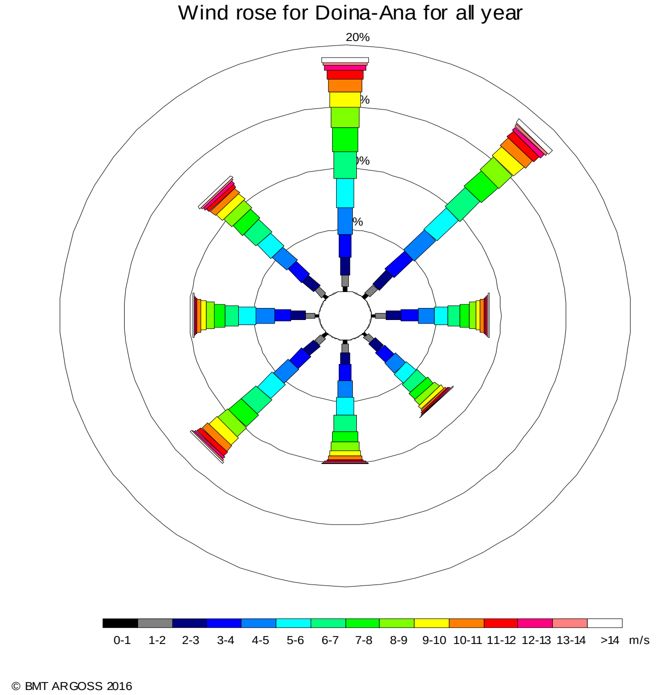
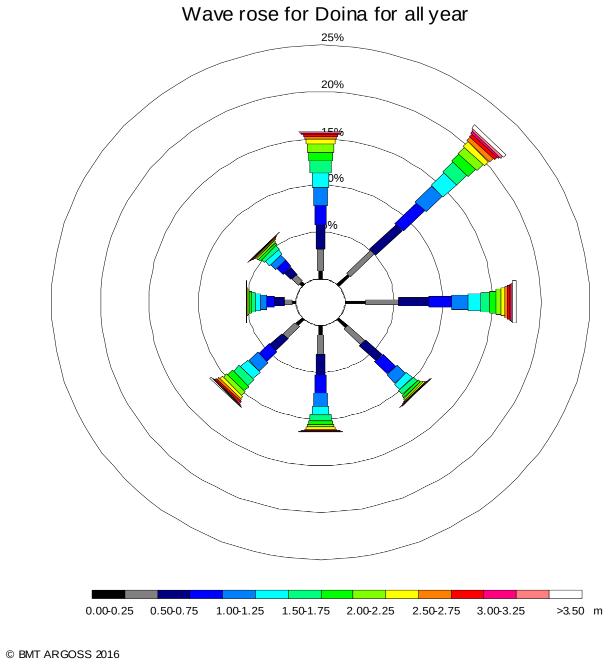
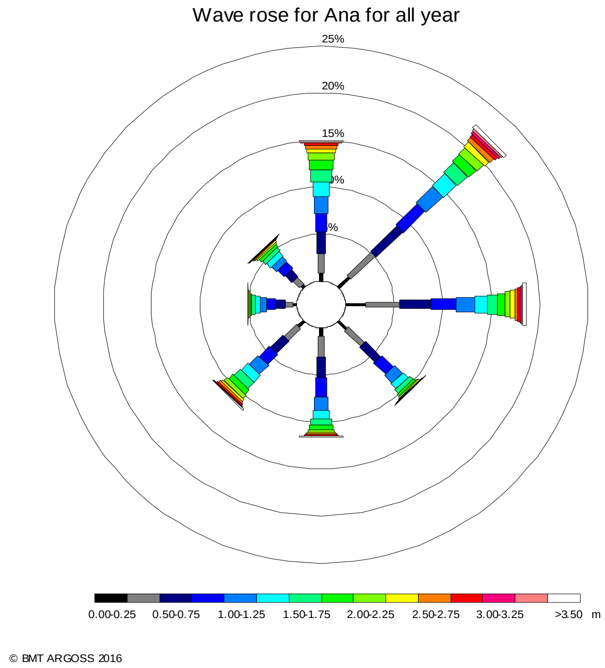


Figure 6.1 Annual wind rose for Doina and Ana (BMT ARGOSS, 2017)





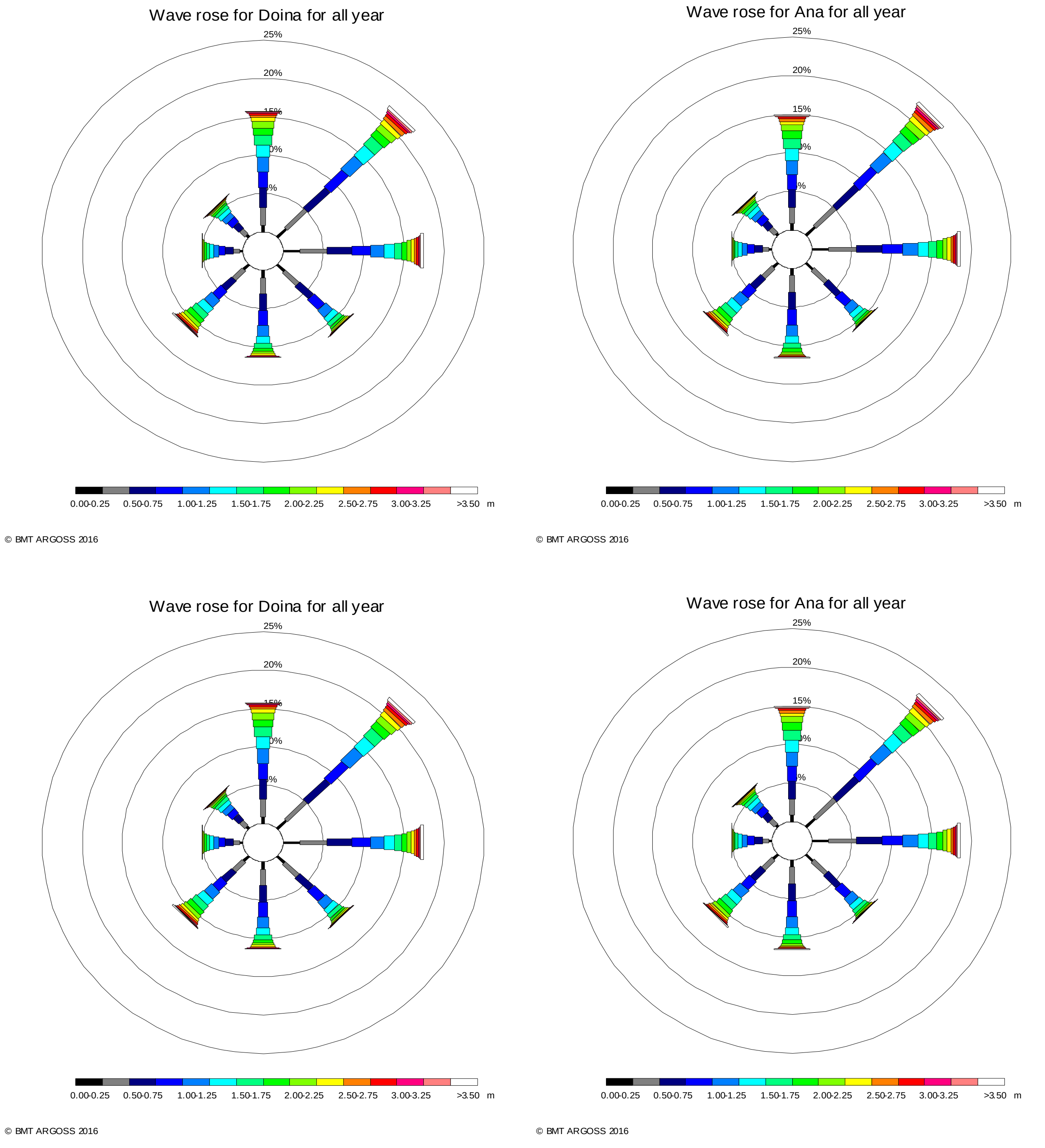


Figure 6.2 Annual wave roses for Ana and Doina locations (BMT ARGOSS, 2017)

6.2.1.3 Water column

The main circulation mechanism within the Black Sea is the cyclonic 'Rim Current'. The Rim Current circulates anticlockwise, approximately following the shelf break, and has a maximum velocity of approximately 0.5 to 1.0 m/s. Within this feature, two smaller cyclonic gyres operate, occupying the eastern and western sectors of the basin (Figure 6.3). Winds blowing across the relatively small Black Sea will strongly affect the Rim Current and as a result it is highly variable, and often barely discernible (State of the Environment of the Black Sea, 2009)

The Danube freshwater discharges influence the circulation along the entire Romanian Black Sea coast, generating a long-shore current mainly confined to the surface layers. This current occurs even at low river discharges regardless of wind conditions and is evident in both surface and deeper waters. Current velocity can reach 0.4 to 0.5 m/s, particularly under the influence of a north easterly wind (Dinu *et al*., 2011).

Water mass circulation along the Romanian shore is generally north to south with the current speeds ranging from 0.5 m/s at the surface to 0.05 m/s in the bottom layers, depending on winds and the specific location. Different mesoscale features are also present in the surface current pattern (Mihailov *et al*., 2013).

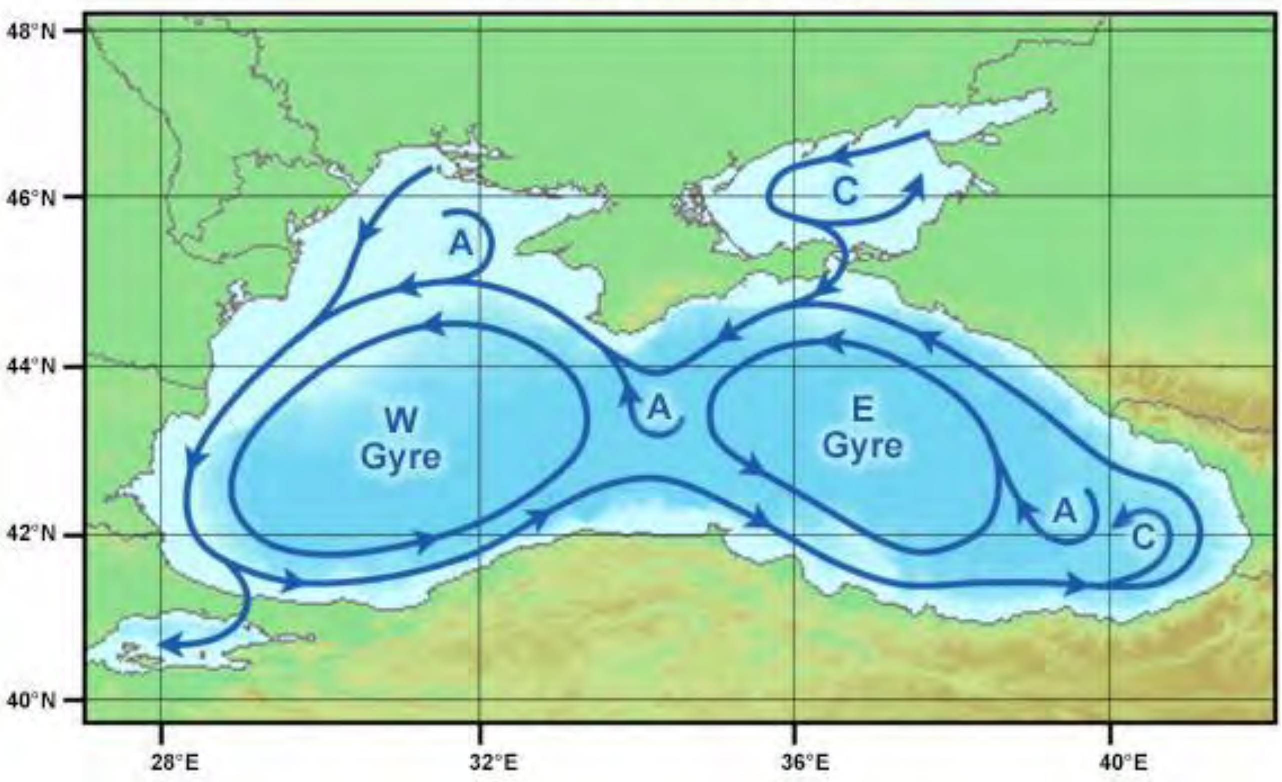


Figure 6.3 Schematic of Black Sea Surface Circulation (source: The Comet Program in BMT ARGOSS, 2017)

At Ana and Doina the predominant current directions toward the south west (Figure 6.4, BMT ARGOSS, 2017), reaching maximum speeds of 0.6 to 0.7 m/s, although more commonly between 0.1 and 0.2 m/s.

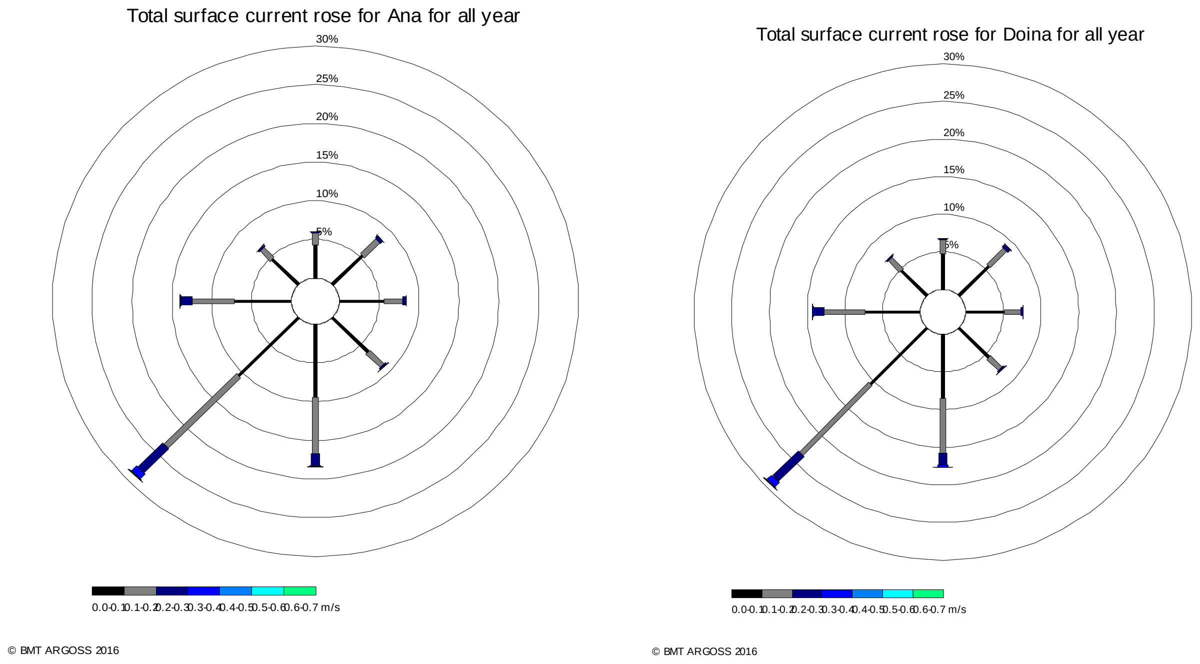


Figure 6.4 Annual total surface current roses for Ana and Doina (BMT ARGOSS, 2017)

The Black Sea is a highly stratified system. With an average salinity of 17-18 PSU, the Black Sea is brackish, and is the largest brackish water basin in the world.

Physical chemical parameters of the water column were sampled in June 2015 in the vicinity of the Offshore Component of MGD Project area and reported in RMRI (2016). The water column temperature and salinity data clearly shows stratification (Figure 6.5). The highest temperatures of approximately 21°C are recorded in the surface layer (0 - 5 m), below which decline rapidly between 5 - 20 m water depth to approximately 12°C. Below 20 m, temperatures decrease at slower rate to a minimum of approximately 8°C at depths of 80 m and beyond. Salinity values show a more uniform change with water depth, fluctuating between 18 – 18.5 PSU in the upper layers under the influence of freshwater inputs from the Danube, and thereafter increasing with depth towards 20 PSU near the seabed at 70 - 80m.

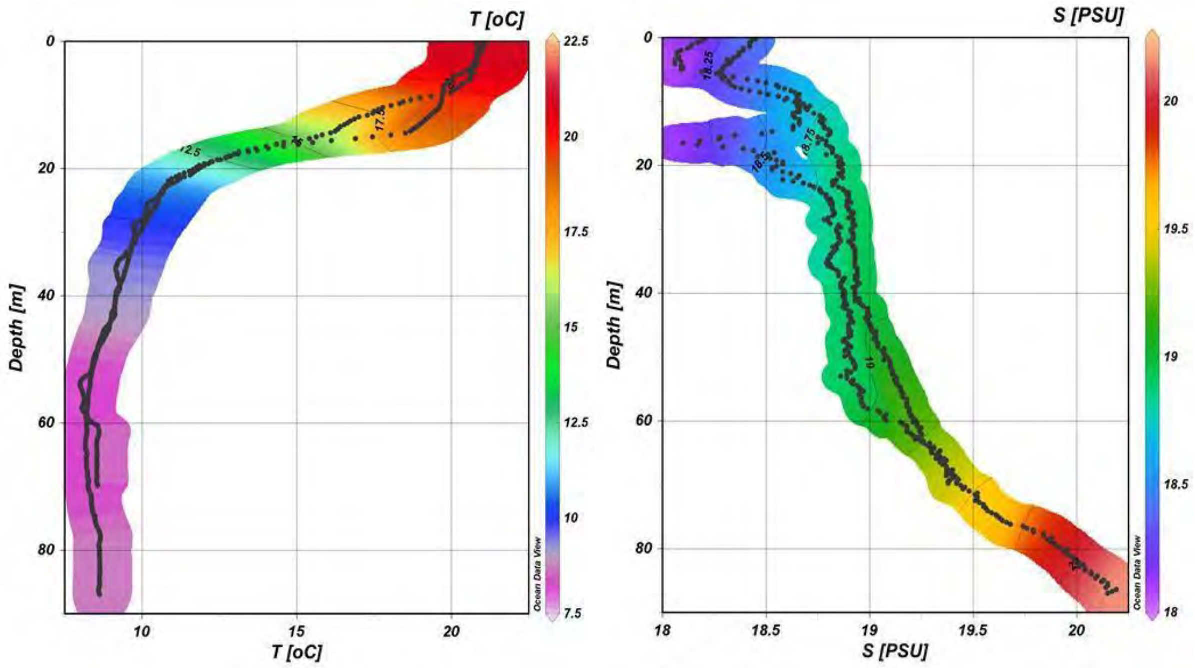


Figure 6.5 Temperature and salinity of the water column (from 0 – 87 m water depth) (RMRI, 2016)

6.2.1.4 Seabed sediments

The seabed and sediments within the MGD Project area were surveyed during 2016 (Figures 6.6 and 6.7). The survey was undertaken by MG3 and the analytical results reported in MG3 and RPS (2017a and 2017b). The survey covered the Ana and Doina fields, the infield pipeline route and the pipeline route from the Ana Wellhead Platform location to shore. Grab and drop-down video sampling were undertaken alongside multibeam echosounder, side scan sonar and sub-bottom profiler survey within a 500 m wide corridor in order to characterise the physical-chemical and biotic elements of the seabed within the proposed MGD Project area. Below is a summary of the findings as reported by MG3 and RPS, (2017a, 2017b), further detail will be provided in the ESIA Report.

The seabed within MGD Project area is sedimentary in nature and dominated by fine sediments, with a total of the 51 out of the 64 stations dominated by mud. Around the Doina field the sediments were mostly classified as gravely mud with a few stations classified as sandy mud; the Doina stations had the highest proportions of mud (75.38%) and the lowest gravel content (8.4%), presumably a reflection of the deep waters and low current speeds here. Along the infield pipeline route towards Ana Platform, areas of bare mud were increasingly associated with layers of dense mussels and mussel shell. At the Ana field, gravelly mud predominated (again, due to the presence of live *Modiolus phaseolina* mussels and relict shell overlying the sediment. Along the pipeline route from Ana Platform location to shore, the sediments became progressively coarser, with proportions of mud decreasing and sand content increasing into shallow water.

Total inorganic nitrogen values were uniform over the whole survey area, ranging from 0.59 to 13.5 mg kg^{-1}. Total organic carbon was found to be low across all stations sampled, ranging from 0.14% to 3.75%. Total organic matter was also low with little variability across the survey area. Sediment pH was predominately alkaline with values between pH 8.0 and 8.9. The main exception was at the shallowest station on the export pipeline corridor closest to the coast, where a pH value of 9.2 was measured on a mainly sandy seabed.

Figure 6.6 Sediment sampling stations along Ana Platform – GTP pipeline (offshore section)

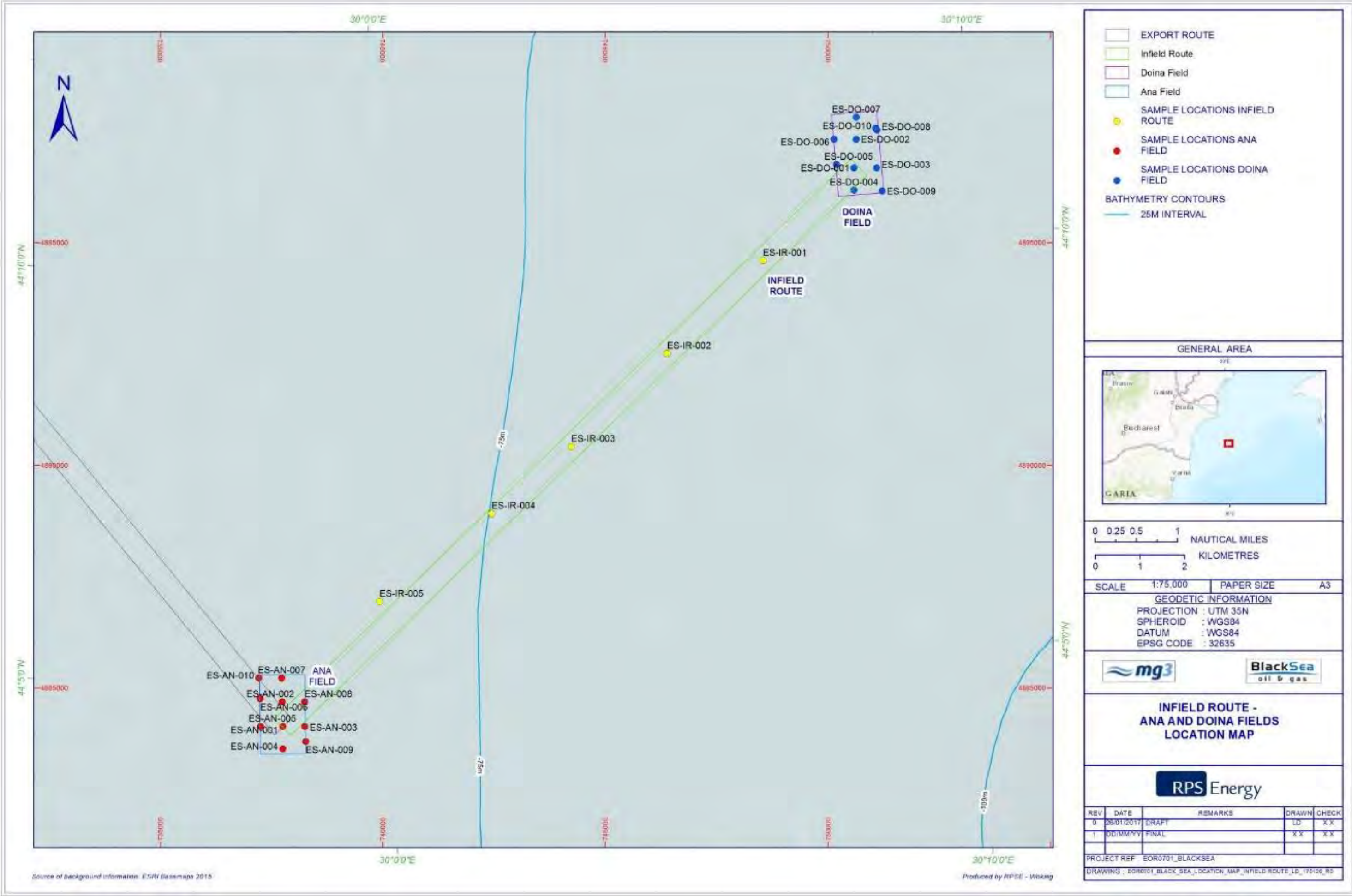


Figure 6.7 Sediment sampling stations forAna, Doina locations and the route of Ana-Doina pipeline

6.2.1.4.1 Metals levels

For most metals measured in the survey, the highest concentrations were observed along the export pipeline corridor and around the Doina field. In general, metals were recorded in highest concentrations in the deeper waters and finer sediments around Ana and Doina fields. An exception to this pattern was arsenic, which ranged from 3.31 mg kg^{-1} to 68.2 mg kg^{-1} overall but where highest concentrations were recorded at two stations on sandy sediments towards the shallowest end of the export pipeline route.

Concentrations of barium ranged from 71 mg kg^{-1} (export route) to 7,250 mg kg^{-1} (Doina Field). Noticeably, the highest concentrations of barium across all sites were recorded in sediments within the Doina field, with values up to two orders of magnitude higher than other sites surveyed, but barium levels were also high in the Ana field and along the infield pipeline route. It is likely that the raised sediment barium levels noted in deeper water are associated with drilling activities and the use of drilling muds rich in barite.

Concentrations of cadmium ranged from 0.1 mg kg^{-1} to 1.37 mg kg^{-1} and were highest in the Doina field and certain sections of the export route corridor. Concentrations of chromium ranged from 11.9 mg kg^{-1} to 107 mg kg^{-1}, copper from 2.74 g kg^{-1} to 65.5 mg kg^{-1} and mercury from 0.04 g kg^{-1} to 0.42 mg kg^{-1}. Nickel ranged from 13.7 g kg^{-1} to 160 mg kg^{-1}, lead from 10.6 g kg^{-1} to 61.9 mg kg^{-1}, vanadium from 19.1 g kg^{-1} to 111 mg kg^{-1} and zinc from 26.5 mg kg^{-1} to 145 mg kg^{-1}.

6.2.1.4.2 Hydrocarbon levels

Total hydrocarbon (THC) concentrations ranged from 1.6 to 53.32 µg.g^{-1} over the offshore MGD Project area.

Mean THC concentrations along the export route were 18.54 ± 13.02 µg.g^{-1}, higher than concentrations across all other sites. Mean THC concentrations were 9.75 ± 3.65 µg.g^{-1} at the Ana Field, 8.19 ± 3.99 µg.g^{-1} at the Doina field, and 9.54 ± 1.39 µg.g^{-1} along the infield pipeline route.

THC levels were generally low, although concentrations roughly equivalent to the 50 µg.g^{-1} threshold above which biological effects might be noticeable in macrobenthic communities (UKOOA, 2002), were recorded at two stations at between 25 – 50 m water depth on the export pipeline route.

Total 2-6 ring polycyclic aromatic hydrocarbon (PAH) concentrations ranged from 20.88 µg.kg^{-1} to 3,178 µg.g^{-1} (minimum and maximum both found on the export route). Total PAH was considerably higher in shallow sediments closest to the Danube Delta, where values ≥1,000 µg.g^{-1} were recorded. At the Ana Field, PAH levels of up to 1,107.66 µg.g^{-1} were recorded.

Hydrocarbon concentrations were highest in the stations closer to the Danube Delta. Most hydrocarbons found in this area were of mixed origin, suggesting natural influences from burnt organic material, fossil fuels and direct petrogenic influence. The deepest stations along the export route and those in the gas fields contained lower concentrations of hydrocarbons, and these were predominantly petrogenic in origin. There was no significant correlation between hydrocarbon concentrations and benthic biodiversity.

6.2.1.5 Seabed features

During the MG3 survey in 2016 a number of physical features were identified on the seabed. At Doina MG3 (2016b; 2016g) reported a relatively flat seabed but that the area is split by a fault running southwest to northeast, resulting in the north-western side of the survey area being 2.5 m higher than south eastern side. In addition, along the infield pipeline route another geological fault was recorded across the route 0.15 km from Doina, resulting in a 2.0 m change in seabed height. Along the infield pipeline route MG3 (2016c and 2016h) also reported that at 10 km from the Doina location, the seabed starts to shoal (with undulations related to faulting) towards the Ana Platform location. In addition, areas of shallow gas were also observed along the route alongside heavy scars (anchoring) related to well activities visible close to Doina and Ana wells alongside some lighter scars thought to be related to trawl fishing. Spudcan depressions were also evident on route at Ana Platform location.

The seabed around the Ana field was described as being relatively flat with no key identifying features. Along the pipeline route from the Ana Platform location to shore, rocky outcrops were observed alongside seabed scars, and scours. A number of suspected gas seep features were also observed.

6.2.2 Biological Environment

6.2.2.1 Plankton

Plankton forms the basis of marine ecosystem food webs and the composition of planktonic communities is variable temporally, depending upon the circulation patterns of water masses, the season and nutrient availability. The distribution and abundance of plankton is heavily influenced by water depth, tidal mixing and stratification within the water column (Edwards *et al*., 2010). The majority of the plankton occurs in the photic zone, i.e. the upper 20 m or so of the sea in temperate latitudes, which receives enough light for photosynthesis (Johns and Reid, 2001). However, zooplankton can extend to greater depths and many species undergo diurnal vertical migrations, rising to feed before returning to depth. Natural seasonality and high small-scale variability, both in species composition and abundance, is an important feature of planktonic communities. Many species of larger animals such as fish, birds and cetaceans, are dependent upon the plankton for food. The distribution of plankton therefore directly influences the movement and distribution of other marine species.

RMRI (2016) presented the result of a plankton study carried out on 9 samples taken in June 2015 from the continental shelf waters, in Constanta area, in water depths of 50 m and 80 m. The phytoplankton was made up of 55 species from six taxonomic groups (Bacillariophyta, Dinoflagellata, Chlorophyta, Cyanobacteria, Chrysophyta and Cryptophyta). Among these, dinoflagellates dominated accounting for 49% of all recorded species followed by Bacillariophyta accounting for 24% out of the total number of phytoplankton species. It was reported that the upper side of the euphotic zone, in the 0-10 m layer, was the most important area for growth of phytoplankton (20-80% of total biomass). In terms of density, diatoms dominated including *Chaetoceros socialis*, *Pseudonitzschia delicatissima* and *Cerataulina pelagica.*

RMRI (2016) reported that the zooplankton was represented by 14 species belonging to 10 taxonomic groups, and mostly consisted of meroplankton[5] with bivalve, gastropod, polychaete and decapod larvae.

6.2.2.2 Benthos

Knowledge of the composition of the infauna (invertebrates living within benthic sediments) and epifauna (mobile or sessile species living on the seabed) is important in identifying the potential impacts of the disturbance that could result from the proposed MGD Project.

As outlined above the seabed and sediments within MGD Project area were surveyed during 2016. The survey was undertaken by MG3 and reported in MG3 and RPS (2017a and 2017b). This section is largely derived from these reports.

6.2.2.2.1 Habitats and epifauna

RPS and MG3 (2017b) identified three different EUNIS habitat types along the infield pipeline route from Doina to Ana:

- A5.37 'Deep circalittoral mud';
- A5.71 'Seep and vents in sublittoral sediments'; and
- A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina'*.

Example images recorded along the route of these habitat types and key features are provided in Figure 6.8.

RPS and MG3 (2017b) described the seabed along the in-field pipeline route as relatively flat and dominated by mud with a high percentage of *M. phaseolina* shell gravel. Live *M. phaseolina* mussels were present carpeting most transects at varying densities, covering on average more than 70% of the seafloor (EUNIS habitat A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina'*. However, in the areas where live *M. phaseolina* were absent, the broader EUNIS habitat A5.37 'Deep circalittoral mud' habitat' was assigned, albeit including an important component of *M. phaseolina* shell gravel.

[5] Meroplankton are temporary members of the plankton, consisting of larval forms of benthic species and fish for example.

There was one transect within which mats of the sulphur-reducing bacterium *Beggiatoa* were observed alongside several raised structures reminiscent of carbonate concretions associated with methane seeps. These structures supported epibiota (*e.g.* hydroids) alongside accumulations of bivalve shells (possible chemosynthetic mussels) and juvenile gadoid fish. It was this area that RPS and MG3 (2017b) assigned the seabed the EUNIS habitat code A5.71 ‘Seep and vents in sublittoral sediments’. This EUNIS habitat type corresponds with the EU HCI 1180 ‘Submarine structures made by leaking gases.

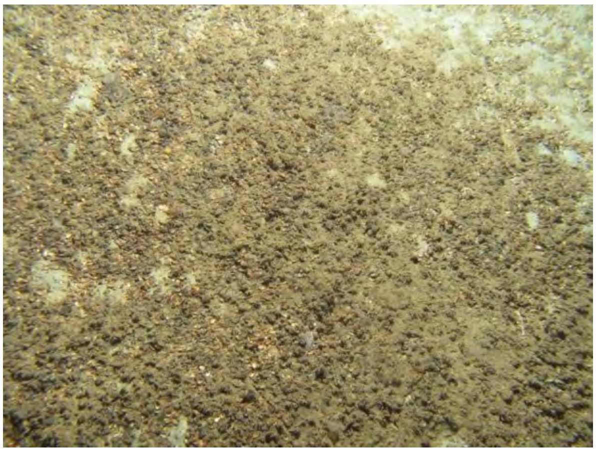
 EUNIS habitat A5.379 “Pontic deep circalittoral muds with *Modiolula phaseolina*	 Carbonate concretions and mats of *Beggiatoa* sp. EUNIS A5.71 “Seep and vents in sublittoral sediments”.
 Carbonate concretions and mats of *Beggiatoa* sp. EUNIS A5.71 “Seep and vents in sublittoral sediments”.	 Raised carbonate concretion, *Beggiatoa* mats and bivalve shells of an unidentified, and possibly chemosyntethic species,

Figure 6.8 Seabed images obtained during the survey of the infield pipeline route (RPS and MG3, 2017b)

RPS and MG3 (2017b) identified seven different EUNIS habitat types within the pipeline corridor from Ana to shore:

- A5.36 ‘Circalittoral fine mud’’;
- A5.44 Circalittoral mixed sediment’;
- A5.37 ‘Deep circalittoral mud’;

- A5.37 ‘Deep circalittoral muds’ with a dense *M. phaseolina* shell gravel component’;
- A5.379 ‘Pontic deep circalittoral muds with *Modiolula phaseolina’*; and
- A5.628 ‘Pontic *Mytilus galloprovincialis* beds on sublittoral sediment’.

Example images recorded along the route of these habitat types and key features are provided in Figure 6.9.

The shallowest sections of the export route (i.e. water depth <30 m) were typically flat and muddy. Although some areas consisted of bare, soft mud, sediments were patchily covered by accumulations of large bivalve shells including the species *Lutraria* sp., *Mya* sp., *Spisula* sp. and *M. galloprovincialis*, among others. The visible community associated with this habitat was species poor and included Cerianthid burrowing anemones, gobies and the mussel *M. galloprovincialis*. The latter occurred in densities insufficient to constitute a mussel structured habitat. Thus, these shelly mud habitats were ascribed to EUNIS habitat A5.44 ‘Circalittoral mixed sediments’.

The seabed in water depths <30 m also included areas of muddy sand habitat, often rippled by the prevailing current. The main species present included *M. galloprovincialis*, recorded as single, semi-infaunal individuals or arranged in small clumps of 1-5 specimens, the cockle *Cerastoderma* sp., and occasional burrowing anemones (Cerianthidae indet.). The whelk *Rapana venosa* was recorded among the mussel clumps as were red mullet *M. barbatus ponticus a*nd evidence of mobile macrofauna such as decapods and gastropods. The presence of burrows and tubes made by infaunal invertebrates was also noted. These muddy habitats were regarded by MG3 and RPS (2017b) as EUNIS habitat A5.36 ‘Circalittoral fine mud’.

The seabed >30 m also consisted predominantly of bare mud with occasional mussel shell with a visible fauna including burrowing Cerianthid anemones, hydroids and semi-infaunal *M. galloprovincialis* and mobile opportunistic scavengers (*e.g.* the crab *Liocarcinus* sp.) and infaunal polychaetes and amphipods. These habitats were assigned the EUNIS Habitats A5.36 ‘Circalittoral fine mud’ and, in waters below 50 m, A5.37 ‘Deep circalittoral muds’.

In some areas, *M. galloprovincialis* were relatively abundant especially compared to shallower transects. The mussels were usually recorded in scattered clumps of 5-20 individuals, together with dense aggregations of polychaete or amphipod tubes. This mussel-dominated habitat was recorded at depths between 30 and 50 m and was assigned to the EUNIS habitat A5.628 ‘Pontic *Mytilus galloprovincialis* beds on sublittoral sediment’.

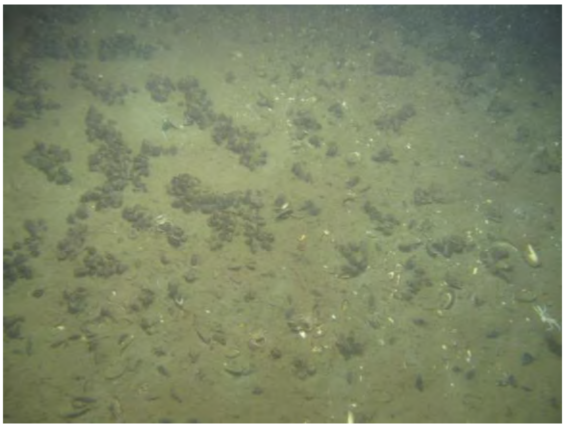
As *M. galloprovincialis* shell became less abundant with depth, it was substituted by shells of the small mussel *Modiolula phaseolina*, first recorded in water depths of approximately 56 m deep. *M. phaseolina* shell fragments became increasingly abundant towards Ana, forming dense carpets that covered in excess of 75% of the seafloor. These shell aggregations were regarded as a variant of EUNIS habitat A5.37 ‘Deep circalittoral muds’ with a dense *M. phaseolina* shell gravel component. Some of these shell beds hosted live *M. phaseolina* and were thus regarded as a distinct habitat similar to EUNIS habitat A5.379 ‘Pontic deep circalittoral muds with *Modiolula phaseolina*’. The faunal assemblage associated with live *M. phaseolina* beds or shell gravel typically consisted of sessile epifauna, chiefly tunicates *Ciona intestinalis*, sponges *Suberites* sp. and *Sycon* sp. as well as foraging fish (juvenile *M. merlangus* and gobies *Pomatoschistus* spp. and *Gobius* sp.).

It is worth noting that although *M. phaseolina* habitats or beds recorded both along the infield route and along the Ana to shore pipeline route are not listed specifically in the EU Habitats Directive as a priority habitat, MG3 and RPS (2017b) indicate that there is potential they could qualify, as other mussel beds do elsewhere in Europe, as an EU Habitat of Conservation Interest (HCI) 1170 Reefs. This is because they are ‘biogenic hard bottoms which supply habitats for epibiotic species’.

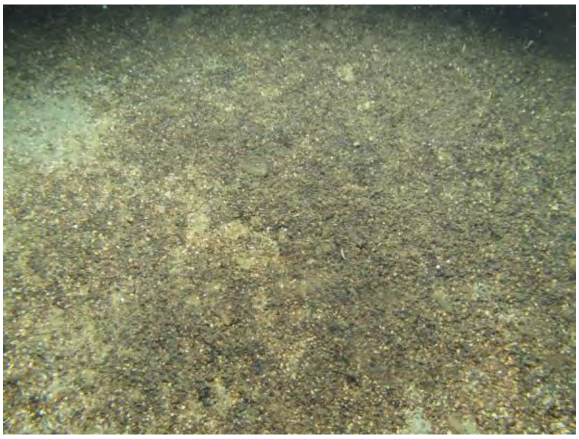
EUNIS habitat A5.44 “Circalittoral mixed sediments”.

EUNIS habitat A5.36 “Circalittoral fine mud”.

EUNIS habitat A5.37 “Deep circalittoral muds



EUNIS habitat A5.628 “Pontic *Mytilus galloprovincialis* beds on sublittoral sediment”.



EUNIS habitat E5.379 “Pontic deep circalittoral muds with *M. phaseolina*”.

Figure 6.9 Seabed images obtained during the survey of the Ana to shore pipeline route (RPS and MG3, 2017b)

6.2.2.2.2 Infauna

MG3 and RPS (2017a) reported the result of infaunal grab sampling undertaken around the Ana and Doina fields alongside along the infield and Ana to shore pipeline routes. They reported that polychaete worms, mollusc species (largely bivalves) and crustaceans (amphipods) contributed to most (87%) of the benthic diversity across all the areas. However, in terms of biomass, molluscs were dominant, representing over 83% of the total biomass.

Of all species recorded, five represented 45% of the total abundance. The most numerous species was the mussel *Modiolula phaseolina*, representing 16% of the total. As indicated in the summary account of benthic habitats and epifauna above, *M. phaseolina* was the characteristic, biotope-defining organism over the majority of the survey area. Another bivalve, *Lentidium mediterraneum* was also abundant, contributing to 12% of the total faunal abundance. However, this clam was recorded at just one location (the shallowest, sandiest and most inshore of the stations sampled), whereas *M. phaseolina* was relatively ubiquitous, recorded at 36 stations. The polychaetes *Melinna palmata* (5%), *Terebellides stroemi* (6%) and *Dipolydora quadrilobata* (5%) were also relatively abundant.

The total number of taxa found ranged from 9 to 46/0.2m^2 over the whole survey area. Although the mean number of taxa found did not vary significantly over most of MGD Project area, the numbers of taxa at stations in the relatively deep water of the Ana Field were slightly higher compared to other stations and showed a positive correlation with sediment gravel content. Numbers of individuals showed low variability across MGD Project area, and a positive correlation with sediment sand content. Diversity, as measured by the Shannon-Wiener H' diversity index, was generally low, ranging from 0.38 (at the shallowest, sandiest and most inshore of the stations sampled) to 3.16 recorded at a station on a *M. phaseolina* mussel bed close to the Ana field.

Multivariate analyses on the macrofaunal data showed that the 64 stations sampled were broadly divisible into six EUNIS infaunal habitat types, mainly reflecting changes in sediment type related to depth and to the presence of the structuring influence of mussels or their shells/shell fragments:

- A5.2351: 'Infralittoral fine sand with *Lentidium mediterraneum*';
- A5.43 'Infralittoral mixed sediments';
- A5.36B 'Pontic circalittoral muds with *Melinna palmata* and *Aricidea claudiae*';
- A5.356: 'Pontic circalittoral sandy muds with *Heteromastus filiformis*, *Dipolydora quadrilobata* and *Nephthys hombergii*';
- A5.37A: 'Pontic deep circalittoral muds with *Terebellides stroemi* and *Amphiura* sp.'; and
- A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina'.*

Infaunal community types and their EUNIS codes differ from the habitat types and codes attributed to each station on the basis of photography; this is due to inherent differences between sampling methods, and to the fact that no satisfactory benthic classification system combining data from both diver/photographic collection and sediment sampling techniques has been devised. Photography collects information about the appearance of the seabed and the larger visible fauna over a large area, whereas grabs typically sample only the small buried macrofauna from within a much smaller area. However, the coincidence between these in terms of approximate depth ranges and position within MGD Project area is summarised in Table 6.1.

Table 6.1 Coincidence between benthic habitats identified through photography and benthic community types identified through infaunal composition

Approximate depth range (m)	Position in MGD Project area	EUNIS habitat based on photography	EUNIS community based on infaunal data
10 m	Nearshore; shallowest station on export route	-	A5.2351: 'Infralittoral fine sand with *Lentidium mediterraneum*'
5-30 m	Nearshore on export route	A5.44 'Circalittoral mixed sediments'	A5.43 'Infralittoral mixed sediments'
20-50 m	Mid-export route	A5.36 'Circalittoral fine muds'	A5.36B 'Pontic circalittoral muds with *Melinna palmata* and *Aricidea claudiae*'
30-60 m	Mid-export route	A5.628 'Pontic *Mytilus galloprovincialis* beds on sublittoral sediment'	A5.356: 'Pontic circalittoral sandy muds with *Heteromastus filiformis*, *Dipolydora quadrilobata* and *Nephthys hombergii*'
55-84 m	Deep export route, Ana, Doina, Infield route	A5.37 'Deep circalittoral muds and dense *M. phaseolina* shell'	A5.37A: 'Pontic deep circalittoral muds with *Terebellides stroemi* and *Amphiura* sp.'
55-84 m	Deep export route, Ana, Doina, Infield route	A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina*'	A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina'*
~75 m	Deep export route, Ana, Doina, Infield route	A5.71 'Seep and vents in sublittoral sediments'	-

6.2.2.3 Fish

The information here is largely derived from a fisheries study undertaken by NMRID (2016) and RMRI (2016).

The main fish species of interest from the Romanian waters of the Black Sea are:

- Sprat (*Sprattus sprattus*) which is a coastal pelagic species, which forms high concentrations making large migrations between its feeding and the breeding areas. It spends the winter mostly at depths of approximately 80-100 m when in April-May it migrates to the coastal waters and then in the summer, avoiding the high-water temperatures it migrates from the coast to offshore areas. Adults feed largely on plankton crustaceans, eggs and larvae of copepods and diatoms;
- Brill (*Psetta maeotica;* considered to be a synonym of *Scophthalmus maximus*) is a demersal species encountered on sandy and rocky bottoms in waters up to 80 m in depth. In the spring (March and April), brill leaves its wintering locations and migrates to the shore, to water depths of 18-30 m, for reproduction and feeding. After reproductive events (around June), the adults return to deeper waters. The migrations of the brill can be characterized as relatively short, perpendicular to the shore. In the spring these migrations have a reproductive nature, and afterwards a feeding and wintering nature. It feeds on fish and invertebrate on and near the seabed;

- Anchovy (*Engraulis encrasicolus*) is a pelagic, gregarious coastal species. It is encountered throughout the Black Sea and makes irregular migrations from the offshore areas to the coast and vice versa depending on thermal and feeding conditions. The anchovy plays an essential role in the general circulation of the organic substances from the Black Sea, as it is a main consumer of plankton, which in turn serves as the main food source for other species, such as saurel, whiting, dolphins, etc. It feeds on plankton, especially copepods and other small crustaceans and mollusc larvae;
- Saurel (*Trachurus mediterraneus ponticus*) is a pelagic marine migrating species and lives in large shoals. In the summer the shoals of saurel make irregular migrations from the offshore areas to the shore and vice versa depending on water temperature, wind, salinity. The appearance of saurel on the Romanian coast is closely related to water warming at 14 °C, which usually takes place at the end of May. Their diet consists primarily of fish (anchovy, tinker, surmullet, sprat) and crustaceans (shrimp and mysidacea);
- Whiting or bluefish (*Merlangius melangus euxinus*) is a cold water demersal species present at water depths from 10 to 130 m. In the spring and autumn this species is present along the coastline whilst in the summer it migrates offshore. Breeding takes place in the winter months (December to March). This species does not have much commercial value but plays in important role in the trophic link between the pelagic fish upon which it feeds (such as anchovy) and larger demersal shark species of which it is preyed upon;
- Blue fish (*Pomatomus saltatrix*) is a marine pelagic species living in water depths of 200 m and less. It is common throughout the Mediterranean Sea, Black Sea, as well as for the Eastern Atlantic, from Portugal to South Africa. In the Black Sea this species migrates to the coast in the summer months (May onwards) and breeding takes place between June and August. The numbers of this species are low at present which prevent it from being of commercial value. However, it is of interest to recreational fishers;
- Common grey mullet (representatives of *Mugilidae* family) is a shallow water school species commonly encountered throughout the warm and mild areas of the Black Sea. Breeding takes place between June and October, at maximum water depths of 60 to 80 m; and
- Spiny dogfish (*Squalus acanthias*) is an offshore shoaling species, especially during its reproduction period. It is encountered especially in the bottom areas, at depths of 70-80 m, sometimes up to 120 m. It reproduces in the spring when adults migrate towards the coastline. In the winter and summer, the shark rests at depths of 30-90 m, under the thermocline, feeding on small fish such as sprat and whiting spawn.

Further information on migration routes for spawning, wintering and feeding such as those presented in Totoiu *et al*. (2016) has been used to inform the ESIA Report.

6.2.2.4 Mammals

In the Black Sea there are five aquatic mammal species. Among them four are exclusively marine: three species of cetacean comprising bottlenose dolphin (*Tursiops truncatus ponticus*), the common dolphin (*Delphinus delphis ponticus*) and the harbour porpoise (*Phocoena phocoena relicta*) and one species of pinniped monk seal (*Monachus monachus* ssp. *albiventer*). The monk seal hasn't been observed in the western Black Sea basin for over 45 years. The fifth aquatic mammal species is the European otter (*Lutra lutra*) whose habits are only occasionally marine, where they do not travel further than 1.5 km from the shore.

6.2.2.4.1 Cetaceans

Romanian sea waters are host to all three of the cetacean species known to live in the Black Sea: these being the bottlenose dolphin, the common dolphin and the harbour porpoise all of which are endemic subspecies of the species found elsewhere in Europe.

Opportunistic visual sightings and passive acoustic monitoring data was obtained during a seismic campaign over Block XV Midia between 13th May - 23rd June 2016 when daily sightings of common and bottlenose dolphins and occasional harbour porpoise were recorded (Oceanic club, 2016a). Sightings included mixed pods containing adults and juveniles and adult only pods, cetaceans that were actively feeding/hunting. Opportunistic visual sightings and passive acoustic monitoring data were also obtained during geophysical survey activities around the Ana platform location between October 27th and November 12th 2016 (Oceanic club, 2016b). During this period one single recording of a cetaceans was made, on November 10th, when five common dolphins were observed (two adults and three juveniles) hunting pelagic fish.

6.2.2.4.2 Otters

The European otter is only occasionally marine and tends not to travel further than 1.5 km from the shore. As discussed in Section 6.3.2 and 6.4, evidence of otters has been observed along the coastline close to the MGD Project area in recent onshore surveys. There are a number of protected sites which have the European otter as protected features within close proximity or within MGD Project area (specifically the nearshore and inshore pipeline route). Therefore, there is potential for European otters to be present in the very nearshore marine area of MGD Project.

6.2.2.5 Birds

Due to the location of the Black Sea located within large areas of continental land mass a large majority of species migrate across the Black Sea on the north-south / south – north migrations and some on their east – west / west – east migrations. Therefore, a considerable number of birds are present over the Black Sea during migrations periods (autumn and spring) (Oceanic club, 2016b).

Fish eating birds are present in all areas where pelagic fish concentrates and although near shore there is a greater density and specific diversity although this doesn't mean that offshore areas are less important.

Up to now, the majority of bird observations made by specialists are concentrated near the shoreline of the Black Sea. Very few and seldom are their studies concerning the distribution and ethology of bird species that “attend” the offshore areas of the Black Sea. There is no systematic study regarding the specific diversity and ethology of bird species in the Black Sea offshore, therefore opportunistic visual sightings of seabirds, made during the geophysical survey activities around the Ana platform location between October 27th and November 12th 2016 (Oceanic club, 2016b) offered a useful opportunity to provide observations offshore during the Autumn migration, albeit for a small period of time.

Oceanic club (2016b) recorded a total of 52 species of birds during the observation period. The most abundant to of these were the Caspian gull *Larus cachinnans* and great cormorant *Phalacrocorax carbo* where 212 and 164 individuals were observed over the 11 day observation period, respectively. Table 6.2 lists all the bird species observed during the 11 day observation period.

Table 6.2 Bird observation records around the Ana platform over an 11 day period in October and November 2016 (Oceanic club, 2016b)

Species	Common name	Total	Species	Common name	Total
Accipiter nisus	Eurasian sparrowhawk	8	*Hirundo rustica*	Barn swallow	1
Alauda arvensis	Eurasian skylark	6	*Hydrocoloeus minutus*	Little gull	9
Ardea cinerea	Grey heron	1	*Ichthyaetus melanocephalus*	Mediterranean gull	17
Asio otus	Long-eared owl	3	*Larus cachinnans*	Caspian gull	212
Butea buteo	Common buzzard	1	*Larus canus*	Common gull	6
Calcarius lapponicus	Lapland longspur	1	*Larus michahellis*	Yellow-legged gull	12
Calidris sp.	-	5	*Motocilla alba*	White wagtail	20
Carduelis carduelis	European goldfinch	1	*Passer montanus*	Eurasian tree sparrow	3
Carduelis chloris	European greenfinch	1	*Phalacrocorax carbo*	Great cormorant	164
Carduelis spinus	Eurasian siskin	1	*Phoenicurus ochruros*	Black redstart	12
Casmerodius albus	The great egret	4	*Phoenicurus phoenicurus*	Common redstart	6
Chroicocephalus genei	Slender-billed gull	2	*Phylloscopus collybita*	Common chiffchaff	2
Chroicocephalus ridibundus	Black-headed gull	31	*Phylloscopus sp.*	Leaf warblers	1
Circus cyaneus	Hen harrier	2	*Podiceps nigricollis*	Black-necked grebe	11
Columba livia	Rock dove	1	*Prunella modularis*	Dunnock	4
Columba oenas	Stock dove	1	*Puffinus yelkouan*	Yelkouan shearwater	63
Coturnix coturnix	Common quail	1	*Regulus regulus*	Goldcrest	2
Emberiza calandra	Corn bunting	2	*Sterna sandvicensis*	Sandwich tern	1
Erithacus rubecula	European robin	26	*Sturnus vulgaris*	Common starling	5
Ficedula parva	Red-breasted flycatcher	5	*Troglodytes troglodytes*	Eurasian wren	1
Fringilla coelebs	Common chaffinch	65	*Turdus iliacus*	Redwing	1
Fringilla montifringilla	Brambling	8	*Turdus merula*	Common blackbird	14
Gavia arctica	Black-throated loon	33	*Turdus philomelos*	Song thrush	46

As outlined further in Section 6.4, the marine and onshore environment surrounding the Project is identified to be of conservation importance for a variety of birds, including waterfowl and seabirds. In particular the nearshore section of the Ana to shore pipeline route passes through the Black Sea Special Protection Area (SPA) which is designated for over 37 bird species due to its importance site for breeding and wintering species.

6.3 Onshore

Onshore data are available from terrestrial ecological surveys commissioned by BSOG, the SEA and EIA Reports and associated AA Reports prepared for the onshore pipeline and the GTP. In addititon, information on biodiversity was provided through the Natura 2000 Forms corresponding to the protected areas existing in the vicinity of or crossing the MGD Project location. This information is included in the following documents:

- Environmental Report (SEA Report): Urban Zoning Plan – Construction of an underground gas pipeline in Corbu Commune area –Segment I, in Corbu unincorporated area, Constanta County (Auditeco, 2016a);
- Appropriate Assessment Study: Construction of an underground gas pipeline in Corbu Commune area – Segment I, in Corbu unincorporated area, Constanta County (Auditeco, 2016b);
- Environmental Report (SEA Report): Urban Zoning Plan– Building of Gas Treatment Plant – Midia Natural Gas Development Project, Corbu Commune, Constanta County (Auditeco, 2016c); and
- Appropriate Assessment Study: Gas Treatment Plant – Midia Natural Gas Development Project, Corbu Commune, Constanta County – Urban Zoning Plan Stage (Auditeco, 2016d);
- Environmental Impact Assessment Report (EIA Report): Building of Gas Treatment Plant – Midia Natural Gas Development Project, Corbu Commune, Constanta County (Auditeco, 2017d);
- Appropriate Assessment Study: Gas Treatment Plant – Midia Natural Gas Development Project, Corbu Commune, Constanta County (Auditeco, 2017c).

In addition to the biodiversity data presented, these reports also describe meteorological conditions and the status of the environment with respect to air, water and soil.

6.3.1 Physical Environment

6.3.1.1 Meteorology

The climate of the Constanta county is described as temperate. The temperate continental climate is characterised by hot summers with low levels of precipitation and relatively mild winters. The marine influence in this area can be seen in the way of a sea breeze over the summer months and in the winter can be responsible for strong wet winds originating in the marine environment.

The annual average temperature varies between 10°C in the north and centre of the county and over 11°C in the south of the county. The average values of the hottest month (July) vary between 21°C and 23°C and the average values of the coldest month (January) vary between 0.2°C and -1.3°C. The maximum absolute temperature recorded was 43°C on 31st July 1985, at Cernavoda, and the minimum temperature recorded was -33.1°C on 25th January 1942 at Basarabi. The average number of frozen days is 73 at the coast and 100 inland.

The average annual precipitation range is 400 to 500 mm. June has the highest levels of precipitation with an average of approximately 60 mm, March is the driest month with an average precipitation level of approximately 25 mm.

Winds from the north dominate in Constanta with winds from the west and north east also being relatively frequent. The average annual wind speed at the coast in the vicinity of MGD Project area is recorded as over 4 m/s.

6.3.1.2 Soils

There is a prevalence of carbonatic chernozems and chernozems in Constanta county. This black coloured soil has a high humus content as well as high percentages of phosphoric acid, phosphorous and ammonia. This soil type is very fertile and is known to produce a high agricultural yield. There are two chernozem belts in the world and the prevalence of the soil type here is due to the presence of the Eurasian Steppe belt which extends from eastern Croatia along the Danube, through southern Romania, northeast Ukraine and southern Russia into Siberia. Cambic chernozems can be found towards the coastal area in areas of low slope.

Beneath forests in the south west of the county grey soils and variations of chernozems and yellowish soils can be identified. Locally, on limestones and green schist, rendsines and litosoils can be identified. Sandy soils can be found along seaside (higher surfaces on Chituc and Lupilor islands). Alluvial soils can be found in the Danube meadow and on its affluent valleys. Salinized soils, up to solonceac soils, can be found in coastal areas where they are generally sandy in nature.

The main type of soils found in the MGD Project area are represented by yellowish soils, marshes and semi-swamps and highly saline surface soils and soils having high content of natrium. Chemical fertilisers and pesticides are regularly used in the area to support the agricultural industry, which has the potential to impact on soil quality.

6.3.1.3 Landscape

According to the “2013 County Environmental Status Report”, in Constanta county, the plateau relief (Casimcea Plateau and Southern Dobrogea Plateau) dominates. The Casimcea Plateau is located in the northern part of the county and the Southern Dobrogea Plateau is located to the south of the county. The natural landscape of the area offers a number of tourism opportunities including the coastal area of the black Sea and numerous nature reserves. The seaside area has a length of 244 km. The northern part of the Black Sea Coast consists of sand belts which separate lakes from the sea. In the southern area there are limestone cliffs which are 15 – 30 m (Auditeco, 2017). Of the total surface area of the county, approximately 80 % (558,204 ha) consists of agricultural land. It is also noted that the MGD Project area has been subject to a number of anthropogenic influences which are reflected in the landscape in agriculture, forestry, industry and settlements.

6.3.2 Biological Environment

6.3.2.1 Overview

Flora, fauna and bird surveys were carried out in the area of and surrounding the GTP and pipeline route in 2012 by RSK (RSK, 2013a, b, c). Monitoring surveys were then carried out in the same areas in 2015, 2016 and 2017 by Auditeco (Auditeco, 2016a, 2017). Auditeco also prepared a biodiversity monitoring report for the area (Auditeco, 2016b). Maps showing the areas surveyed are included in Section 9.3.

The majority of the area surveyed in 2012 (to the south of the current location) was affected by anthropogenic activity. These activities and their influence on the habitats in the survey area are likely to have had a cumulative negative impact on the fauna in the area (RSK, 2013). The survey area was found to support an assemblage of both common and protected species, tolerant of human activities. None of the species were considered to be critically endangered (RSK, 2013).

6.3.2.2 Flora

The RSK survey in 2013 identified several plant communities. Some of the communities present are representative of the Mediterranean salt meadows habitat (1410 - *Juncetalia maritimi*) which is a habitat of community importance mentioned in the Standard Form Natura 2000 for ROSCI0065 Danube Delta. No species of vascular plants of community importance within the Danube Delta designated site (of which there are4) were identified in either Auditeco’s monitoring surveys in 2014, 2015, 2016 and 2017 or RSK’s survey in 2013 (RSK, 2013a, Auditeco 2016a and 2017).

Five vulnerable, endangered or critically endangered plant species, according to the Red List of Romania’s Vascular Plants (Oltean *et al*., 1999) were identified in the MGD Project area as follows: seaside eryngo – (*Eryngium maritimum*) – vulnerable, *Artemisia tschernieviana* – endangered, sea kale (*Crambe maritima*) -

endangered, *Dianthus bessarabicus* - endangered, *Elymus farctus* - critically endangered. However, according to the IUCN Red List of Endangered Species, all of the species listed above have th conservation status Not assessed, except for *Eryngium maritimum* and Crambe maritima which have the status Least Concern According to IUCN species that have been evaluated to have a low risk of extinction are classified as Least Concern.

6.3.2.3 Mammals

Mammals were described as being well represented in the 2013 flora and fauna survey prepared by RSK. The eastern edge of the survey area is bordered by the Black Sea and most of the land is covered by the Petromidia Refinery and is largely unsuitable for many species. The small amount of area which did offer suitable habitat included cliff areas which were found to contain red fox (*Vulpes vulpes*) burrows, the presence of the species was confirmed using camera traps. The same area could also support badger (*Meles meles*) and stone marten (*Martes foina*) but the presence of these species could not be confirmed (RSK, 2012).

The area compromising Lake Corbu and the surrounding area was dominated by anthropogenic activities including agriculture and fish farming. Mammals identified in this area included musk rat (*Ondata zibethicus*) and European ground squirrel (*Spermophilus citellus*). European ground squirrel is a species of community importance appearing on Annex II of the habitats directives and is also listed as vulnerable on the IUCN Red List of Threatened Species. During the 2013 survey the squirrel was noted close to a former industrial area (Rare Metals Company) and also in areas of Chituc Hill especially near access roads. European ground squirrels were also observed on the south east extent of Lake Tasaul and on the banks of an irrigation channel in the eastern extent of the survey area (RSK, 2012). During Auditeco’s monitoring surveys, the ground squirrel was also observed in similar areas to the 2013 survey as well as the western side of the proposed pipeline route (on the surface of and close to the P264/1 plot). Burrows were also identified in 2016 in the area west of the proposed pipeline route and one burrow was located in the vicinity of the proposed GTP (Auditeco, 2016a).

Concerning the European otter, no holts were found in the Project area. Clear marks (fresh spraint) were discovered around the platforms of the concrete road from Vadu village to the beach and in the southern corner of the mud-setting pond belonging to Rompetrol Rafinare, which is communicating with Balta Mare – a natural pond (all the locations are outside the Project area). Clear tracks were also noticed (soil footprints) between Balta Mare pond and Balta de Mijloc pond, this area being probably used from crossing from one pont to the other.

No European otter was identified in these areas, although in May 2015 Auditeco performed nocturnal monitoring around the places (both zones outside the Project area), where spraints were found by RSK in 2013. The intense tourist road traffic, coming from Vadu locality towards the beach area, is likely to have caused the otters to leave those areas.

Otters are listed as Near Threatened (NT) on the IUCN Red List of Threatened Species. This Near Threatened assessment is more of a precautionary listing, as it indicates that while the recovery in western Europe is occurring, conservation actions for the species need to be sustained (Roos *et al*., 2015). Otters and are also classed as European Protected Species (EPS). EPS status means that otters are protected against capture, injury and harassment. In addition, in a number of circumstances it is an offence to disturb the animal and it is an offence of strict liability to damage or destroy a breeding site or resting place. Otters are also classed as species of community importance as they appear on Annex II of the Habitats Directive.

Other mammal species identified in the area by RSK in 2013 and by Auditeco in 2014 and 2015 include: European hare (*Lepus europaeus*), Red fox (*Vulpes vulpes*) and the golden jackal (*Canis aureus*). In addition, northern white-breasted hedgehog, (*Erinaceus roumanicus*), European mole (*Talpa europaea*), muskrat (*Ondatra zibethicus*), least weasel (*Mustela nivalis*), European badger (*Meles meles*) and the wild boar (*Sus scrofa*). Also, during RSK’s monitoring in 2013, ultrasound signals from *Nyctalus noctula* (common noctule) and *Pipistrellus pipistrellus* (common pipistrelle) were recorded in the proposed pipelines vicinity (RSK, 2013a, Auditeco, 2016a and 2017).

6.3.2.4 Birds

MGD Project area is known to be important for a number of bird species as indicated by the many designations in the vicinity and overlapping MGD Project area for which bird species are a common designating feature. In 2013, RSK performed spring passage and wintering bird surveys in MGD Project area which covered a much larger area than the Project area.

Covering all the seasons and migration periods, in 2015,2016 and 2017 Auditeco continued the monitoring campaings according to RSK methodology and performed long monitoring surveys which included a much larger surface (over 3,100 hectares) than the footprint of the Project. Also, very detailed monitoring was carried out in the Project footprint in the area of the pipeline route andthe GTP area and also the beach area.A large number of bird species were recorded during these surveys including 46 species of birds which are listed on Annex I of the Birds Directive 2009/147/EC. Only a few number of species occurring as vulnerable or near threatened according to the IUCN Red List of Threatened species were recorded, most of the birds have the Least Concern status according to IUCN. No endangered or critically endangered species were recorded in the monitored area. No nesting colonies were identified in the Project footprint. No colonies of birds were identified in the Project area or in the footprint of the project.According to RSK's conclusions, the following species were found nesting in MGD Project area and in its close vicinity in 2013: mute swan (*Cygnus olor;* Photo 6.2), great crested grebe (*Podiceps cristatus*), Eurasian coot (*Fulica atra*), red-crested pochard (*Netta rufina*), ferruginous duck (*Aythya nyroca*), common pochard (*Aythya ferina;* Photo 6.3), mallard (*Anas platyrhychos*), gadwall (*Anas strepera*), Eurasian reed warbler (*Acrocephalus scirpaceus*), Sedge warbler (*Acrocephalus scoenobaenus*), great reed warbler (*Acrocephalus aerundinaceus*), common reed bunting (*Emberiza schoeniclus*), common grasshopper warbler (*Locustella naevia*), Savi's warbler (*Locustella luscinoides*), common pheasant (*Phasianus colchius*) and western marsh harrier (*Circus aeruginosus;* Photo 6.1) (2013, b&c).

Following Auditeco's monitoring campaigns in 2015, the following bird species listed in Appendix I of Council Directive 2009/147/EC were identified (nesting): purple heron (*Ardea purpurea*), Eurasian bittern (*Botaurus stellaris),* white stork (Ciconia ciconia), ferruginous duck (*Aythya nyroca*), western marsh harrier (*Circus aeruginosus*), pied avocet (*Recurvirostra avosetta*), black-winged stilt (*Himantopus himantopus*), common tern (*Sterna hirundo*) – in the area of the pipeline near the two ponds (Balta Mare and Balta Mica), calandra lark (*Melanocorypha calandra*), tawny pipit (*Anthus campestris),* red-backed shrike (*Lanius collurio*), lesser grey shrike (*Lanius minor) – in the agricultural lands in the GTP area* and red-footed falcon (*Falco vespertinus;* Photo 6.9) – in the acacia forest near the GTP. The following species were also identified while nesting: common shelduck (*Tadorna tadorna;* Photo 6.5) – outside the Project area, gadwall (*Anas strepera*) – outside the Project area and corn bunting (*Miliaria calandra*) and Eurasian skylark (*Alauda arvensis*) - in the agricultural areas near the GTP.

It was noted from surveys from 2013 and 2015, 2016 and 2017 that the areas preferred by the birds identified in the MGD Project area and in its vicinity during wintering and nesting are represented by the former Rare Metals Company's settling ponds and settling basins and the wetland area in-between them, and also the self-treatment ponds of wastewater belonging to the Refinery Rompetrol Rafinare S.A. and Balta Mare's northern half.

During migration, the coastline was found to be preferred by seabirds with the greatest density (species and specimens) being recorded here. The area between Balta Mare and Balta de Mijloc were mainly used by birds of the Passeriformes order. The birds of the Falconiformes order are the only ones found to use the entire MGD Project area's surface for feeding and the reed areas or the forest for nesting.

The 2013 RSK surveys and 2015, 2016 and 2017 Auditeco monitoring surveys identified 46 bird species mentioned in Appendix I of Council Directive 2009/147/EC and in the Standard Forms of the two designated sites which the MGD Project area overlaps. The surveys also identified 36 bird species with regular migration not mentioned in Appendix I of Council Directive 2009/147/EC, but mentioned in the Standard Forms of the two designated sites. A further 28 species which are not listed in the Birds Directive were identified some of which also are found on the Standard Forms of the designated sites.

Key findings from the survey campaigns:

- The surface of the MGD Project area includes agricultural land, grazing pasture and non-productive land, spreading over several hectares; only a few species of birds are characteristic to the agricultural landscape, species widely spread in similar areas in south east Romania, including in Dobrogea, namely: Fam. Alaudidae (larks): *Melanocorypha calandra, Alauda arvensis, Galerida cristata*, Fam. Motacillidae (wagtails and pipits): *Motacilla alba, Motacilla flava, Motacilla flava feldegg, Anthus campestris*, Fam. Galliformes (pheasants, partridges, quails): *Phasianus colchicus, Perdix perdix, Coturnix coturnix*, Fam. Laniidae (shrikes): *Lanius collurio, Lanius minor*, Fam. Corvidae (magpies, rooks, hooded crows, jackdaws): *Pica pica, Corvus frugilegus, Corvus corone cornix, Corvus monedula*), Fam. Coraciiformes (hoopoes, bee-eaters): *Upupa epops, Merops apiaster*. Daylight predators (Fam. Accipitriforme) are also present, that cover the area daily, looking for food: *Buteo buteo, Buteo rufinus, Circus aeruginosus, Circus pygargus, Falco tinnunculus, Falco vespertinus*;
- There are 10 bird species listed in Appendix I of Council Directive 2009/147/EC which were identified (nesting) in the area of the pipeline corridor, especially in the reed areas: purple heron (*Ardea purpurea*), Eurasian bittern (*Botaurus stellaris),* white stork (*Ciconia ciconia*), ferruginous duck (*Aythya nyroca*), western marsh harrier (*Circus aeruginosus*), pied avocet (*Recurvirostra avosetta*), black-winged stilt (*Himantopus himantopus*) and common tern (*Sterna hirundo*);
- During winters, a few specimens of gulls, summer geese, shelducks that are aquatic species were identified feeding on the agricultural land near the GTP area and in its vicinity, e.g.: *Larus cachinnans* (*michahelis;* Photo 6.10*), Larus melanocephalus, Larus ridibundus*; these species ussualy feed on the beach area in large numbers (more than 200 specimens of *Larus* sp. recorded);
- A series of migratory species were identified during monitoring campaings, for example: little cormorant - *Phalacrocorax pygmaeus*, Dalmatian pelican - *Pelecanus crispus* (Photo 6.6), great white pelican - *Pelecanus onocrotalus*, purple heron - *Ardea purpurea*, great egret – *Egretta alba*, little egret - *Egretta garzetta*, squacco heron - *Ardeola ralloides*, wood sandpiper - *Tringa glareola*, whiskered tern - *Chlidonias hybridus*;
- The species of predator birds (e.g. Falconiformes) use the entire MGD Project area located between the agricultural land next to Vadu village and the beach for hunting and nesting;
- The most common species identified in the studied area are the cormorants, especially great cormorant - *Phalacrocorax carbo sinensis* (sedentary species; Photo 6.4) and gulls (Photo 6.7), especially Caspian gull - *Larus cachinnans* (*michahellis*) and they were noticed in a great number (hundreds of individuals);
- In a lower number, but constantly present on the beach, the species of Eurasian magpie – *Pica pica*, hooded crow - *Corvus cornix*, rooks - *Corvus frugilegus and jackdaw – Corvus monedula* were noticed; In the false acacia forest located eastwards from GTP, a group of red-footed falcons - *Falco vespertinus (species of community importance listen on Annex I of Birds Directive)* were identified during the monitoring campaigns. IUCN conservation status for Falco vespertinus is VU – vulnerable. The specimens identified return on yearly basis to the same nests identified in the acacia forest east of GTP, but also in the acacia forest at the entrance in Vadu village. The group consists of approx.10-12 specimens (adults and juveniles) which hunt in the agricultural areas near the GTP
- No birds nesting were identified in the GTP area, but this area being an agricultural land would be suitable for nesting for a number of species including *Melanocorypha calandra, Lanius collurio, Anthus campestris, Milaria calandra etc* which were identified in the area.

Photo 6.1 Western marsh harrier (*Circus aeroginosus*)

Photo 6.2 Mute swan (*Cygnus olor*)

Photo 6.3 Common pochard pairs (*Aythya ferina*) and Eurasian coots (*Fulica atra*)

Photo 6.4 Great cormorant (*Phalacrocorax carbo*)

Photo 6.5 Common shelduck (*Tadorna tadorna*)

Photo 6.6 Dalmatian pelican (*Pelecanus crispus*)

Photo 6.7 Black-headed gull (Larus ridibundus)

Photo 6.8 Sanderling (*Calidris alba*)

Photo 6.9 Red-footed falcon (*Falco vespertinus*)

Photo 6.10 Caspian gull (*Larus michahellis)*

6.3.2.5 Reptiles

During the monitoring campaigns performed by RSK in 2013 and AUDITECO in 2015, 2016 and 2017 in the MGD Project area, the presence of the two species of reptiles of community importance was identified: the European pond turtle (*Emys orbicularis*) and the Spur-thighed tortoise (*Testudo graeca*).

The specimens of *Emys orbicularis* were noticed in the perimeter of the pipeline corridor but also in the wetland areas located to the eastern part of the former settling ponds of the Rare Metal Factory. A specimen was also identified in a concrete-covered basin located in front of the southern access gate in the former Rare Metal Factory.

The specimens of Testudo graeca were observed mainly in the beach area and in the pipeline corridor inflection area, at half the distance between the beach and the area included between Balta Mare and Balta de Mijloc ponds.

Other species of reptiles which are not of community importance identified during monitoring campaigns were: the steppe-runner (*Eremias arguta*), the sand lizard (*Lacerta agilis*), The Balkan green lizard (*Lacerta* *trilineata*), the grass snake (*Natrix natrix*), The Caspian whipsnake (*Dolichophis caspius*) and the dice snake (*Natrix tessellata*).

6.3.2.6 Amphibians

During the monitoring campaigns performed by RSK in 2013 and AUDITECO in 2015, 2016 and 2017 in the MGD Project area, the presence of the one species of two amphibian of community importance was identified: the European fire-bellied toad (*Bombina bombina*) and *Pelobates syriacus*.

During spring monitoring campaings, specimens of Bombina bombina were identified on wide surfaces in the wetlands from the pipeline corridor in temporary flooded areas. However, during summer-autumn interval, the specimens retreat to permanent wet areas.

Other species of amphibians which are not of community importance identified during monitoring campaigns were: The marsh frog - *Rana (Pelophylax) ridibunda*, *Pelobates fuscus* and *Hyla arborea*.

6.3.2.7 Fish species

No fish species of community importance were recorded in either the 2013, 2014/2015, 2016 and 2017 monitoring campaigns

6.4 Biodiversity and Conservation

6.4.1 Overview of Designated Sites in the MGD Project area

As indicated above in Sections 6.2 and 6.3, there are a number of sites of conservation value designated for valued and/or sensitive habitats and species within and surrounding MGD Project area. These are further described in this section for offshore and onshore areas as follows:

- Offshore and nearshore; and
- Beach and onshore.

Maps displaying the locations of the sites described below are displayed in Figure 6.10, Figure 6.11 and Figure 6.12. Key features of the site described are outlined in Table 6.3.

6.4.1.1 Offshore and Nearshore

Offshore, there are two Natura 2000 sites located in the vicinity of the Offshore Component of MGD Project area: ROSCI0413 Southern lobe of the *Phyllophora* field of Zernov (Lobul sudic al Câmpului de Phyllophora al lui Zernov) 32 km to the north; and ROSCI0311 Canyon of the Brave (Canionul Viteaz), currently a pSCI, located 12.5 km to the south east of the location of Ana Wellhead Platform.

Closer to shore, the footprint of MGD Project directly interacts with a number of other Natura 2000 sites. The gas pipeline crosses through the ROSCI0066 Danube Delta marine zone (Delta Dunarii – zona marina) over a distance of approximately 52 km, and in the nearshore also crosses the ROSPA0076 Black Sea (Marea Neagra) for approximately 12 km.

In the nearshore environment there are a number of additional protected sites types. The nearshore section of the gas pipeline passes through the marine economic area of the Danube Delta Biosphere Reserve and Black Sea IBA. The boundary of the Black Sea IBA falls within that of the RO**SPA**0076 Black Sea. As an IBA this site also is designated as a Key Biodiversity Area (KBA).

6.4.1.2 Beach and Onshore

Onshore and along the beach, the gas pipeline route crosses through two Natura 2000 sites: RO**SCI**0065 Danube Delta (Delta Dunarii) and RO**SPA**0031 Danube Delta and Razim-Sinoie Complex (Delta Dunarii Complexul Razim Sinoie). In addition, the onshore gas pipeline route into the GTP is located approximately 6 km south west of RO**SPA**0060 Lakes Tasaul – Corbu (Lacurile Tasaul – Corbu), and 15 km west of RO**SPA**0019 Dobrogea Gorges (Cheile Dobrogei).

Onshore, the gas pipeline also crosses through the marine economic area of the Danube Delta Biosphere Reserve, the Danube Delta IBA and the Danube Delta Ramsar site (the boundaries of which are within the RO**SPA**0031 Danube Delta and Razim-Sinoie Complex). The Onshore Component of MGD Project is located approximately 6 km north east of the Lake Tasaul IBA and 15 km east of the Dobrogei George IBA (the boundaries of both IBAs are within that of the RO**SPA**0060 Lakes Tasaul – Corbu (Lacurile Tasaul – Corbu) and RO**SPA**0019 Dobrogea Gorges (Cheile Dobrogei). As IBAs these sites are also designated as KBAs.

The UNESCO World Heritage site of Danube Delta lies over 70 km to the north of the Onshore Component of MGD Project.

6.4.1.2.1 Protected habitats

For ensuring a comprehensive view, the protected habitats relevant to MGD Project are detailed in Section 6.4.3 of this Report.

6.4.1.2.2 Protected species

In Table 6.3, all the natural protected areas which are found in the vicinity of the MGD Project area or overlapping the MGD Project area are described as well as all the habitats (plant communities) and protected or important species of flora and fauna for which they were designated. Their location is indicated in Figures 6.10, 6.11 and 6.12. The protected species which were identified by RSK and Auditeco surveys throughout all the monitoring campaigns are detailed in Chapter 6.3.2.

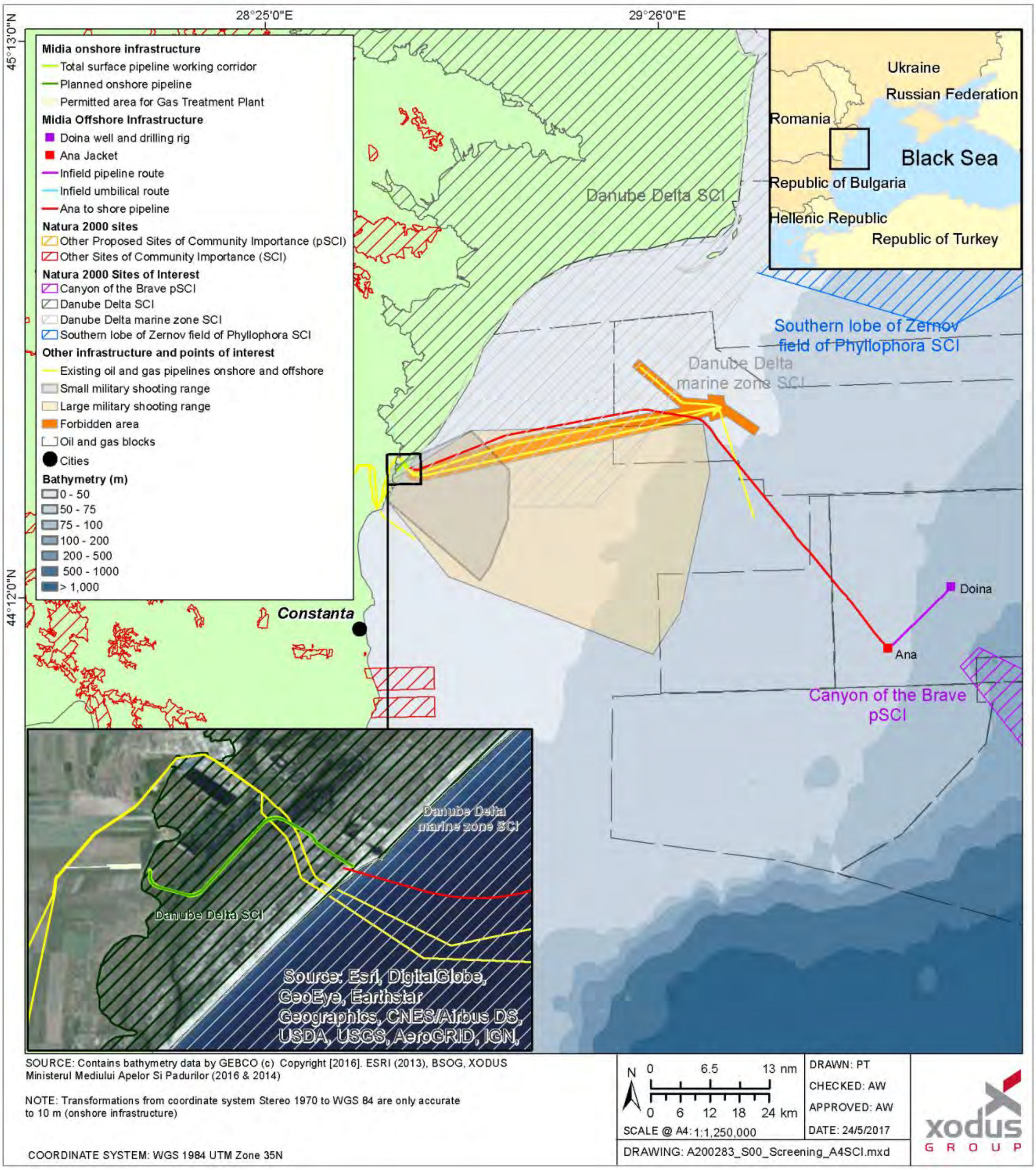


Figure 6.10 Sites of Community Importance (SCI) and Proposed SCI

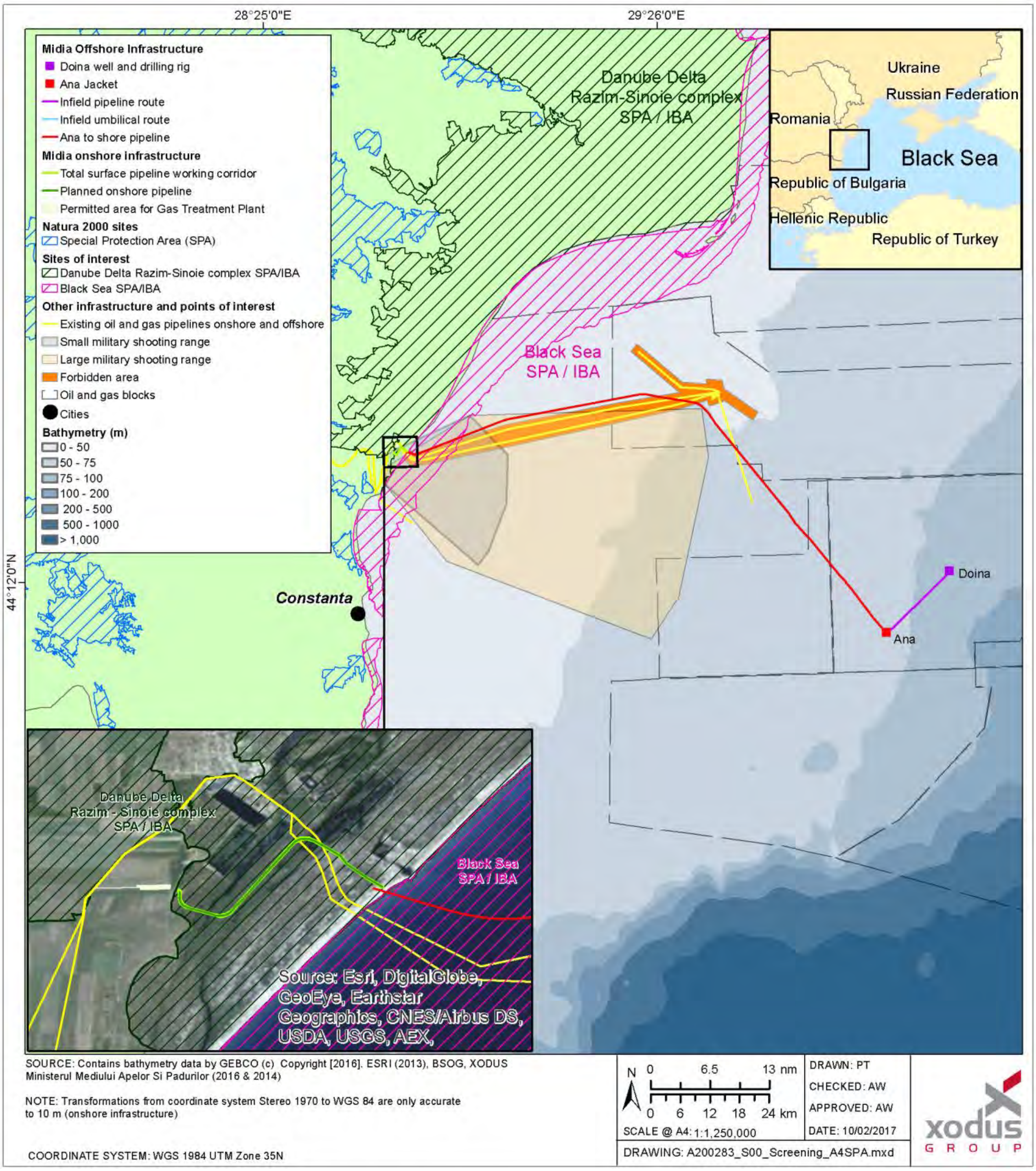


Figure 6.11 Special Protection Areas (SPA) and Important Bird Areas (IBA)

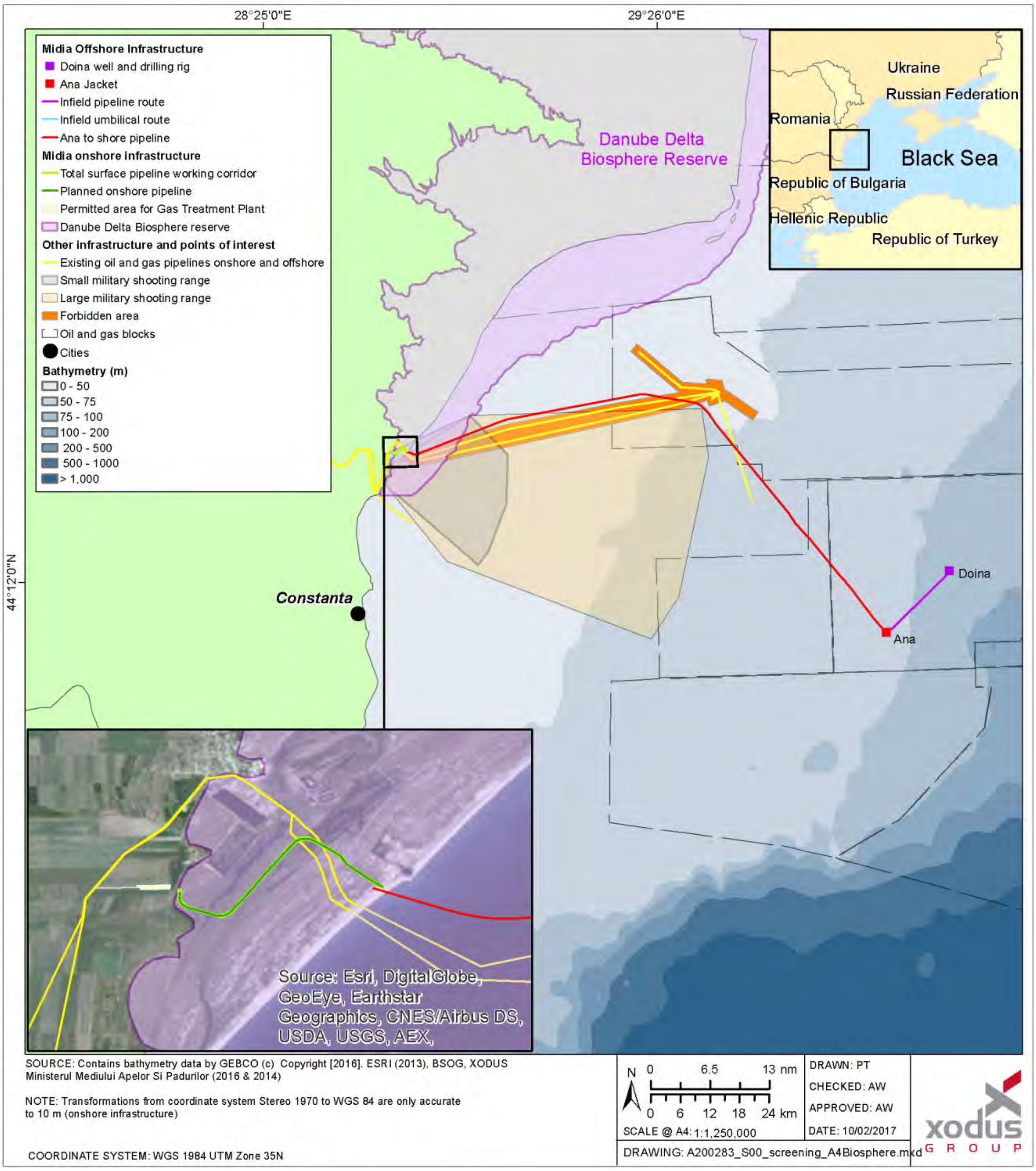


Figure 6.12 The Danube Delta Biosphere Reserve

Table 6.3 Protected sites in the vicinity of the MGD Project

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
Danube Delta marine zone SCI (Delta Dunarii – zona marina)	RO**SCI**0066	Extends into offshore; gas pipeline crosses site over a distance of ~52 km	Sandbanks which are slightly covered by sea water all the time; Estuaries; Mudflats and sandflats not covered by seawater at low tide; and large shallow inlets and bays. Bottlenose dolphin, harbour porpoise, Black Sea shad, Pontic shad.
Black Sea SPA (Marea Neagra)	RO**SPA**0076	Extends into nearshore; gas pipeline crosses site over a distance of ~12 km	37 bird species, important site for breeding and wintering species. During migration periods the site holds over 20,000 species of waders.
Southern lobe of the *Phyllophora* field of Zernov SCI (Lobul sudic al Câmpului de Phyllophora al lui Zernov)	RO**SCI**0413	Offshore; 32 km to north from landfall	Zernov's *Phyllophora* field is a unique habitat located in the northwestern Black Sea. Its main feature is a dense stand of several species of the red algae *Phyllophora* spp. including *Phyllophora crispa,* which are mainly unattached. This supports a high diversity of associated fauna. The northwestern Black Sea was heavily impacted by anthropogenic loading in the period 1960–1980, and the *Phyllophora* field was considerably degraded and reduced in area. During recent years, recovery of the benthic phytocoenosis has begun in both Ukrainian and Romanian waters. The site occupies 186,815 ha, and borders similar protected habitat in adjacent Ukrainian waters. It includes EU Habitats 1110 Sandbanks which are slightly covered by sea water all the time, and 1180 Submarine structures made by leaking gases. Species named in the designation are the harbour porpoise *Phocoena phocoena*, common bottlenose dolphin *Tursiops truncatus*, and the shad *Alosa immaculata*.

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
Canyon of the Brave SCI (Canionul Viteaz)	RO**SCI**0311	Offshore; 12.5 km to south east from Ana Wellhead Platform	The Danube Canyon is a large shelf-indenting canyon that has developed seaward of the late Pleistocene paleo–Danube valley. The canyon is a major erosional trough with a flat bottom cut by an entrenched axial thalweg. The thalweg path varies from highly meandering to fairly straight in relation to the local gradient. Segments of the canyon are characterized by specific morphology, orientation and gradient along the axial thalweg. During the last lowstand level of the Black Sea the canyon was located in an area of high sediment supply close to the paleo-Danube River mouths. This is indicated by buried fluvial channels on the shelf and by a wave-cut terrace associated with a water level situated about 90 m below the present level. The canyon is situated in an area with important gas-hydrate deposits and is a place of intense methane seepage in the anoxic water layer. As a result, large columnar methanogenic carbonate structures (bubbling reefs) are present throughout the canyon. The site occupies 35,376 ha, and a depth range of approximately 90 to 500 m+. It includes EU Habitats 1170 Reefs, and 1180 Submarine structures made by leaking gases. The Annex II species *Tursiops truncatus* (common bottlenose dolphin) is included as a feature in this designation.
Danube Delta Biosphere Reserve	n/a	The MGD pipeline crosses through the southern tip of this site, ~12 km through the marine economic area and ~4.1 km through the onshore economic area.	Designated in 1991 and covering 580,000 ha, the Danube Delta Biosphere Reserve also stretches into Ukraine. In Romania, the Danube Delta, located in the northern part of the Reserve approximately 80 km from the MGD Project location, is the largest European wetland and reed bed, and also forms Europe's largest water purification system. The Biosphere Reserve is particularly well known for the abundance of birdlife (331 species) and is an important stopover and breeding area for many bird species. About 135 fish species have been recorded here, including populations of sturgeon. It is also one of the last refuges for the European mink, the wildcat, the freshwater otter and the globally threatened monk seal. The Biosphere Reserve was declared as both a Natural World Heritage and a Ramsar site in 1991.

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
Black Sea IBA	RO082	Extends into nearshore; offshore pipeline crosses through over a distance of ~12 km	An important area for wintering wildfowl, holding 20,000 or more on a regular basis. Wintering species of global conservation concern that do not meet IBA criteria: *Aythya nyroca*, *Oxyura leucocephala* and *Haliaeetus albicilla*
Danube Delta SCI (Delta Dunarii)	RO**SCI**0065	Onshore, pipeline crosses southern tip of site	Coastal, marine, terrestrial, aquatic Annex I habitats: Sandbanks which are slightly covered by sea water all the time, Coastal lagoons, Annual vegetation of drift lines, Salicornia and other annuals colonizing mud and sand, Mediterranean salt meadows (*Juncetalia maritimi*), Pannonic salt steppes and salt marshes, Embryonic shifting dunes, Fixed coastal dunes with herbaceous vegetation ("grey dunes"), Dunes with *Hippophaë rhamnoides*, Humid dune slacks, Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea, Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp, Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation, Natural dystrophic lakes and ponds, Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation, Ponto-Sarmatic deciduous thickets, Xeric sand calcareous grasslands, Mediterranean tall humid grasslands of the *Molinio-Holoschoenion*, Alluvial meadows of river valleys of the Cnidion dubii, Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*), Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae,* Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*), *Salix alba* and *Populus alba* galleries and Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*) Annex II species. Mammals: European otter, steppe polecat, European mink, European ground squirrel and Marbled polecat. Amphibians: Fire-bellied toad and Danube crested newt. Fish: Black Sea herring, Black Sea shad, Aral asp, Spined

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
			loach, White-finned gudgeon, Kessler's gudgeon, Balon's Ruffe, Striped Ruffe, Mud loach, Sabre carp, European bitterling, Golden spined loach, European mud-minnow, the streber and common zingel. Invertebrates little ramshorn whirlpool snail, *Arytrura musculus*, *Catopta thrips*, Ornate Bluet, Danube clouded yellow, *Graphoderus bilineatus*, Fenton's Wood White, Large Copper, *Morimus funereus*, Green snaketail and *Theodoxus transversalis*. Plants: waterwheel plant, *Centaurea jankae*, *Centaurea pontica*, Russian Bugloss, *Marsilea quadrifolia*. Reptiles: European pond terrapin, Mediterranean spur-thighed tortoise and Meadow viper. An additional 47 plant, 18 invertebrate, 6 amphibian, 9 mammal, 13 fish, 3 fungi and 3 reptile species are also identified within the site as important.
Danube Delta and Razim-Sinoie Complex SPA (Delta Dunarii Complexui Razim Sinoie)	RO**SPA**0031	Onshore, the pipeline crosses the southernmost tip of site; however, the GTP is located outside of this site	97 bird species – breeding, migratory, hibernating, resident populations with globally and/or regionally significant percentages of the populations. The site is particularly important for breeding population of the following species: *Pelecanus crispus, Pelecanus onocrotalus, Aythya nyroca, Falco vespertinus, Phalacrocorax pygmeus, Plegadis falcinellus, Egretta garzetta, Nycticorax nycticorax, Egretta alba, Recurvirostra avosetta, Ardeola ralloides, Sterna albifrons, Porzana Porzana , Haliaeetus albicilla, Sterna hirundo, Larus melanocephalus, Himantopus himantopus, Glareola pratincola, Platalea leucorodia, Ixobrychus minutus, Charadrius alexandrinus, Chlidonias hybridus, Circus aeruginosus, Ardea purpurea, Botaurus stellaris, Coracias garrulus, Alcedo atthis, Gelochelidon nilotica*. Because this area is the limit for *Falco naumanni* complex, there are fluctuations in breeding birds. Migratory species include: *Phalacrocorax pygmeus, Gelochelidon Nilotic, Larus minutus, Sterna caspia, Sterna sandvicensis, Philomachus pugnax, Recurvirostra avosetta, Himantopus himantopus, Charadrius alexandrinus, Puffinus yelkouan, Aquila pomarina, Phalaropus lobatus, Larus gene, Pluvialis apricaria, Tringa stagnatilis, Tringa erythropus, limosa limosa, Larus ridibundus, Numenius arquata, Calidris minutes, Anas clypeata, Calidris alpina, Calidris ferruginea, Phalacrocorax carbo,*

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
			Tringa totanus, Tringa nebularia, Vanellus vanellus, Larus canus, Gallinago gallinago, Calidris alba, Anas crecca, Calidris temminckii, Arenaria interpres, Chlidonias leucopterus, Charadrius hiaticula, Charadrius dubius, Anser fabalis, Anas querquedula, Tringa ochropus, Anas acute cachinnans Larus, Larus fuscus, Lymnocryptes minimus, Mergus Serra, Limicola falcinellus. The site is important for wintering for the following species: *Anser erythropus, Aquila clanga*, red-breasted goose, *Phalacrocorax pygmeus, Cygnus cygnus, Egretta alba, Mergus albellus, Falco columbarius, Netta rufina, Aythya ferina, Aythya fuligula, Anser anser*
Lakes Tasaul – Corbu Lacurile Tasaul – Corbu	RO**SPA**0060	Onshore; approximately 6 km to the south west of Onshore Component of MGD Project	Important winter passage for bird species and supports assemblages of breeding birds. Designated for the presence of breeding Annex II species *Acrocephalus scirpaceus, Anthus campestris, Charadrius alexandrines, Ciconia ciconia, Fulica atra, Ixobrychus minutus, Lanius collurio, Larus cachinnans, Oenanthe pleschanka* and *Tadorna tadorna.* Permanent populations of *Falco tinnunculus, Gallinula chloropus* and *Melanocorypha calandra*. Important concentrations of *Alcedo atthis, Anas crecca, Anas penelope, Anas platyrhynchos, Anas strepera, Anser albifrons, Ardea cinerea, Ardeola ralloides, Aythya farina, Aythya fuligula, Aythya nyroca, Branta ruficollis, Chlidonias hybridus, Chlidonias niger, Ciconia ciconia, Circus cyaneus, Cygnus olor, Egretta alba, Egretta garzetta, Falco cherrug, Falco peregrinus, Falco vespertinus, Fulica atra, Gavia arctica, Gelochelidon nilotica, Larus cachinnans, Larus fuscus, Larus ridibundus, Motacilla alba, Nycticorax nycticorax, Oxyura leucocephala, Pandion haliaetus, Pelecanus crispus, Phalacrocorax carbo, Phalacrocorax pygmeus, Platalea leucorodia, Podiceps cristatus, Sterna albifrons, Sterna caspia, Sterna hirundo, Sterna sandvicensis, Sturnus vulgaris* and *Tadorna tadorna*. Wintering populations of *Anas platyrhynchos, Aythya farina, Aythya fuligula, Fulica atra, Larus cachinnans, Larus canus, Larus ridibundus, Pelecanus crispus* and *Phalacrocorax carbo*.

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
Dobrogea Gorges Cheile Dobrogei	RO**SPA**0019	Onshore; approximately 15 km to the west of Onshore Component of MGD Project	Important winter passage for bird species and supports assemblages of breeding birds. Designated for the presence of breeding Annex II species *Accipiter brevipes, Alauda arvensis, Alcedo atthis, Anthus campestris, Aquila pomarina, Asio otus, Burhinus oedicnemus, Buteo rufinus, Calandrella brachydactyla, Caprimulgus europaeus, Circaetus gallicus, Coracias garrulous, Coturnix coturnix, Cuculus canorus, Dendrocopos medius, Dryocopus martius, Emberiza hortulana, Falco cherrug, Falco vespertinus, Hieraaetus pennatus, Hirundo rustica, Lanius collurio, Lanius minor, Lanius senator, Lullula arborea, Luscinia megarhynchos, Melanocorypha calandra, Merops apiaster, Miliaria calandra, Milvus migrans, Oenanthe isabellina, Oenanthe oenanthe, Oenanthe pleschanka, Oriolus oriolus, Pernis apivorus, Phoenicurus ochruros, Picus canus, Riparia riparia, Saxicola torquata, Streptopelia turtur, Sturnus roseus, Sylvia atricapilla, Sylvia borin, Sylvia communis* and *Upupa epops*. Permanent populations of *Bubo bubo* and *Dendrocopos syriacus.* Important concentrations of *Accipiter brevipes, Aquila heliacal, Aquila pomarina, Branta ruficollis, Burhinus oedicnemus, Buteo rufinus, Ciconia ciconia, Circaetus gallicus, Circus aeruginosus, Circus cyaneus, Circus macrourus, Circus pygargus, Crex crex, Falco cherrug, Falco columbarius, Falco peregrinus, Falco vespertinus, Ficedula albicollis, Ficedula parva, Glareola pratincola, Grus grus, Haliaeetus albicilla, Milvus migrans, Neophron percnopterus,* and *Pernis apivorus.* Wintering populations of *Falco columbarius.*
Danube Delta IBA	RO081	Extends from coastline into nearshore; pipeline crosses through over a distance of ~12 km	21 species of wintering birds, 38 breeding birds, 21 birds use during passage and 21 species during the winter.

Site name	Site code (if relevant)	Location relative to MGD Project	Overview of features / description
Lake Tasaul IBA	RO109	Onshore; approximately 6 km to the south west of Onshore Component of MGD Project	A coastal lake at the end of the Casimcea valley with a steep limestone shoreline, except on the eastern side where it is separated from the sea by a sandbank. The lake reaches a depth of 5.6 m and has two islands. Sparse reedbeds (*Phragmites*) are found in the north west of the lake. This is an important site for passage and wintering waterbirds.
Dobrogei Gorge IBA	RO108	Onshore; approximately 15 km to the west of Onshore Component of MGD Project	Six species of birds during passage, 15 breeding bird and one species overwinter here.
Danube Delta Ramsar	RO521	Onshore, the pipeline crosses the southernmost tip of site; however, the GTP is located outside of this site	Important wetland for overwintering and breeding birds.

6.4.2 Offshore and Nearshore Sensitivities

6.4.2.1 Priority biodiversity features

Under PR 6, habitats highlighted within the EU Habitats Directive (Annex I) count as priority biodiversity features. Environmental surveys commissioned by BSOG at Ana field and Doina field locations and along pipeline corridors have thus far identified two habitats that could potentially qualify as EU Annex I habitats (Habitats of Conservation Importance, HCI). The EU habitats are identified below, together with the relevant habitats identified in MGD Project area through survey work as outlined in Section 6.2.2:

- Habitats dominated by mussel species (potentially qualifying as EU Annex I 1170-Reefs habitat);
  - A5.628 'Pontic *Mytilus galloprovincialis* beds on sublittoral sediment'; and
  - A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina*'.
- Seep/vent habitats with structures (methane-derived authigenic carbonate or MDAC) made by leaking gases (potentially qualifying as EU Annex I habitat 1180-Submarine structures made by leaking gasses);
  - A5.71 'Seep and vents in sublittoral sediments' (on the basis of photographic data).

Under PR 6 species listed as vulnerable on the IUCN Red List of Threatened species, those species listed on national/regional lists such as the Black Sea Red Data Book count and those species listed under Annex II of the EU Habitats Directive are also considered as priority biodiversity features.

Three recognised Black Sea endemic cetacean subspecies have been observed in the area all of which are listed in the Black Sea Red Data Book and on the IUCN Red List of Threatened species:

- Black Sea bottlenose dolphin (EN);
- Black Sea common dolphin (EN); and
- Black Sea harbour porpoise (EN).

P. phocoena and *T. truncatus* are also listed as Annex II species within the EU Habitats Directive which are also considered under PR6 to equate to Priority Biodiversity Features.

In addition, during the environmental surveys commissioned by BSOG at Ana and Doina field locations and along pipeline corridors red mullet (*Mullus barbatus ponticus*) was recorded which is locally classified as 'Endangered' in the Black Sea by the IUCN and listed in the Black Sea Red Data Book. The crustacean *Apseudopsis ostroumovi* was also recorded during the Environmental surveys which is also listed in the Black Sea Red Data Book. In addition, although gobies were also recorded during the surveys, it was not possible to identify these from the camera footage obtained during Environmental surveys or to establish if they belonged to the species included in the Black Sea Red Data Book and listed as Endangered in the Black Sea as a whole (*Gobius bucchichi*, *G. cobitis*).

As discussed further in Section 6.4.1, the RO**SCI**0065 Danube Delta is designated in part for the European otter (*Lutra lutra*) which is listed as both an Annex II species within the EU Habitats Directive and as Endangered in the Black Sea Red Data Book. Although only occasionally marine in habit where they tend not to travel further than 1.5 km from the shore evidence of otters has been observed along the coastline close to MGD Project area in onshore recent surveys (Auditeco, 2016a, b). Therefore, there is potential for European otters to be present in the coastal/nearshore marine area of the MGD Project.

Opportunistic sightings of birds were made during geophysical survey activities around the Ana platform location between October 27th and November 12th, 2016. The following Annex I species listed under the EU Birds Directive were observed (those marked with an '**' are designated Annex I features for the SPAs displayed in Figure 6.11):

- Eurasian sparrowhawk (*Accipiter nisus*);

- Hen harrier (*Circus cyaneus***);
- Red-breasted flycatcher (*Ficedula parva* **);
- Common chaffinch (*Fringilla coelebs*);
- Black-throated loon (*Gavia arctica* **);
- Yelkouan shearwater (*Puffinus yelkouan* **);
- Sandwich tern (*Sterna sandvicensis* **); and
- Eurasian wren (*Troglodytes troglodytes*).

The nearshore section of the pipeline also passes through the offshore economic area of the Danube Delta Biosphere Reserve (Figure 6.12) and the Black Sea Important Bird Area (IBA) RO082, Figure 6.11) and Key Biodiversity Area (KBA). This site has a number of species listed as vulnerable (VU) on the IUCN red list, these are:

- Red-breasted goose (*Branta ruficollis*);
- Common pochard (*Aythya farina*);
- Yelkouan shearwater; and
- Dalmatian pelican (*Pelecanus crispus*).

6.4.2.2 Critical habitat

According to EBDR Performance Requirement 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources, in paragraph 14 a 'critical habitat' is defined as the most sensitive biodiversity feature which comprise one of the following:

(i) Highly threatened or unique ecosystems;
(ii) Habitats of habitat of significant importance to Endangered or Critically Endangered species, (as listed by the International Union for the Conservation of Nature (IUCN) Red List of threatened species and in relevant national/regional legislation);
(iii) Habitats of significant importance endemic or geographically restricted species;
(iv) Habitats supporting globally significant migratory or congregatory species; areas associated with key evolutionary processes; and
(v) Ecological functions that are vital to maintaining the viability of biodiversity features described in this paragraph.

Also, paragraph 19 of the EBRD Performance Requirement 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources stipulates that where the project occurs within or has the potential to adversely affect an area that is protected through legal or other effective means, and/or is internationally recognized or proposed for such status by national governments, the client must identify and assess potential project-related impacts and apply the mitigation hierarchy so that impacts from the project will not compromise the integrity, conservation objectives and/or biodiversity importance of such an area.

IFC Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources defines 'critical habitat' as areas with high biodiversity value including:

(i) Habitat of significant importance Critically Endangered and /or Endangered species;
(ii) Habitat of significant importance to endemic and/or restricted-range species;
(iii) Habitat supporting globally significant concentrations of migratory species and/or congregatory species;
(iv) Highly threatened and/or unique ecosystems; and/or
(v) Areas associated with key evolutionary processes.

Critical habitats are areas of high sensitivity and biodiversity value where stringent requirements must be met if project activities are to be permitted within them. In order to meet compliance, a series of conditions must be fulfilled by the Client.

Under PR 6 areas that are Important Bird and Biodiversity Areas identified for congregatory species count as critical habitat. The Black Sea IBA (RO082) (also a KBA) has been identified as category C4 which is 'Congregatory – large congregations' where the site is known to regularly hold at least 20,000 migratory waterbirds and/or 10,000 pairs of migratory seabirds of one or more species.

Habitats which support endangered species are defined as Critical habitat for the purposes of PR 6. The Danube Delta Ramsar site qualifies for Ramsar designation under a number of criteria including Criterion 5 (A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds) and Criterion 6 (a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird). These criteria both qualify the site as critical habitat. This Ramsar site covers the nearshore marine environment as well as the onshore environment, as discussed in further detail in Section 6.4.3.2.

6.4.3 Onshore Sensitivities

6.4.3.1 Priority biodiversity features

Onshore, the pipeline overlaps with two Natura 2000 sites (Figure 6.10):

- RO**SPA**0031 Danube Delta and Razim-Sinoie Complex;
- RO**SCI**0065 Danube Delta (Figure 6.10) which includes:
  - Coastal, marine, terrestrial, aquatic Annex I habitats;
  - Mammals including the beaver Castor fiber and the Romanian hamster, *Mesocricetus newtoni* European otter (NT), European ground squirrel (VU), European mink (CR), marbled polecat (VU), steppe polecat (LC);
  - 97 bird species – breeding, migratory, hibernating, resident populations including some - like the over-wintering Red Breasted Goose *Branta ruficollis* (VU) - with globally and/or regionally significant percentages of the population;
  - 5 amphibian and reptile species;
  - 17 fish species;
  - 9 invertebrates; and
  - 50+ plant species.

RO**SPA**0031 was designated for sheltering 89 species listed in Annex I of Birds Directive and 131 species with regular migration not mentioned in Annex I but mentioned in the Standard Form of ROSPA0031.

Under PR 6, species listed as vulnerable on the IUCN Red List of Threatened species or in the National Red Lists/Red Books count as priority biodiversity features. Surveys in the area (RSKand Auditeco identified the following vulnerable species: European ground squirrel *(Spermophilus citellus* common pochard (*Aythya ferina*), and spur-thighed tortoise (*Testudo graeca* and *Aythya farina)*. Details about them are found in the following paragraphs.

The pipeline also overlaps with an Important Bird Area and Key Biodiversity Area (KBA) (ref RO081) and passes through the onshore economic area of the Danube Delta Biosphere Reserve (Figure 6.11).

6.4.3.2 Critical habitat

6.4.3.2.1 Introduction

The critical habitat determination regarding the presence and extent of potential critical habitats relevant to the Project based on a set of qualifying criteria established by the performance requirements and standards of two financial institutions – EBRD Performance Requirement 6 and IFC Performance Standard 6 (see summary in Section 6.4.2.2) is detailed below. Detailed guidance on critical habitat determination is provided by the IFC Guidance Note 6 (accompanying PS6) and the EBRD Guidance Note on PR6, which were used for development of the critical habitat determination.

Both performance standards presented above contain subtle differences in the definition of potential critical habitat triggers. This assessment has therefore adopted a consolidated list of critical habitat criteria that generally reflect the more stringent requirements in any areas of discrepancy.

The fulfilment of one of the following criteria is enough to qualify habitat as critical:

- Criterion 1: habitat of significant importance to Critically Endangered, Endangered or Vulnerable species, as defined by the International Union for the Conservation of Nature (IUCN) Red List of threatened species and in relevant national legislation;
- Criterion 2: habitat important to the survival of endemic or restricted-range species, or unique assemblages of species;
- Criterion 3: habitat supporting globally significant migratory and/or congregatory species;
- Criterion 4: highly threatened or unique ecosystems;
- Criterion 5: areas associated with key evolutionary processes; and
- Criterion 6: habitat of key scientific value.

All terrestrial candidate biodiversity features within the area of interest (AOI) were assessed in detail to determine whether they triggered critical habitat. The AOI is represented by a larger area than the project footprint, an area monitored both by RSK and Auditeco through extensive field investigations. The precautionary approach has been applied when assessing and qualifying critical habitats.

As part of the ESIA, extensive baseline studies comprising in-field studies and literature review were conducted over multiple seasons by competent professionals and experts of RSK UK during 2012 and 2013 and also by competent professionals and experts from Auditeco in 2014, 2015, 2016 and 2017. The RSK and Auditeco studies covered an area of interest which is much larger that the project footprint area, but also very detailed monitoring was performed in the area of the footprint of the project.

6.4.3.2.2 Critera 1 and 2

Based on screening of over 200 terrestrial or aquatic biodiversity features known to occur or potentially occurring within the AOI, only five biodiversity features were identified that could qualify for critical habitat under the adopted criteria: five species of terrestrial vascular plants, two reptile species, one amphibian species, one mammal species and one bird species.

Species listed in Subchapter 6.3.2 of the ESIA identified within the AOI have been screened in order to classify them as either Vulnerable, Critically Endangered or Endangered globally, nationally or regionally. Table 6.4 lists the species identified along with their IUCN, Romania Red List of Vascular Plants and Romania Red Book of Amphibian and Reptile conservation status. The species' status as being either endemic or range restricted is also shown in the table. However, in Romania the only Red Lists/Red Books are the one for vascular plants and reptiles and amphibians. Further descriptions of each species listed in the table is provided below.

Table 6.4 Vulnerable, endangered and critically endangered species

No. crt.	Species (terrestrial and aquatic)	IUCN Conservation Status	Romania Red List/Red Book Conservation Status	Endemic/Restricted Range
Plants				
1	*Artemisia tschernieviana*	Not assessed	Endangered	No
2	*Crambe maritima (sea-kale)*	Least Concern	Endangered	No
3	*Dianthus bessarabicus*	Not assessed	Endangered	No
4	*Elymus farctus spp bessarabicus*	Not assessed	Critically endangered	No
5	*Eryngium maritimum*	Least Concern	Vulnerable	No
Reptiles and Amphibians				
6	*Testudo graeca*	Vulnerable	Endangered	No
7	*Pelobates syriacus*	Least Concern	Endangered	No
8	*Eremias arguta*	Near Threatened	Endangered	No
Mammals				
9	*Spermophillus citellus*	Vulnerable	-	No
Birds				
10	*Aythya ferina*	Vulnerable	-	No

1. *Artemisia tschernieviana Besser*

Conservation status: Endangered (EN) - according to Romanian Red List.

Taxonomy: subfrutescent, glabrescent, up to 75 cm, 1-2 pennate leaves, the lower ones being petiolated, ending lobes of 10 – 15 cm, oblanceolated to linear, mucronated; oval antodies, shortly pedunculated; whitish or yellowish corolla.

Chorology: Chituc sand banks, Capul Midia, Constanta, La Tăbăcărie, Mamaia, Eforie Sud, Techirghiol, Dune reservation at Agigea, Sulina, Rosetti-Letea, Sf. Gheorghe.

Areal (geoelement): southern part of Russia up to eastern part of Romania; continental species (Euro-Siberian, having the Western limit in the Romanian Dobrogea).

Habitat, cenology: psammophile seaside species, heliophile; Scabioso ucrainicae-Caricetum ligericae, Festuco-Brometea.

Biology: perennial plant (H).

Limiting factors: seaside development for tourists, lack of education related to preservation, use of mechanical equipment in order to clean the beach, seaside ruderalization by crowdy tourism; although it produces many fruits, the multipliction pace is very low; it is parasited by *Puccinia artemisio-arenariae*.

Importance: important from scientific point of view, due to rarity and ecology.

2. *Crambe maritima L.*

Status: Endangered (EN) – according to Romanian Red List.

Taxonomy: perennial, without any stings, having a pulpy root, lower leaves from dentated to irregularly pinatiphide, white petals, transversely articulate silicula, having upper segment 7-12 mm, globose to ovoid.

Chorology: Vadu, Chituc sand bank, Mamaia, Techirghiol, Eforie, Agigea, Constanta, Eforie Sud, Eforie, sand dunes between sea and Techirghiol, Schitul-Costinesti, Letea Woods, Sulina, Sf. Gheorghe, Beibugeac, Babadag Lake, Razim Lake, Jurilofca, Perisor, Portita, between Sinoe Lake and Black Sea, Histria Fortress.

Areal (geoelement): European, disjunct, south-west, west and north seaside of the Black Sea, Atlantic seaside; seaside (European) element.

Habitat, cenology: psammophile, xeromezophile species; belongs to the marine dune vegetation – Elymion gigantei.

Biology: perennial (H), amphimictic (sexuated), entomophile, autocore, plant of full light, it develops on dry soils.

Importance: important from scientific point of view, due to rarity; the species is not economically turned into profit yet; ornamental and melipher; contains fat oil in seeds, up to 40%.

Limiting factors: seaside development for tourism, waste storage on dunes, pollutants thrown in the sea water, extremely poor populations; aeolian factors can play a negative role in planet existence; the plant is parasite by the *Pleospora herbarum fungus*.

3. *Dianthus bessarabicus*

Conservation status: Endangered (EN) - according to Romanian Red List.

Taxonomy: perennial, up to 50 cm; acute leaves, the basal ones up to 2 mm wide, the stem ones with vaginils at least three times longer than their width, having thickened edges; flowers gathered 2-7 in capitula; the calyx of 18-20 mm having obtuse teeth, twice longer than wider; red, barbulate petals, of 10-15 mm.

Chorology: Histria Fortress, Mamaia, Saele-Istria sand bank; maritime dune reservation at Agigea; Constanta towards Palazu and towards Mamaia; Gl. Hanul Conachi, sands; Danube Delta, on seaside sands at Caraorman and Histria, Periprava, Letea, Rosetti, Cardon, Caraorman, Sulina, Sf. Gheorghe, Perisor, Grindul Sărăturile, Wolf Sand Bank.

Areal (geoelement): Getic-Dobrogea element, described from the Delta Chiliei. Kept as independent taxon in Flora Europaea, 2nd edition.

Habitat, cenology: Psammophile, xeromezophile species, developing on sandy soils, having very low nitrogen content. It often develops with Artemisia tscherneviana, Medicago marina, Polygonum maritimum, Silene thymifolia, Stachys maritima, Salsola kali etc.

Biology: perennial (H), amphimictic (sexuated), entomophile, autocore, VI-VIII.

Importance: important from scientific point of view, due to rarity and taxonomic problems; it is decorative.

Limiting factors: seaside development for tourism.

Conservation measures: it is protected in the Danube Delta Biosphere Reserve, Histria Fortress, Sahalin-Zătoane Complex, Wolf Sand Bank, Maritime dune reservation at Agigea. Attempts to cultivate it in botanical gardens; setting up a global natural reservation for seaside flora; ecological education of tourists.

4. *Elymus farctus*

Status: critically endangered (CR) - according to Romanian Red List.

Taxonomy: perennial, robust, cespitous plant, having short rhizome; plane leaves or leaves having convolute edges, with ligule up to 2.5 mm; spikes of 14-40 cm, with fragile rachis and small spikes shorter than lower internodes; small spikes of 18-25 mm; obtuse glumes and lemma; spiky-chilied palea only in the upper half of the ridges.

Chorology: Chituc (Vadu) sand bank, Capul Midia, Mamaia, Eforie Sud, Tuzla, Costinesti, In arenosis littoralibus prope Agigea; south of Mangalia, Sahalin Island.

Areal (geoelement): The seaside of the Black Sea from Bulgaria to Crimea; seaside element of the Black Sea.

Habitat, cenology: psammophile, halophile, heliophile, thermophile, of neutral humid moderate sublayer; Salsolo-Euphrobietum paralias; Euphorbion peplis.

Biology: perennial (H), amphimictic by vegetative reproduction and policormy, anemophilous, barocor-anemocore, endozoochory, epizoochory, V-VII.

Importance: it has arealogic si scientific importance, the proof being numerous taxonomic combinations.

Limiting factors: ruderalization of beaches because of overcrowdy tourism and their mechanical cleaning; very poor populations.

5. *Eryngium maritimum*

Status: Vulnerable (VU) - according to Romanian Red List.

Taxonomy: perennial, stem of 15-60 cm; numerous basal, persistent leaves, lamina equal to the petiole, of 4-10 or 5-15 cm, obovate, truncated or cordated at the base, having spinescet teeth; ovate or rombic involucral bracts; capituliform bloosom, sub-globulous, bluish, of 1.5-3 cm; sepals of 4-5 mm.

Chorology: Chituc sand bank, Midia, Mamaia, Constanta, Agigea; Eforie, Techirghiol, Mangalia Nord, Vama Veche, Capul Midia, Letea, Delta in fornt of Tulcea, Sulina, Caraorman, Wolf sand bank.

Areal (geoelement): seaside sands of the European costs up to 60° North, seaside element (Atlantic, Baltic Sea, Mediterranean Sea, Black Sea, Caspic Sea).

Habitat: chorology: develops on maritime dunes, in pioneer, heliophile, perennial vegetation (Ammophiletea).

Biology: perennial (H), probably sometimes monocarpic, entomophile, barocor, VI-IX.

Importance: important from scientific point of view, due to rarity and ecology; ornamental plant.

Limitating factors: anthropization and urbanization of the seaside.

6. *Testudo graeca* (spur-thighed tortoise)

The habitat for this species is around the Mediterranean area and reaches Iran. The shell of an adult measures around 25 cm or more. The shell is ovoid, slightly wider at the back. The supracaudal shield is complete. The head ends with a slightly bent muzzle. The anterior limbs have 5 claws and the posterior ones, 4. In the femoral areas there is a conic scale, looking like a spur. The tip of the tail is rounded, without horny tip. For males, the supracaudal shield is more combered outwards and more bent towards the tail, its tip being lower than the low edge of the adjacent shields.

The shell is coloured in yellow and black and the plastron, in yellow or in greyish-yellowish. It lives in forests and steppes, in areas with cliffs and vegetation. This is a diurnal species, spending the night in the grassy brushwoods, scrubs or caves. The mating takes place in May and in June the female lays about 8 ellipsoid-shaped eggs, having hard shell, in a hole dug using the posterior limbs, that then it covers and pounds using the plastron. The hatching takes place in September, the juveniles having about 3 cm and soft shell. In October, the tortoises bury themselves in sol and hibernate until next spring.

7. *Pelobates syriacus* (Eastern spadefoot)

The habitat for this species can be found from the south-eastern Balkans up to south-eastern Transcaucasia and northern Iran. The adults measure up to 9 cm. The skull is wide, with the forehead oblated between the eyes. The hind limbs are relatively short, with hollow interdigital membranes; the metatarsal tuber is well developed and clearly coloured. The tegument has rare relatively small warts. It has separated olive-green spots, on a light white-ashen background. The abdomen is white-pearled, with dark grains. The males have red warts on their back and their thighs, red spots on the calves, muzzle and ocular globes and a humeral ovoid gland, with a red pigmentation. The females have a darker and greenish background, without warts or red spots.

It is a nocturnal, digging species, which buries itself during the day, using the metatarsal tubers. It prefers the mobile, sandy sublayers and avoid the rocky areas. It populates the aquatic basins only during reproduction. The spawn resembles a thick belt and it is coiled around aquatic plants, in deeper and clearer ponds, during April-May. The metamorphosis ends in early July.

8. *Eremias arguta* (sand lizard)

The species' dispersal area extends from Romania, Moldova, Ukraine, Crimea, south-western Russia, the Caucasus, northern Iran, Central Asia, up to north-western China and south-western Mongolia. The body length is 7.5 cm and the tail is as long as or longer than the body. The colour is ashen or ashen-brownish, with several longitudinal rows of ocellate spots. The youths have longitudinal, light coloured stripes and lines, with an early segmentation in ocelli. The ventral side is white, glaze-like. On the ventral side, there are 14-20 transversal rows of scales, in the middle of the body.

It lives in sandy areas, represented by littoral or river dunes. It digs galleries in the sand. In case of danger, they run very fast and bury themselves in the sand. In early June, the females lay approximately 4 eggs.

9. *Spermophilus citellus* (European ground squirrel)

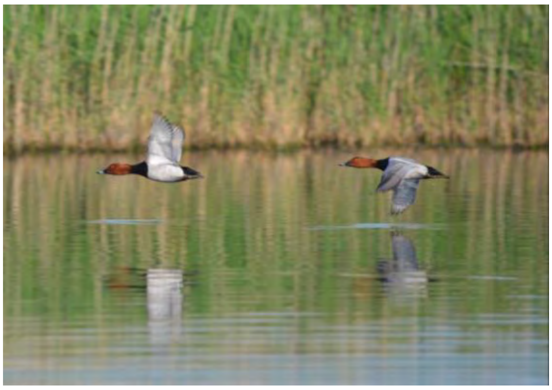
This species is endemic to Central and South Eastern Europe, from Ukraine's steppes to Eastern Germany and Poland, its range divided by the Carpathian Mountains. Body and head length for adults is between 19-22 cm, and the tail is 6-7 cm long. The backside is covered with a thick, ochre-yellow fur, with white scattered spots and black spots. The ventral side is lightly coloured, with a sandy abdomen. The eyes are big and dark coloured, and the ears are small, rounded and hidden by the fur. The feet are strong and bear sharp claws, adapted for digging. The males are larger than the females.

Preferred habitats include steppes, grass lands and dry banks, in which they can dig galleries. It can be encountered at heights up to 800 m. They lead a colonial life, mainly diurnal. They dig complex galleries with multiple exits. They feed on seeds, storing them in galleries using cheek pouches. The food surplus is stored and eaten during autumn, when they retreat to the galleries before hibernating until the end of March. The reproduction happens immediately after leaving the galleries, when they give birth to a single batch of cubs (around 6), after a gestation lasting 20 days, in May or June. The cubs are born in a deep gallery chamber, where they stay and they are fed by the female for 6 weeks, when they are ready to leave the gallery. The sexual maturity is reached the following spring and the lifespan is approximately 8-10 years

10. *Aythya ferina* - Common Pochard

The species breeds from western Europe through central Asia to south-central Siberia and northern China (Carboneras and Kirwan 2014). It is present throughout the year but may make within-winter movements. European migratory populations winter mostly in north-western and western Europe, the eastern Mediterranean, Black Sea and the Caspian Sea, as well as in Turkey, the Middle East and as far south as sub-

Saharan Africa (Hagemeijer and Blair 1997, Carboneras and Kirwan 2014). Birds breeding in east of range winter in south-east and east Asia across the Indian sub-continent as far east as Japan.



This species has an extremely large range in both the breeding season and in winter, and an extremely large population. New information suggests the population has declined rapidly across the majority of the range, and it has therefore been uplisted to Vulnerable. Although the species might be expected to benefit from a reduction in eutrophication, this does not appear to have been the case.

6.4.3.2.3 Criterion 3 - Migratory and congregatory species

Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem).

Congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis; examples include the following:

Species that form colonies;

- Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non-breeding purposes (e.g., foraging, roosting);
- Species that move through bottleneck sites where significant numbers of individuals of a species pass over a concentrated period of time (e.g., during migration);
- Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (e.g., wildebeest distributions); and
- Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere (especially important for marine species).

In order to determine if the project's site is located in a Tier 1 or Tier 2 critical habitat with respect to Criterion 3, the following Tier 1 and Tier 2 were applied:

- Tier 1
  - Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle where that habitat could be considered a discrete management unit for that species.
- Tier 2
  - 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' life-cycle 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;
  - For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance;
  - For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species;

- o Source sites that contribute ≥ 1 percent of the global population of recruits.

Section 6.3.2 of the ESIA provides a list of bird species which were identified in the area of interest during the extensive field investigations which were performed in 2012, 2013, 2014, 2015, 2016 and 2017 covering all the seasons and migratory periods. This list contains also the species listed in Appendix I of the Council Directive 2009/147/EC identified in the area of the project as well as other bird species identified in the area.

The project footprint is located inside the economic area of the Danube Delta Biosphere Reserve, which is an IBA site as well as a RAMSAR site, so the project site would qualify as critical habitat.

6.4.3.2.4 Criterion 4 - Highly threatened or unique ecosystems

A number of natural and seminatural habitats were recorded within the Study Area by the extensive field work of botanists from RSK (2012, 2013) and Auditeco (2015, 2016, 2017). The identified habitats during the RSK monitoring included Western pontic communities with *Elymus* (*Leymus*) *sabulosus* and *Artemisia (arenaria) tschernieviana*, Western – pontic communities with *Juncus maritimus* and *J. littoralis*, Danubian Communities with *Phragmites australis* and *Schoenoplectus lacustris*, Western-pontic grasslands with *Poa bulbosa*, *Artemisia austriaca*, *Cynodon dactylon* and *Poa angustifolia*, Anthropic communities with *Onopordon acanthium, Carduus nutans* and *Centaurea calcitrapa*, Danubian communities with *Typha angustifolia and T. latifolia*.

The habitats identified by Auditeco botanist included the following plant communities: *Agropyretum elongati* with *Elymum gigantea*, *Artemisio-santonicae – Juncetum litorallis*, *Juncetum maritimi* and *Typhetum latifoliae* and *Halimionetum verrucifarae*, Communities with ruderal plants, communities with *Elymentum gigantea* and *Agropyretum elonfati*, Phytocenosis with *Onopordum acanthium*, *Eleagnus angustifolia*, communities with *Phragmitetum australis* and *Typheum latifoliae*, Phytocenosis with *Onopordum acanthium* and plantations of *Robinia pseudoacacia* and *Crategus monogyna*.

Vegetation mapping was performed both by RSK and Auditeco for the whole Study Area as well as very detailed mapping of the vegetation from the project footprint and its vicinity (Figures 6.13 and 6.14).

Figure 6.13 The distribution of vegetation inside the monitored area by RSK – 2013

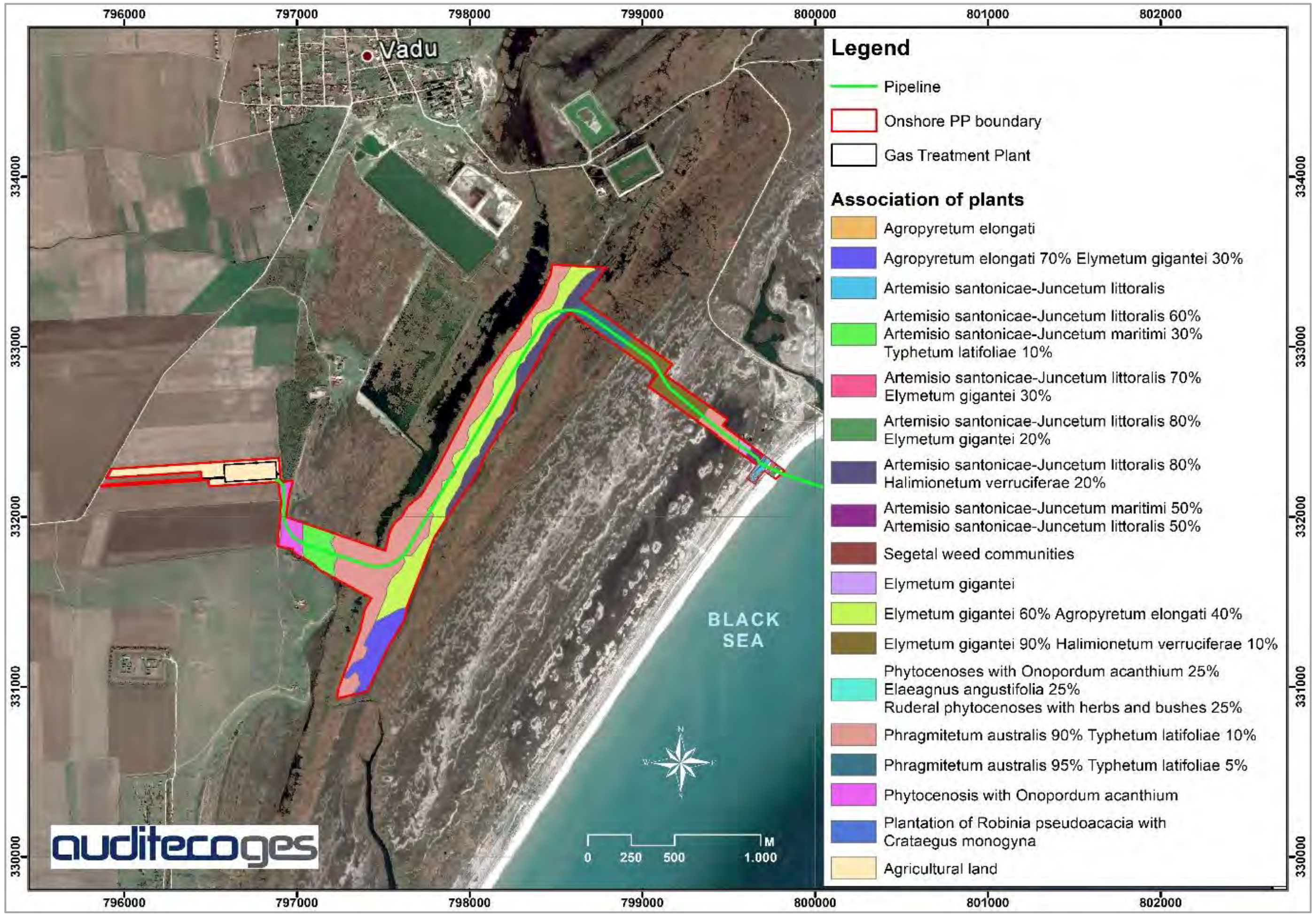


Figure 6.14 Distribution of habitats in the project footprint and its vicinity, Auditeco 2016

The project is located inside the Natura 2000 site of community interest ROSCI0065 - Danube Delta designated for sheltering 29 habitats (plant communities). After extensive field investigations and literature review, the only Natura 2000 habitat (plant community) which was identified in the area of interest was habitat of community importance 1410 - *Juncetalia maritime* – Mediteranean Salt Meadows.

Figure 6.15 illustrates the area of interest of the project and areas identified with *Juncetalia maritime*. This habitat has a wide spread on the coastal area of Romanian and Bulgarian Black Sea, but also inside the Danube Delta Biosphere Reserve. Also, it is widely spread in coastal areas of Spain, Italy and other countries belonging to the Mediteranean Basin and in the coastal area of Macro Indonesian islands.

Figure 6.15 Distribution of Natura 2000 habitat – 1410 Jucentalia maritime in the area of interest (AOI)

According to the report regarding the conservation status of species and habitats in Romania – 2015 published by the Institute of Biology Bucharest[6], see Figure 6.16, the EU conservation status in Romania for this habitat is inadequate with an unknown tendency.

Figure 6.16 Distribution of Natura 2000 habitat – 1410 Juncetalia maritime in Romania

The project footprint overlaps approximatively 7,840 m^2 from this habitat which represents 0,017% from the total surface of 4,540.37 ha which this habitat occupies inside ROSCI0065 – Danube Delta.

However, taking into consideration that horizontal directional drilling will be performed on a surface overlapping one of the areas which this habitat occupies inside the footprint of the project, the total temporary affected surface will represent 5,932 m^2 which represent 0,013% from the 4,540.37 ha which this habitat occupies inside ROSCI0065 – Danube Delta.

6.4.3.2.5 Criteria 5 and 6

The Study Area is situated at the southernmost end of the Danube Delta Biosphere Reservation. The Danube Delta Biosphere Reservation has 580,000 hectares and it is located in the south-eastern part of Romania, comprising the Danube Delta itself, the Lagoon-Lake Complex Razim-Sinoe, the maritime Delta up to Cotul Pisicii including the flooding area Somova-Parches, Saraturi -Murighiol Lake and the marine area comprised between the shore line and the 20 m isobath. The Study Area is located south of Sinoe Lake and it does not not include scientifically protected areas or any areas with key evolutionary processes. It is not an isolated area, it does not contain flora/fauna with unique evolutionary histories.

6.4.3.2.6 Summary

The onshore area from the MGD Project location has been identified as containing examples of critical habitat.

On the base of the onshore critical habitat assessment above, the following onshore features can be considered as critical habitat: *Artemisia tschernieviana*, *Crambe maritima* (sea-kale), *Dianthus bessarabicus*, *Elymus farctus* spp *bessarabicus*, *Eryngium maritimum, Testudo graeca, Pelobates syriacus, Eremias arguta, Spermophillus citellus, Aythya ferina* and Natura 2000 habitat (plant community) of community importance 1410 - Juncetalia maritime – Mediteranean Salt Meadows.

Habitat which supports endangered species is defined as Critical habitat for the purposes of PR 6.

6 http://www.ibiol.ro/posmediu/pdf/Ghiduri/Raportul%20sintetic%20privind%20starea%20de%20conservare%20a%20speciilor%20si%20habitatelor%20din%20RO.pdf).

The project footprint is located inside the economic area of the Danube Delta Biosphere Reserve, which is an IBA site as well as a RAMSAR site. The Danube Delta Ramsar site qualifies for Ramsar designation under a number of criteria including Criterion 5 (A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds) and Criterion 6 (A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird). These criteria both qualify the site as critical habitat. The pipeline route avoids the main wetlands area, cutting through a relatively narrow part. There are no bird colonies identified in the project footprint, most of the bords can be found on the ponds near the Project area.

7 SOCIO-ECONOMIC CONTEXT

7.1 Offshore

7.1.1 Fisheries

Commercial fishing is of economic importance to Romania (Totoiu *et al.*, 2016) and occurs in offshore and onshore waters in the Black Sea. Anatec (2017) was commissioned to produce a Marine Fishing Activity Assessment using AIS data collected from vessels in the region. Of the 151 Romanian fishing vessels registered, only 14 are large enough to require the mandatory AIS, meaning fishing vessel traffic may be underestimated.

The Black Sea is fished by vessels from Turkey (~80%), Bulgaria (~10%) Russia (~5%) Ukraine (~3%) and Romania (~1%) with the final 1% made up of other countries. Romania contributes a very small percentage of the vessels fishing in the Black Sea and the numbers have been declining over the past couple of years. However, within 50 nm of the proposed pipeline routes it was Romanian vessels that made up the majority (94%) of the traffic in the area.

The Romanian fishing fleet uses both static and mobile fishing gear targeting seven commercial species. The trawlers of the Romanian fleet are typically multi-species and multi gear vessels meaning boats will switch from one gear to another several times throughout the year depending on their target species. The main species of commercial interest in Romania are:

- Sprat;
- Turbot;
- Anchovy;
- Saurel;
- Sumullet;
- Shark; and
- Rapana snails.

The dominant catches in the Black Sea from 2008 to 2014 (a range of recent years are used to give a more consistent picture in the context of annual variation) were the herring, sardine and anchovy, including the European sprat and the European anchovy. As these are pelagic species they are mainly caught using trawl lines and pelagic trawls. The dominant catch on the Romanian coast, which is the area most likely to be impacted by the proposed pipelines is the snail *Rapana*. *Rapana* has increased in value in the last few years which has led to an increased catch of the species and in turn an upward trend in the total catch in Romanian waters with the total Romanian catch increasing form ~50 tonnes in 2008 to ~4750 tonnes in 2015. *Rapana* snails fished in the coastal waters are a demersal species and are predominantly caught using beam trawls. Beam trawls typically need to be heavy to ensure that the trawl maintains good contact with the seabed. Pelagic trawls are also used to capture the snails.

There are high levels of illegal fishing in the Black Sea. The nature and extent of illegal, unreported and unregulated (IUU) fishing is not clearly known at the present however, a decreasing trend has been observed. This decline in IUU fishing coincides with the joining of the EU. This has allowed the European Union Common Fishery Policy (CFP) to extend to the area providing better frontier control and implementation of security measures.

Due to over fishing, through both poor management and IUU fishing, many of the resources in the Black Sea are at risk of over overexploitation. To combat this, there are several prohibited fishing periods that are approved at the beginning of each year by Order of the Ministry of Environment. These involve permanent, general temporary and additional temporary prohibitions. The period of prohibition is all dependent upon the species being targeted. The 2018 prohibitions are as follows:

- A general temporary prohibition period for all species for a period of 60 days between 1 April and 30 May, applicable in natural fish habitats;
- A general temporary prohibition period for all species for a period of 45 days between 1 April and 15 May, applicable in waters which represent the state border (e.g. the coastal Black Sea);
- Permanent prohibited fishing of dolphins and sturgeon all year round, although exceptions are made for scientific fishing of sturgeon; and
- Additional prohibition periods include:
  - Fishing for shark between 1 January and 31 January and also between 15 October and 30 November inclusively;
  - Fishing for frog fish between 1 May and 31 May, inclusively;
  - Fishing for brill is subject to applicable EU Regulations and forbidden between 1 April and 1 July.

All other marine species, excluding those mentioned above, may be fished throughout the year. Fishing for *Rapana* using a beam trawl is allowed all year round; however, NAFA must be notified at every ship port entrance and exit (with the exception of the Danube Delta Biosphere Reserve) to ensure any accidental brill catches are discovered.

7.1.2 Shipping

Anatec (2017) was commissioned to undertake a shipping study and vessel collision risk assessment for the proposed Ana platform location, this report highlights that shipping levels in MGD Project area are high.

There are 12 shipping routes within 10 nm of the proposed location of the Ana Wellhead Platform. These routes are trafficked by an estimated 8,518 vessels per year. This corresponds to 23 vessels per day, although Anatec notes that this only takes into account route-based traffic and may be higher for additional non-routine shipping. The busiest route, Route No. 12 between the Bosphorus Channel and the Ukrainian Black Sea Port of Odessa which is east of the platform location, is used by approximately 5,760 vessels per year. This route has a mean position of 7.8 nm from the Ana Wellhead Platform location and is the busiest shipping region close to the platform.

The report highlights that there are 3 vessel routes, Route No. 1 to 3, within 2 nm of the platform location, however the area directly around the Ana Wellhead Platform is considered to have a relatively low level of shipping for the area. The details for Route No 1 – 3 are;

- Route No. 1 is used by an estimated 160 vessels per year between the Bosphorus Channel and Ukraine ports. This route passes the Ana Wellhead Platform location to the west at a mean distance of 0.1 nm;
- Route No. 2 is used by an estimated 10 vessels per year between Midia and Poti. This route passes the location to the north at a mean distance of 0.9 nm; and
- Route No. 3 is used by an estimated 822 vessels per year between Constanta and Novorossiysk. This route passes the location to the south at a mean distance of 1.5 nm.

The majority of vessels in the area are cargo vessels (76% followed by tankers (14%) and offshore oil and gas vessels such as stand by vessels, supply vessels and survey vessels (10%). Most of the passing vessels fall into the size range 5,000 to 15,000 tonnes deadweight.

Looking specifically at the navigable sectors in Constanta area, the Romanian Naval Authority highlighted the following areas:

- The area between Periteasca and the Bulgarian border (with a width of 300 m from on-shore), excluding Mangalia, Constanta and Midia ports, Tomis touristic port, the areas where maritime traffic separation devices are located and the anchorage areas; and
- Tasaul lake, Siutghiol lake, Limanu lake and Razim-Sinoe Lagoon (located in the economic area of DDBRA).

All types of leisure ships are allowed to navigate in the above areas.

The Romanian Naval Authority has no special fishing and navigation restrictions in the project area with the exception of the two OMV Petrom subsea pipelines (marked with pink on the below map) and the territory of the Military Authority. Here, fishing and anchoring are strictly forbidden.

Still, there are two recommended routes that may be used for fishing and navigation, one recommended by the Romanian Naval Authority and one recommended by the Bulgaria Naval Authority. These are marked in grey and red respectively in Figure 7.1.

The Romanian Naval Authority monitors maritime activity continuously using tools such as RADAR and Automatic Identification System (AIS).

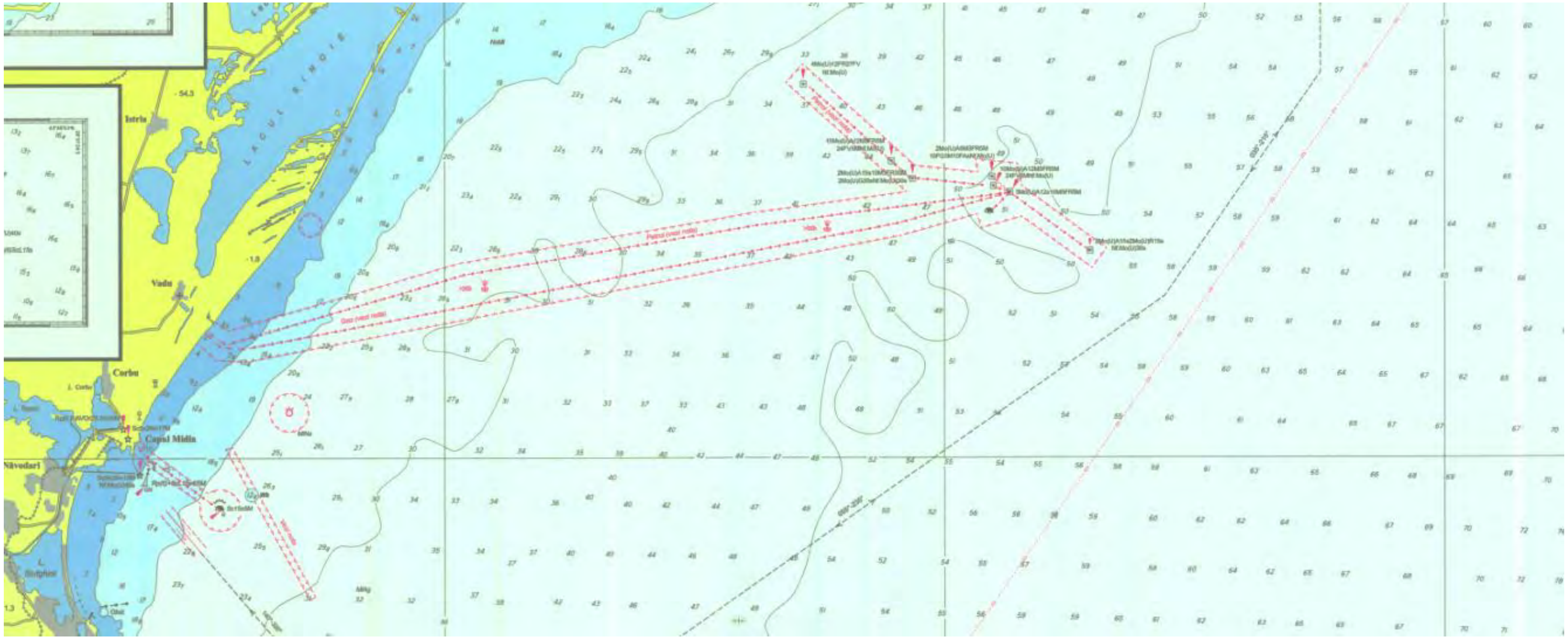


Figure 7.1 Recommended navigation routes by the Romanian/ Bulgarian Naval Authorities

7.1.3 Other Sea Users

The pipeline route passes through a military firing range and lies close to the existing Lebada offshore production facility of OMVP. The pipeline route crosses two existing subsea pipelines (see Figure 1.1).

7.1.4 Offshore Archaeology and Cultural Heritage

The updated List of existing and disappeared historical monuments in Romania (both onshore and offshore) is provided under Order no. 2828/2015. Depending on their importance, Law no. 442/2001 classifies the historical monuments as:

- Class A – historical monuments of national and universal value; and
- Class B – historical monuments of local value.

It should be noted that the existing listing of historical monuments and archeological sites started in the early '90s and that the List is updated periodically (every couple of years) via Order of the Minister of Culture. From a practical perspective, the inclusion of certain areas / items on the list was done only based on preliminary data. In certain areas, the need to set a degree of protection for any potential heritage item to be found in such area along the lack of more precise information on the location of the historical monuments and archeological sites, generated the classification of a very large area. In respect of the MGD Project, such areas are the entire offshore of the Black Sea and the tumulus site on the onshore. However, once an area is included in the List, any project to be carried out in the area/location of the project must follow a specific and highly regulated permitting process in order to obtain the permission for project execution and operation.

Six historical Class A monuments are listed on the Romanian Black Sea's continental shelf, including one submarine archaeological site and five submarine archaeological vestiges (Table 7.1).

Table 7.1 Offshore historic monuments in Romanian Black Sea

No.	Code LMI 2004	Outline description
1.	CT-I-s-A-02561	Submarine archaeological site
2.	CT-I-m-A-02561.01	Submarine archaeological vestiges
3.	CT-I-m-A-02561.02	Submarine archaeological vestiges
4.	CT-I-m-A-02561.03	Submarine archaeological vestiges
5.	CT-I-m-A-02561.04	Submarine archaeological vestiges
6.	CT-I-m-A-02561.05	Submarine archaeological vestiges

During the research activities carried out in 2016 along the future route of the Ana - shore pipeline, two anomalies were recorded which were at the time identified as wrecks (Figures 7.2 and 7.3). However, after further research work done for permitting purposes in 2018, it was determined that the initial interpretation was incorrect and that the found objects were sunk metal floats.

As a general note it should be mentioned that, just as provided by national legislation, in the areas of archeological sites and historical monuments, prior to the performance of the works: (i) a preliminary diagnosis research activity for archeological discharge must be carried out and its conclusions validated by the regulator, and (ii) historical monument clearance must be obtained from the regulator. Moreover, throughout the performance of the works, a chance find procedure will be but in place. At the date of issuance of this Report, BSOG is in process of perfoming the permitting processes required for the Offshore Component for the execution of the works. The actions and results of the process will the documented accordingly.

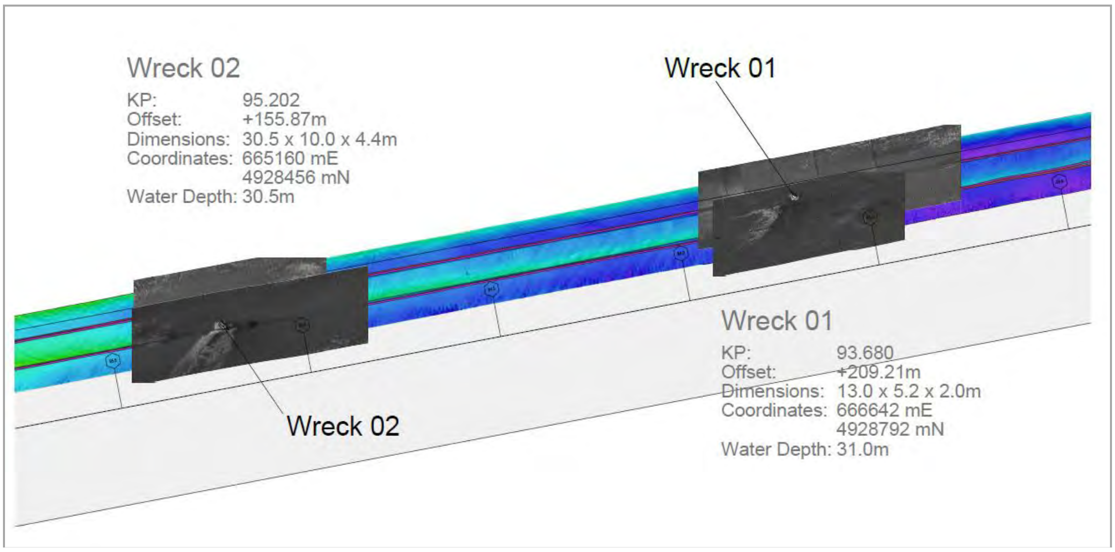


Figure 7.2 Localisation of the wrecks identified during the 2016 pipeline research activities

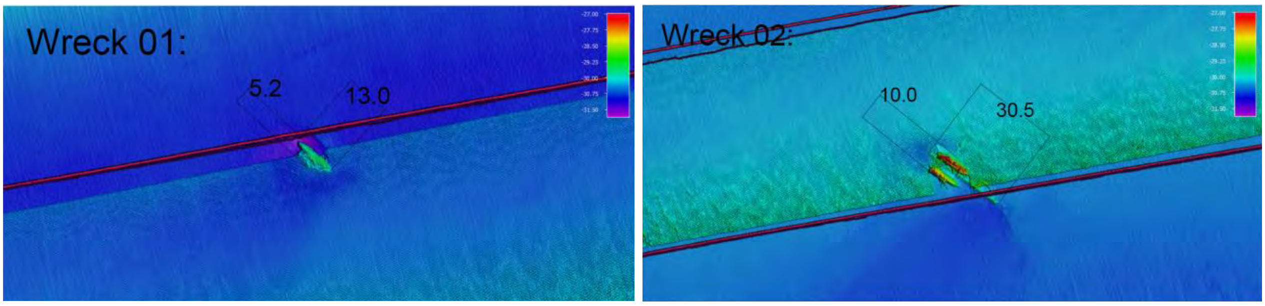


Figure 7.3 Details of items in Figure 7.2

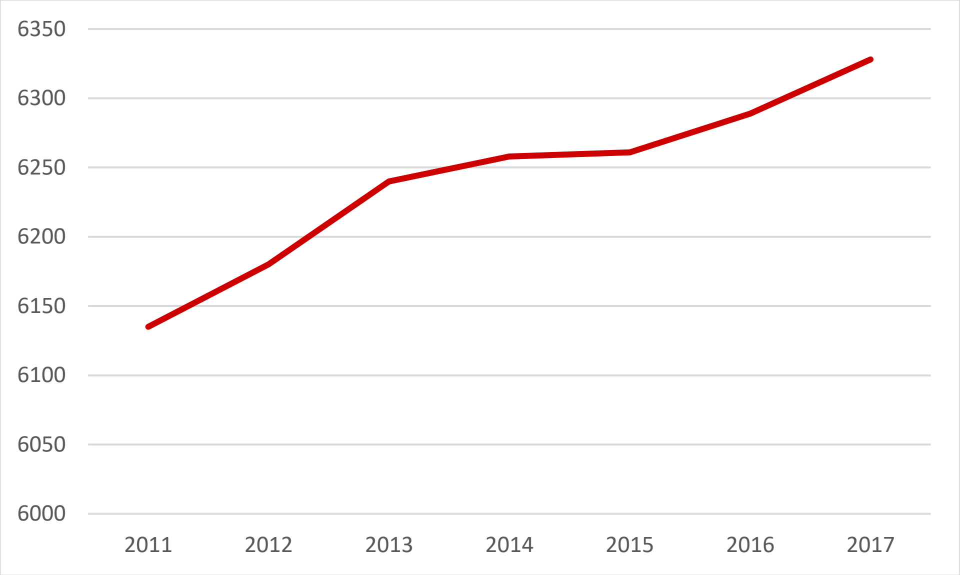
7.2 Onshore

7.2.1 Demographics

7.2.1.1 Introduction and population

Romania is located in south-eastern - central Europe with an area of 238,391 km^2 and an estimated population of 22.2 million. The Project is located in Constanta County, Dobrogea Region, in the south-east part of the country, on the territory of Corbu Commune (Corbu Commune / Corbu AU). Corbu AU includes three villages but the Onshore Component of MGD Project will only impact directly on two of them: Corbu and Vadu. Official statistical data are only available at the level of Corbu AU.

Corbu AU borders the Black Sea and is largely rural with a population of 6,328 inhabitants (NIS, 2017). The population of Corbu AU has increased since 2011, when the last population and housing census was performed (Figure 7.4).



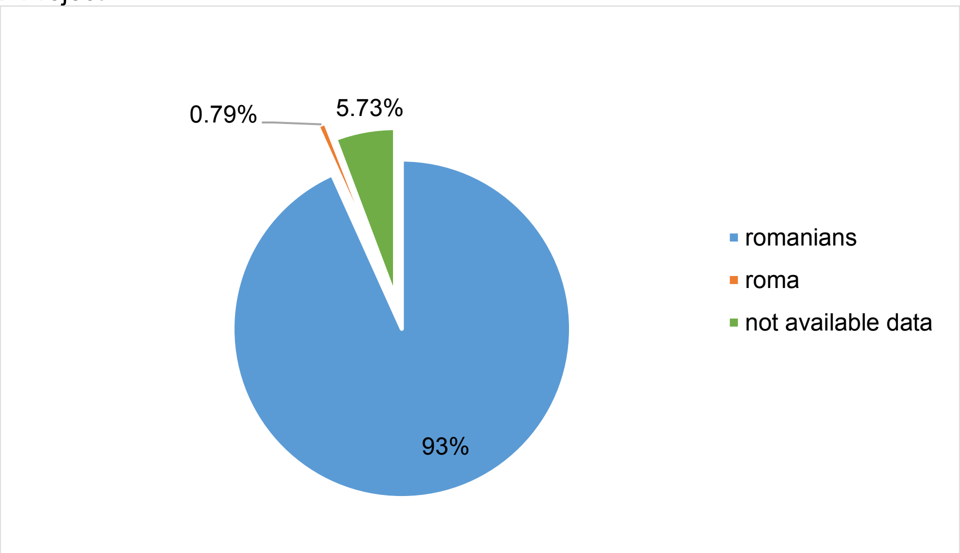
Source: NIS processed data 2011-2017

Figure 7.4 Population in Corbu AU between 2011 and 2017

7.2.1.2 Ethnicity

The ethnic composition of Corbu AU is based on the Census of October 2011, in which it was optional to declare ethnicity; however, it can be noted that 93% of the population declared themselves to be of Romanian ethnicity (Figure 7.5). The largest minority group in Corbu AU is the Roma population, which constitutes a small percentage (0.79%). According to Corbu Municipality, there are approximately 17 Roma people in Corbu AU. There is also a very small presence of Turkish (0.09%) and Russians (0.07%).

Given the very small size of the Roma population in the Project area, they are not considered to be a vulnerable group for MGD Project.

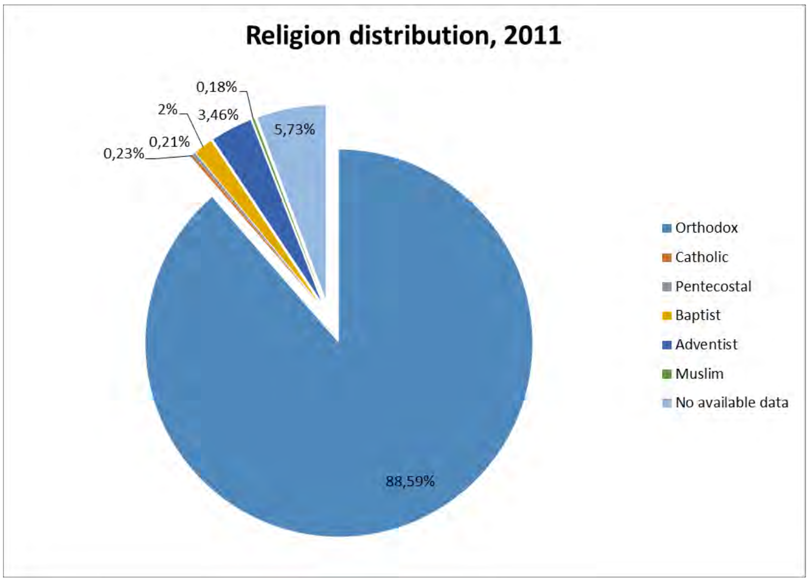


Source: Population and Housing Census, 2011

Figure 7.5 Ethnic structure in Corbu AU, 2011

7.2.1.3 Religion

Although it was also optional to declare religious affilication in the 2011 census, 88.6% of the inhabitants of Corbu AU declared themselves to be Romanian Orthodox, the dominant religion in Romania. Other religious orientations present are Adventists (3.46%), Baptists (1.56%), Catholics (0.23), Pentecostals (0.21%) and Muslims (0.18%) as shown in Figure 7.6. Corbu Municipality has advised that there are three Orthodox churches, two Adventist churches and one Baptist church.



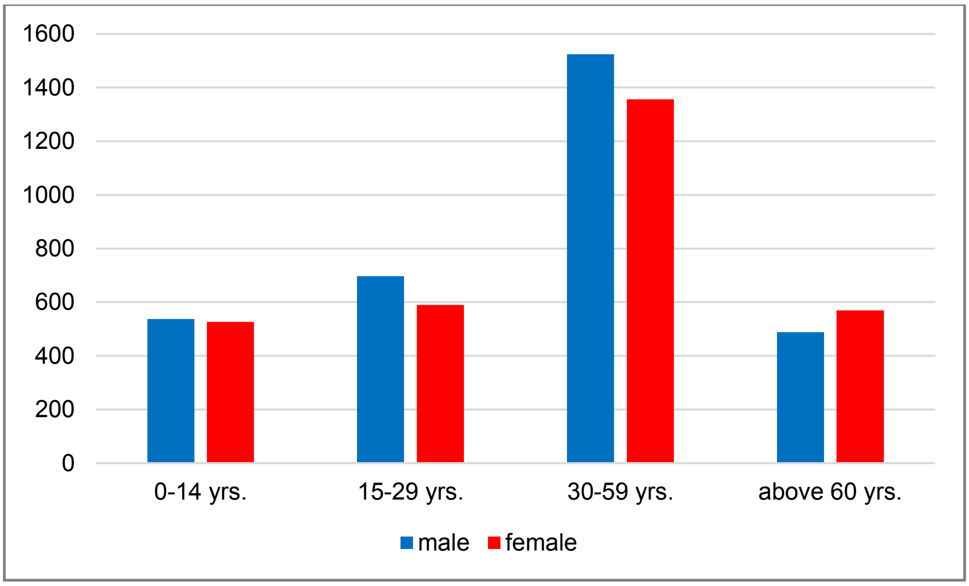
Source: Population and Housing Census, 2011

Figure 7.6 Religion distribution in Corbu AU, 2011

7.2.1.4 Age and gender profile

Figure 7.7 shows the age and gender distribution for Corbu AU. The largest age group (46%) is 30-59 years. Approximately 40% of the inhabitants is under 30 years of age and 18% is under 14 years, while people aged over 60 represent 16% of the population.

Males outnumber females in all age groups except for the over 60 years, but the difference is most pronounced in the 30-59 age group where the ratio of males to females is 53:47, compared to 51:49 for the under 14 age group.



Source: NIS processed data, 2016

Figure 7.7 Gender and age distribution, 2016

7.2.2 Settlements and Housing

Dobrogea Region is characterised by clustered settlements. The landscape of this area includes plains, lowlands and plateau areas; geographic conditions that have led to the existance of large villages able to expand. The two nearest settlements are Corbu and Vadu Villages. Vadu is the village located closest to the Onshore Component of MGD Project (approximately 2.5 km distance) with the nearest household, located outside of Vadu village, only 1.2 km away.

Most houses in Corbu AU are of one storey. Vadu Village is characterised by traditional houses and dirt roads, whereas the traditional houses in Corbu Commune have been replaced with more comfortable, modern homes; a reflection of the changes in the economic conditions in the area in the last few years. Both villages contain tourist housing complexes which are easily distinguishable due to their modern structure, parking, leisure and playground amenities (Figure 7.8).

Figure 7.8 Housing in Vadu and Corbu (July 2017) [(a) House in Vadu village; (b) House in Corbu village; (c) Tourist housing (holiday accommodation) in Corbu AU]

Based on the site visits and discussions with representatives of the Agricultural Department of Corbu Municipality, there are five farming settlements identified in the proximity of the MGD Project with one only 300 m from the onshore pipeline route and the other located on the neighbouring land to the GTP. There is also a restaurant located on Vadu beach, approximately 400 m from the beach section of the onshore pipeline route (Figure 7.9). BSOG has undertaken land acquisition for the MGD Project (see Section 7.2.3) and there is no project-related resettlement anticipated.

Source: Google Earth, 2017[7]

Figure 7.9 Settlements and structures located near the MGD Project

7.2.3 Land usage and land acquisition

7.2.3.1 Land usage patterns in the region

The land usage patterns in the region can be divided into three categories: private agricultural land, natural reserve and public land. The agricultural land is used mostly for farming (90.4%) and grazing (9.4%), with vineyards accounting for a very small percentage of the agricultural land use (0.2%) The Danube Delta Biosphere Reserve is in charge of licencing tourist and other types of permits in the perimeters of the reserve. Public land in the area includes Vadu beach, all the roads to be crossed by the pipeline or any other land plot that does not fall into any of the above categories.

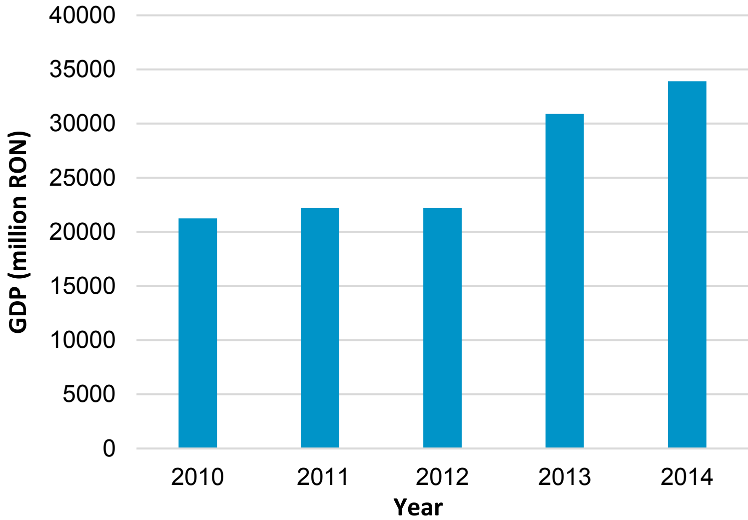
7.2.3.2 Land acquisition

The project area consists of 14 private land plots (11 land plots are needed for the construction of the onshore pipeline and 4 are needed for the construction of the GTP). All land rights were acquired by BSOG via direct negotiations. Ownership rights were acquired by BSOG for all private land plots needed for the Onshore Component, except for a single plot to be crossed by the underground pipeline over which BSOG acquired easement rights for the private owner. The land rights acquisition process has run smoothly and was conducted by the BSOG team via ***direct negotiations*** *and* ***full disclosure of the acquisition purpose*** *was made in the land transfer deeds*. Moreover, the immediate registration of BSOG, and subsequently of its partners, with the Land Book and with the Tax Direction of Corbu Commune ensured full third-party access to the land rights transfer documents.

7.2.4 Economy

The Romanian economy increased annually between 2011 and 2013 as well as in 2017 compared to 2016. This was also the case in Constanta County, the county in which the Corbu Commune is located. In 2014, Constanta County had a GDP of 33,901 million RON (approx. 7,722 EUR). Figure 7.10 shows the evolution of the GDP in Constanta between 2010 and 2014.

[7] The distances are estimations, measured in Google Earth



Source: NIS data, 2010-2014

Figure 7.10 Evolution of the GDP in Constanta between 2010 and 2014

The main economic activities in the Corbu AU are agriculture, tourism and fishing. In 2017, a total of 201 businesses were located in the AU, of which 54 were agricultural businesses (vegetables and livestock production farms, poultry processing farm, granary) and the rest shops, pharmacies, funeral services and restaurants etc.

7.2.4.1 Agriculture

Agriculture is the main economic activity with approximately 90% of the agricultural area being used for arable farming and 9% for pasture. In Romania, arable farming is mainly undertaken on small plots of land due to the highly fragmented nature of land ownership. These small agricultural land plots are mainly used by land owners together with their family members for subsistence agriculture. In some cases, the land is formally leased to larger farming companies/associations which give the owners a share of the produce. In the majority of cases, land owners own more than one plot of land, in addition to small vegetable gardens next to the house. The main crop in the Corbu region is wheat, but corn, oats and rape are also cultivated.

There are 41 livestock farms located within the Corbu commune: ten goat farms (of which nine are big farms with over 50 goats), eight sheep farms (which one is a big farm with over 500 sheep), four small poultry farms, eleven cattle farms and eight pig farms.

As outlined in Section 7.2.2 above, five farming settlements have been identified in proximity to the MGD Project. Of these farms, the nearest to the onshore project area is 330 m away and is a temporary arable farm used for producing vegetables. The other four farms, which are located between 500 and 650 m from the onshore Project area, are used for livestock (Table 7.2).

In addition, temporary bee farming takes place, including on the land situated within the Project area (Figure 7.11).

Table 7.2 Details of farms located in the proximity of the project (see Figure 7.9 for locations)

	Estimated distance to MGD project (m)	Type of activity
Farm 1	630	Livestock production (approx. 140 cattle)
Farm 2	330	Production of crops (vegetables) - temporary
Farm 3	500	Livestock production (approx. 60 cattle)
Farm 4	550	Livestock production (sheep)
Farm 5	650	Livestock production (approx. 50 cattle)

Source: Site visit to the onshore location of the MGD Project, July 2017

Figure 7.11 Farming in the proximity of the project area (February and July 2017 and September 2018) [Cattle farm located 630 from the project (b); Arable farm located 300 m from the project on the neighbouring land of the GTP (b); Bee hives located on the neighbouring land of the GTP (c); poultry processing farm Corbu AU (d)]

7.2.4.2 Tourism

Tourism is also key to the area with an influx of tourist in the summer months to visit the Corbu and Vadu beaches, two of the few remaining undisturbed beaches in Romania (Figure 7.12). As Corbu AU is fully covered by the economic area of DDBR, tourist activities and camping on the beaches are forbidden by law and a permit is required to enter the beach. However, based on discussion with an owner of authorised tourist accommodation unit in Corbu village, inspections are very rare; the last one was in May 2018.

Alongside agriculture and tourism, leisure fishing is practiced on Corbu Lake (the lake is concessioned and lake access and fishing is allowed against payment of a tax) and the coastal area near Vadu Sea fishing is done by non-local entities/individuals of Vadu.

Figure 7.12 Corbu beach during spring (a); Vadu beach during winter (b) (May and February 2017)

During summer weekends, approximately 2,000 and 1,000 tourists visit Corbu and Vadu, respectively (pers comms Corbu Municipality). Even though camping is forbidden on the beach, different types of accommodation for the tourists have developed in both Corbu and Vadu (Figure 7.13). According to Corbu Municipality there are three authorized accommodation units and approximately 70 unauthorized units in Corbu AU with an average of 16 beds per accommodation unit. Usually, an accommodation unit has around two-three locals as employees.

Some of the accommodation units provide facilities for tourists such as pools, playground areas, air conditioning, Wi-Fi or breakfast. In general, earnings from a touristic unit providing these types of facilities should be at around 10,000 – 15,000 EUR per season but the real earnings are approximately 4,000 to 5,000 EUR. These amounts were estimated by an owner of an authorised tourist accommodation unit in Corbu village. The difference might be due to the fact that the owners of these accommodation units cannot raise the price above the market price in the region.

Based on site visit observations, most of the tourist accommodation units are located in Corbu and in the western part Vadu village, the closest lying approximately 2 km from the project's area.

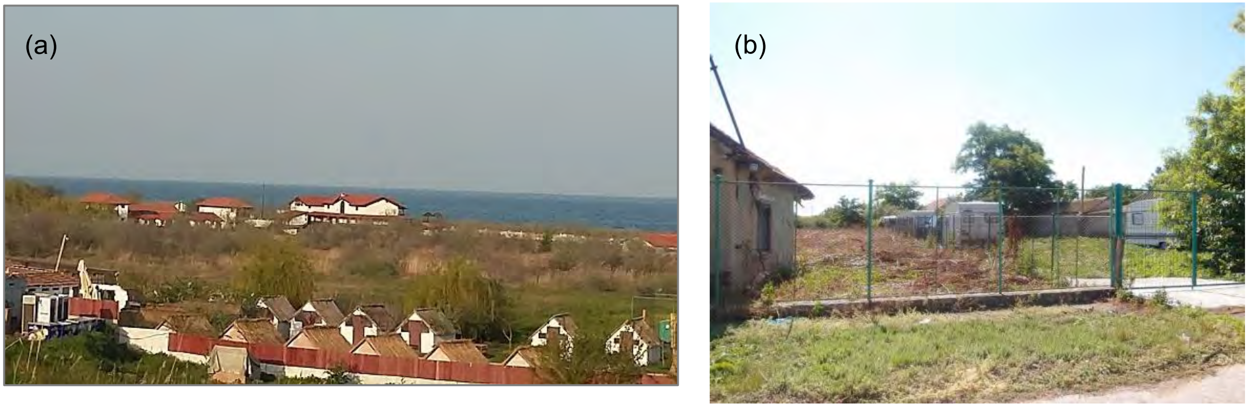


Figure 7.13 Tourist activity [Accomodation units near Corbu beach (a); Trailer parking in Corbu village (b) (May 2017)]

There are on-going initiatives to expand the touristic potential of this area and local people have started to access European Funds in this regard.

7.2.4.3 Fishing

Fishing is a relevant economic activity in Corbu AU, mostly due to the intense activity on Corbu Lake, situated on the west side of the AU, found more them 15 km away from the MGD Project location. Over 40 national, regional and local fishing contests take place each year at Corbu Lake, and two fishing business are located on the lake. MGD Project will not affect such activities. Fishing activities also take place in the sea area near Vadu Village. Sea fishing as a traditional, life supporting activity for the Corbu AU community is not known, being carried out rather as a random, leisure activity. A fishing permit is required to fish at sea. Permits are issued either by the DDBRA (for the territory administrated by them) or by the National Agency for Fishing and Aquaculture. The permits are issued for one year in accordance with the procedure established each year by the Ministry of Environment. DDBRA has an online system for purchasing these permits.

As the area of relevance for the MGD Project is located within the marine territory of DDBR (up to the 20 m isobath which is approx. 7 km away from the shoreline) a special fishing permit must be obtained from DDBRA.

The most popular fish captured is turbot. On the territory of the DDBR, fishing for turbot and trawling for whelks (in Romanian *rapană*) is forbidden. On the territory of the National Agency for Fishing and Aquaculture, fishing for turbot is allowed all year apart from during the annual prohibition period of 60 days. The prohibition period is established each year by the Ministry of Environment and Ministry of Agriculture and Rural Development. The fishermen have to declare on a monthly basis the captured amount of turbot and whelk to the National Agency for Fishing and Aquaculture.

It was known that a a turbot fish farm is located close to Rompetrol Refinery (some 11 km south of the MGD Project landfall) but it seems it is not functional anymore.

7.2.4.4 Industry and mining

Historically, the mining industry was intense in the Corbu AU due the *Metale Rare* enterprise (Rare Metals), extracting and processing zirconium and titanium (Figure 7.14). The plant has ceased operations approx. 15 years ago and there are no known plans for its future existence.

Figure 7.14 Metale Rare Enterprise (Rare Metals) (May 2017)

Other industrial activities in the area are represented by a cement factory (CEMROM) and a producer of construction materials (CELCO). As stated by the Corbu Municipality, there is good cooperation between the cement factory and the Municipality. When needed, the factory supplies the commune with cement and construction materials for different construction works.

As observed during the site visits (May and February 2017), there at least three small businesses in the AU territory selling construction materials.

7.2.4.5 Other businesses in the area

There are three restaurants active in Corbu AU. One restaurant is located near Corbu Beach and another in the centre of Corbu. The third restaurant is located on Vadu beach, approximately 400 m from the MGD Project pipeline route (Figure 7.15). The fish is acquired directly from the neighbouring fishing business.

Figure 7.15 Restaurant on Vadu beach (February 2017)

7.2.5 Livelihood

In 2015, at a national level, 87.2% of Romanian household incomes were monetary incomes and 12.2% were represented by in-kind incomes. Furthermore, 60.4% of the total incomes were from wages, 21.8% from social benefits (including pensions, unemployment benefit, child allowance etc.) and 3.8% from agriculture. The composition of the total income of households is shown in the Figure 7.16.

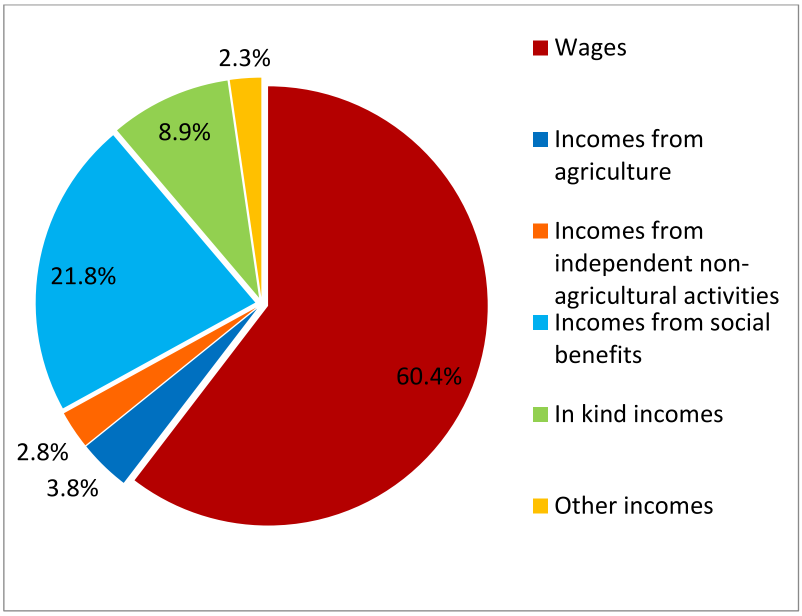


Figure 7.16 Structure of the total income of households (NIS, 2015)

In 2014, at the level of Constanta County, employees from the following sectors had the highest monthly net incomes: electricity, gas and water production and supply (approx. 1000 EUR). This is followed by extractive industries (approx. 650 EUR), public administration and defence (approx. 600 EUR), financial intermediation and insurance (approx. 520 EUR) and transport and depositing (approx. 460 EUR). The monthly average net income for all economic activities is less than 450 EUR.

NIS (2016) provides data on the compositon of general household expenses (Table 7.3).

Group	Total average monthly costs (RON)	% out of total:						
		Monetary cost	% out of which, costs for:					Value of own products
			Consumption	Breakdown of consumption			taxes	
				Food & drink	Non-food products	Utilities		
Employed	1,214.71	94.9	61.6	19.0	24.1	18.5	29.4	5.1
Person engaged in agriculture	551.72	69.7	58.3	20.2	26.2	11.9	4.1	30.3
Unemployed	482.50	88.2	71.3	29.3	22.5	19.5	12.6	11.8
Pensioner	843.79	88.0	71.8	23.9	27.6	20.3	9.0	12.0
Urban	1,142.80	95.8	67.1	21.7	24.2	21.2	24.5	4.2
Rural	754.15	82.9	62.4	19.7	27.6	15.1	14.1	17.1
Total	962.41	91.1	65.4	21.0	25.4	19.0	20.7	8.9

Table 7.3 Household's expenses composition at national level (NIS, 2016)

According to Corbu Municipality reps, there are approximately 40 people in Corbu commune receiving social support. The Municipality holds specific training courses for integrating them into the labour market but the presence and interest of people at these courses is low.

7.2.6 Employment

As stated above, the main economic areas and employment opportunities are in agriculture, tourism and fishing. The secondary data collected from the 2017 NIS suggests that unemployment in the Corbu Commune is at 2.01%, which is higher than that registered in 2016 at 1.03%. The unemployment level of the female population is higher than that of the male population (Figure 7.17). This may be due to economic activities existing in the AU which are predominantly male activities. According to the Municipality, CELCO and CEMROM use the local work force in their activities.

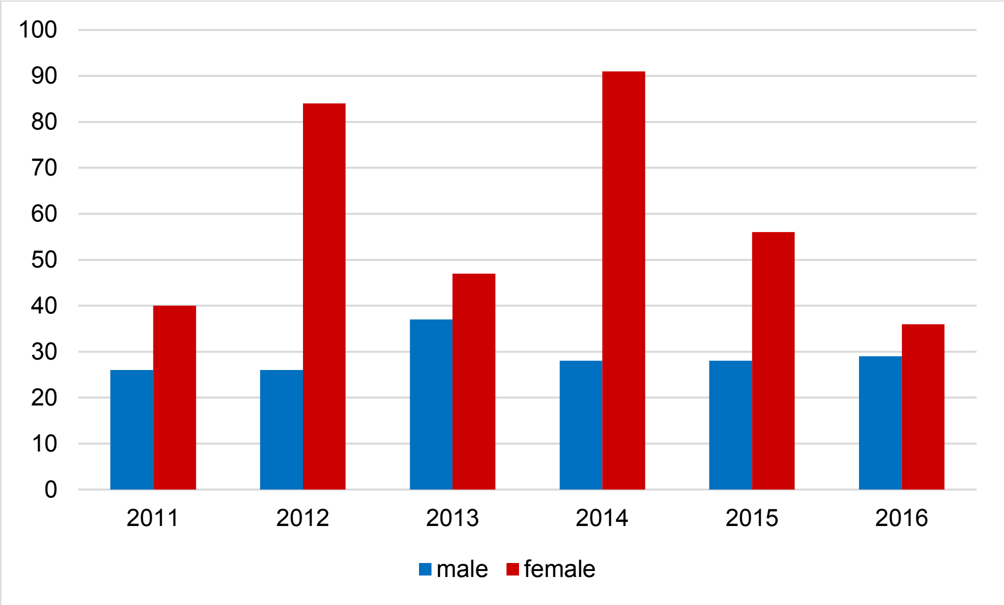


Figure 7.17 Gender distribution of unemployed people between 2011 and 2016 (NIS, 2016)

7.2.7 Education

The data available from the Constanta County School Inspectorate for the 2015-2016 school year suggests that there are six schools in the Corbu Commune. There are two schools in Vadu village (one kindergarten and one primary school), and once pupils have completed their primary education they travel to Corbu village which has four schools (two primary/secondary schools) and two kindergartens. In 2017, according to NIS data, 17% of the pupils registered in education were in kindergarten, 45% in primary education and 39% in secondary education.

Corbu Commune also has a youth centre administered by the Corbu Cultural Centre Association which provides additional educational and sports activates for pupils.

7.2.8 Health Facilities

Within the Corbu Commune there are nine health units which include both medical care units and pharmacies (Figure 7.18). Constanta County (in which Corbu AU resides) also has mobile emergency units to tend to the area and a large number of hospitals.

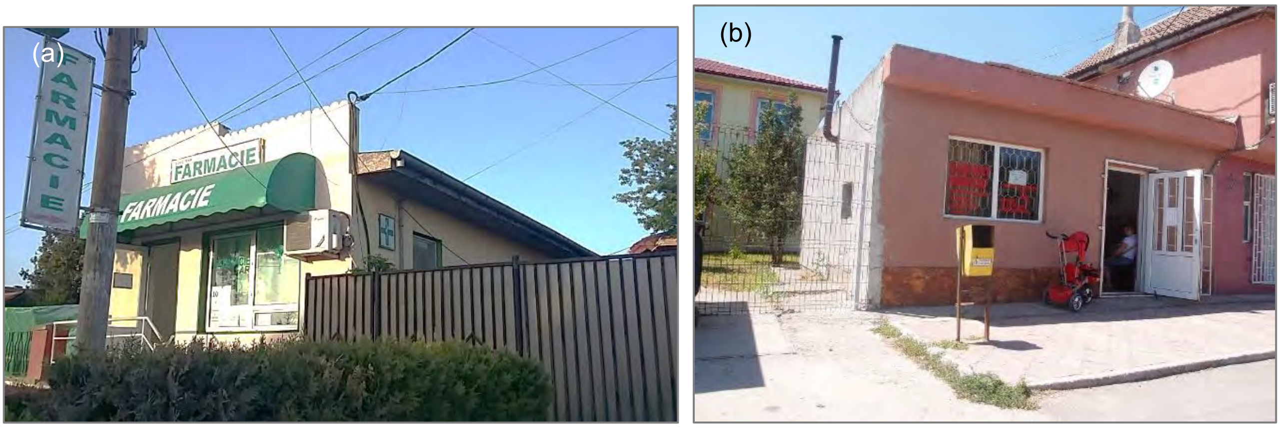


Figure 7.18 Pharmacy (a) and medical care unit (b) in Corbu (May 2017)

7.2.9 Public Utilities, Service and Transport Infrastructure

The NIS provides information about the main utilities in the Corbu AU including water supply, , electricity and telecommunication facilities.

Transport infrastructure elements were collected via the EIA prepared by Auditeco for the GTP and via the interview with Corbu Municipality.

7.2.9.1 Access to water, wastewater and waste collection services

The NIS collects data only for one indicator relevant for water supply: the quantity of water distributed to consumers. The statistical data show that Corbu AU has access to the water distribution network. However, Corbu village is divided (historically) into two parts: Corbu de Jos and Corbu de Sus. Following the discussion with Corbu Municipality, it is apparent that only Corbu de Jos has access to the water and wastewater distribution network.

The connection of Corbu to the water supply and wastewater system was implemented by the regional water operator RAJA SA, under the Sectorial Operational Program 2007-2013.

Corbu de Sus, Vadu village and Luminita village do not have access to the water distribution network and drinking water is sourced from private or public wells.

According to the Constanta County Environmental Report 2015, investments are planned in coming years for the construction of a wastewater treatment plant in Corbu AU.

Both Corbu and Vadu benefit from a waste collection system. A selective waste collection system is also organised at AU level, separating waste into four types (Figure 7.19).

7.2.9.2 Access to natural gas system

Corbu AU is not connected to the gas supply system. Following a feasibility study, gas shares were allocated to Corbu AU but the process stopped when CONGAZ (the former gas distributer in the area) was acquired by ENGIE. The project is currently pending even though one of the main needs of the local community is access to this resource.

7.2.9.3 Access to transport infrastructure

Seven roads will be crossed by the MGD Project pipeline on the territory of Corbu AU: De 541/A, De 541/B, De 539/80, De 539/79, De 539/78, De 522/9 and De 265. These roads will be used in project-related transportation purposes. The road linking Corbu and Vadu is a single-track communal asphalt road (DC83). This road will not be crossed by the pipeline but borders the GTP lands.

A bus, departing every 30 minutes, links Vadu, Corbu and Năvodari villages. Also, pupils from Vadu benefit from a free transportation service (financed by the Municipality of Corbu) to Corbu where the secondary schools are located.

7.2.9.4 Access to electricity and telecommunication networks

Electricity and telecommunication networks are available in both Corbu and Vadu. During site visits it has been observed that the signal for the mobile network service is poor in some areas such as Vadu village and Vadu beach.

Figure 7.19 Selective waste collection in Corbu AU (July 2017)

7.2.10 Onshore Archaeology and Cultural Heritage

According to the list approved by Order no. 2828/2015 there are 22 historical monuments in the area of the Onshore Component route (Table 7.4), of which 10 are in Corbu village[8] (found approx. 7 km from the closest location point of MGD Project) and 12 are in Vadu village (found approx. 2 km from the closest location point of MGD Project). These include a single historical Class A monument (a national cultural heritage item) which covers the entire territory of Corbu Commune and consists of tumulus (a mound of earth or stones raised over a grave or graves) who's exact number and location/s are unknown. The remainder are Class B and mainly comprise the remains of settlements of various ages, many of them being Roman in origin.

Of the List inventory, the following ones are located closest to the location of the GTP:

- The rural settlement in the Roman era sec. II-IV p. Chr "Vicus Celeris"; and
- The Roman and Roman-Byzantine settlement from Vadu – Bardalia dated in cent. II-IV p. Chr.

According to the Archaeological Diagnosis Report developed by the Museum of National History and Archaeology Constanta for the site of the GTP, it seems that these two sites partially overlap and in fact they represent a sole archaeological site – "Vadu-Bardalia" (possibly to be identified with the Roman rural settlement Vicus Celeris, mentioned by epigraphic information sources), which is supported by the chronological dates mentioned in the National Archaeological Repertory (NAR).

[8] Corbu Village has two areas Lower Corbu (in Romanian: "Corbu de Jos") and Upper Corbu (in Romanian: "Corbu de Sus"). Nonetheless, it is the same village.

It must be also mentioned that following the site assessment and the intrusive investigations performed on the plots of land located on the GTP lands, namely land plots A270/3, A270/4, A270/5, A270/6/3, an area having high archaeological potential was delimited. The southern border of the Roman settlement at Vadu-Bardalia, which is outside the PP perimeter, was more clearly established.

The Archaeological Diagnosis Report proposed an archaeological research for the area having high archaeological potential and an archaeological survey of the works that involve intrusive interventions upon the subsoil on the remaining land where the GTP will be located and for the related infrastructure works, so that the works related to GTP construction would be performed without any impact upon the archaeological heritage.

The archaeological research performed according to the Archaeological Diagnosis Report in the area having high archaeological potential allowed registration of a section of antic unpaved road (via terrena), delimited by ditches. The direction of the road is approximately N-S. Because of intensive ploughing, the exact perimeter of the actual road is very difficult to establish, but most probably it was located immediately to the eastern part of the ditch system. The road can be interpreted as a connection artery between the archaeological site located in the neighbourhood (the above-mentioned Roman settlement at Vadu-Bardalia) and the possible stone road of the seaside (mentioned in antic itineraries). The archaeological material recovered following the archaeological research was rare and it consisted of ceramic fragments including the time period of centuries II-IV p.Chr. In the agricultural soil next to the digging, a silver ring that could be dated in the Ottoman time period was casually discovered. All these discoveries confirm that in the neighbourhood settlements in the Roman and Ottoman time periods exist (the settlement at Vadu-Bardalia is the nearest).

The relevant permits and archaeological discharge and clearance from the competent authorities *i.e.* Ministry of Culture and Department for Culture Constanta County have been obtained by BSOG for the GTP lands.

Table 7.4 Historic monuments in the area of the Onshore Component

Run. No.	Code LMI 2004	Name	Locality	Address	Age
1.	CT-I-s-B-02632	Archaeological site at Corbu, "Capul Midia" point	Corbu village, Corbu commune	"Capu Midia", at 3.5 km SSE from Corbu commune, SW area of the peninsula; overlapped by the border police picket and by a fishery	
2.	CT-I-m-B-02632.01	Settlement	Corbu village, Corbu commune	"Capu Midia", at 3.5 km SSE from Corbu commune, SW area of the peninsula; overlapped by the border police picket and by a fishery	sec. I-IV p. Chr. Roman age
3.	CT-I-m-B-02632.02	Settlement	Corbu village, Corbu commune	"Capu Midia", at 3.5 km SSE from Corbu commune, SW area of the peninsula; overlapped by the border police picket and by a fishery	sec. V a. Chr.- sec. I p. Chr. Latene
4.	CT-I-m-B-02632.03	Settlement	Corbu village, Corbu commune	"Capu Midia", at 3.5 km SSE from Corbu commune, SW area of the peninsula; overlapped by the border police picket and by a fishery	sec. VI-V a. Chr. Late Hallstatt
5.	CT-I-s-A-02633	Tumuli assembly	Corbu village, Corbu commune	In the entire commune	Antique era
6.	CT-I-s-B-02634	Inhumation necropolis	Corbu de Jos village, Corbu commune	In the W limit of the cemetery	sec. VI-V a. Chr. Late Hallstatt
7.	CT-I-s-B-02635	Archaeological site at Corbu de Jos, "Valea Vetrei" point	Corbu de Jos village, Corbu commune	"Valea Vetrei", between Corbu de Jos and Corbu de Sus	
8.	CT-I-m-B-02635.01	Settlement	Corbu de Jos village, Corbu commune	"Valea Vetrei", between Corbu de Jos and Corbu de Sus	sec. I-VI p. Chr. Roman age
9.	CT-I-m-B-02635.02	Settlement	Corbu de Jos village, Corbu commune	"Valea Vetrei", between Corbu de Jos and Corbu de Sus	sec. IV a. Chr.- sec. I p. Chr. Latene
10.	CT-I-s-B-02636	Rural settlement	Corbu de Jos village, Corbu commune	1 km NW from the village	sec. III-IV p. Chr. Roman age
11.	CT-I-s-B-02773	Archaeological site at Vadu, "Ghiaur-Chioi" point	Vadu village, Corbu commune	"Ghiaur-Chioi", at 2 km N from the Rare Metal Plant, on the promontory	

Run. No.	Code LMI 2004	Name	Locality	Address	Age
12.	CT-I-m-B-02773.01	Settlement	Vadu village, Corbu commune	"Ghiaur-Chioi", at 2 km N from the Rare Metal Plant , on the promontory	sec. XVI-XVIII Medieval age
13.	CT-I-m-B-02773.02	Necropolis	Vadu village, Corbu commune	"Ghiaur-Chioi", at 2 km N from the Rare Metal Plant , on the promontory	sec. XVI-XVIII Medieval age
14.	CT-I-m-B-02773.03	Settlement	Vadu village, Corbu commune	"Ghiaur-Chioi", at 2 km N from the Rare Metal Plant , on the promontory	sec. VI-IV a. Chr.
15.	CT-I-m-B-02773.04	Defence elevation	Vadu village, Corbu commune	"Ghiaur-Chioi", at 2 km N from the Rare Metal Plant , on the promontory	sec. VI-IV a. Chr.
16.	CT-I-s-B-02774	Karaharman fortress	Vadu village, Corbu commune	In the yard of the Rare Metal Plant	sec. XVII-XIX
17.	CT-I-s-B-02775	Rural settlement	Vadu village, Corbu commune	"Pepiniera" (seminary), at 2 km NW from the village	sec. II-III p. Chr. Roman age
18.	CT-I-s-B-02776	Vicus Celeris	Vadu village, Corbu commune	At 1.5 km S from the village	sec. II-IV p. Chr. Roman age
19.	CT-I-s-B-02777	Settlement	Vadu village, Corbu commune	On the shore of the Chituc island, at 5 km NW from the village	sec. II-IV p. Chr. Roman age
20.	CT-I-s-B-02778	Archaeological site at Vadu, "Bardalia" point	Vadu village, Corbu commune	"Bardalia", at 2 km S from the village, E from the Vadu border police picket	
21.	CT-I-m-B-02778.01	Settlement	Vadu village, Corbu commune	"Bardalia", at 2 km S from the village, E from the Vadu border police picket	sec. IV-VI p. Chr. Romano-Byzantine era
22.	CT-I-m-B-02778.02	Settlement	Vadu village, Corbu commune	"Bardalia", at 2 km S from the village, E from the Vadu border police picket	sec. II-IV p. Chr. Roman age

8 OFFSHORE ENVIRONMENTAL IMPACT ASSESSMENT

8.1 Air Quality

8.1.1 Introduction

The use of energy optimisation and BAT studies for power generation, and key design decisions regarding flaring and venting, have minimised the atmospheric emissions associated with the MGD Project. This section details the expected residual levels of atmospheric emissions (i.e., the quantities of gases emitted to the atmosphere) from the installation and operation of the Offshore Component of MGD Project and assesses the potential impacts on air quality arising from the main operational source, i.e. the diesel turbines on the Ana Platform.

The atmospheric emissions associated with the Onshore Component of MGD Project and potential impacts on air quality are discussed in Chapter 9 Onshore Environmental Impact Assessment, Section 9.1. That assessment also includes an overall appraisal of the greenhouse gas emissions associated with the MGD Project.

Atmospheric emissions, with potential impacts on natural ecosystems and human well-being, may potentially result in impacts at local and regional levels, in a transboundary context, and on a global scale. The environmental effects of the most common combustion gases, which can be split into direct and indirect greenhouse gases, are summarised in Table 8.1. Due to the dispersive nature of the offshore environment and the lack of receptors in the vicinity of the offshore infrastructure, locally elevated concentrations of emissions will be short lived and are unlikely to be detectable except in the immediate vicinity of the activities. Concern with regard to atmospheric emissions is therefore increasingly focused on global warming and climate change.

Table 8.1 Potential environmental impacts associated with atmospheric emissions

Gaseous emission	Environmental effect
Carbon dioxide (CO_2) and nitrous oxide (N_2O) **Direct greenhouse gases**	Inhibit the radiation of heat into space. An increase in global greenhouse gas concentrations may increase temperatures at the earth's surface.
Methane (CH_4) **Direct greenhouse gas and air quality**	Implication in global climate change and contribution to regional-level air quality deterioration through low level ozone production, which can be detrimental to health and can potentially impact vegetation, crops and ecosystems.
Carbon monoxide (CO) **Air quality and indirect greenhouse gas**	At elevated levels, CO can have direct effects upon human health (asphyxiant). May contribute indirectly to climate change.
Oxides of nitrogen (NO_X) **Acidification gas and indirect greenhouse gas**	The direct effect of NO_X emissions is the formation of photochemical pollution in the presence of sunlight. Low level ozone is the main chemical pollutant formed, with by-products that include nitric and sulphuric acid and nitrate particulates. The effects of acid formation include contribution to acid rain and dry deposition of particulates. The indirect effects of acid deposition are damage to buildings and vegetation, and a contribution to the acidification of soils and lakes.
Sulphur oxides (SO_X) **Acidification gas and indirect greenhouse gas**	Precursor to acid rain and atmospheric particulates. Can result in respiratory illnesses and disease at elevated levels.
Non-methane volatile organic compounds (nmVOCs) **Air quality and indirect greenhouse gas**	Significant greenhouse gas and can react with NO_2 in the atmosphere to form ozone in the lower atmosphere. Deterioration of local air quality.

Particulate matter	Dependent upon composition

Sources of atmospheric emissions associated with the construction, commissioning, operation and decommissioning of the offshore infrastructure include:

- Fossil fuel combustion for power requirements of the Ana WHP, the MODU, installation and support vessels and helicopters; and
- Venting of hydrocarbon gas (methane) during operational maintenance.

There will be no routine flaring or venting from MGD Project offshore.

Supporting studies conducted to inform this assessment comprise:

- Generation of an emissions inventory which covers all phases of MGD Project to assess the amount of each gas emitted into the atmosphere (see Section 8.3.3.3 below). This is to enable the estimated worst-case Project emissions to be put into context with national and international emissions inventories and assess the overall contribution of these gases, since potential impacts from atmospheric emissions are globally cumulative; and
- Atmospheric dispersion modelling to determine if emission concentrations will exceed relevant air quality standards. The results of the dispersion modelling are presented in Section 8.3.3.4.

8.1.2 Discussion of potential impacts

8.1.2.1 Characterisation of the offshore MGD Project area

As described in Section 6.2.1, the winds in the vicinity of the Ana platform and Doina tieback may originate from any direction but are predominantly from the north, north-east and south-west. During the summer months (July to September), winds from the north and north-east are prevalent. Figure 8.1 shows the annual wind rose for the Ana Platform area.

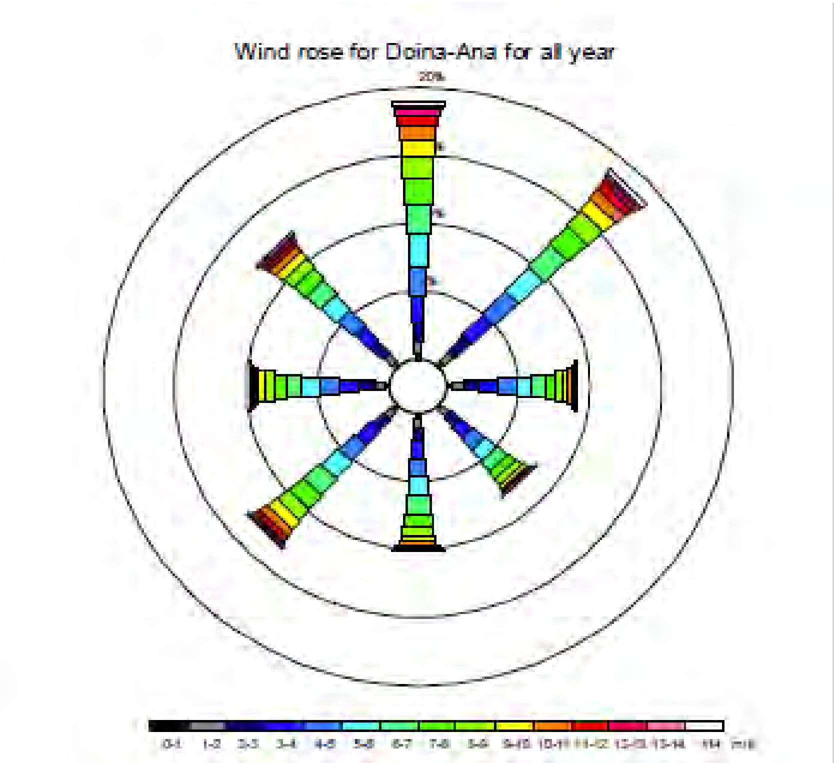


Figure 8.1 Wind rose for Ana-Doina (BMT ARGOSS, 2017)

8.1.2.2 Sources of atmospheric emissions

The main sources of emissions for each stage of the MGD Project are identified below. The quantification of emissions is presented in in Section 8.1.3.3.

8.1.2.2.1 Drilling

During drilling of the development wells, atmospheric emissions are associated with the use of the jack-up drilling rig, helicopters and support vessels. The emissions are the result of fuel combustion (diesel and aviation fuel). Drilling and completion of all four Ana wells is expected to take approximately 120 to 180 days, while the subsea well at Doina will take approximately 45 to 55 days.

8.1.2.2.2 Installation, commissioning and decommissioning stages

The main sources of atmospheric emissions during the offshore construction and decommissioning stages of the MGD Project are associated with the use of vessels including pipelay vessels, heavy lift vessels and barges amongst others. Helicopters will also be used to transfer personnel offshore during these periods. The emissions are the result of fuel combustion (diesel fuel, aviation fuel).

8.1.2.2.3 Operational stage

During the operational stage, atmospheric emissions are associated with fuel consumption by:

- Diesel generators on the Ana platform;
- Support and intervention vessels; and
- Helicopters.

A diesel-powered crane will be installed on the Ana Platform. However, the use will be minimal, as it will only be used during manned conditions as required and therefore this has not been included with in the emissions calculations. In addition, there are emissions associated with the breather vent on the diesel storage tank on the Ana platform.

There will also be a cold vent available on the Ana Platform. However, this will only be used in the unlikely event of needing to manually depressurise the topside or pipelines.

8.1.2.3 *Emissions inventory*

8.1.2.3.1 Calculations and assumptions

Emission calculations have been made for all equipment emitting to the atmosphere either on a regular basis or during unforeseen events such as refuelling or temporary closures. The anticipated atmospheric emissions for each stage of the project are presented in the following sections based on these calculations.

The assumed fuel consumption values for the vessels to be used during drilling, installation and commissioning are detailed in Table 8.2.

Table 8.2 Fuel consumption by vessel type

Vessel Type	Fuel consumption (tonnes/day)
Jack-up drilling rig	6
Dredging vessel	18
Dive support vessel	18
Pipelay vessel	15
ROV support vessel	5
Survey vessel	4
Vessel for umbilical installation	15
Tug boats	5
Heavy lift vessel	20
Barges	22
Support vessels	4

Emissions factors and estimated daily fuel consumption were derived from data published by the Intergovernmental Panel on Climate Change (IPCC; 2006) and guidelines produced by the Institute of Petroleum (2001) to calculate atmospheric emissions from vessel, rig and helicopter movements.

8.1.2.3.2 Drilling

The estimated usage days for the jack-up drilling rig and standby vessel, including the time spent in port and in transit are shown in Table 8.3.

Table 8.3 Drilling schedule

Type of vessel/rig	Days		
	In port	In transit	Working
Jack-up drilling rig	3	1.5	130,235
Standby vessel	3	1.5	130,235

The calculated emissions from vessel, rig and helicopter movements during drilling operations are shown in Table 8.4.

Table 8.4 Atmospheric emissions generated during drilling activities and movements of support vessels and helicopters

Source of the emission	CO_2 (t)	SO_2 (t)	CO (t)	NOx (t)	CH_4 (t)	nmVOCs (t)
Vessel and jack-up drilling rig	6,486.4	6.4	20.8	51.6	0.3	3.1
Helicopters	563	0.08	1.48	0.02	0.04	0.43

8.1.2.3.3 Installation and commissioning

Table 8.5 provides the anticipated vessel usage during installation and commissioning.

Table 8.5 Installing and commissioning schedule

Activity	Vessel type	Installing and commissioning (vessel days)		
		In port	In transit	Working
Ana-to-shore pipeline including dredged shore approach	Dredging	6	2	10.8
	Diver support	6	3	8.29
	Pipelay	10	1.25	56.68
	ROV support	3	1.5	7.26
	Survey	3	1.25	65.77
Doina-to-Ana pipeline	Pipelay	10	1.5	8.89
	ROV support	3	1.5	4.79
	Umbilical lay	6	21	14.5
	Diver support	6	3	7.48
	Survey	3	1.25	9.89
Platform installation	Tug boat	3	1.5	53
	Heavy lift	10	1.5	20
	Barges	10	1.5	18
	Support/standby	3	1.5	53

The calculated emissions from vessel and helicopter movements during installation and commissioning are shown in Table 8.6.

Table 8.6 Atmospheric emissions generated during movements of vessels and helicopters

Source of the emission	CO_2 (t)	SO_2 (t)	CO (t)	NOx (t)	CH_4 (t)	nmVOCs (t)
Vessels	14,537.3	55.0	72.0	270.6	0.8	11.0
Helicopters	1,969	0.29	5.19	0.06	0.17	1.50

8.1.2.3.4 Operational stage

The following assumptions were made in calculating emissions to the atmosphere from power generation during offshore operations:

- One of the diesel power generators of 45 kW is permanently operational;
- Turbine efficiency is 35%.

Emission factors were used to calculate the total emissions to the atmosphere (Table 8.7), both per year and for the life of field.

Table 8.7 Atmospheric emissions – power generation on offshore installations

Time	CO_2 (t)	SO_2 (t)	CO (t)	NOx (t)	CH_4 (t)	nmVOCs (t)
Annual	341	0.43	1.67	6.33	0.02	0.21
Life of field	6,824	9	33	127	0.38	4.3

8.1.2.3.5 Venting of the offshore installation

The offshore installation will be vented/depressurised only during planned maintenance events or in the case of unplanned events. The hydrocarbon gas volumes calculated are based on the following assumptions:

- Maximum field life is 20 years (worst case scenario);
- There will be a planned, total blowdown/depressurization during commissioning;
- There will be a maintenance blowdown every year; and
- The volume vented during a maintenance event is 0.5 tonnes.

The total emissions generated from venting offshore during the life of field are detailed in Table 8.8.

Table 8.8 Inventory of natural gas emission for blowdown events

Event	Total number	Vented volume (t)
Full blowdown of the installation	1	10.7
Maintenance blowdown	20	10.0
		20.7

A conversion factor can be applied to determine the CO_2 equivalent (CO_2e) resulting from the release of the hydrocarbon gas into the atmosphere (Climate Change Connection, 2018). Assuming the gas is 100% methane (CH_4), the CO_2e is calculated as follows:

- The equivalence factor for CH_4 is 25;
- The equivalent mass of CO2 released over life of field = 20.7 tonnes x 25 = 517.5 tonnes of CO2e.

8.1.2.3.6 Emissions from vessels and helicopters during operational activities

Emissions will also result from helicopters and vessels used during normal operations. The following assumptions have been used to estimate the annual emissions from vessel and helicopter movements:

- Helicopter flights lasting 4 hours in total;
- Supply vessel every four weeks, 16 hours for transit, 2 hours for unloading;
- Survey the pipeline for two weeks every year to verify its integrity; and
- Type of helicopter used - Agusta Westland AW139.

Table 8.9 shows the calculated atmospheric emissions from vessel and helicopter movements during the operational stage of MGD Project Emission factors and estimated daily fuel consumption were derived from IPCC (2006) and the Institute of Petroleum (2001) guidelines.

Table 8.9 Annual emissions resulting from vessel and helicopter movements

Source	CO_2 (t)	SO_2 (t)	CO (t)	NOx (t)	CH_4 (t)	nmVOCs (t)
Ships	760.8	2.88	3.77	14.16	0.04	0.58
Helicopters	39	0.01	0.10	0	0	0.03

8.1.2.3.7 Decommissioning

Data were taken from the offshore installation and decommissioning cost estimates to determine vessel types and usage days during the decommissioning phase. The data are presented in Table 8.10.

Table 8.10 Decommissioning schedule

Activity	Type of ship	Decommissioning (ship/day)		
		In the port	transit	work
Decommissioning works in the shore area	Diver support ship (DSV)	3	1.5	26.57
	Survey ship	33	13.75	53.33
Decommissioning of the Doina-to-Ana pipeline	Diver support ship (DSV)	6	3	21.23
	Survey ship	3	1.5	1.62
Decommissioning of the Ana platform	Tug boat	3	1.5	106
	Ship for heavy lifting	10	1.5	40
	Barges	3	1.5	36
	Support ship	3	1.5	106

Table 8.11 shows the calculated atmospheric emissions from vessel and helicopter movements during decommissioning operations.

Table 8.11 Estimate of air emissions from ships and helicopters – decommissioning stage

Source	CO_2 (t)	SO_2 (t)	CO (t)	NOx (t)	CH_4 (t)	nmVOCs (t)
Vessels	12,742.5	48.2	63.1	237.2	0.7	9.7
Helicopters	1,391	0.20	3.67	0.04	0.12	1.06

8.1.2.4 Atmospheric dispersion modelling

Atmospheric dispersion modelling was conducted using the CERC ADMS 5.2 software to investigate the dispersion of pollutants emitted from the offshore diesel power generator on the Ana Platform (Xodus, 2017). The modelling was based on the maximum emissions from the normal operation of one diesel generator, operating at 100% load.

The Ana Platform is located in the Black Sea more than 100 km from the coast, in a highly dispersive environment and not near any significant sources of air pollution. The relatively small quantities of pollutants emitted from the diesel generator, together with the local conditions, mean that pollutant concentrations in the plume are low. No exceedances of Romanian air quality standards were predicted for the Ana Platform as a result of the use of a diesel generator under normal operating conditions.

Further details of the modelling methodology and air quality standards applied are provided in Chapter 9 Onshore Environmental Impact Assessment.

8.1.3 Management and mitigation measures

The control measures that BSOG will have in place to ensure that atmospheric emissions are minimised where possible are detailed below.

The design of the MGD Project to date has used a BAT study to inform the selection of offshore power generation equipment. BSOG will ensure that the detailed design and selection of the offshore facilities will focus on the overall reduction of atmospheric emissions.

- The jack-up drilling rig will comply with the relevant IMO atmospheric emissions standards to operate in the Black Sea (Midia area);
- Fuel with a low sulphur content will be used, in accordance with IMO requirements;
- The project will follow relevant established design guidelines and will include mitigation measures to reduce accidental gas leakage;
- Any relevant legislative requirements on emission limits will be observed;
- The emission reduction processes will also be imposed to BSOG subcontractors;
- Modern vessels will be used during offshore construction activities; and
- BAT studies, which include reviewing design, equipment efficiency and proper equipment sizing, will be used as required during further project stages.

8.1.4 Residual impacts

The importance of the receptor is considered to be Low due to its resilience. The activities carried out within the project do not have to potential to change air quality in the long term or over extended areas. The impacts during the drilling and installation phase will be temporary, while those during the operational stage will occur for the life of field but will have only localised effects. The overall impact is considered to be insignificant.

8.1.5 Cumulative and transboundary impacts

In terms of air quality, since there will be no exceedance of Romanian air quality standards for the Ana platform, no cumulative impacts on air quality are expected as a result of the operation of the offshore facilities. Similarly, there will be no potential for any transboundary impacts on air quality.

A discussion of the greenhouse gas footprint of the MGD Project is included in Chapter 9.

8.2 Marine Water Quality

8.2.1 Introduction

This section considers the potential impacts on marine water quality that may result from the development drilling and from the installation, commissioning, operation and decommissioning of the production facilities.

Potential impacts to marine water quality may occur with the discharge to sea of:

- Drill cuttings, drilling fluids and cement;
- Dewatering discharges from the Ana-to-shore and infield (Doina-to-Ana) pipelines during pre-commissioning and commissioning; and

- Routine discharges (for example, grey and black water, bilge water, slops water, ballast water, brine from desalination units, cooling water, macerated food waste) from the jack-up drilling rig and from the vessels used during all stages of the Project.

Such discharges have the potential to impact marine water quality through:

- The introduction of particulate matter (especially in the case of drilling discharges), causing elevated levels of suspended solids and turbidity; and
- The introduction of chemicals or organic matter contained in the discharge streams.

This impact assessment characterises and quantifies as far as possible the discharges to sea and describes the management and mitigation measures employed to adhere to legislation and good international industry practice.

Supporting studies conducted to inform the assessment below comprise:

- Generation of an inventory of discharges covering the relevant phases of the Project; and
- Dewatering discharge dispersion modelling. The results of the modelling are presented later in this section.

Changes in marine water quality could potentially affect marine organisms through pathways such as toxicity, bioaccumulation, organic enrichment, the introduction of particulate material and the potential for the introduction of invasive alien species via ballast water. The potential biodiversity impacts of these inputs are discussed in Section 8.4 Marine Mammals and Fish.

Discharges of grey water, black water (sewage) and food waste are expected to have a negligible effect on marine water quality as these are controlled by international requirements for treatment and discharge that apply to all shipping and are considered to pose negligible environmental risk in the offshore environment. Therefore, such discharges are not discussed in detail, but the relevant controls are identified in the sections covering mitigation and management. The waste aspects of these discharges are discussed further in Section 8.6 Waste Generation. As such, no quantification of these routine discharges is included in this assessment.

The section assesses the potential impacts on marine water quality from planned activities associated with the MGD Project. Risks from an accidental release of oil or chemicals are considered in Section 8.7.

8.2.2 Regulations and guidance

The following national regulatory drivers and international treaties, agreements and industry guidance are relevant to the assessment of impacts on seawater quality:

- IMO Convention for the Prevention of Pollution from Ships, 1973 and the Additional Protocol of 1978, ratified by Law no. 6/1993 (MARPOL 73/78); and
- Convention on the Protection of the Black Sea Against Pollution, 1992, Bucharest, ratified by Law no. 98/1992 and related Protocols.

All chemicals to be used in the MGD Project are subject to the Romanian environmental impact assessment and approval processes. Chemical use and potential impacts will also be assessed in line with the European Bank for Reconstruction and Development (EBRD) Performance Requirement 3 – Resource efficiency and pollution prevention and control. Guidance provided by the International Finance Corporation (IFC) is also being followed by the project. Of relevance here are the World Bank Group (2015) Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development. These state that, in managing hydrotest waters, the following pollution prevention and control measures should be considered:

- *"Minimize the volume of hydrotest water offshore by testing equipment at an onshore site prior to loading the equipment onto the offshore facilities;*
- *Use the same water for multiple tests;*

- *Reduce the need for chemicals by minimizing the time that test water remains in the equipment or pipeline;*
- *Carefully select chemical additives in terms of dose concentration, toxicity, biodegradability, bioavailability, and bioaccumulation potential; and*
- *Send offshore pipeline hydrotest water to onshore facilities for treatment and disposal, where practical.*

If the discharge of hydrotest waters to the sea is the only feasible alternative for disposal, a hydrotest water disposal plan should be prepared that considers points of discharge, rate of discharge, chemical use and dispersion, environmental risk, and monitoring. Hydrotest water disposal into shallow coastal waters and sensitive ecosystems should be avoided."

International conventions that need to be considered by the project include the Convention on the Protection of the Black Sea against Pollution, 1992, Bucharest, ratified via Law no. 98/1992 and related Black Sea Biodiversity and Landscape Conservation Protocol, ratified via Law no. 218/2011.

Also, directly applicable in Romania is Regulation (EC) no. 1907/2006 concerning the registration, evaluation, authorisation and restriction of chemicals, establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (REACH).

8.2.3 Characterisation of the offshore MGD Project area

According to the Basin Management Plan of the Danube River, the Danube Delta, the Dobrogea hydrographic area and the coastal waters (developed for the implementation of the Water Framework Directive 2000/60 / EC), the MGD Project is located within the Black Sea ecoregion, partially overlapping the body of subsea transiting waters RO_TT03 Chilia - Periboina and coastal waters RO_CT01 Periboina - Singol Head (coastal shallow waters).

As described in Section 6.2.1.3, water mass circulation along the Romanian coastline is generally north to south with current speeds ranging from 0.5 m/s at the surface to 0.05 m/s in the bottom layers, depending on winds and the specific location. Similarly, offshore, at the Ana and Doina locations, the predominant current directions toward the south west, reaching maximum speeds of 0.6 to 0.7 m/s, although more commonly between 0.1 and 0.2 m/s.

With an average salinity of 17-18 PSU, the Black Sea is brackish, and the water column is also highly stratified. Section 6.2.1.3 provides the results of sampling undertaken throughout the water column in June 2015 in the vicinity of the Offshore Component of MGD Project area in June 2015. The highest temperatures of approximately 21°C are recorded in the surface layer (0 - 5 m), below which temperatures decline rapidly between 5 - 20 m water depth to approximately 12°C. Below 20 m, temperatures decrease at slower rate to a minimum of approximately 8°C at depths of 80 m and beyond. Salinity values show a more uniform change with water depth, fluctuating between 18 – 18.5 PSU in the upper layers under the influence of freshwater inputs from the Danube, and thereafter increasing with depth towards 20 PSU near the seabed at 70 – 80 m.

8.2.4 Routine vessel discharges (all project stages)

Routine discharges to sea from the jack-up drilling rig and the vessels used for installation and commissioning the MGD Project, for routine maintenance during the operational stage, and for decommissioning, will include:

- Grey and black water; and
- Treated oily water discharges from the machinery spaces of vessels (MARPOL requires removal of oil in water to 15 ppm).

These are assumed to comply with applicable maritime requirements, in particular:

- IMO Convention for the Prevention of Pollution from Ships, 1973 and the Additional Protocol from 1978, ratified by Law no. 6/1993 (MARPOL 73/78); and
- Convention on the Protection of the Black Sea against Pollution, 1992, Bucharest, ratified by Law no. 98/1992, and Related Protocols.

Annex I of MARPOL 73/78 regulates the prevention of pollution by oil; it would apply to any ships used in MGD Project of 400 t gross tonnes and above and sets forth rules for discharge of oil into the water. Annex IV regulates the prevention of pollution by sewage from ships by specifying the requirements for sewage treatment and discharge for different categories of ships.

8.2.5 Drilling discharges

8.2.5.1 Discussion of potential impacts

Drilling-related discharges to sea comprise drilled formation rock cuttings, drilling fluids and minimal quantities of liquid cement. All sections of the development wells are expected to be drilled using WBM only. The drilling waste material such as drilled rock cuttings and the associated residual drilling fluids will be discharged to sea.

Oil based muds (OBM) are currently not planned to be used. The discharge of cuttings from well sections drilled with OBM is not permitted. Therefore, if OBM use is required for any technical reasons, the OBM will be completely recovered for re-use or recylcling and the drilled rock cuttings taken ashore for treatment and disposal. No waste whatsoever from drilling of well sections with oil-based drilling fluids will be discharged into the sea.

The expected volumes and mass of cuttings for the five wells to be drilled are detailed in Table 8.12. Conductor piles will be installed at the Ana Platform wells before any drilling takes place; conductor pipe cleanout will be by seawater with barite/bentonite sweeps and the remaining sections of each well will be drilled using WBM. The discharges for all sections of the Ana wells will be from the jack-up rig at the sea surface. The 36-inch hole at the Doina subsea well will be drilled without a conductor or riser in place and therefore the cuttings and mud from this section will be deposited directly onto the seabed in the immediate vicinity of the wells. Once the marine riser is installed, the cuttings and WBM will be circulated back to the drilling rig and pass through a mud recovery, cleaning and treatment system. The cuttings and residual associated WBM will be discharged overboard to sea from the jack-up rig at the sea surface.

Table 8.12 Estimated Quantities of Cuttings and WBM Discharged During Drilling Operations

Well	Section ID (in)	Length (m)	Hole Volume (m^3)	Dry Cuttings (m^3)	Cuttings & Mud (m^3)	Total Tonnes
Ana-100 Vertical Well	26"	67	23.0	18.4	36.9	70.1
	17 1/2"	270	41.9	33.5	67.0	127.4
	12 14/"	692	52.0	41.6	83.3	158.2
	16"	32	4.1	3.3	6.6	12.6
Ana-101 Deviated Well	26"	67	23.0	18.4	36.9	70.1
	17 1/2"	382	59.3	47.4	94.9	180.2
	12 14/"	919	69.1	55.3	110.6	210.1
	16"	37	4.8	3.8	7.7	14.6
Ana-102 Deviated Well	26"	67	23.0	18.4	36.9	70.1
	17 1/2"	335	52.0	41.6	83.2	158.1
	12 14/"	955	71.8	57.5	114.9	218.3
	16"	36	4.7	3.7	7.5	14.2
Ana-103 Deviated Well	26"	67	23.0	18.4	36.9	70.1
	17 1/2"	286	44.4	35.5	71.0	134.9
	12 14/"	934	70.2	56.2	112.4	213.5
	16"	50	6.5	5.2	10.4	19.7
Doina-100 Vertical Well	36"	67	44.3	35.4	70.8	134.6
	17 1/2"	490	76.0	60.8	121.7	231.2
	12 14/"	450	33.8	27.1	54.1	102.9
	16"	25	3.2	2.6	5.2	9.8
Total Tonnes						**2,220.6**

Discharges to sea during drilling operations include drilling fluids, cuttings, and minimal volumes of liquid cement and associated chemicals. These discharges may lead to potential impacts to the seabed or water column through the following mechanisms:

1. Increased suspended solids in the water column (water turbidity);
2. Settlement of cuttings, muds and cement on the seabed (smothering and burial; change in seabed habitat); and
3. Introduction of chemical fluids and particulate additives used in the drilling operations (change in chemical composition and toxicity).

The potential impacts on seabed sediments and associated communities are assessed in Section 8.3 Seabed Habitats and Communities. The present section is concerned with the potential impacts on the water column (including items 1 and 3 above). Generally, the impacts of drilling discharges in the water column are more transient and therefore less significant.

Potential water column impacts associated with each well are likely to be short-term and localised. Previous studies have indicated rapid dilution of drilling discharges. Alldredge *et al*. (1986) showed that the long-term exposure to drilling muds or additives did not alter phytoplankton composition. This study suggested that, where dilution is rapid, a long-term discharge of muds containing additives would not significantly alter the primary production of natural phytoplankton assemblages in the vicinity of drilling platforms.

Increased suspended solids, especially near the seabed, may result in direct irritation to certain types of marine organisms, abrading protective mucous coatings and increasing their susceptibility to parasites and infections, as well as affecting growth, reproduction and feeding.

The following assessment addresses the potential impacts described above as these are the key operational discharges associated with drilling offshore wells. The jack-up drilling rig and support vessels used during the drilling stage will also discharge drainage water and waste water in common with most marine vessels. As discussed in Section 8.2.1, these impacts are not discussed in this chapter. These discharges will be properly managed in line with international requirements to ensure they do not lead to a deterioration in marine water quality.

8.2.5.2 Management and mitigation measures for drilling discharges

Drilling fluid additives and chemicals will be selected as per the BSOG procedures and will only include those approved for use and discharge in the Black Sea.

8.2.5.3 Residual impacts from drilling discharges

The importance of the receptor is considered to be low due to its resilience. The activities carried out within the project do not have to potential to change marine water quality in the long term or over extended areas.

Potential water column impacts from the drilling of each well are likely to be short term and localised. Considering the transient nature of water column impact, and the open water unpolluted offshore environment, the potential impacts from drilling discharges to the water column is considered to be insignificant.

8.2.6 Installation and commissioning discharges

8.2.6.1 Discussion of potential impacts

Pre-commissioning of the Ana to shore pipeline will involve filling it with inhibited seawater (i.e., seawater treated with chemicals such as oxygen scavenger, biocide and corrosion inhibitor). These chemicals generally degrade or bind to the pipeline on use and therefore the concentrations of them in the pipeline discharge would be expected to be very low. After cleaning the line, it will be pressure tested by pumping additional water into the line; this process, known as hydrotesting, results in a small discharge of water when the pressure is reduced to ambient levels. The largest discharge from the pipeline occurs when the water is removed from the pipeline prior to commissioning it for use; this process is known as dewatering.

The sea water used for hydrotesting the subsea pipelines may be discharged to sea during pre-commissioning (dewatering), although this strategy is not confirmed. The process of dewatering involves opening a valve at one end of the pipeline and moving a series of pigs along the pipeline to force the treated seawater through the open valve. The potential volumes to be discharged are detailed Table 8.13.

Table 8.13 Water volume in the subsea pipelines

Pipeline	Volume (m^3)
Ana - shore	15380
Ana - Doina	578

The total volume of seawater and associated chemicals discharged to sea is assumed to be 110% of the total pipeline volume. Concentrations of chemicals in the seawater are be confirmed.

Due to the chemical additives used, these discharges may lead to changes in the chemical composition and toxicity of the seawater in the vicinity; they are also likely to be oxygen depleted. Such chemicals generally degrade or bind to the interior surfaces of the subsea infrastructure, such as flowlines, on use and therefore their concentrations upon discharge would be expected to be relatively low.

The fluids in the section of pipeline from the onshore golden weld to the GTP will be discharged back to the onshore plant (total discharge volume 569 m^3) for disposal and will not be discharged to sea.

8.2.6.1 Dewatering discharges dispersion modelling

8.2.6.1.1 Objectives

Use has been made of mathematical modelling to investigate the potential fate and effects of the dewatering discharges on the receiving environment, including their dilution and toxicity (Xodus, 2017).

For the purposes of the modelling, it was assumed that pigs will start at the onshore end of the pipeline so that up to a maximum of 13,900 m^3 of treated seawater will be discharged at the Ana platform at a discharge rate of between 0.057 and 0.345 m^3/s, from a 6-inch pipe facing downwards at the water surface.

The modelling study aimed to assist in determining the mixing zone and potential for toxic effects in the water column under the various discharge conditions that may occur, in order to inform development of a hydrotest water discharge plan, including the requirement for any mitigation.

8.2.6.1.2 Results

The discharge from the pipeline is assumed to have the same density as the ambient environment and is discharged vertically downwards from a pipeline that has an internal diameter of 6 inches (*ca* 15 cm) and is positioned at the water surface (70 m above the seabed). The behaviour of the discharge varies according to the current velocity and the discharge rate.

The behaviour of the plume is predicted to be dependent on the discharge momentum of the plume as the discharge is neutrally buoyant. As such, the discharge initially moves downwards, away from the discharge point and is deflected to a lesser or greater extent by the current. Once the momentum of the plume has dissipated, the dilution of discharge is driven by ambient mixing processes in the surface layer of the water column.

At the lowest current speeds (i.e. around slack-water) the discharge moves down through the water column until it reaches the seabed, where it impinges with a near vertical angle resulting in an unstable flow and recirculation of the plume. This unstable flow is predicted to extend to the full depth of the water column. For all other current speeds, at the lowest discharge rate the plume is bent over by the current and does not reach the seabed until it has travelled a significant distance from the discharge location. At the higher discharge rate, the increased momentum of the plume results in the discharge (at current velocities of less than 0.3 m/s) interacting with the seabed within 500 m of the discharge location, whilst at current velocities of 0.3 m/s and more, the plume is only predicted to interact with the seabed at distances in excess of 1 km from the discharge location.

The behaviour of the discharge at each current velocity is reflected in the predicted plume cross sectional area at 500 m; at lowest current speeds (0.001 m/s), the plume is predicted to be uniformly mixed and take up the full depth of the water column. For the lower discharge rates, the plume is predicted to have a circular cross-section at 500 m for all current speeds above 0.001 m/s. Similarly, for the higher discharge rate, at current speeds of 0.3 m/s and greater, the plume cross-sectional area is also predicted to be circular at 500 m, whilst at the intermediate current velocities (0.05 – 0.2 m/s) it is predicted to be a submerged rectangular plane. If the area of the water column at 500 m from discharge location is considered, an 18° sector (equivalent to 5% of the area) at this distance has a length of 156.6 m which when multiplied by the depth gives an area of 10,962 m^2. Therefore, whilst at the lower current speeds the poorly dilute plume takes up a large area of the water column at 500 m, all other combinations of discharge rate and current velocity result in a discharge that affects less than 5% of the cross-section of the water column at 500 m from the point of discharge.

Whilst the amount of dilution achieved at 500 m is less than that required to dilute the biocide to a concentration below a level at which it is toxic to marine species, it unlikely that the actual dilution required for the actual discharge would be as large. This is because it is likely that the biocide and other chemicals applied to the pipeline would be used up and degraded by use in protecting the pipeline and the actual concentration of toxic chemical added would be less than the 100% of the product assumed in this work.

A discharge plume in the marine environment is transient both over time and in location, moving with the changing current velocities around the tidal cycle. At the higher discharge rate, it will take around 11 hours to discharge the 13,982 m^3 of water in the export pipeline, whilst at the lower discharge rate the discharge duration increases to around 2 days and 20 hours, thus taking from slightly less than one to around six tidal cycles to empty if the pipeline is discharged in a single continuous operation. Whilst the lower rate introduces the chemicals into the environment at a lower rate it also results in less dilution of the plume. Thus, a higher discharge rate is preferable as it reduces the time of exposure of the environment to the plume whilst achieving a higher near-field dilution.

From the point of view of organisms in the marine environment it is desirable to minimise the interaction between the plume and the organisms in the near-field region. Therefore, since many benthic organisms are often either sessile or relatively slow moving, avoiding the discharge interacting with the seabed where possible is an important consideration. Water column organisms that are drifting in the water column (e.g. plankton) are likely to be exposed to toxic chemical in the plume, but this will result in a negligible environmental impact as these organisms are present throughout the water column in very high numbers. Motile organisms in the water column (e.g. fish and marine mammals) are likely to sense unfavourable conditions and move away from the plume, thus minimising their exposure to the transient plume, in addition to possessing enzyme systems capable of detoxifying any chemicals absorbed. Therefore, the discharge is not expected to have an impact on organisms present in the water column.

8.2.6.1 Management and mitigation measures for commissioning discharges

- Any chemical used to treat the hydrotest water will be selected according to BSOG procedures and will be approved for discharge in accordance with applicable regulations.
- The discharge port and rate of discharge will be optimised during detailed design, informed by the discharge modelling conducted.

8.2.6.2 Residual impacts for commissioning discharges

The importance of the receptor is considered to be Low due to its resilience. The activities carried out within the project do not have to potential to change marine water quality in the long term or over extended areas.

The duration of the discharge will be short term (hours to days). With the mitigation measures in place, the impact is not considered to be significant.

8.2.7 Operational stage discharges

There are not expected to be any routine discharges to sea during the operational stage, other than stormwater from the open drains system of the Ana Platform. Due to the simplicity of the proposed hydrocarbon processing facilities on the Ana Platform, there will be no requirement for an offshore closed drains or sewerage system. Wherever required, equipment will have local drip pans to collect any released liquids which will be then transported ashore by the supply vessel. There will be no discharges of produced water from the Ana Platform over the life of field.

There will be occasional discharges to sea of hydraulic fluid at the Doina well head. The hydraulic fluid selected (Pelagic 100 or equivalent) is a water-based hydraulic fluid which is readily biodegradable with a low potential for bioaccumulation. Given that the quantities to be discharged are very small (approximately 2 L), that discharges will happen infrequently (approximately once per year when the well is shut down), the impact on the environment is assessed as being negligible.

In the unlikely case of a Doina well shut-in, there may be subsea discharge of EHC from the 18 km umbilical controlling the well from the Ana Platform, but this would be of limited volume and contain few chemicals, which had been selected for limited environmental impact.

8.2.8 Decommissioning discharges

In addition to routine discharges from vessels used for decommissioning the offshore infrastructure, there may potentially be operational discharges associated with the cleaning of the Doina to Ana pipeline and umbilicals and the Ana to GTP pipeline, prior to their possible removal. No specific details are currently available; any such discharges and the associated impacts would be the subject of a detailed decommissioning plan and EIA.

8.2.9 Cumulative and transboundary impacts

Given the temporary nature and localised impacts of the discharges to sea from the MGD Project, there are not anticipated to be any cumulative impacts with the other existing activities planned projects. It is not considered likely that any discharges could cross into other jurisdictions and therefore no transboundary impacts are expected to occur.

8.3 Seabed Habitats and Communities

8.3.1 Introduction

Potential impacts to seabed habitats and communities associated with development drilling and the installation, operation and decommissioning of the offshore infrastructure include:

- Direct disturbance to seabed habitats and species within the footprint of the infrastructure and anchors;
- Localised loss and change to seabed habitats through the installation new hard substrata to the seabed (e.g. rock protection and subsea infrastructure);
- Indirect disturbance to seabed habitats and species resulting from the suspension and re-settlement of sediments generated during installation and decommissioning of infrastructure (offshore pipeline excluded) and use of anchors;
- Localised disturbance and change to benthos through the deposition of drill cuttings and associated drilling muds;
- Introduction of alien invasive species via:
    - Attachment to vessels and/or contained within ballast water used during the construction, commissioning and operation including MODU, flotel and support vessels should any of which have come from outside Romanian and/or Black Sea waters; and
    - Attachment to seabed infrastructure such as jackets, pipelines and manifolds (including any protection such as rock or mattresses), should any be built and transported to the MGD Project area from outside Romanian and/or Black Sea waters.
- There is also the potential for impacts to the seabed as a result of dropped objects. Although the occurrence and impacts from dropped objects cannot be quantified, this section includes the relevant prevention and mitigation measures.

8.3.2 Discussion of potential impacts

8.3.2.1 Characterisation of the offshore and nearshore MGD Project area

As described in Section 6.2.1.5, the seabed in the vicinity of the Ana field is relatively flat with no key identifying features. Along the pipeline route from the Ana Platform location to shore, rocky outcrops were observed alongside seabed scars, and scours. A number of suspected gas seep features were also observed.

The environmental surveys conducted at the Ana and Doina locations and along the entire pipeline routes showed the presence of seven EUNIS habitat types, illustrating the wide depth range of the routes:

- A5.37 'Deep circalittoral mud';
- A5.37 'Deep circalittoral muds' with a dense *M. phaseolina* shell gravel component';
- A5.379 'Pontic deep circalittoral muds with *Modiolula phaseolina'*;

- A5.36 ‘Circalittoral fine mud’;
- A5.44 Circalittoral mixed sediment’;
- A5.628 ‘Pontic *Mytilus galloprovincialis* beds on sublittoral sediment’; and
- A5.71 ‘Seep and vents in sublittoral sediments’.

Details of the epifaunal and infaunal species encountered during the survey are provided in Section 6.2.2.2.

8.3.2.2 Deposition of drilling discharges

The quantities of drill cuttings and associate drilling fluids to be discharged are described in Section 8.2.3.

The particulate material discharged will settle to the seabed and may form a localised accumulation around the wellheads, while finer particles may disperse over a wider area by the water currents. The material deposited will be a mixture of cuttings (i.e. rock removed from the well), drilling mud (bentonite – a clay material) and some cement traces with associated fluids and particulate additives.

Burial of benthic organisms may result in mortality depending on the depth of cuttings deposition. Filter feeding organisms (for example hydroids and bryozoans) that rely on suspended particles as a source of food may be more vulnerable to the potential smothering impacts of the drilling discharges than deposit-feeding organisms that rely on the deposition of suspended material. Filter feeding structures may become clogged with increased suspended solids in the water column just above the seabed and therefore feeding would be temporarily limited. The more mobile species present may be able to avoid unfavourable conditions. Due to the nature of drilling activities the increased suspended solids loading is expected to be short term.

There is potential to impact to the composition of the benthic community in the immediate vicinity of the drilling location. The impacts from the deposition of cuttings and associated WBM are generally limited to within the immediate vicinity of the wellhead, with good potential for recover in the short to medium term

In addition to potential impacts associated with deposition of material to the seabed, potential impacts associated with drilling and completion fluids and particulate additives need to be considered. Barite consists of barium sulphate, an insoluble, chemically inert mineral powder that normally contains measurable concentrations of several trace metals. As such, the barium is considered to be ‘biologically unavailable’[9], and therefore of low toxicity and unlikely to have a measurable impact on the benthic fauna (Jenkins *et al*., 1989; Starczak *et al.,* 1992; Hartley, 1996). The potential environmental impact of other trace metals will depend on their concentration in the drilling fluids cuttings, which in turn depends partially on the geological source of barite. Neff *et al*. (2008) found that metals associated with drilling mud barite are virtually unavailable to marine organisms that might come into contact with discharged drilling fluids.

8.3.2.3 Disturbance to the seabed

Direct disturbance to the seabed will be limited to the immediate footprint of the pipelines, umbilicals and subsea equipment. Impacts at the Ana and Doina locations will be negligible in the context of the amount of similar seabed habitat available at those water depths.

The offshore segment of the Ana Platform – GTP pipeline will cross a wide depth range and range of seabed types as described above. The nearshore parts of the pipeline will cross protected sites. However, the area affected by the pipeline will be very small compared to the available habitat.

[9] In order to be toxic to living organisms, heavy metals must be readily soluble or extractable from the source (such as contaminated sediments) so that they can be taken up by living organisms upon exposure (typically by ingestion).

8.3.3 Management and mitigation measures

- If the option for installing the pipeline by the technique of directed horizontal drill, water-based drilling muds will be used as much as possible and the synthetic substances will be used, if applicable, in quantities strictly necessary for operating the drill;
- Simultaneous installation and operation procedures (SIMOPS) will be employed in order to reduce the potential occurrence of dropped objects;
- Construction contractors will attend courses / presentations for raising their awareness. They will also implement and observe a protocol for objects fallen into the sea in order to reduce the risk of abandoned objects and promote good on-board maintenance of equipment, tools and building materials, such as safe storage of deck elements. Height planning will be undertaken to manage the risks during lifting activities, including taking into consideration of prevailing environmental conditions and the use of specialized equipment where appropriate. All lifting equipment will be tested and certified. Procedures will be established to record the location of any lost material and to recover important items where possible; and
- The use of anchors is to be confirmed, but anchoring will only take place within the safety exclusion zones (500 m).

8.3.4 Residual impacts

The importance of the abiotic receptor seabed habitats is considered to be Medium because this environmental component has special sensitivity and importance, representing the substratum on which benthic communities develop; higher sensitivity is also generated by the fact that the project involves the installation of both temporary infrastructures (mobile drilling platform or vessel anchors) and permanent infrastructure (pipelines, Ana Platform and subsea installations) that will contribute to changing the shape (the occurrence of depressions / pits on the seabed) or will permanently cover the substrate. Also, habitats of community importance have been identified in the project area: 1110 Shallow submerse sand banks, 1140 Sand and mud surfaces uncovered at low tide, 1170 - Reef and 1180 Submarine structures created by leaking gases.

The importance of the biotic receptors (benthic organisms) is considered to be High because benthic organisms are largely sessile and dependent upon seabed habitat that will be directly affected by the project activities; these organisms cannot avoid the impact.

Considering the long-term presence of the facilities, together with the highly localized impact, the overall magnitude of impact is regarded as Minor and not significant.

8.3.5 Cumulative and transboundary impacts

There is potential for cumulative seabed impacts to occur with existing subsea pipeline infrastructure owned and operated by OMV Petrom (production area and oil and natural gas transportation pipelines) as identified in Section 3.10. The offshore section of the Ana Platform–GTP pipeline runs close to the OMVP offshore pipelines mentioned above for part of its route. There will be a cumulative impact in terms of the percentage of available natural seabed habitat lost due to the presence of the pipelines. The negative cumulative impact is considered minor due to the very small total area affected by both pipelines.

8.4 Biodiversity Features – Marine Mammals and Fish

8.4.1 Introduction

Potential impacts to marine mammals and fish associated with construction, commissioning, operation and decommissioning of the offshore infrastructure include:

- Injury and disturbance due to noise generated during the construction and operation of the offshore infrastructure, including piling and vessels;
- Disturbance to mammals due to the physical presence of vessels; and
- Direct and indirect disturbance to fish spawning and nursery habitats, in particular demersal (seabed) habitats.

Marine mammals and fish would also be at risk in the case of any significant deterioration in marine water quality. The potential impacts of the MGD Project on water quality are assessed in Section 8.2 Marine Water Quality and the implications of the findings for marine mammals and fish are discussed in the present section.

This section assesses the potential impacts on marine mammals and fish from planned activities associated with the MGD Project. Marine fauna could also be affected in the unlikely event of a significant accidental release of oil or chemicals. Risks from accidental releases are considered in Section 8.7.

8.4.2 Discussion of potential impacts

8.4.2.1 Characterisation of the offshore and nearshore MGD Project area

8.4.2.1.1 Marine mammals

As described in Section 6.2.2.4, Romanian marine waters are host to all three of the cetacean species known to live in the Black Sea: the bottlenose dolphin, the common dolphin and the harbour porpoise, all of which are endemic subspecies of the species found elsewhere in Europe. These are listed in the Black Sea Red Data Book and on the IUCN Red List of Threatened species. The Black Sea harbour porpoise and the Black Sea bottlenose dolphin are also listed as Annex II species in the EU Habitats Directive, which are considered under EBRD's PR6 to equate to Priority Biodiversity Features.

The bottlenose dolphin and harbour porpoise are features of the Danube Delta marine zone SCI, through which the offsohre segment of the Ana Platform to GTP pipeline passes passes over a distance of ~52 km. The bottlenose dolphin is also included as a feature in the designation of the Canyon of the Brave SCI, located offshore approximately 12.5 km south-east of the Ana Platform location.

The European otter, a European Protected Species (EPS) and Annex II species under the EU Habitats Directive, is also present in on the coast and may occur in the vicinity of the pipeline shore approaches and shore crossing. This species is a protected feature of designated conservation areas through which the nearshore pipeline route passes, including the Danube Delta SCI, and is listed as Endangered in the Black Sea Red Data Book. There is potential for European otters to be present in the coastal/nearshore marine area of the MGD Project.

Further details of the conservation status of marine mammals in the project area is provided in Section 6.4.

8.4.2.1.2 Fish

Information on the main fish species of interest in the Romanian waters of the Black Sea is provided in Section 6.2.2.3. Site-specific surveys conducted for the MGD Project recorded the presence along pipeline corridors of red mullet *Mullus barbatus ponticus*, which is locally classified as 'Endangered' in the Black Sea by the IUCN and listed in the Black Sea Red Data Book. In addition, gobies were also recorded during the surveys, and it was not possible to identify from the camera footage obtained whether they belonged to the species included in the Black Sea Red Data Book and listed as Endangered in the Black Sea as a whole (*Gobius bucchichi*, *G. cobitis*).

8.4.2.2 Underwater noise

8.4.2.2.1 Overview and noise sources

Manmade underwater noise has the potential to affect or even harm marine animals. In the marine environment, underwater sound is generated by natural sources such as rain, breaking waves and marine life, including whales, dolphins and fish (termed ambient sound). Industrial use of the marine environment adds additional sound from numerous sources including shipping, fishing, oil and gas exploration and production, aircraft and military activity.

Noise sources associated with the MGD Project fall into two types:

> Impulsive noise – would be generated by hammered piling activities; and

> Continuous noise – all vessels including the construction, pipelay and support vessels will generate underwater noise. The noisiest vessels are often those employing dynamic positioning (DP), in which thrusters are used to maintain the position of the vessel.

Continuous noise sources are generally of less concern than intermittent (impulsive) sources where relatively high doses of noise can be received by animals over a short period with little warning. As discussed above, there is already a high level of passing vessels (and associated noise) in the development area, which is part of the baseline against which noise from the MGD Project is assessed.

The assessment of the impacts of underwater noise is informed by noise propagation modelling as described below. The focus of the modelling was on the most significant noise-generating activities with the potential for impacts on sensitive receptors, these being the offshore construction elements of the MGD Project at Ana (particularly) and at Doina, including piling of the Ana Platform jacket, construction vessel usage, and drilling of the development wells. Consideration was also given to pipeline installation throughout the marine project area.

The main potential sources of underwater noise associated with the construction and drilling phases of the MGD Project are as follows:

> Piling operations - associated with installation of the Ana Platform jacket and of the drilling conductors;

> Vessel activity – associated with the activities taking place at the height of construction phase e.g. heavy lift vessel, barge, anchor handling tugs and standby vessel; and

> Drilling operations using jack-up rig.

In addition, pipelay vessels will be used along the lengths of the Doina to Ana infield pipeline and the Ana to shore pipeline.

Piling activities

The Ana Platform is supported by a four-legged jacket. Piling operations will be required to fix the platform legs (one pile per leg) and to drive the 30" drilling conductors. Piling operations will typically be carried out with an underwater hydraulic hammer. For the legs this will be done via a barge, for the conductors the hydraulic hammer will be deployed directly from the drilling rig.

The sound generated and radiated by a pile as it is driven into the ocean floor is complex, due to the many components which make up the generation and radiation mechanisms. However, a wealth of experimental data is available which allows prediction of the sound generated by a pile at discrete frequencies. For the modelling study, the source noise levels were based on a combination of measured noise data from other projects and extrapolations.

Leg piling activities are expected to last 10 days in total, including pre-installation surveys, positioning, rigging installation / repositioning, lifting, piling, levelling and finishing off. While operations are going to be 24 hours per day the actual pile installation is likely to be approximately 5 to 6 days of the full period, equating to roughly 50% of the time.

Details of the source levels used in the underwater noise assessment are based on the assumptions in Table 8.14.

Table 8.14 Assumptions used for modelling the noise caused by piling of the WHP jacket

Parameter	Input values to the model	Data source
Pile diameter	1.5 m	Project
Hammer blow rate	80-120 strikes per minute	E.g. Typical value for such equipment according to the equipment producers
Time period necessary for installing a pile (hours)	Approximately 12 hours for each pile	Estimate based on the practices in the specialised industry
Total number of piles and the approximate installation schedule (one pile per day)	A platform having four legs and a pile for each leg, installation of one pile per day	According to the data in the project
"**Soft start**" **period**	20 minutes	Good practice - ACCOBAMS methodology

For the 30-inch conductors, typical hammer rates will be lower (45-50 strikes per minute) with overall operations expected to be of shorter duration than those for the leg piles. The leg piles operations are therefore considered to the worst-case scenario.

Construction vessels

The noise levels used in this study for the construction vessels (heavy lifting vessel (HLV), barges and anchor handling tugs) and standby vessels are presented in Table 8.15.

Table 8.15 Vessel noise source data

Type of vessel	rms sound pressure level @ 1 m, dB re 1 µPa	Peak sound pressure level @ 1 m, dB re 1 µPa	Equivalent SEL* @ 1 m, dB re 1 µPa2s	Source of data/comments
Heavy lift vessel (HLV) (1800 t)	188	191	188	Austin et al., 2005
Barge	178	181	178	MacGillivray & Racca, 2006
Anchor handlng tug x2	191	194	191	Per vessel. Xodus calc. 2016
Standby vessel	188	191	188	Austin et al., 2005
Pipelay vessel	188	191	188	Hannay, McGillivray et al, 2004
* SEL for 1s of exposure to vessel noise				

A correction of 3 dB was applied to the sound pressure level in order to obtain the maximum level of acoustic pressure and SEL is based on the sound pressure level at rms integrated in the exposure time.

Drilling

The intention is to drill the wells using a three-leg jack-up drilling rig, being approximately 74 m high and 61 m wide. As the rig is jacked up out of the water during drilling operations, the only noise will be from drilling as the rig does not float and there is no requirement for dynamic positioning. Furthermore, all major rotating and reciprocating machinery is isolated from the water and therefore noise does not radiate via the structure into the sea.

As there was no specific information on the noise produced by drilling operations, it was necessary to use the data available in the literature. As very little information exists for jack-up rigs, it has been necessary to use data from a semi-submersible rig. This will be a slight over estimate as there will be a contribution from equipment noise radiated by the vessel's hull.

Nedwell and Edwards (2004) provide power spectral density (PSD) data for hydrophone measurements of drilling operations from the rig *Jack Bates* while drilling. This PSD data has been used to generate a spectrum shape for drilling operations, which has been used as the basis of this analysis.

The source levels for drilling noise are presented in Table 8.16. It should be mentioned that the SEL presented in this table is one second exposure to the source and that the continuous exposure for 24 hours will lead to a higher SEL value.

Table 8.16 Drilling noise source data

Description	rms sound pressure level @ 1 m, dB re 1 µPa	Peak sound pressure level @ 1 m, dB re 1 µPa	Equivalent SEL* @ 1 m, dB re 1 µPa2s	Source of data/comments
Drilling	186	189	186	Values and spectrum adapted after Nedwell and Edwards (2004)
* SEL for 1s of exposure to drilling noise				

8.4.2.2.2 Results of underwater noise modelling

The distances presented in the following results tables are the closest distances that a marine mammal or fish can be to the source of the noise before the onset of physiological damage or behavioural changes. At distances greater than those shown in the tables, it is assumed that there will be no adverse impact.

In all modelling scenarios, it is assumed that mammals will move away from the source of the noise at a constant rate of 1.5 ms^{-1}; this is thought to be a conservative estimate of mammal swim speed for the mammals in the project area.

Marine mammals - Impulsive noise (piling operations)

The results of the noise modelling for piling operations with regard to the potential for injury are shown in Tables 8.17 and 8.18, while those with regard to the potential for disturbance are shown in Table 8.19.

Table 8.17 Noise modelling results for impulsive noise sources – Peak

Activity / Source	Peak Injury Zone Radius			
	LF Cetacean	*MF Cetacean*	*HF Cetacean*	*Pinnipeds*
Piling operations	8 m	2 m	55 m	2 m
Piling assuming soft start operations	3 m	0 m (threshold not exceeded)	17 m	0 m (threshold not exceeded)

Table 8.18 Noise modelling results for impulsive noise sources - SEL

Activity / Source	SEL Injury Zone Radius (Assuming 1.5 ms^{-1} Swim Speed)			
	LF Cetacean	*MF Cetacean*	*HF Cetacean*	*Pinnipeds OW*
SEL of swimming mammal (at 1.5 m/s)	480 m	185 m	68 km*	5 m
SEL of swimming mammal with 20-minute soft start (at 1.5 m/s)	65 m	19 m	60 km*	1 m

*See comments below regarding the 155 dB re 1 $\mu Pa^2 s$.

The use of 20 minutes of soft start for piling results in a significant reduction of the radius of effect for piling operations. It is worth noting that levels close to the noise source are likely to be an overestimate. This is because the model assumes that each noise source is an infinitesimally small point in space, whereas in reality, the sound is distributed over a larger surface area, in this case a large cylindrical steel pile.

Table 8.19 Estimated disturbance range for marine mammals for impulsive noise

Source / Vessel	Estimated Range for Onset of Disturbance
Piling operations	2,434m

Marine mammals - Continuous Noise (vessel operation / drilling activities)

Estimated ranges for injury to marine mammals from continuous noise sources are presented in Tables 8.20 and 8.21; for SEL calculations a swim speed of 1.5 ms-1 has been assumed. It should be noted that impact range is not a hard and fast 'line' which has impact on one side and no impact on the other; impact is more probabilistic than that. These ranges are therefore simplistic representations of 'potential impact range'.

Table 8.20 Noise modelling results for continuous noise sources - Peak

Activity / Source	Peak Injury Zone Radius (Assuming 1.5 ms^{-1} Swim Speed)			
	LF Cetacean	*MF Cetacean*	*HF Cetacean*	*Pinnipeds (OW)*
Vessel operations during construction activities	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)
Drilling operations	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)

Table 8.21 Noise modelling results for continuous noise sources - SEL

Activity / Source	SEL Injury Zone Radius (Assuming 1.5 ms^{-1} Swim Speed)			
	LF Cetacean	*MF Cetacean*	*HF Cetacean*	*Pinnipeds OW)*
Vessel operations during construction activities	2 m	1 m	185 m	0 m (threshold not exceeded)
Drilling operations	0 m (*threshold not exceeded*)	0 m (*threshold not exceeded*)	12m	0 m (*threshold not exceeded*)

Note a range of '0 m' corresponds to an animal not being exposed to sufficiently high noise to cause injury at the closest possible distance from the source of the noise i.e. *the threshold was not exceeded*.

With regard to the disturbance of marine mammals due to continuous noise, the estimated ranges for onset of disturbance effects are shown in Table 8.22. The disturbance thresholds are based on 140 dB re 1 μPa rms due to continuous noise (vessels / drilling).

Table 8.22 Estimated disturbance range for marine mammals for continuous noise

Source / Vessel	Estimated Range for Onset of Disturbance
Vessel operations during construction activities	1,203 m
Drilling operations	379 m

It is important to place the results in the context of the baseline noise environment, i.e. that the 120 – 140 dB re 1 μPa rms sound pressure level criterion for disturbance from continuous noise is within the range of likely baseline noise levels in the area. It is therefore important to understand that exceeding the criteria for potential onset of disturbance effects does not in itself mean that disturbance will occur. Southall *et al*. (2007) notes that:

"*…the available data on behavioural responses do not converge on specific exposure conditions resulting in particular reactions, nor do they point to a common behavioural mechanism. Even data obtained with* *substantial controls, precision, and standardized metrics indicate high variance both in behavioural responses and in exposure conditions required to elicit a given response. It is clear that behavioural responses are strongly affected by the context of exposure and by the animal's experience, motivation, and conditioning. This reality, which is generally consistent with patterns of behaviour in other mammals (including humans), hampered our efforts to formulate broadly applicable behavioural response criteria for marine mammals based on exposure level alone*."

Consequently, the above behavioural disturbance zones should be viewed as the maximum likely extent within which behavioural change could occur. The fact that an animal is within this area does not necessarily mean that disturbance will occur. It should also be noted that during construction a full armada of vessels has been assumed and therefore this represents a worst-case scenario.

Fish – Impulsive and continuous noise

The results of the noise modelling for fish for both piling operations and continuous noise sources are shown in Table 8.23. These indicate that the zone of potential injury fish is limited to within 30 m of the activities. Some disturbance due to piling noise may be experienced to 1,725 m from the source. Any disturbance from continuous noise sources will be limited to within a few hundred metres of the source.

Table 8.23 Noise propagation results for fish

Activity	Radius of potential injury zone[10]				Radius of potential disturbance[11] zone
	No swim bladder	Swim bladder not involved in hearing	Swim bladder involved in hearing	Eggs and larvae	
Impulsive noise					
Piling operations – peak	16 m	30 m	30 m	-	-
Piling operations – peak with soft start	5 m	10 m	10 m	-	-
Piling operations SEL	N/E	3 m	3 m	-	-
Piling operations SEL with soft start	N/E	N/E	N/E	-	-
Piling noise - rms	-	-	-	-	1725 m
Continuous noise					
HLV, 2 AHV, barge and MSV	-	-	18 m	-	380 m
Drilling and guard boat	-	-	4 m	-	85 m

8.4.2.3 Physical presence

There will be a variety of vessels operating during the installation of the Ana Platform, the Ana-Doina pipeline and the Ana Platform – GTP pipeline, ranging from small survey vessels up to and including pipelay/construction vessels, which will result in an increase in overall vessel activity in the area.

The physical presence and movement of vessels could result in behavioural changes, displacement or collision with marine fauna. There is potential for collisions to take place between vessels and marine mammals, causing injury or fatality. As noted above, the development area may be frequented by protected cetacean

[10] Based on Popper *et al*., 2014 criteria
[11] Sound pressure levels in excess of 150 dB re 1 μPa (rms) are expected to cause temporary behavioural changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area.

species. Cetaceans are able to avoid obstructions they detect through vision or echolocation. Support vessels typically travel at a speed 10 - 11 knots and may be slower when manoeuvring in the development area. The pipelay vessel is expected to operate at slow speeds, and the jack-up drilling rig will be stationary once on location.

As noted in Section 7.1.2, existing levels of shipping activity in the development area are high. With this high level of baseline shipping activity in the area, the increase due to the MGD Project is not regarded as significant.

8.4.2.4 Disturbance of fish spawning and nursery habitats

Disturbance to the seabed from the deposition of drill cuttings, the installation of the subsea infrastructure and pipelines and placement of the jack-up drilling rig and Ana Platform, could affect demersal fish species. Quantification of the area of seabed affected cuttings deposition and the installation of the facilities is detailed in Section 8.3. The area of seabed on which will be affected is very small when compared to the total area of similar seabed available.

None of the fish species known to occur in the area are known to rely on the seabed for spawning activities, or where there is reliance the project area does not cover the entirety or even majority of preferred available habitat. Mobile fish species are expected to move away from this type of activity and are not likely to be impacted by localised seabed disturbance.

8.4.3 Management and mitigation measures

8.4.3.1 Underwater noise

A report developed by ACCOBAMS (2013), considering the Convention for preserving migratory species of wild animals (CMS), issued a set of guiding measures for diminishing noise sources. These attenuation measures, which are relevant for the activities of pillar assembling, are presented in three phases, covering the planning phase, the attenuation practices in real time and the post-activity. The recommendations for each of these phases for the MGD Project are summarised in Table 8.24.

Table 8.24 Attenuation measures for pillar assembling operations

ACCOBAMS Guideline	MGD Project
Planning phase	
Taking into account/adopting alternative technologies, acoustic sources having low level etc.; Reviewing the presence of cetaceans in the time periods proposed for project implementation, financing the research if information is missing or is inappropriate; Selecting a time period with low biologic sensibility; Using the modelling of sound propagation in order to define the dimension of the exclusion area.	BSOG gathered information about potential presence of marine mammals in the Project vicinity during planned drilling and construction activities, information presented in the current report. The results of the modelling for sound propagation confirms the need for using an exclusion area of 500 m. The findings in this report were used for assessing the environmental impact, in order to establish whether a potential attenuation is needed, for ex. avoiding certain time periods of the year.
Attenuation measures in real time (implemented)	
Establishing an exclusion area of 500 m for MMO (marine observers); if a marine mammal is detected in the exclusion area, then the activity must be interrupted or postponed until the moment when the animals leave the exclusion area. The activities will be restarted using “Soft start”; Using an acoustic monitoring protocol, namely using devices	These practices are recommended for pillar beating operations. The MMO and PAM are used under ACCOBAMS attenuation protocol. As it is often very difficult to observe marine mammals, at long distances/low visibility conditions or at night, PAM will provide MMO (marine observers) with valuable

ACCOBAMS Guideline	MGD Project
for passive acoustic monitoring (PAM) for detecting marine mammals; Using the “Soft Start” protocol.	additional information. The “Soft start” procedure is often used to avoid the negative effects of impulsive noise sources and it should be implemented no matter if MMO and/or PAM are implemented.
Post activity	
Reporting the results of monitoring and implementing attenuation methods	MMO will develop reports after finalizing the pillar beating operations.

8.4.3.2 Soft Start

When a pile is hammered, it is normal practice to start with low energy of the hammer and to increase the energy until maximum power is reached. As the noise generated is related to hammer energy, this procedure of progressive increase can be used for a long time, so that the first strikes of the hammer produce a lower noise level and give the mammal a chance to leave the area after it heard the first few strikes. Such process is known as "Soft start" and it differs from a "slow start", when the time between the first few strikes is increased to allow mammals to leave the area before increasing the hammer power. In the UK, for example, the current attenuation protocol provides that the” Soft start” duration must be at least 20 minutes.

However, in engineering practice, the interval for increasing the necessary energy is lower (5-15 minutes) and sometimes uses an initial energy for hammer striking higher than the one provided by the "Soft start” protocol, in order to reduce the risk for injuring marine mammals. Although progress was made as regards “Soft start adaptation by developing detailed “Soft start” procedures, guidance about what “Soft start” represents is still missing.

“Soft start” efficacy depends on many factors, not lastly on the striking energy of the hammer. The relation between the striking energy of the hammer and noise seems to be rather simple, so that reducing hammer energy by half leads to a noise reduction by 3 dB and if the energy is reduced ten times, the noise is reduced by 10 dB. In order for the “Soft start” procedures to be efficient in reducing the "injury potential" for marine mammals, it is important that the pillar beating protocols should be designed with as low as possible energy of the hammer for as much time as possible, preferably starting by a reduction of hammer energy by at least ten times and not increasing the energy too rapidly, but constantly and gradually, on the entire “Soft start” duration.

The efficacy of the “Soft start” procedures is mostly based on an assumption that a marine mammal will be able to localize the initial sound and will react as wanted, it will move away from the source in order to avoid exposure respectively. This is based on empiric data, but there are no proofs that “Soft start” has always the desired effect.

As using a “Soft start” as an attenuation method is based on using the initial sound in order to "disturb" the marine mammal, it is important to take into account whether “Soft start” represents an acceptable perturbation in accordance with the requirements of the policy. Of course, a perturbation would have occurred anyway, if a “Soft start” had not been used, so that there is no additional impact from “Soft start”, other than the additional time necessary in order to beat each pillar. It is considered that the additional half life time of 15-20 minutes (as compared to a layer reduced by 5 minutes for a "standard start") would have a minor consequence as regards perturbations, especially when the potential benefits of reducing the injury probability are taken into account (the prejudice is a more severe impact than perturbation, although perturbation takes place in a much more extended area and therefore it could affect more animals).

8.4.3.3 Ships and drilling activities (continuous noise)

There are no specific procedures on reducing continuous noise. Use of MMO and of the PAM and the” Soft Start” are not generally applicable to these types of noise due to the intrinsic nature of the activities generating continuous noise. The results of modelling noise propagation present a very low injury risk resulting from the noise produced by the drill or by ships. Risk assessment was used in order to establish whether an attenuation is necessary as regards, for example, the calendar of the activities in various areas of the project, in order to avoid the reproduction seasons, not identifying in the same area time periods more favourable for performing activities and less favourable time periods.

8.4.4 Residual impacts

The following are the conclusions of the underwater noise study, assuming the above mitigation measures are implemented:

> There is a very low risk of injury to low and mid frequency cetaceans, otters or fish associated with the continuous noise activities. For the more sensitive high frequency cetaceans there is the possibility of PTS impairment up to 185 m from the noise source.

> A behavioural response (i.e. disturbance) is predicted for mid frequency cetaceans up to 1,202 m from continuous noise operations. The same may apply to otters, although they are less sensitive and spend only a small amount of time underwater. Any disturbance to fish from continuous noise operations will be limited to 380 m from the source. It is important to place this result in the context of the baseline noise environment, i.e. that the 140 dB re 1 µPa rms sound pressure level criterion for disturbance from continuous noise is within the range of likely baseline noise levels in the area. Consequently, exceeding the criteria for potential onset of disturbance effects does not in itself mean that disturbance will occur.

> For impulsive noise associated with the hydraulic pile hammer there is a very low risk of peak level injury with a safe start distance of 55 m for high frequency cetaceans (and considerably less for other hearing types). Under soft start conditions the range reduces to 17 m or less.

> For cumulative sound exposure levels, safe distances start at 480 m for low frequency and 185 m for mid frequency cetaceans. Under soft start conditions these reduce to 65 m and 19 m respectively. The limits (155 dB re. 1 µPa2s) specified for the high frequency hearing type are extremely onerous and, due to the nature of cumulative exposure calculations, mean that distances are in tens of kilometres. Using Lucke's M-weighted SEL criterion of 177 dB re 1 µPa2s for harbour porpoises the range is 875 m, reducing to 150 m under soft start conditions.

> The inclusion of a 'soft start' procedure will reduce the potential impact from piling operations. For soft start procedures to be effective, it is important that piling protocols are designed with as low a hammer energy as possible for an extended period of at least 20 minutes, preferably starting with at least a tenfold reduction in hammer energy and not increasing the energy too rapidly but steadily and gradually over the entire soft start time.

> A behavioural response to piling (impulsive noise) from cetaceans is anticipated out to a distance of 2,431 m. The same may apply to otters, although they are less sensitive and spend only a small amount of time underwater. There is potential for behavioural responses from fish out to a distance of 1,725 m.

> For continuous noise activities associated with drilling there is no significant risk of impact on cetaceans

For marine mammals, the importance of the receptor is considered to be High because the three marine mammal species present in the project area have a high conservation value as they are endangered endemic species for the Black Sea; they are species protected by legislation, directives or international conventions / agreements. They are the most sensitive organisms to project noise in the aquatic environment and to marine pollution. The rate of regeneration of mammal populations is very low and they are also very important from an ecological point of view, being top predators in the marine environment and therefore sensitive to any change in the trophic chain structure. The project overlaps migration routes, feeding or reproduction areas and has a direct impact on the food source for the marine mammals.

For fish, the importance of the receiver is considered High because many fish species present in the project area are of economic importance or endangered species. The project also overlaps fish migration routes, feeding or reproduction areas. The project activities have direct effects upon fish through noise produced in the aquatic environment, by accidental pollution or damage to their food source (planktonic or benthic organisms).

Considering the mitigation measures that will be in place and that the hammer piling activities will be of short duration, the impacts are not considered to be significant.

8.4.5 Cumulative and transboundary impacts

There is potential for a cumulative disturbance impacts on species of community importance identified in the area (fish, marine mammals), especially for those using the area for feeding and breeding. The temporary nature of the installation and decommissioning activities reduces the potential for cumulative impact. Cumulative impacts are considered to be minor following the application of the proposed mitigation measures.

The underwater noise propagation modelling has demonstrated the relatively small scale of impact, and no potential for transboundary impacts has been identified.

8.5 Biodiversity Features – Birds

8.5.1 Introduction

Potential impacts to bird species associated with construction, commissioning, operation and decommissioning of the offshore infrastructure mainly include possible interference with migration routes and pathways resulting from the minimal navigational lighting at the Ana Platform.

The most significant risk to birds is from accidental releases of oil to sea. Seabirds are particularly vulnerable when on the sea surface, while any oil reaching inshore or coastal areas has the potential to affect the feeding and breeding communities of many bird species, including those in protected areas. The risks to birds in the unlikely event of a significant accidental release of oil are considered in Section 8.7.

8.5.2 Discussion of potential impacts

8.5.2.1 Characterisation of the offshore and nearshore MGD Project area

The MGD Project area is known to be important for a number of bird species as indicated by the many designations in the vicinity, and overlapping the MGD Project area, for which bird species are a common designating feature. Sightings of birds during survey activities around the Ana Platform location included several Annex I species listed under the EU Birds Directive as detailed in Section 6.3.2.4.

The nearshore section of the pipeline passes through the marine economic area of the Danube Delta Biosphere Reserve and the Black Sea IBA. As an IBA this site also is designated as a Key Biodiversity Area (KBA). This site has a number of species listed as vulnerable on the IUCN red list: red-breasted goose *Branta ruficollis*; common pochard *Aythya farina*; yelkouan shearwater *Puffinus yelkouan*; and Dalmatian pelican *Pelecanus crispus.*

Under PR 6 areas that are Important Bird and Biodiversity Areas identified for congregatory species are considered to be critical habitat. The Black Sea IBA has been identified as category C4 which is 'Congregatory – large congregations' where the site is known to regularly hold at least 20,000 migratory waterbirds and/or 10,000 pairs of migratory seabirds of one or more species. Details of the biodiversity and conservation interests in the offshore project area are provided in Section 6.4.

8.5.2.2 Bird migration

Migration is part of the behaviour of birds. They migrate or travel from one habitat to another to benefit from different resources such as more food or more welcoming and safer places for reproduction. Most migrations occur once a year in a given season, but others occur at higher or lower frequencies.

Although migrations are necessary, they consume a lot of their energy and time, exposing it to dangers such as predators or exhaustion. In spring, birds fly from hotter areas with large amounts of food to the colder areas where they lay their eggs and raise their chicks. These colder regions offer a large amount of food only in spring and summer. Some species migrate in less-fed areas, but which provide more protection during breeding and raising their chicks. Birds return each year to these breeding sites. The longest distance is travelled by polar chiara, flying from the place where the eggs are laid, from the Arctic to Anctartica and back, each year a round trip of about 36,000 km.

Because most bird species find their food using their vision, the short duration of the day limits the time they can feed, and this can be a very important issue, especially for parents who try to gather food for their offsprings. Moving north or south to warmer climate zones, migratory birds ensure that they can find food throughout the year, taking advantage of longer days in the areas closer to the poles.

Many species of ducks, geese and swans migrate south from the Arctic to Europe, Asia and North America in the winter, returning to the northern regions in the spring to reproduce.

The mechanisms that trigger bird migration are not yet fully understood by scientists, although daytime, wind direction, and hormonal changes appear to be key elements. Also, it is not yet clear how birds migrating at big distances can find their way back, some studies suggest that these species are guided by the sun and the stars, as well as some landscape details. Other species seem to use the magnetic field of the Earth to help them find their way when they fly over a very monotonous landscape or above the sea.

Romania is on a large migration corridor in the Dobrogea area, with wild birds arriving both during autumn and spring migrations. Spring migration begins in April-May, when birds from Central and West Africa and the Mediterranean Sea arrive. They stay in Romania over the summer, lay their eggs and hatch them, then teach their chicks to fly or feed themselves. In September, these birds go back to the African area, returning to the Danube Delta in the following spring. Winter migration begins in November and ends in March. In that period in the Danube Delta there are wintering species of birds that spend the summer past the North Polar Circle in the Siberian region.

Migratory birds in Romania leave in autumn, generally to southern Africa, thus covering a distance of between 7,000 and 10,000 kilometers. Storks need three months to fly the distance between nesting and wintering, and swallows need only two months for the same purpose. The hardest part of the trip is the crossing of the Mediterranean Sea. Storks, for example, prefer to go around Asia Minor and Gibraltar, because they cannot rest on the surface of the water. The cranes, though very similar in structure to storks, resist crossing the Mediterranean, because they use the movement of the wings alternating it with gliding and thus, consume less energy.

Above the Black Sea there is the second largest bird migration corridor in Europe. Most migratory birds flying over the Pontic basin are close to the western shores (Via Pontica) and the eastern shores. There are some species that frequently cross the sea through its narrowest part of the southern shore of Crimea and the northern shore of Asia Minor.

In autumn, the birds in Northern Europe and Western Siberia fly south. Some of them, such as swans and some species of ducks, stop to winter in the wetlands adjacent to the Black Sea, the Danube Delta or the lakes and coastlines. The others, after a short stop to rest and feed, fly farther and winter in Asia Minor, North Africa, and some reach South Africa. In spring, when they return, they follow the same migration routes. It is estimated that over 90,000 raptor birds, 10,000 pelicans, 120,000 storks, and hundreds of thousands of waders and passeriformes each season cross the Western Pontic Region on their way to the wintering areas.

Fewer are the birds that do not leave their nesting lands, an example being the pontic seagull, sedentary on the Romanian Black Sea shore.

Coastal lakes, marshes and lagoons in the vicinity of the Black Sea are particularly important areas for intermittent migratory birds. Some stay here for a short period, others remain the entire winter. The populations that hunt here usually get formed at the end of November and reach a peak between mid-January and mid-February.

Departures and arrivals of birds are still closely related to temperature, vegetation development and feeding possibilities. Most birds migrate very slowly in autumn, since the warm days and still abundant food delay them from their journey.

Birds migrating at night (swallows, ducks, Eurasian coot, larks) do well when the stars cannot be seen because of the clouds, so the stars are not the only direction support of the birds, they also need a map and then they get oriented by using the relief. When the landscape changes suddenly, even accidents can occur. However, the relief plays a much lower role in orientation than the sun or the stars, as birds are migrating at night rather than the day.

For example, the Eurasian sparrow hawk starts its journey with clock accuracy, 30-40 minutes after sunset, the explanation being as follows: migratory birds use daylight to feed, recover from consumed energy, and the darkness of the night protects them from diurnal predators. Observations made by specialized radars show that the climax is reached between 22:00 and 23:00.

Most night migratory birds fly up to 1,000 m above ground, but also outside migrations, birds can reach considerable heights, ducks up to 800 m, storks at 900 m, cranes and swallows at 2,000 m, eagles at 3,000 m, while in the mountainous regions, condors and bald eagles fly at a height of 7,000 m above sea level.

There are birds that prefer to travel alone (nightingale and Eurasian hoopoe), others fly in flocks (ducks, Eurasian coot and swallows), others are divided by gender or age. The geese, pelicans and cranes are organized in perfectly organized in aerodynamic groups. The starlings and seagulls migrate into large and disorganized groups, always changing their shape without mistaking the direction, while storks migrate in large formations (200-500 birds), but not very organized. Iinstead storks always travel "in the family", which is already formed before the actual mating.

The chaffinches nest in Central and Northern Europe, but only females travel, males being sedentary birds. In the case of blackbirds, only "young people" migrate, meaning first year birds. Owls migrate only once in a lifetime.

8.5.2.3 Bird migration and offshore installations

The seas and oceans represent a major ecological obstacle which are faced by millions of migratory birds every spring and autumn, the installation of drilling platforms representing a new and important component in the bird migration route.

In the last decades, studies have been carried out on the ecology of migration and the influence on migrants over the marine areas of oil platforms. The objectives of the studies have been to quantify migration across the spring and autumn over the seas and to assess the influence of marine platforms on migratory birds.

Marine platforms have three types of primary impact on migratory birds: 1) provide a habitat for rest and refeeding; 2) induce atypical nocturnal flight behaviour; 3) result in some crash mortality.

Platforms seem to be suitable habitats for most species, especially in the spring. Many of these migrants have been able to feed successfully, and some have emerged to achieve mass growth rates that have exceeded what is typical of land habitats. Migrants may also be affected by other sources of fatigue, other than total depletion of fat sources, such as excessive lactic acid accumulation or central nervous system coordination disorder. These types of tiredness can be eliminated by simply resting, which may take hours or days, after which migrants are again able to fly.

Migrants use the micro habitats of the marine platforms in an extremely aleatory way, a phenomenon specific to species that cross the sea between spring and autumn.

Platforms can facilitate the evolution of migratory strategies of certain species by offering so-called "foot stones" that allow beginner migrants to cross the marine area.

Sometimes migrants arrive at certain platforms shortly after the night's fall and fly around for varying periods of time, from minutes to hours. This circular evolution occurs clearly when migrants appear on the nights with the sky covered, being attracted by the platform lights. It is believed that this atypical flight behaviour is maintained when the birds get inside the cone of light around the platform and are reluctant to leave, being apparently caught by the "dark wall" and the loss of visual landmarks on the horizon. This nocturnal behaviour is a risk factor for birds by colliding with the platform and leading to inefficient energy expenditure.

Collisions with platforms were the most frequent in autumn, as most migrants reached platforms during the dark hours during that season. Available information suggests that collision deaths are negligible compared to other anthropogenic sources of mortality.

8.5.3 Management and mitigation measures

Lighting on the drilling rig and Ana Platform will be reduced to levels required for safe and secure operations.

8.5.4 Residual impacts

The importance of the receptor is considered to be medium because the project activities will take place in an area designated as a protected area for birds (ROSPA0076 Black Sea) and for a sufficiently long period to overlap the migration periods of birds. Also, the activities carried out by the project will overlap some feeding areas for birds.

Although several vessels will be operating in the field for a few years during the drilling and operational phases, the MGD Project is in a location already subject to high levels of shipping and the additional vessels do not represent a significant increase from the baseline. Lighting of vessels during the installation phase will be temporary. Lighting of the Ana Platform will continue for the life of field. Considering the open offshore location and the fact that the area is already used by vessels using lighting at night, any behavioural effects such as disorientation and attraction are expected to be minor and the magnitude of the impact is assessed as Low.

The significance of the impact is assessed as being Minor.

8.5.5 Cumulative and transboundary impacts

There is potential for cumulative disturbance impacts on species of community importance identified in the area, including birds. Given the small impact predicted on birds from the MGD Project, there is limited potential for any significant cumulative impacts.

No potential for transboundary impacts has been identified.

8.6 Waste Generation

8.6.1 Introduction

Wastes will be generated during the construction, commissioning, operation and decommissioning of the offshore infrastructure. The main sources of wastes that will require management include:

- Hazardous wastes;
- Vessel routine wastes e.g. sewage and water;
- Diesel filters used on the Ana Platform; and
- Infrastructure removed during decommissioning.

Further details on the treatment and disposal of some of the waste types are provided in the sections below.

8.6.2 Waste types and their management

8.6.2.1 Overview

Waste produced by MGD Project will be generated throughout all phases of the project, but particularly during the drilling and installation phases offshore and during decommissioning of the Project. Some of the waste generated offshore will include maintenance or well intervention wastes, as well as domestic waste and chemical receptacles.

Table 8.25 provides an overview of the waste streams and disposal options that can be expected as a result of installation, commissioning, production and decommissioning operations.

Table 8.25 Waste Types and Disposal Options

Waste stream	Hazardous/ non-hazardous		Project component			Waste hierarchy options				
	Hazardous	Non-hazardous	Ana WHP + drilling	Pipeline	Onshore GTP	Reused	Recycled	Recovered	Treated	Disposed
Scrap metal/anodes		✓	✓	✓	✓		✓			
Metal (re-bar, pipe, plate, tubing, wire, rope, welding materials)		✓	✓		✓	✓	✓			
Used equipment, machinery and tools	✓	✓	✓	✓		✓	✓			
Used filters and cartridges	✓		✓		✓		✓			
Hydrocarbons (oil, diesel, helicopter fuel, lube, waxes, sludge)	✓		✓		✓			✓		✓
Naturally occurring radioactive materials (NORM) waste or equipment containing NORM (including Low Specific Activity material)	✓		✓	✓	✓					✓
Domestic waste		✓	✓	✓	✓		✓			✓
Packaging waste and containers		✓	✓	✓	✓	✓	✓			
Plastics		✓	✓	✓	✓		✓			
Glass		✓	✓	✓	✓		✓			
Paper and cardboard		✓	✓	✓	✓		✓			
Unused Water Based Mud		✓	✓			✓				
Drill cuttings	✓		✓						✓	
Gaskets and seals		✓	✓		✓					✓
Refrigerants or non-ozone-depleting substances (ODS)		✓	✓	✓			✓			
Kitchen waste		✓		✓				✓		✓
Hoses		✓	✓	✓		✓	✓	✓		
Medical waste	✓			✓	✓					✓

Waste stream	Hazardous/ non-hazardous		Project component			Waste hierarchy options				
	Hazardous	Non-hazardous	Ana WHP + drilling	Pipeline	Onshore GTP	Reused	Recycled	Recovered	Treated	Disposed
Chemicals and chemical sacks	✓		✓	✓	✓	✓	✓	✓		✓
Paint residuals (including solvents and thinners) and paint tins	✓		✓	✓	✓			✓		✓
Oily absorbent	✓		✓	✓	✓		✓			
Oily rags	✓		✓	✓	✓			✓		✓
Cooking oils	✓				✓			✓		✓
Batteries	✓		✓		✓		✓	✓		
Fluorescent tubes	✓		✓		✓			✓		✓
Electrical equipment	✓		✓		✓		✓	✓		
Radioactive waste (i.e. smoke detectors, instrumentation etc.) at decommissioning phase	✓		✓		✓					✓
Aerosol containers	✓		✓		✓			✓		
Chemical or oil drums	✓		✓		✓	✓	✓	✓		

8.6.2.2 Wastewaters

The IFC Guidelines provide that the generation and discharge of wastewater of any type should be managed through a combination of:

- Improving the use of the water resources to reduce the amount of residual water generated;
- Changing the technological processes, including reducing the waste quantities and reducing the use of hazardous materials as well, in order to reduce the pollutant loads that require treatment; and
- If necessary, apply residual water treatment techniques to further reduce the contaminant load prior to discharge, taking into account the potential impact of the transfer of contaminants during treatment (e.g. from water to air or to soil).

BSOG will follow these recommendations whenever possible.

8.6.2.3 Construction waste

The construction phase is expected to contribute significantly to the total waste generated by the project. However, all waste in the construction phase will be treated in accordance with the requirements described in the following sections.

8.6.2.4 Drilling waste (generated during drilling of the Ana and Doina wells)

All sections of the development wells are expected will be drilled using the water-based drilling fluids. In this case, the drilling waste and the associated residual substances and fluids can be discharged into the sea. The potential impacts from the discharges of cuttings and associated drilling fluids are discussed in Sections 8.2 and 8.3. No waste from drilling of well sections with oil-based drilling fluids (if any) will be discharged to the sea.

8.6.2.5 Waste produced during decommissioning

The waste resulting from the project decommissioning will be assessed according to the legislative requirements at the end of the MGD Project's life time. The detailed Decommissioning Plan has not yet been developed, but it is currently anticipated that:

- The Ana Platform topsides and jacket will be designed to enable complete removal and transport to shore for dismantling and recycling of components or re-use elsewhere;
- The Doina subsea wellhead/Christmas tree and associated pipeline termination structures/spools will be designed to enable complete removal and transport to shore for dismantling and recycling of components or re-use elsewhere;
- The GTP will be fully dismantled and its components removed for re-use, recycling or disposal.

8.6.2.6 Waste management during construction, operation and decommissioning

Waste producers must be aware of the waste they produce during the course of their activities and must implement procedures for their collection, storage and transportation and keep a record of the whole process.

Waste segregation, storage and handling under safe conditions are mandatory requirements for both offshore and offshore components.

All specific waste management and disposal requirements to be provided through MGD-related authorisations will prevail and will be fully observed by the BSOG and by its contractors.

8.6.2.7 Waste identification and assessment and classification methodology

For the waste to be properly managed, it can be fall into one of the following two main groups:

- Non-hazardous or general waste - Material without apparent or actual pathogenic/infectious, radioactive or chemically hazardous contamination. The general waste includes kitchen waste, wood, plastic materials, paper and scrap.
- Hazardous waste - Hazardous waste is defined as any waste having hazardous properties that may cause harm to human health or to environment; and all medicines issued based on medical prescription. The hazardous waste includes materials such as oil-filled cloths, barrels / containers containing chemical waste, waste paint boxes, waste batteries, engine oil and fluorescent tubes / bulbs.

The hazardous and non-hazardous waste has different storage, labelling and expedition requirements, and therefore a correct classification is needed.

8.6.2.8 Segregation, storage and labelling of waste

Following classification, the waste has to be separated and stored in accordance with legislative requirements and with company procedures.

BSOG expects staff to pay special attention to how waste is stored and transported. The waste will be segregated, temporarily stored and dispatched in accordance with legal requirements in regard to waste management.

Measures must be taken to prevent mixing incompatible waste. Therefore, BSOG expects the best practices above to be observed in terms of segregation and disposal of waste.

The recyclable materials must be separated and packaged without other waste. If the recyclable waste is contaminated, it will be rejected by the waste contractor. Depending on the type of contamination, the waste will be disposed of as hazardous or domestic waste.

8.6.2.9 Waste containers

The generated waste must be stored in accordance with the standards described above and following the following practices:

> The number of containers available for waste collection must correspond to demand at any time.

> Containers intended for the storage and transport of waste should be suitable for the storage of waste (e.g. IBC for liquid waste) and should not show corrosion or deterioration that could lead to the loss of waste in the environment.

> The containers should be covered to avoid contamination with other wastes, to avoid exposing the waste to the environment and to avoid waste spreading.

> The compacting bags should be placed in a container or kept for subsequent transportation.

> All hazardous waste is stored for transportation in hazardous waste containers (see the regulation on hazardous goods for international goods (IMDG) to see whether a UN-approved container is required).

> All garbage containers stored in the container must be secured prior to dispatch.

> Attention should be paid to the situation of the containers used for the storage of waste and of the containers used for transportation. Plastic has a lifetime of 5 years: make sure that plastic containers are in the specified use period of time.

> Waste must be stored in transparent bags to identify them.

> Several types of compatible waste in separate containers can be placed in a single container for subsequent transportation.

8.6.2.10 Labelling

Waste containers must be clearly labelled to identify the desired content.

The wastes listed in the IMDG Code as hazardous goods or that containing hazardous materials require special labelling of the hazardous properties on all four sides of containers to be shipped to the shore.

Containers for non-hazardous waste must be clearly labelled and easily identifiable by all staff.

8.6.2.11 Waste storage area

It is necessary to create a special and large enough area for waste temporary storage. These areas will include, as applicable:

> Waste landfills;

> Waste transfer areas to be shipped to the shore / off-site;

> Delimited / fenced areas for liquid waste storage in containers.

The containers on the Ana Platform and in the GTP must be labelled in a legible manner and placed in appropriate, dedicated areas.

8.6.2.12 Waste loading (transfer and expedition)

Waste shipments from the Ana Platform must be accompanied by the correct documentation.

All waste, non-hazardous and hazardous, must have a six-digit numerical code - the European waste code (EWC) in order to be transported to a warehouse.

Several types of compatible waste, stored in separate containers, can be placed in a single container for transfer.

However, separate containers must be presented in detail on the documents accompanying the transportation.

The quantity of each waste stream must be mentioned on the waste transfer documents. More specific details on the waste stream can be detailed in a table attached, as needed.

As part of the BSOG waste obligation, the records of non-hazardous waste will be kept for at least two years; and the shipment notes for the hazardous waste will be kept for at least three years.

8.6.3 Training and competency

All employees arriving at the Ana Platform or at the GTP will benefit from an induction training session that includes an overview of the waste management practices in MGD Project's installations, as well as the identification of the available containers.

BSOG expects this process to be resumed on a regular basis to all staff by supervisors.

The personnel responsible for controlling materials must be qualified in the transportation of hazardous goods to ensure that the staff is aware of the classes of hazardous goods and of how to properly package, mark, label and document the materials.

The persons handling materials receive adequate waste management training on the roles and responsibilities established by the Waste management strategy.

BSOG expects all contractor staff working at MGD Project to be given special attention related to waste management practices. This may take the form of discussions or training on task-specific sets of instruments to ensure that they understand the legal requirements, BSOG requirements, and the specific asset requirements as set out. This will include segregation, storage and disposal practices. The BSOG expects this be repeated on a regular basis for all personnel by supervisors.

8.6.4 Awareness

Each container will be labelled to identify its contents and any hazardous properties.

There are also posters displayed for educating and guiding people through the correct waste management channels; reminding the personnel the importance of segregation, recycling etc.

In addition, on the Ana Platform, warning signs will be displayed in visible places about the fact that waste disposal into the sea is prohibited.

8.6.5 Reporting requirements

Waste transfer notes / documents should be kept. These documents detail all waste resulted from exploitation and they should be permanently updated. Waste transfer notes are documents that are shipped with the shipment of hazardous waste and copies of them must be kept by BSOG.

Annual waste syntheses developed by MGD should be reported at company level, as per legal requirements

8.7 Risk of Accidental Releases

8.7.1 Introduction

Accidental releases can include unplanned releases of hydrocarbons, chemicals and wastes during the installation, commissioning, operational and decommissioning phases. Accidental releases can result from a number of sources including:

- Small operational accidental releases (oil and chemical) from the jack-up drilling rig and support vessels to sea;

- Significant loss of diesel inventory from the jack-up drilling rig and support vessels to sea;
- Loss of wastes during the storage and transfer of wastes, including chemicals from the jack-up drilling rig; and
- Vessel collisions resulting in release of vessel fuel inventory to sea.

Accidental hydrocarbon and chemical releases have the potential to impact various receptors in the marine and coastal environment including marine flora and fauna, especially seabirds, coastal habitats and fisheries.

8.7.2 Regulations and guidance

The MGD Project is subject to applicable Romanian and EU regulatory requirements and to those of international conventions ratified by Romania. It will also follow good international industry practice and meet the requirements of international finance institutions, especially the EBRD.

Key legislation relating to offshore hydrocarbon spill risk assessment and response planning includes:

- Law no. 165/2016 on the safety of offshore petroleum operations (Offshore Law) - which transposes the EU Offshore Safety Directive 2013/30/EU;
- Government Decision no. 1593/2002 regarding the approval of the National preparation, response and cooperation plan in case of oil pollution by sea;
- International Maritime Organisation (IMO) Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, ratified by Government Ordinance no. 14/2000 (OPRC Convention);
- IMO Convention for the Prevention of Pollution from Ships, 1973 and the Additional Protocol from 1978, ratified by Law no. 6/1993 (MARPOL 73/78);
- Convention on the Protection of the Black Sea against Pollution, 1992, Bucharest, ratified by Law no. 98/1992 and related Black Sea Biodiversity and Landscape Conservation Protocol, ratified by Law no. 218/2011; and
- The 1991 United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, ratified by Law no. 22/2001 (Espoo Convention).

EBRD Performance Requirement 3 - Resource Efficiency and Pollution Prevention and Control - makes clear the need to assess and mitigate potential adverse impacts on human health and the environment arising from pollution from a project, including that arising from accidental events.

The World Bank Group (2015) provides a summary of environment, health and safety (EHS) issues associated with offshore oil and gas developments, along with recommendations for their management. These state that a spill response plan should include:

" *oil spill trajectory modelling supported by internationally recognized models (in accordance with the relevant regulatory jurisdiction prescriptions, if any), for the prediction of oil fate and relevant environmental impacts for a number of spill simulations (including worst-case scenario, such as blowout from an oil well), with the ability to input local current and wind data*."

8.7.3 Accidental hydrocarbon releases

8.7.3.1 Sources of accidental hydrocarbon release

Based on the findings of risk assessments and workshops, BSOG has identified the 'credible worst case' hydrocarbon release scenarios which have been the subject of hydrocarbon spill modelling in order to inform the determination of the predicted area of potential impact. The target hydrocarbon for the MGD Project is gas only.

During the drilling and construction phase of the project, the largest volume of liquid hydrocarbon in the field will be the diesel inventory on the jack-up drilling rig, which will be located at the Ana Platform for the drilling of four production wells, and at Doina for the drilling of one subsea well. During the operational phase, the largest volume of liquid hydrocarbon in the field will be the total diesel inventory on the Ana Platform (a small diesel tank will be present).

Whilst modelling in the oil and gas industry usually considers the worst-case release of a storage inventory on an offshore structure (drilling rig or platform), such releases are highly unlikely, as are releases of fuel from any vessel engaged in supporting the offshore structure. The diesel inventory of support vessels is not typically used as the worst-case release for offshore oil and gas developments, since such vessels operate independently of offshore oil and gas operators over a wide area and are governed by shipping regulations, such as the requirement to carry a shipboard oil pollution emergency plan under the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC).

The most common mechanism for diesel release during offshore operations is during bunkering, due to poor working practices or poorly maintained hoses. In general, such spills only amount to a few cubic metres of diesel each time, which is rapidly dissipated in the environment.Based on the above, the following two scenarios have been modelled:

Scenario 1 – Jack-up drilling rig diesel inventory loss; and

Scenario 2 – Ana Platform diesel storage inventory loss.

Loss of these entire diesel inventories is highly unlikely to occur and would result from a collision with a ship. Smaller accidental hydrocarbon losses may occur during bunkering operations (transfer of fuel from the supply ship into the tank on the platform) or following leakage from tanks or at valves.

8.7.3.2 Behaviour of diesel in the marine environment

When hydrocarbons are released into the marine environment they undergo a number of physicochemical changes. Spilled material is immediately exposed to a wide variety of physical, chemical and biological processes that will begin to break down the oil, changing its composition, behaviour and toxicity. These changes are dependent upon the type and volume of hydrocarbon released, and the prevailing weather and sea conditions. The most important weathering processes acting on hydrocarbons released into the marine environment are illustrated in Figure 8.2.

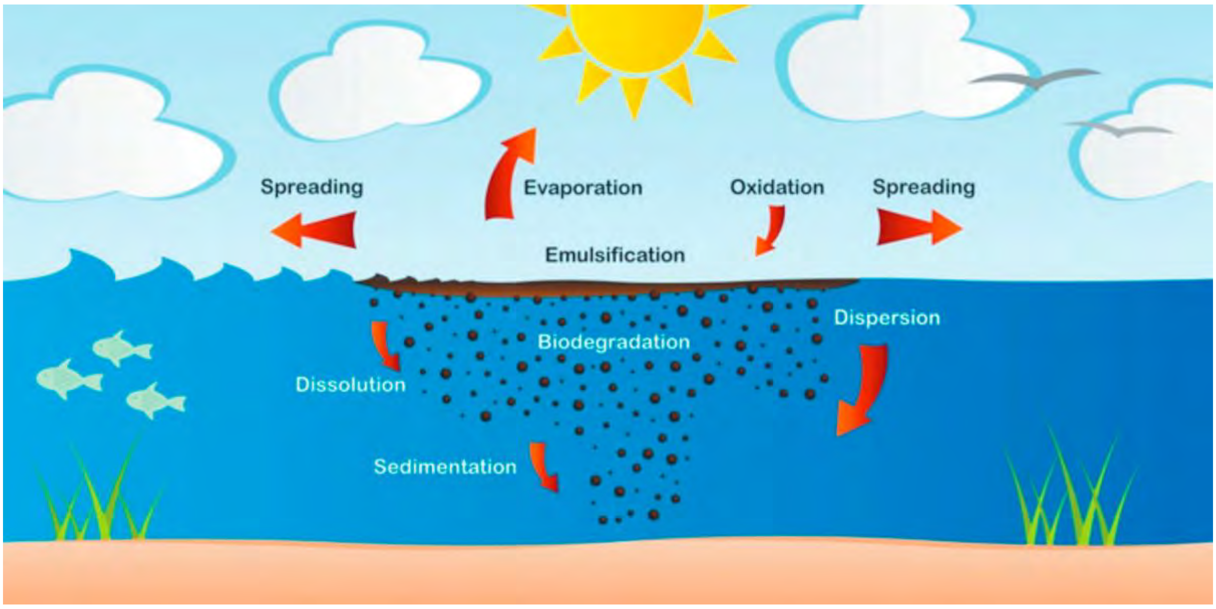


Figure 8.2 Overview of oil weathering processes (ITOPF, 2014)

Marine diesel will be used as fuel by the drilling rig, the construction vessels and support vessels. The Ana Platform will also store small quantities of diesel on board. While diesel spills are a relatively uncommon occurrence in the offshore oil and gas industry, they present the highest likelihood of an accidental release, resulting in the adoption of various controls described in Section 8.7.5.

Diesel is a light oil, high in aromatic compounds that evaporate quickly on exposure to air. Under ideal environmental conditions (warm, sunny day and moderate winds) a large proportion of even a very large release of diesel will evaporate within the first 24 hours of release. The processes of dissolution, dispersion (entrainment) and photo-oxidation (described above) will also act to break down the hydrocarbons.

After the light fractions have evaporated, the process slows down and natural dispersion (entrainment) becomes the dominant mechanism in reducing the volume on the sea surface. This process is dependent upon sea surface turbulence, which in turn is affected by wind speed. Water-soluble components of the hydrocarbon mass will dissolve in the seawater. The immiscible components will either emulsify and eventually disperse as droplets, or aggregate into a viscous mass.

8.7.3.3 Hydrocarbon spill modelling

Theoretical hydrocarbon spill modelling was conducted using the GNOME (General NOAA Operational Modelling Environment) (v1.3.9) and ADIOS 2 (Automated Data Inquiry for Oil Spills) (v2.0.12) model systems. Model runs were conducted to assess the worst-case consequences of the hydrocarbon spill scenarios under consideration. This requires use of a ‘standoff approach’, wherein the modelled scenarios assume no response or intervention from any party.

GNOME is a well-recognised and leading 2D numeric oil spill trajectory model that is used daily by the National Oceanic and Atmospheric Administration (NOAA) and other regulatory agencies all over the world to model oil spill trajectories to inform spill response, planning, and statistical risk analyses. In particular, GNOME has been used in many high-profile major oil spills, including the Exxon Valdez, Cosco Busan and Deepwater Horizon oil spills, among others.

GNOME allows the modeller to:

> Predict how winds, currents and other processes move and spread spilt hydrocarbon on water;

> Learn how predicted oil trajectories are affected by uncertainty in current and wind data; and

> See how spilt hydrocarbons are predicted to change chemically and physically during the time that is remains on the surface.

The ADIOS 2 model is an oil spill response tool used to assist in making decisions on potential oil spill contingency and response strategies. The modelling tool integrates a library of approximately one thousand oils with a short-term oil weathering model estimating the time that spilled oil will remain in the marine environment. Information about the location, density, viscosity, flash point, pour point, hydrocarbon group analysis and distillation data are also included in the database. The model estimates how long spilled oil will remain in the environment.

Scenario 1 – Drilling rig diesel inventory loss

An instantaneous release of 351 m^3 of diesel was modelled from the Ana Platform location, where the drilling rig will be located during drilling of the Ana wells. The dispersion and evaporation of diesel varied according to wind conditions. Average wind speeds during spring, summer and autumn were predicted to result in the majority of diesel evaporating four days after release. During winter, the entire volume of hydrocarbon was predicted to have evaporated 57 hours after release.

A detailed analysis of the the fate of 351 m^3 of marine diesel instantaneously released to the sea surface was was conducted with ADIOS2. The model was used with combinations of relevant water temperatures (8-25°C) and wind speeds (1-20 m/s).

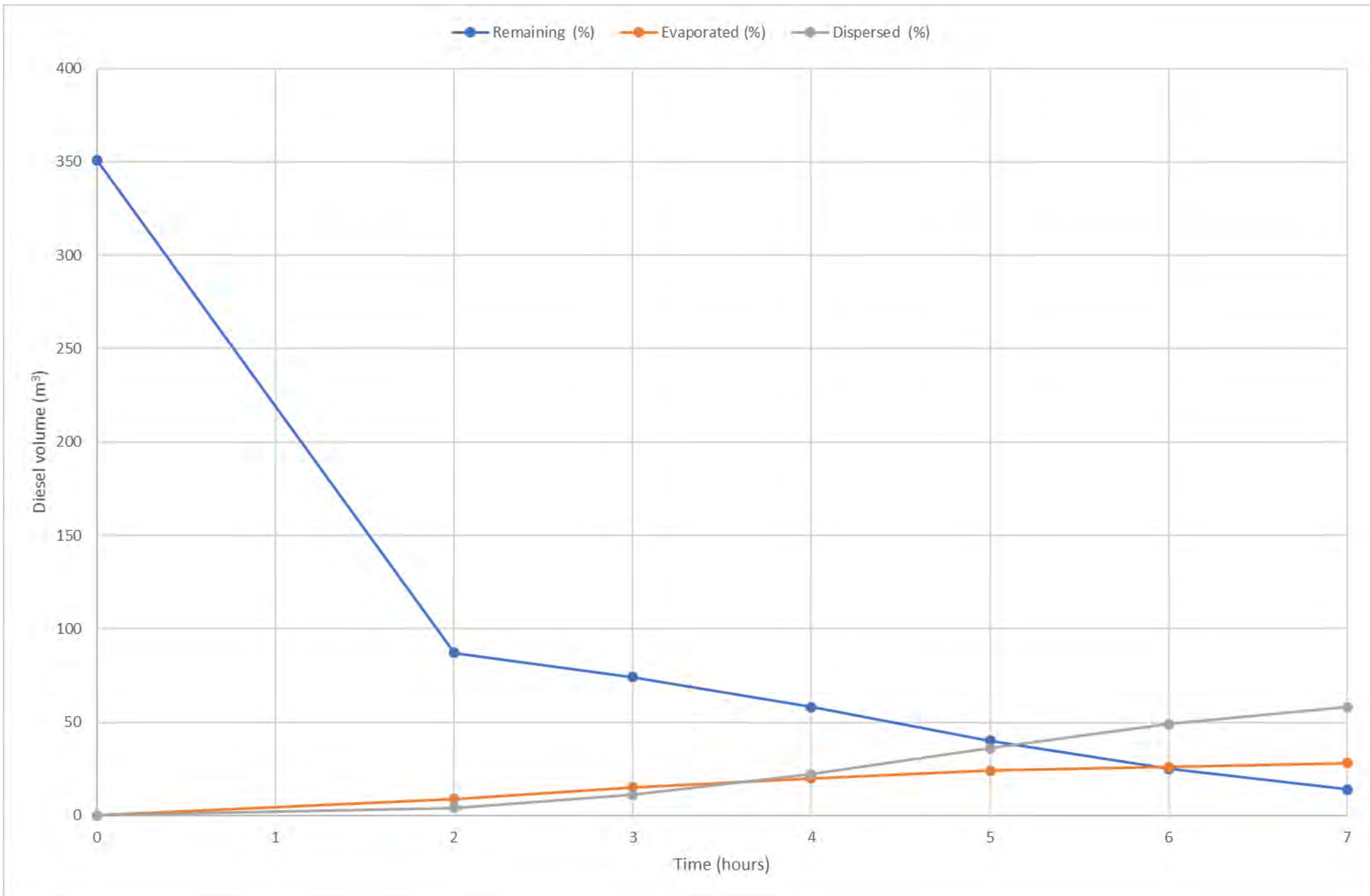
At the minimum temperature and wind speed, the model predicted that there would be little dispersion due to the low wave action, but that 64% (226.6 m^3) of the diesel would evaporate after 120 hours (5 days), assuming no external intervention. In contrast, at the maximum wind speed and water temperature, 20% (70.2 m^3) had evaporated and 66% (231.6 m^3) had dispersed within 2 hours of the release.

Reducing the temperature to the minimum value whilst maintaining the windspeed at the maximum results in a decrease in the amount of evaporation to 12% (42.1m^3) and slightly increases dispersion to 68% (238.7m^3).

At the average windspeed of 10 m/s, the evaporation rate is such that 28% (98.3 m^3) evaporates in 7 hours at the minimum temperature and 39% (136.9 m^3) at the maximum temperature, with the dispersed amount at the minimum and maximum temperatures of 58% (203.6 m^3) and 44%, respectively.

An example graphical representation of the fate of diesel is provided in Figure 8.3.

Figure 8.3 Fate of diesel spilled to the sea surface with a wind speed of 10 m/s and a water temperature of 8°C



These findings are in line with more general experience of diesel releases, where it would typically be expected for the surface hydrocarbon to be no longer visible on the sea surface after 12 to 24 hours under typical offshore conditions, where calms are extremely rare and the wind speed is important both in driving evaporation from the sea surface and creating winds to mix the hydrocarbon into the surface layer and promote its dissipation.

GNOME modelling completed for all seasons predicted no beaching to occur 10 days after release. Trajectories of the released hydrocarbon varied depending on the current direction, but in general remained relatively close to the release location at the Ana WHP location.

An example of the slick trajectory predicted by GNOME is presented in Figure 8.4. This trajectory should be interpreted in combination with the results of the ADIOS analysis described above, since no account is taken in the graphic of the dissipation and evaporation of the diesel. Therefore, whilst the initial slick on the trajectory represents the entire diesel inventory on the surface, later ones would be increasingly diminished, tending toward a sheen that may not be visible. As such, the 10 day model run is highly conservative and should not be interpreted as meaning that a significant quantity of diesel will remain on the sea surface over this entire period.

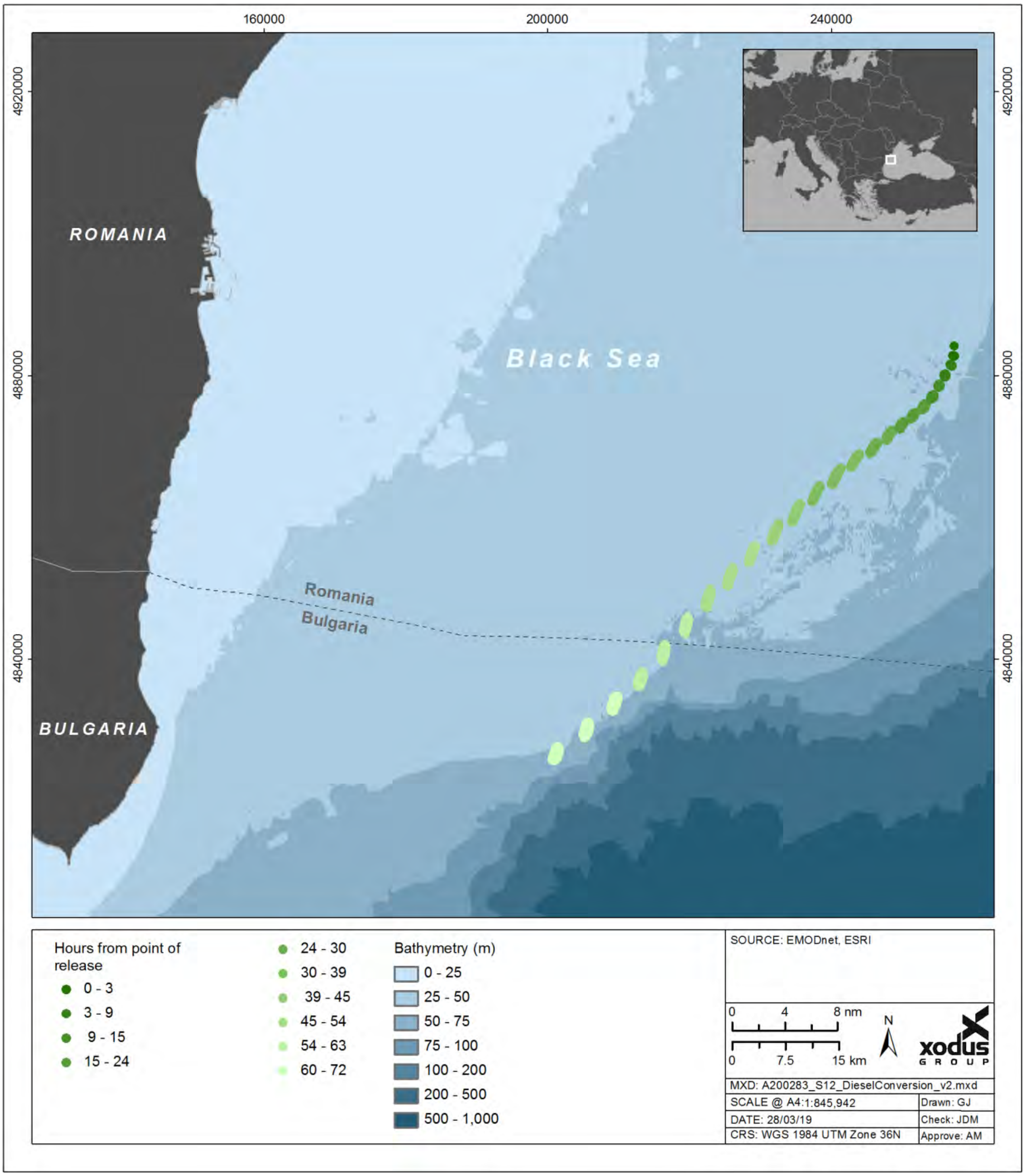


Figure 8.4 Example of the trajectory of worstcase platform diesel release from GNOME

Scenario 2 – Ana diesel storage inventory loss

An instantaneous release of 12.5 m^3 of diesel was modelled from the Ana platform location. Average wind speeds during summer and autumn were predicted to result in the majority of diesel evaporating four days after release. During winter and spring, the entire volume of hydrocarbon was predicted to have evaporated or dispersed between 45 and 95 hours after release. The model predicted maximum seasonal wind speeds to result in the released hydrocarbon to evaporate or disperse after 1 to 10 hours for all seasons.

GNOME modelling completed for all seasons predicted no beaching to occur 10 days after release. Trajectories of the released hydrocarbon from the Ana Platform varied depending on the current direction, but in general remained relatively close to the platform.

Whilst the vessel inventory of any supply vessel may be larger that the storage inventory on the platform, the loss of this vessel is highly unlikely and outwith the scope of the assessment of routine opperations in an ESIA. Typically, losses of diesel during operations are small and result from bunkering operations, whilst the loss of the entire inventory is extremely unlikely.

As demonstrated by the ADIOS modelling for the loss of diesel from the drilling rig, any released diesel would rapidly dissipate and evaporate from the sea surface.

8.7.3.4 Environmental vulnerability to hydrocarbon releases

The intensity and duration of this type of pollution depends on the meteorological conditions at the time of the release and the response measures taken.

Environmental vulnerability to hydrocarbon release is a factor of both the likelihood of impact from a spill and the sensitivity of the environment. There can be impacts on plankton in the immediate area of the release for the duration of the release due to the solution of aromatic fractions into the water column. However, any acute toxic effects are not likely to be measurable in the medium to long-term after the release has stopped. Such effects will be greater during a period of plankton bloom and during fish spawning periods. Contamination of marine prey including plankton and small fish species may then lead to aromatic hydrocarbons accumulating in the food chain. These could have long-term chronic effects such as reduced fecundity and breeding failure on fish, bird and cetacean populations. This may affect fish stocks of commercially fished species. A major release could also have a localised effect on the fishing industry, should certain areas be closed to fishing.

The vulnerability of seabirds to oil on the sea surface may vary seasonally with their foraging and dispersion habits. The magnitude of any impact will depend on the number of birds present, the percentage of the population present, their vulnerability to spilled hydrocarbons and their recovery rates from oil pollution. The physical impact of a spill is one of plumage damage leading to loss of insulation and waterproofing.

With respect to cetaceans, the amount of hydrocarbon ingested or aspirated which is likely to cause harm will depend on the species and their feeding strategy, the overall health of individuals before ingestion or exposure, and the characteristics of the hydrocarbons. It is thought unlikely that a population of cetaceans in the open sea would be affected by a spill in the long-term (Aubin, 1990).

The likelihood of a hydrocarbon spill impacting the coastal environment is a function of the likelihood of a hydrocarbon spill occurring and the probability of the spilled hydrocarbons beaching. While the probability of a worst-case diesel release at the Ana field coming ashore is low, this consequence of hydrocarbons beaching must still be considered. Coastal environmental sensitivities to spills include nearshore breeding seabird populations, shore birds, marine mammals, and sub-littoral and coastal habitats including SCIs and SPAs (see Chapter 4). High energy rock, boulder or cliff coastlines are of low vulnerability to hydrocarbon pollution, while in contrast, sheltered, low energy shorelines as occur in the Danube Delta are of moderate to high vulnerability.

8.7.4 Accidental chemical releases

Chemical spills may occur during chemical transfer, chemical/mud handling or through mechanical failure. The most frequently reported accidental releases from vessel traffic are associated with upsets in bilge treatment systems and are usually small (<1 m3). The most recent Advisory Committee on Protection of the Sea report on discharges to sea states that approximately 87% of accidental chemical releases were considered under the OSPAR list of substances used and discharged offshore as Posing Little or No Risk to the Environment, that none of the chemicals were included in the OSPAR list of chemicals for priority action (which are considered to pose the greatest potential impact) and that none of the releases resulted in a significant environmental impact.

Since chemical spills will often be water soluble, many spills would rapidly be diluted in the water column to below toxic effect concentrations. Spills of chemicals with oil-based constituents may float on the sea surface, but given the small volumes involved, these would likely degrade due to wind and wave action before contacting vulnerable receptors. It is therefore not expected that released chemicals would cause any significant impacts in the marine environment or on the coastline and that any minor impacts offshore would be consistent with those described in Section 8.2 (Water Quality).

8.7.5 Prevention and response measures

BSOG will develop Emergency Response Plans and the Prevention and Intervention Plan for Accidental Marine Pollution with Hydrocarbons.

They will undertake responsibility for reporting potential incidents/accidents and will actively participate in the intervention throughout the time period when the MGD Project takes place. The coordination of the intervention activities will be made in accordance with the provisions stipulated in the Emergency Response Plans. Emergency intervention simulation exercises will be performed for testing all intervention elements, plans and procedures. The scenarios of these simulations and exercises will be varied to cover different aspects of the necessary interventions needed in the respective emergency situation.

During the activities, one of the assistance ships will monitor the site to identify any infringement of sea pollution regulations, including waste disposal or accidental pollution with petroleum products, chemicals or household waste. These infringements, as well as their potential source, will be immediately reported to the competent authorities and the intervention in the case of marine pollution will be coordinated by these authorities. In marine depollution activities no substances dispersing the spills of petroleum products will be used, except for the situations when the consent of the competent authorities was obtained.

BSOG has procedures for reporting incidents / accidents and will establish the level of investigation of all incidents according to the Internal Reporting Procedure, Investigation of Incidents. After investigation, recommendations will be made to prevent the recurrence of the incident. The conclusions drawn from incidents or from potential incidents prevented in time will be shared among as many stakeholders as possible.

8.7.6 Residual risk

As the only hydrocarbon to be produced by the MGD Project is gas, the risk of hydrocarbon spills is limited to that from diesel spills. During the temporary drilling phase of the project, the worst-case scenario would be loss of the diesel inventory of the jack-up drilling rig. During the operational phase, the worst-case scenario would be loss of the diesel inventory stored on the Ana Platform (only 12.5 m^3).

The Black Sea marine environment supports a variety of protected species and the Romanian coastline adjacent to the MGD Project would be highly sensitive to any oil contamination.

Hydrocarbon spill modelling concluded that:

- No beaching of hydrocarbons was predicted and therefore they are not expected to affect any coastal environmental or social sensitivities;
- Any offshore impact of surface diesel oiling on environmental sensitivities would be undetectable due to the rapid removal of the diesel from the sea surface as a result of natural processes and would be restricted to the vicinity of the release location. Diesel is a refined product which evaporates and dissipates within 18 to 24 hours of release; this is supported by the ADIOS modelling conducted;
- There are unlikely to be any transboundary impacts from a diesel spill because it evaporates and dissipates so quickly. Based on the simulations which caused the released hydrocarbons to travel furthest, it is possible that some hydrocarbon could cross the boundary into Bulgarian waters; however, this would be as a thin sheen at most, and more likely invisible to the human eye.

Given the measures BSOG will take to prevent diesel spills, and the response measures that will be in place, the overall risk is regarded as low.

9 ONSHORE ENVIRONMENTAL IMPACT ASSESSMENT

9.1 Air Quality and Greenhouse Gas Footprint

9.1.1 Introduction

This chapter details the expected levels of atmospheric emissions (i.e., the quantities of gases emitted to the atmosphere) from the installation and operation of the Onshore Component of the MGD Project and assesses the potential impacts on air quality arising from the main operational sources, i.e., gas engines and compressor turbines at the GTP. It also provides an appraisal of the greenhouse gas emissions associated with the MGD Project as a whole.

The atmospheric emissions associated with the Offshore Component of MGD Project and potential impacts on air quality are discussed in Chapter 8 Offshore Environmental Impact Assessment, Section 8.1. As discussed in Section 8.1, atmospheric emissions, with potential impacts on natural ecosystems and human well-being, may potentially result in impacts at local and regional levels, in a transboundary context, and on a global scale.

9.1.2 Regulations and guidance

The key regulations relating to the assessment of air quality and atmospheric emissions are:

- Law no. 278/2013 on industrial emissions – which transposes the Industrial Emissions Directive 2010/75/EU;
- Emergency Government Ordinance no. 104/2001 on ambient air quality – which transposes the Ambient Air Quality Directive 2008/50/EC and Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (EGO no. 104/2011);
- Government Decision no. 780/2006 establishing a scheme for greenhouse gas emission allowance trading – which transposes Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC;
- Order no. 462/1993 approving the Technical conditions for atmospheric protection and Methodological guidelines for determining atmospheric pollutants emissions from stationary sources;
- Order no. 3420/2012 approving the Procedure for issuing the authorization for greenhouse gas emissions for 2013 – 2020;
- Law no. 601/2012 on monitoring and greenhouse gas reporting under the EU Emissions Trading Scheme (ETS);
- Law no. 188/2018 on limiting the air emissions of certain pollutants generated by combustion installations with medium capacities - which transposes Directive 2015/2193;

9.1.3 Discussion of potential impacts

9.1.3.1 Characterisation of the onshore MGD Project area

From a climatic point of view, the onshore area is characterised by temperate continental climate, having pontic (maritime) influences. This climate is characterised by warm summers, the temperatures being attenuated by the presence of marine breeze and by mild winters, marked by strong and wet winds from the sea.

The annual average temperatures are of about 11°C and the monthly average temperatures vary between 0 and 10°C in January and between 22 and 23°C in July.

The precipitations are characterised by annual average quantities around 400 mm, most of them being registered during the hot season, when the precipitations occur as of rainfalls. In the studied area, the winds from the north are predominant (annual average frequency of about 22%), followed by winds from the west (annual average frequency of about 12.7%) and those from NE direction (annual average frequency of about 11.7%). The annual average speed is about 4 m/s. The studied area is characterised by the development, during hot season, of a local thermal circulation as sea breeze (during the daytime) and as shore breeze (at night). The calmness period has a percentage value of 15.2% and the average intensity of winds on the Beaufort scale is of 2.4 – 4.4 m/s.

The weather data recorded at the Gura Portitei meteorological station located at 36 km north-east from the project's site were interpreted in order to better characterise the area. The data consists in a presentation of the multi-annual average values recorded between 2000 and 2016 for the following indicators: temperature, precipitations, air wetness, wind speed. The following conclusions can be drawn:

- According to the information presented in Table 9.1 and Figure 9.1, the multi-annual average temperature values (2000-2016) fall within the range between 11.1°C and 13.1°C;
- The multi-annual average values for air wetness fall within the range between 74 and 83% and they are presented in Table 9.2 and Figure 9.2;
- The values of the average quantities of precipitations fall within the range between 18.6 l/square meter and 47.11 l/square meter and they are presented in Table 9.3 and Figure 9.3; and
- The multi-annual average values for wind speed fall within the range between 3.9 m/s and 4.9 m/s and they are presented in Table 9.4 and Figure 9.4.

Table 9.1 Values of multi-annual average temperature at Gura Portitei meteorological station in Constanta county, between 2000 and 2016 (°C)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Value	12.4	12.3	12.6	11.1	12.06	12.1	11.9	13.1	12.9	12.8	12.6	11.7	12.6	12.8	12.6	12.8	12.6

Table 9.2 Values of multi-annual average humidity at Gura Portitei meteorological station in Constanta county, between 2000 and 2016 (%)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Value	77.16	74.5	75.2	79.08	78.16	77.3	76.16	74.8	78.3	77.25	83.58	79.41	77.58	77.91	82.66	79.91	72.75

Table 9.3 Values of multi-annual average quantities of average precipitations at Gura Portitei meteorological station in Constanta county, between 2000 and 2016 (l/square meter)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Value	18.6	19.7	27.4	27.1	36.2	47.06	26.85	31.2	29.2	30.69	41.8	24.5	25.7	33.9	47.11	43.7	37.8

Table 9.4 Values of multi-annual average wind speed at Gura Portitei meteorological station in Constanta county, between 2000 and 2016 (m/s)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Value	4.6	4.9	4.5	4.4	4.4	4.4	3.9	4.4	4.6	4.1	4.2	3.9	4.3	4.3	4.1	4.1	3.5

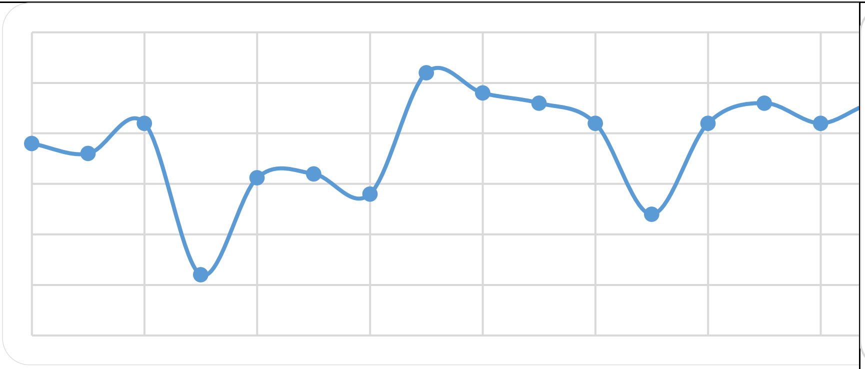
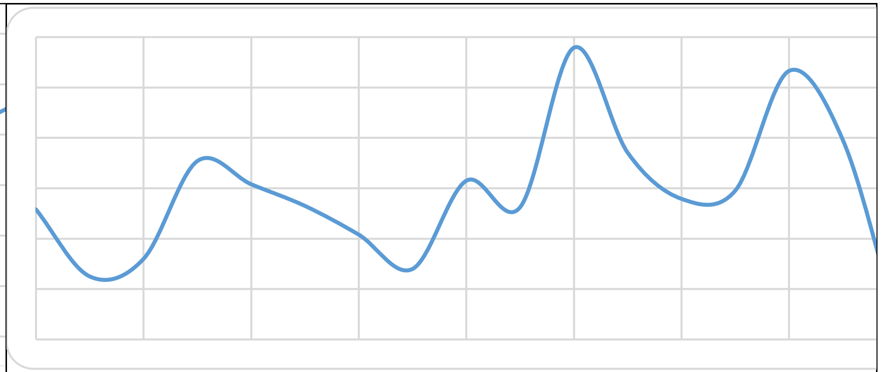
	

Figure 9.1 Average temperature, Gura Portitei meteorological station, 2000 to2016	Figure 9.2 Average humidity, Gura Portitei meteorological station, 2000 to 2016

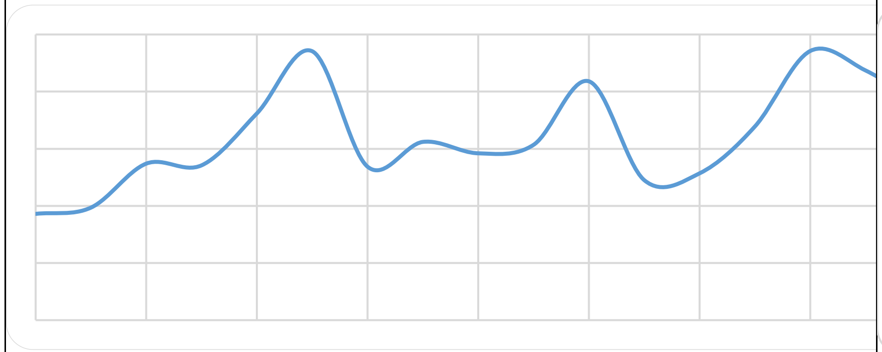
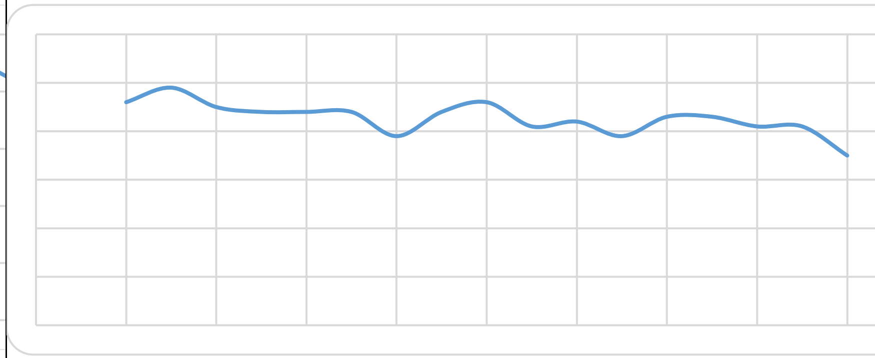

	

Figure 9.3 Average precipitation, Gura Portitei meteorological station, 2000 to 2016	Figure 9.4 Average wind speed, Gura Portitei meteorological station, 2000 to 2016

For atmospheric dispersion modelling conducted to support the impact assessment, 5 years (2012 - 2016) of hourly sequential meteorological data from the Constanta meteorological station (44°12’50”N, 28°38’44”E WGS84) were used, provided by the UK Met Office[12]. The wind rose in Figure 9.5 shows that the majority of the time wind is blowing from the north with a smaller proportion of winds blowing from the west.

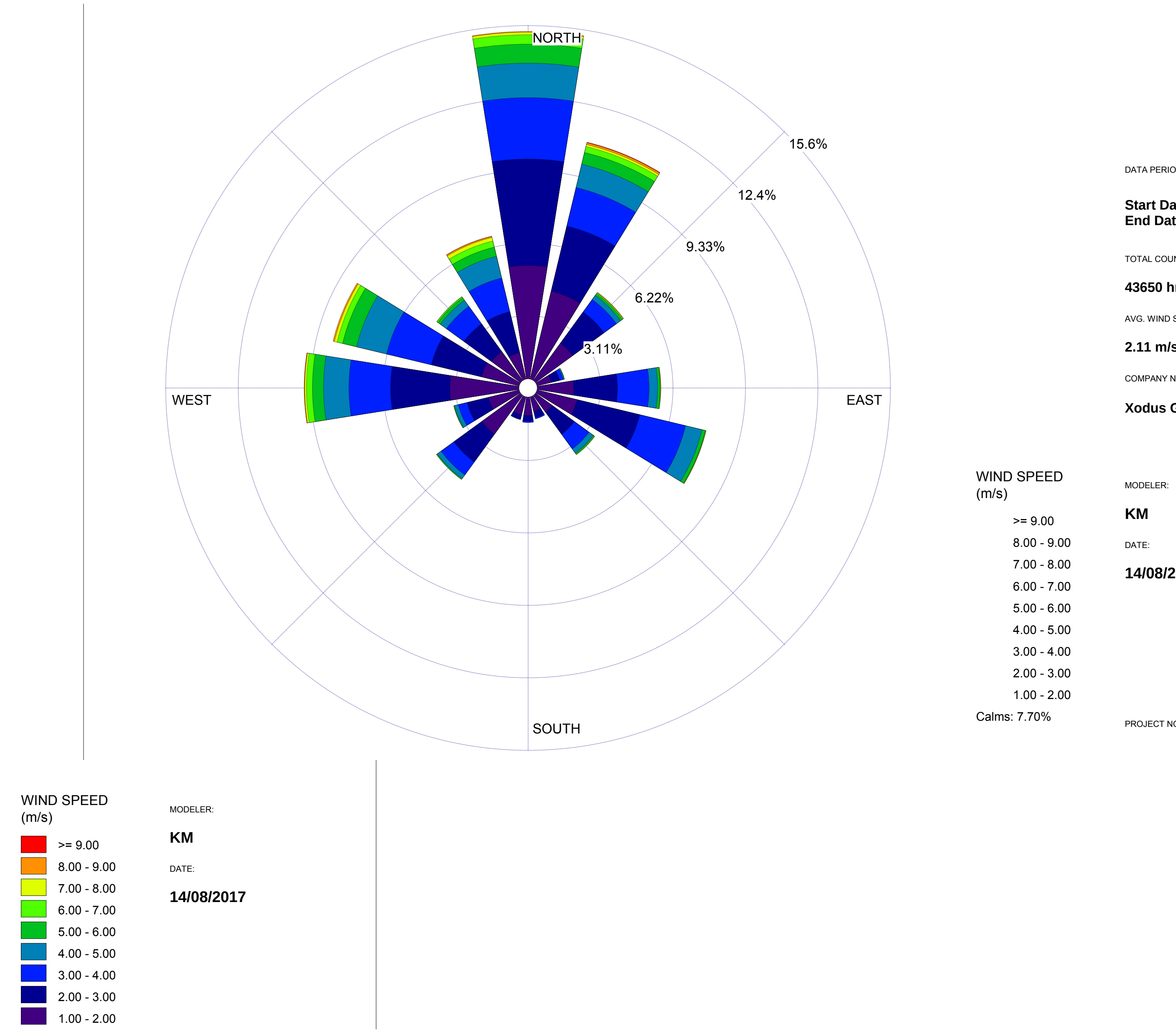


Figure 9.5 Wind rose for Constanta meteorological data (2012 - 2016)

[12] This was the closest available location for both the onshore and offshore sites, about 110 km west of the WHP and 25 km south of the GTP.

9.1.3.2 Air quality

The main activities with an impact upon air quality in Constanta county are the following: burning processes in the industry for transforming and producing electrical and thermal power, burning processes in the processing industry, production processes, extraction and distribution of fossil fuels, use of solvents, road traffic, waste treatment and disposal and agriculture.

In Constanta county, the air quality is monitored through continuous measurement in 7 automated stations by E.P.A. Constanta county. The monitored pollutants are: sulphur dioxide (SO_2), nitrogen oxides ($NOx/NO/NO_2$), carbon monoxide (CO), benzene, suspended powders (PM 10), ozone (O3) and weather parameters (wind direction and speed, pressure, temperature, sun radiation, relative humidity, precipitations)

The monitoring stations are as follows:

- Station CT1: Traffic station, located in Constanta city (Casa de Cultură area) – evaluates the influence of the emissions caused by traffic;
- Station CT2: Urban background station, located in Constanta city (City Hall Park area) – monitors the average pollution levels inside an ample urban area, caused by phenomena taking place inside the city, with possible significant contributions caused by transportation phenomena originating outside the city;
- Station CT3: Urban background station, located in Năvodari town– Tabăra Victoria – monitors the average pollution levels inside a suburban area, caused by transportation phenomena originating outside the town and by phenomena taking place inside the town;
- Station CT4: Traffic station, located in Mangalia city (Archaeological park area) – evaluates the influence of the emissions caused by traffic;
- Station CT5: Industrial station, located in Constanta city (str. Prelungirea Liliacului no. 6) – evaluates the influence of industrial sources upon air quality;
- Station CT6: Industrial station, located in Năvodari town – evaluates the influence of industrial sources upon air quality; and
- Station CT7: Industrial station, located in Medgidia town – evaluates the influence of industrial sources upon air quality.

According to the 2016 annual report for the indicators sulphur dioxide and benzene, no data exists for 2016 as insufficient data was collected/validated for fulfilling the quality criteria according to EGO no. 104/2011 (capturing data for minimum 75% of the calendar time interval). For the indicators nitrogen dioxides, carbon monoxide, ozone and suspended powders (PM10) there were not recorded any values exceeding the annual average concentration limits (there is no annual limit for carbon monoxide).

During 2010-2014, in Constanta county the Integrated Program for Air Quality Management was implemented in the Constanta crowdy area and in Medgidia town for the indicators NO2, SO2 and PM 10 indicators. According to the "2014 County Environmental Report", the air quality improved starting with 2013 as a result of the implementation of certain measures for reducing emissions from industrial sources, linear (traffic) sources and surface sources.

In terms of air quality, no monitoring activity is performed in the Vadu area. The closest monitoring stations are the industrial station CT6 having a representativeness area of 10 – 100 m and the urban background station CT3 having a representativeness area of 1 - 5 km. Both stations are located in Năvodari town at approximately 15 km SW from the project area.

One of the pollution sources in the area is represented by the limestone extraction activity and by the production of construction materials in Corbu commune. Another factor affecting air quality in the area is represented by tourist activities, through the emissions generated by road traffic.

Taking into account that the GTP is located in a rural area, the quality of the base air is considered to be similar to the one registered at the closest station for monitoring air quality in rural environment, station located in

Călărasi. Thus, the values registered at the air monitoring station in Călărasi were considered relevant for the site at Vadu as well (Table 9.5).

Table 9.5 The quality of environmental air for relevant pollutants

Pollutant	Concentration	Measurement unit
NO_2	14.42	µg/m^3
SO_2	12.81	µg/m^3
PM_{10} SEE NOTE 13]	0	µg/m^3
CO	0.00008	µg/m^3
Benzene	1.16	µg/m^3

9.1.3.3 Sources of atmospheric emissions

9.1.3.3.1 Construction and decommissioning phases

The main air pollution sources during the construction and decommissioning phases for the Project are represented by:

- The construction/decommissioning works (land excavation, handling of construction materials, traffic in the site area) generate solid particles (powders) into the atmosphere;
- Works for executing and finishing constructions: cutting, turning, welding, painting, wall painting, grinding, which can generate high powder concentration in the atmosphere, resulting from handling construction and finishing material, volatile organic compounds (VOC) from thinners and paints and heavy metals in the welding smoke; and
- The machines and equipment used for these works generate pollutants, such as: NOx, SOx, CO, CO_2, particles in suspension and settleable particles.

The above-mentioned emission sources fall into the following categories:

- Mobile or linear sources: the road traffic taking place within the site management area; and
- Surface sources: works performed by the industrial equipment and transportation means.

The emission values during the construction and decommissioning of the natural gas below ground pipeline are estimated to be insignificant.

In order to estimate the emissions generated by the GTP construction works, a tool which is a part of IFC technical guidelines was used for estimating carbon emissions was used (CO_2e). The following estimated data was introduced in the calculation of emissions:

- The surface to be occupied by GTP installations is estimated at about 300 m x 100 m = 30,000 m^2;
- The PP total surface = 0.09 ha;
- 50% of the surface where the GTP will be located (15,000 m^2) will be occupied by buildings and process installations; and
- The remaining surface where the GTP will be located will be occupied by roads (asphalt-covered road).

NOTE [13] A value of 0 is assumed due to location in rural environment

According to the IFC calculation tool, a total amount of 6,598 tonnes of CO_2 equivalent (CO_2e) is estimated to be generated during the GTP construction phase. It is assumed that a similar amount of CO_2 will result during the GTP decommissioning phase.

9.1.3.3.2 Operational stage

During the operation of the natural gas below ground pipeline, the emissions will be insignificant.

During the operational phase of the GTP, besides the dispersion vent/gas discharge system, emissions will be generated from the stationary sources mentioned below:

- Discharge vent from the compressor and turbine package (code GP-Z-32-01);
- Discharge vent from gas engines (GP-G-60-01A/B);
- Discharge vent from Diesel Generator (GP-GD-63-01);
- Aeration valve from the Wet MEG storage tank (GP-T-44-01);
- Aeration valve from the Regenerated MEG storage tank (GP-T-44-02);
- Aeration valve from the Corrosion inhibitor storage tank (GP-T-49-01);
- Aeration valve from the Diesel fuel storage tank (GP-T-53-01);
- MEG regeneration package (GP-Z-44-01); and
- TEG regeneration package (GP-Z-45-01).

9.1.3.4 Emissions inventory

Various quantities of air pollutants will be generated on the site of the proposed project, both during construction and operational phases. For the decommissioning phase, the emissions are estimated to be similar to those generated during the construction phase. Generally, quantities of pollutants are discharged into the atmosphere are small, taking into account the ampleness and the complexity of the activities to be performed.

Thus, the generation of the following air pollutants is anticipated:

- CO, CO_2, NO_X, SO_2 as a result of the combustion processes in the engines of the used pieces of equipment;
- VOC as a result of using thinners and paints for metallic structures and of the fuel used for various pieces of equipment;
- Cd and Pb resulted from welding activities; and
- CH_4 resulted from the discharge of the natural gas from the venting process (composition of the natural gas from the deposit is over 99.5% made of CH_4, between 0.05% - 0.19% CO2 and 0.04 – 0.12% N2; this does not contain H_2S or mercaptans) in the GTP.

9.1.3.4.1 Routine emissions generated by activities within the GTP

During the operation of the GTP, the main source of direct emissions into the air is represented by the gas venting used for gas discharge from GTP pieces of equipment and pipelines, in case of de-pressurization or blocking of the gas compressor outlet. The natural gas continuous emissions (methane 99.5% mol) at the gas discharge system are made up of gas losses at compressor sealing part, which are calculated below.

The maximum flow of methane continuous emissions is 1,956 tonnes in 20 years, namely 97.8 tonnes per year, which, transformed into mass/hourly volumetric flow, results: 11.3 kg/hour (16.54 Sm^3/hour).

The other continuous emissions at the gas discharge system (vent) are the following:

- Water vapours (99%) containing low traces of hydrocarbon resulted from the MEG regeneration package (GP-Z-44-01) and from the TEG regeneration package (GP-Z-45-01);
- Nitrogen purges at vent collectors; and
- Nitrogen used for stripping during TEG regeneration process.

The water vapours will be discharged into the atmosphere both from the MEG regeneration package and from the TEG regeneration package. In order to calculate the emissions in the MEG and TEG regeneration package, the following assumptions were considered:

- The water discharged from TEG is 105 kg/hour;
- The water discharged from MEG is 157 kg/hour;
- All water vapours rise by means of ventilation from the TEG package; and
- 50% of the water vapours rise by means of ventilation from the MEG package.

Based on the above-mentioned aspects, the vapour discharge speeds for the MEG and TEG regeneration packages will be as follows:

- 105 kg/hour from TEG package; and
- 78.5 kg/hour water vapours from MEG package.

The discharged vapours are expected to be at least 99% water, having some traces of hydrocarbons.

Table 9.6 estimates the emissions for stationary sources at the compressor and turbine package and at the gas engines of 580 kW (the calculation is made for the conditions when the turbine efficiency is 35%).

Table 9.6 Types and quantities of emissions into the atmosphere from the stationary sources of GTP compressor, turbine package and of gas engines during operations

Time period	Types of emissions (tone equivalent)				
	CO_2e te	CO te	NOx te	CH_4 te	nmCOV te
Annual	35,973	37.73	76.77	11.61	0.5
Deposit life time	718,850	750	1530	230	10

The heat necessary for MEG and TEG regeneration will be provided by two heating boilers that will use natural gas as fuel and that will operate permanently.

Table 9.7 estimates the emissions generated by these stationary sources under the following conditions: the flame heater swill operate permanently, having a thermal efficiency of 90% and a power of 783 kW.

Table 9.7 Types and quantities of emissions into the atmosphere from the stationary source represented by flame heaters during operation

Time period	Types of emissions (tone equivalent)				
	CO_2e te	CO te	NOx te	CH_4 te	nmCOV te
Annual	1,054	0.21	0.88	0.03	0.006
Deposit life time	2,108	4.2	17.6	0.6	0.12

9.1.3.4.2 Emissions in emergency and maintenance situations

Another stationary source is the diesel emergency (backup) generator, which will operate only in emergency situations for starting the installation and for generating energy when the installation is stopped. The emissions that could be caused by this generator were estimated under the following assumptions: the diesel engine has an efficiency of 40%, the capacity is 1200 kW and it is used one hour per week (Table 9.8).

Table 9.8 Types and quantities of emissions into the atmosphere from the stationary source represented by the diesel (spare) generator during operation

Time period	Types of emissions (tone equivalent)					
	CO_2e te	SO_2 te	CO te	NOx te	CH_4 te	nmCOV te
Annual	45	0.06	0.22	0.84	0	0.03
Deposit life time	910	1	4	17	0	0.6

The high- and low-pressure stack (vent) is designed so that it safely removes the hydrocarbons discharged by processing installations, both during normal operation and in certain emergency or maintenance situations.

The emergency discharges (of natural gas) (blowdown) in GTP are driven by the ESD (Emergency Shut Down) system, which means: insulating the equipment under pressure by means of on/off valves and at the same time opening the BDV (blowdown valves) in order to discharge the gas in the system under pressure into the vent system, for the insulated portion; the valves for emergency discharge are calculated to reduce pressure in the system down to 50% of the design pressure in 15 minutes. There are three types of discharge:

- Discharge at maximum capacity (full blowdown);
- Controlled discharges (manually driven) with a view to emptying the gas pressure from various equipment under pressure in order to check/repair them (maintenance blowdown); and
- Discharges from safety valves (safety discharges) (relief events).

The total emissions generated by the venting process during operation were calculated for all these situations (Table 9.9).

The calculation was made under the following assumptions:

- The life duration of field is 20 years (this is the worst-case scenario, as in reality the maximum field life will be maximum 15 years);
- Discharge at maximum capacity (full blowdown) every 10 years;
- Controlled discharges (maintenance blowdown) every 2 years;
- The estimated quantity of discharged gas is 7 tonnes/per discharge; and
- Only one event of discharge from the safety valves for approximately 15 minutes throughout deposit life (158 t per hour).

Table 9.9 Estimation for the gas quantity discharged by the venting process during GTP operation period

Event	Number of events	Quantity of discharges gas (vent) (t)
Discharge at maximum capacity (full blowdown)	2	14
Controlled discharges (maintenance blowdown)	10	70
Discharges from safety valves (full relief event)	1	39.5
TOTAL		**123.5**

A conversion factor was applied to determine the CO_2 equivalent resulting from natural gas emissions under the situations presented above. The equivalence factor 25 was used, assuming 100% CH_4 for gas composition. The mass of CO_2 equivalent discharged throughout field life: 123.5 t x 25 = 3,087.5 tonnes of CO_2 equivalent.

In conclusion, the total quantity of emissions estimated throughout a 20-year operation time for the GTP (the worst-case scenario) under the de-pressurization instances presented above equals **123.5 tonnes of CH_4 (3,087.5 tonnes of CO_2 equivalent)**.

9.1.3.5 Atmospheric dispersion modelling for operational phase

The pollutant dispersion in air was modelled by Xodus (2017) – Offshore and Onshore Atmospheric Dispersion Modelling Report A200283-S00. According to this study, the main punctual sources of emissions corresponding to the GTP are the generators (diesel, gas respectively) and the package of the compressor turbine.

In order to model emission dispersion, CERC ADMS 5.2 was used, a Gaussian model of atmospheric dispersion, in order to characterize atmospheric turbulence. The model is applicable on a distance of 60 km, starting from the source towards wind direction and it can supply useful information for a distance up to 100 km towards wind direction.

ADMS 5.2 uses hourly sequential meteorological data about the speed and direction of the wind and about temperature and nebulosity, in order to calculate emission dispersion. The meteorological conditions have a major effect upon emission dispersion within the model. Hourly meteorological data for five years was used, obtained from Constanta meteorological station, as described in Section 9.1.3.1.

The study compared the results of the modelling with a series of air quality standards developed with a view to protecting human health. The air quality standards represent concentrations registered for a certain time period and considered relevant taking into account the scientific proofs for the effects of the emissions upon human health and upon environment.

As stated herein above, air quality in Romania is regulated by EGO no. 104/2011 transposing intro national legislation Directive 2008/50/EC on air quality and Directive 2004/107/CE on heavy metals and polycyclic aromatic hydrocarbons in the air. The air quality limits are noted in Table 9.10.

Table 9.10 Air quality limits

Pollutant	Average time period	Concentrations
Nitrogen dioxide (NO_2)	1 hour	200 µg/m^3 (99.79th percentile)
Sulphur dioxide (SO_2)	1 hour	350 µg/m^3 (99.73th percentile)
	24 hours	125 µg/m^3 (99.18th percentile)
	1 year	40 µg/m^3 (annual average value)
Particles ($PM1_{10}$)	24 hours	50 µg/m^3 (annual average value)
	1 year	40 µg/m^3 (annual average value)
Carbon monoxide (CO)	8 hours	10 µg/m^3 (8 hours operation time)
Benzene	1 year	5 µg/m^3 (annual average value)

The emission dispersion modelled by Xodus Group (2017) resulted in the following conclusions:

- Under normal operation conditions for the GTP (use of a gas engine and of a package of compressor turbines), no exceedances of Romanian standards for air quality are envisaged for emissions of SO_2, benzene, PM10, NO_2 or CO; and
- Under abnormal operation conditions for the GTP (use of a generator having a diesel engine), no exceedances of Romanian standards for air quality are envisaged for the above-mentioned pollutants.

9.1.3.6 Air quality impacts from construction activities

The direct impacts anticipated to be generated upon the atmosphere refer to the local increase of the short-term concentration for various pollutants into the air:

- Material particles and burned gases (CO, CO_2, SO_2 and NO_X) from the combustion engines of the machineries and from the activities generating high powder quantities and performed on site;
- The volatile organic compounds resulted from painting metallic components in case of necessity; and
- Heavy metals resulted from the welding smoke.

The increase of the above-mentioned concentrations has various effects upon the environment. Thus, the burned gas contributes to the intensification of the acid rain occurrence and CO_2 is the main gas responsible for the intensification of the greenhouse effect.

Also, the increase of the concentrations of the above-mentioned pollutants can have a direct impact upon human health. Thus, these pollutants can have the following effects upon the human body:

> The high concentrations of VOC produce nose, eye and throat irritation, headache, loss of concentration, dizziness and they can affect the liver, the kidneys and the central nervous system;

> The high concentrations of powders produce irritation of the respiratory system and depending on the size and nature of the particles and on the exposure time, they can lead to various diseases of the respiratory system respirator (e.g.: silicosis, anthracosis etc.);

> The high concentrations of burned gases can produce irritation of the respiratory system and if the ventilation is insufficient, they can produce asphyxiation; and

> Based on the work developed by the Environmental Protection Agency of the United States of America[14], the heavy metals present in the welding smoke can have the following effects upon the human body:

  - Cadmium (inorganic) has acute effects that are not specific for oral exposure to a low concentration, but in case of exposure to smoke having high concentrations, it can cause acute bronchitis or even chronic diseases (e.g.: pulmonary emphysema, pulmonary fibrosis or pulmonary cancer); and
  - Lead is a metal having various effects upon the body, depending on exposure. Newly born children and babies are the most affected persons; thus, depending on its concentration in the blood, it can cause anaemia or impairments of the central nervous system.

9.1.4 Management and mitigation measures

The following measures are proposed in order to protect air quality during the construction, operation and decommissioning of the proposed project:

> Appropriate maintenance of vehicles and machines and restriction of their idle running;

> Observance of routes for the vehicles transporting materials that can represent sources of particle emissions in the atmosphere; materials will be transported by covering vehicles by canvases; Imposing speed limits in order to reduce the level of dust generated by vehicles when moving:

> Imposing speed limits in order to reduce the dust level generated by vehicles when moving: 5-15 km/h during construction and 30 km/h respectively during operation;

> Fitting monitoring installations for the stationary pollution sources of air emissions that leads to observance of the values provided by the legislation in force regarding air quality;

> Equipping with modern facilities and using high performance construction machineries, carrying out periodical technical inspections;

> Fitting monitoring installations for the stationary pollution sources of air emissions that leads to observance of the values provided by the legislation in force regarding air quality;

> The machineries and equipment will be supplied with fuel only on the special site that was set up for this purpose within the site management area; and

[14] http://www.epa.gov/raf/publications/pdfs/HUMANHEALTHEFFECTS81904.PDF

- Minimization of emissions of dust and suspended solids resulted from the works necessary to set up the land (drilling, compacting, loading-unloading) by applying technologies that lead to observance of the provisions of STAS 12574-87 *Air in the protected areas. Quality conditions*.

9.1.5 Residual impacts

9.1.5.1 Air quality – Operational phase

Considering the specificity of the activities to be performed on site, no significant impact upon air is anticipated during the operation phase. Thus, the following impact upon air is anticipated:

- The increase of the concentration of powders and burned gases (CH_4, COV non-methanic, CO, CO_2, SO_2 and NO_X) during operation, when on the PP site turbines and compressors supplied with natural gases are operational;
- If motorized transportation means or machines are used in order to perform maintenance works during operation, short and point emissions of noxae (NOx, SOx, CO, VOC, suspended and settleable solids can occur). Under normal operation, no other sources of air pollution should exist during operation; and
- Taking into account the composition of the natural gas in Ana and Doina deposits that is to be treated (over 99.5% CH_4, 0.05% - 0.19% CO_2, 0.04 – 0.12% N_2 and absence of H_2S), the PP will contribute during the operation phase to the improvement of the general air quality, through the reduction of emissions generated by the energy sector. The burning process for the natural gas generates carbon dioxide, nitrogen oxides and sulphur oxides, but the quantities (concentrations) are significantly lower than those generated by burning coal or oil (50% carbon dioxide, 33% nitrogen oxides, 1% sulphur oxides respectively from the quantities of the same compounds resulted from burning coal).

9.1.6 Greenhouse gas footprint

9.1.6.1 Introduction

The Kyoto Protocol on climate change established six greenhouse gases: carbon dioxide (CO2), methane (CH_4), protoxide of nitrogen N_2O), hydro-fluorocarbons (HFCs), per-fluorocarbons (PFCs) and sulphur hexa-fluoride (SF6).

At county level, E.P.A. Constanta monitors emissions of carbon dioxide (CO_2), methane (CH_4) and protoxide of nitrogen (N_2O). The quantities of greenhouse gas generated in 2013 at the level of Constanta county are presented in Table 9.11. The data was taken from the "Report regarding the status of the environmental factors for 2013".

Table 9.11 Quantities of greenhouse gas generated in 2013

Annual total emissions CO_2 equivalent [tonnes]	Annual emissions CO_2 [tonnes]	Annual emissions CH_4 [tonnes]	Annual emissions N_2O [tonnes]
656,600	129,560.698	89.232	69.33

The overall greenhouse gas footprint of the MGD Project has been estimated for each phase of the project using the quantification of atmospheric emissions for both the offshore and the onshore components as presented in Sections 8.1.2 and 9.1.3 respectively. The amounts of CO_2 equivalent (CO_2e) were calculated by summing the quantities of CO_2 and CH_4 in the emissions inventories. An equivalence factor of 25 was used for the conversion of CH_4 to CO_2e. The amounts of CO_2e provided below do not include the CO_2 equivalent of N_2O from NOx, as an estimation of N_2O is not available.

9.1.6.2 Greenhouse gas emissions from offshore component

During the construction phase, the greenhouse gas footprint of the Offshore Component is estimated to be 23,588.45 tonnes of CO_2e and includes:

- Emissions during drilling activities and associated movements of support vessels and helicopters (7,057.9 tonnes of CO_2e); and
- Emissions during installation and commissioning (16,530.55 tonnes of CO_2e).

During the decommissioning phase, the greenhouse gas footprint of the Offshore Component is estimated to be 14,154 tonnes of CO_2e and includes emissions from vessels (12,760 tonnes of CO_2e) and helicopters (1,394 tonnes of CO_2e).

During the operational phase, the average annual greenhouse gas footprint of the Offshore Component is estimated to be 1,168.175 tonnes of CO_2e and includes:

- The annual quantities from power generation on offshore installations (341.5 tonnes of CO_2e), vessels and helicopter movements (800.8 tonnes of CO_2e); and
- The average annual quantity of CO_2 equivalent from the venting processes of the offshore installation (25.875 tonnes of CO_2e - calculated by assuming an equal yearly distribution of the total quantity of emissions estimated throughout a 20 years operation time).

Assuming a total field life of 20 years, the total greenhouse gas footprint for the Offshore Component is estimated to be 61,105.95 tonnes of CO_2e.

9.1.6.3 Greenhouse gas emissions from onshore components

During the construction phase, the greenhouse gas footprint from the Onshore Component is estimated to be 6,598 tonnes of CO_2e and includes emissions from fuels used to transport materials on the site and by the equipment used for the building site activities.

During the GTP decommissioning, it is assumed that the amount of CO_2e will be similar to that during the construction phase.

During the operational phase, the average annual greenhouse gas footprint of the Onshore Component is estimated to have a value of 37,226.35 tonnes of CO_2 equivalent and includes:

- The annual quantities of routine emissions from the operation of the GTP compressor and turbine package, gas engines (35,973 tonnes of CO_2e), fired heaters (1,054 tonnes of CO_2e) and the diesel (spare) generator (45 tonnes of CO_2e);
- The average annual quantity of CO_2 equivalent from the venting processes (154.35 tonnes of CO_2e - calculated by assuming an equal yearly distribution of the total quantity of emissions estimated throughout a 20 years operation time for the GTP).

Assuming a total field life of 20 years, the total greenhouse gas footprint for the Onshore Component is estimated to be 744,527 tonnes of CO_2e.

9.1.6.4 Overall greenhouse gas footprint for MGD

Error! Reference source not found.12 sets out the overall expected offshore greenhouse gas (GHG) emissions from the project over its 20-year lifetime. Offshore drilling and installation emissions make up the bulk of the construction GHG emissions, whereas operational emissions are dominated by onshore emissions. There will also be offshore emissions of over 14,000 t during the decommissioning phase, with none expected for the onshore facility.

Table 9.12 Total GHG Footprint by Project Phase (Tonnes of CO_2 Equivalent)

Project Phase	Offshore	Onshore	Total project emissions over 20-year lifetime
Construction	23,588	6,598	30,186
Operation (20-year)	23,364	744,527	767,891
Decommissioning	14,154	6,598	20,752
Total	**61,106**	**757,723**	**818,829**

The total GHG footprint for the project is **818,829 t CO_2e**, with **767,891 t CO_2e** of that occurring during the operational phase.

It is possible that implementation of the MGD Project will lead indirectly to an overall reduction in emissions of greenhouse gases from the energy sector, taking into account that the combustion of natural gas produces up to 50% less CO_2 than other fossil fuels (coal, oil).

9.2 Water and Soil Quality

9.2.1 Introduction

Potential impacts to soil quality and geology associated with construction, operation and decommissioning of the onshore pipeline and GTP include:

- Changes to existing land quality and agricultural productivity of soils;
- Exposure of contaminated soils as a result of excavation of site and/or earth moving and storage during construction of the pipeline;
- Accidental pollution of soil due to:
  - Minor spills of diesel, oil or chemicals;
  - Stormwater run-off;
  - Waste resulting from technological processes and sanitary waste if they are inappropriately stored/disposed of;
  - Loss of drilling fluids/waste during HDD and boring activities;
  - Major rupture/loss of containment of either the pipeline or within the GTP; and
- Sediment mobilisation in surface runoff.

9.2.2 Discussion of potential impacts

9.2.2.1 Characterisation of the onshore MGD Project area

9.2.2.1.1 Groundwater

Ten groundwater bodies were identified by the Basin Water Administration Dobrogea – Seaside, of which four had a free level for the aquifers and six were under pressure. The groundwater bodies RODL01 (Tulcea), RODL02 (Babadag), RODL03 (Hârsova - Ghindăresti) and RODL04 (Cobadin - Mangalia) belong to porous – permeable type (Holocene, Medium-Upper Pleistocene, Jurassic Cretaceous deposits) and they are fissure – carstic type, being developed in tough rocks, predominantly calcareous. The groundwater bodies RODL05 (Central Dobrogea), RODL07 (Danube Meadow), RODL09 (Northern Dobrogea) and RODL10 (Southern Dobrogea) belong to fissure – carstic type (developed in deposits of Triassic and Sarmaritan ages). The groundwater body RODL06 (Platforma Valahă) and the below ground water body RODL08 (Casimcea) belong to carstic – fissure type (Jurassic age), being located in Medium and/or in Upper Jurassic deposits.

The route of the underground pipeline (section I and connection section) does not overlap with any of the groundwater bodies identified; the closest is RODL05 Central Dobrogea.

The area where the GTP will be located overlaps the eastern limit of the RODL05 Central Dobrogea groundwater body. According to the "2014 County Environmental Report" issued by EPA Constanta, the 10 groundwater bodies were monitored by the Basin Water Administration Dobrogea – Seaside. Six of the 10 groundwater bodies (RODL02, RODL03, RODL04, RODL06, RODL07 and RODL 08) have good chemical condition and four of them have poor chemical condition, recording exceeding values for NH, NH_4, NO3, PO_4, chlorides and Pb indicators).

According to the Geotechnical study conducted for the GTP, developed by PAZYGEO PROIECT in 2016, no water infiltrations were intercepted in the geotechnical boreholes, except for the F2 borehole, where groundwater infiltrations were intercepted at about 14.3 m, but in all boreholes, between 9.3 and 10 m, the soil was damp (see Figure 9.6 for borehole locations). Following the stabilization of the phreatic aquifer, the depth of the groundwater is considered to be between 9.3 and 9.8 m.

According to the geotechnical study conducted for the onshore pipeline, developed by PAZYGEO PROIECT in 2018, water infiltrations were intercepted at average depths of 0.5 – 1.0 m in the geotechnical boreholes F1-F9 which were located on the working corridor in the area between the shoreline and the slope of the continental shelf (indicating that the sand is saturated below these depths). Groundwater infiltrations were not intercepted in boreholes F10 and F11 which were located on the sharp slope where the pipeline reaches the GTP.

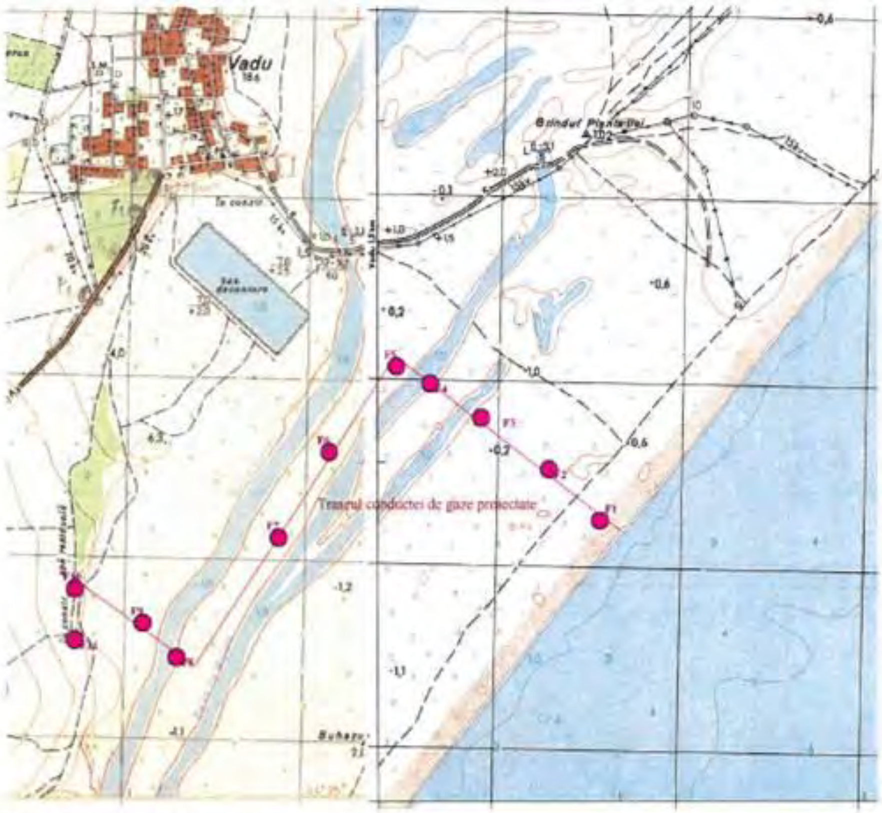


Fig. 1 Traseul conductei de gaze proiectate

Figure 9.6 Locations of geotchnical boreholes to determine groundwater levels

9.2.2.1.2 Surface water

The area where the GTP will be built falls within the hydrographic basin: Valea Vadului – Hydrographic code: 8a. There are no surface waters on the site of the future GTP and in its immediate vicinity.

The route of the underground pipeline will intersect temporarily/permanently floodable areas (Balta Mare and Balta de Mijloc ponds) belonging to the Danube Delta Biosphere Reserve and the connection point with the subsea pipeline will be on the Black Sea shore.

Sinoie Lake is located in the northern part of the proposed project area. To the north-west of the proposed project area lie the former settling ponds of the Rare Metals Factory and the biological treatment (self-treatment using macrophytes) ponds for the wastewater resulted from the refinery owned by Rompetrol Rafinare S.A.

There is no detailed literature on the hydrology regime of the onshore pipeline area, but visual observation throughout the years when the site was monitored indicate that only the larger pond (Balta Mare) is permanently flooded, while the smaller pond (Balta Mica) is only flooded during heavy rain periods and during the spring after the snow has melted. The main (and probably the only) permanent water supply for the larger pond (Balta Mare) is the treated wastewater that discharges from the biological treatment ponds of Rompetrol Rafinare S.A.

9.2.2.1.3 Soil

In Constanta county, the climate, the plateau relief and the loess deposits have resulted in the predomination of carbonic chernozem and of chernozems, together with yellowish soils in the west and with cambial chernozems in the east, towards the Black Sea.

The yellowish soils occur where the relief is stronger and more deeply fragmented, while the cambic chernozems, are found in areas located on the plain crest, with a very low gradient. The carbonatic chernozems and chernozems are found in transition areas between those mentioned above. In the south-west of the county, under current forests, grey soils and variations of chernozems or of yellowish soils can be identified in small areas, under arborescent vegetation. All soils were formed on loess and have medium texture. On slopes, especially in Oltenita Plateau, eroded phased of soils and even erodisoils associate. Locally, on limestones and green schist, rendsines and litosoils can be identified, soils having short profile. Sandy soils can be found along seaside (higher surfaces on Chituc and Lupilor islands). Alluvial soils can be found in the Danube meadow and on its affluent valleys. Differently salinized soils, up to solonceac soils, can be found especially along seaside, close to the beach, where they are generally sandy and in meadows, where their texture varies.15

According to the information in the "2014 County Environmental Report" issued by EPA Constanta, the total land surface statistically recorded is 707,129 ha, out of which 558,04 ha is represented by agricultural land. Table 9.13 presents the agricultural land surfaces corresponding to various categories of land use, according to the "2014 County Environmental Report" issued by EPA Constanta.

Table 9.13 Agricultural land surfaces corresponding to various categories of land use in Constanta county

Run. No.	Category of use	Occupied surface (ha)
1.	Ploughable	484,168
2.	Grazing lands	58,713
3.	Grass lands and natural grazing lands	11,543
4.	Vineyards	3,780
5.	Orchards	11,829

The main processes for soil degradation are: erosion, degradation of organic matter, contamination, salinization, conglomeration, loss of soil biodiversity, exclusion from agricultural circuit, land slides and floods.

[15] Geographical Encyclopedia of Romania, Scientific and Encyclopaedia Publishing House, Bucharest, 1982

Soil quality is influenced by the use of chemical fertilisers and of phytosanitary products. Chemical fertilizers used are mostly those based on nitrogen, phosphorus and potassium. In 2013, 19.3 tonnes of herbicide, 19.5 tonnes of fungicides and 8.1 tonnes of insecticides were used on a surface of 483,000 ha. According to the "2014 County Environmental Report" issued by EPA Constanta, in 2014, 11,410 tonnes of nitrogen (N) fertilizers, 6,778 tonnes of phosphorus (P_2O_5) fertilizers, 0.03 kg/ha herbicides, 0.05 kg/ha fungicides and 0.05 kg/ha insecticides were used.

Information on soil quality is presented in Table 9.14. According to the “County report regarding environmental status, 2014” issued by EPA Constanta, the limiting factors affecting the land plots in the county are mainly represented by the gleization, salinization, erosion processes and landslides. In Constanta county, the total gleized surface was estimated at 12,936 ha, the total salinized surface was estimated as 19,690 ha, the surface affected by (moderate and strong) erosion because of water was estimated as 59,258 ha and the surface affected by landslides was estimated as 2391.71 ha.

Table 9.14 Soil quality from agrochemical point of view

Agricultural surface of the county	558,804 (ha)
Surface that is poorly and very poorly supplied with potassium	62,917 (ha)
Surface that is moderately and strongly alkaline at county level	26,884 (ha)
Surface that is poorly and very poorly supplied with phosphorous	54,035 (ha)
Surface on ensuring humus for the soil (poor and very poor)	189,574 (ha)

In order to provide the necessary data for designing works under maximum safety conditions during production, a Geotechnical Study was conducted for the GTP in 2016 by PAZYGEO PROIECT to determine the geo-morphological, geological and geo-technical conditions on the site. Seven geo-technical wells were drilled at depths between 10 and 18.5 m and three static penetrations (CPT) were performed at depths between 9.6 and 18.8 m.

The results of the study showed an alternation of cinnamon yellow and yellowish dusty clays, from plastically rich-plastically hard to plastically consistent soft, with cinnamon brick reddish clays; plastically rich was intercepted down to a depth of about 18.5 m in the geo-technical wells. The limy base layer was intercepted in F2 well at the depth of 18.5 m. Also, no water infiltrations were intercepted in the geo-technical wells, except for F2 well, where groundwater infiltrations were intercepted from about 14.3 m, but in all wells, between 9.3 and 10 m, the soil was wetter. The groundwater was stabilized between 9.3 and 9.8 m in all wells on the second day.

As shown in Figure 9.7, yellowish soils occur in the GTP area and highly saline surface soils and soils with high natrium and psamosoils content of are found in the area of the underground pipeline.

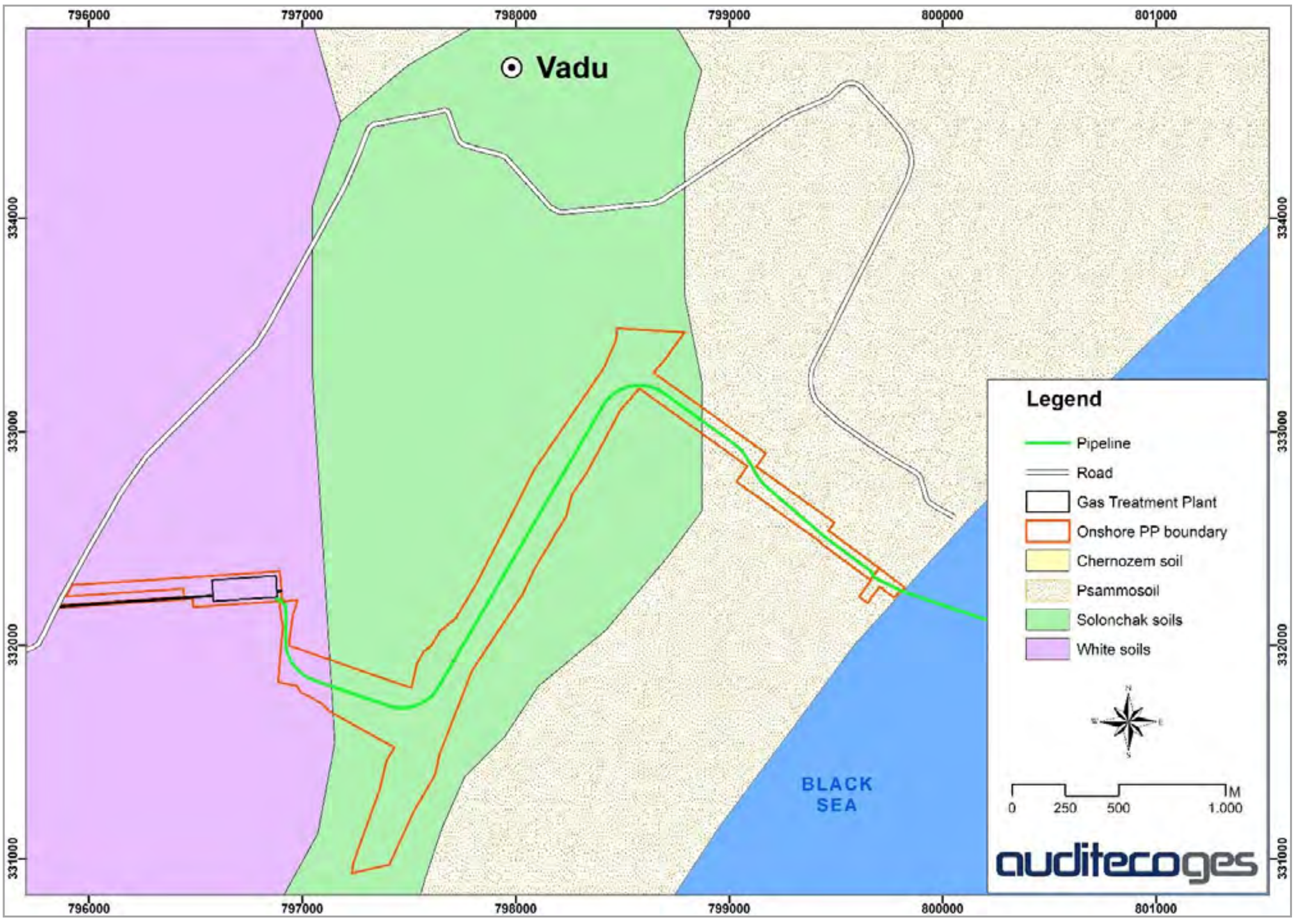


Figure 9.7 Soil map in the proposed project area onshore

9.2.2.2 Water supply to the MGD Project

As regards the Ana – GTP upstream below ground supply pipeline, the water supply will be needed only during construction and decommissioning. This will be for hygienic-sanitary purpose and for the site management activities. The drinking water supply will be ensured by a specialised company in water dispensers. No water supply will be needed during the operation of the upstream supply pipeline.

In the GTP, the water will be supplied from two water wells equipped with submersible pumps GP-P-40-02A/B, (an active one and a spare one) that will have a flow of 20 m3/hour and 8 barg for filling the water tank for fire extinguishing and for domestic consumption for the buildings inside the GTP.

The two water wells will have the following features:

> Maximum depth: 40 m;
> Well diameter: 200 mm;
> Estimated water flow for a well: maximum 1 l/s, namely 3.6 m^3/h; and
> Estimated water flow for a well: optimum 0.5 l/s, namely 1.8 m^3/h.

The wells will be located in the northern part of the site, about 100 m apart. The abstracted water volumes will be measured according to legal requirements.

The requirement for fire water is 2,000 l/min. (QSFF) for 240 minutes; the intangible stock for fire prevention water is 480 m^3 which will be refilled in a maximum of 24 h.

The water requirement for domestic consumption under permanent operation regimen is 0.428 m^3/day.

The GTP buildings, namely the Control & work room building, the building for machineries for snow removal and the Guarding Compartment, will be supplied with water under permanent regimen for domestic consumption at the toilets and at the kitchen and this water does not have potability properties.

The drinking water for human consumption will be supplied by a specialist company in water dispensers.

9.2.2.3 Discharges of domestic wastewater and stormwater

Wastewater generated during the construction and decommissioning of the underground pipeline will be mainly sanitary wastewater generated by site management activities, which will be collected separately, emptied and eliminated by means of a specialized company.

During operation, no wastewater will be generated from the pipeline.

Within the GTP, the wastewater will be discharged by means of two external sewer installations:

- External sewer installation for storm water, with gravitational flow, that will take over the storm run-off from roofs, the roads inside the precincts, the paved surfaces inside the GTP and unpaved surfaces inside the GTP and will direct them into a retention basin, for collection and subsequent discharge by means of the scooping vehicle to a treatment station, based on a contract; this installation will also take over the water used for fire extinguishing (should such events occur). On this network, a hydrocarbon separator will be provided before the discharge into the retention basin. The flow of the storm water will be 245.3 l/s; the sewage the storm water will be made of non-perforated and perforated concrete tubes, for taking over infiltrated surface water; and
- The external installation for the sanitary water sewage, with gravitational flow, that will take over the sanitary wastewater from the buildings inside GTP and will discharge them into a basin that could be emptied using a scooping vehicle and that has a capacity of 22 m^3, built of glass fibre.

9.2.2.4 Process water

Hydrotest water from the underground pipeline will be collected, treated and disposed of by a specialist company. If the horizontal drilling method is selected, water for the water-based drilling muds will not be taken directly from natural groundwater or surface water bodies. During operation of the pipeline, no process water will be generated.

Wastewater from the industrial process at the GTP, where gas is dried, will be collected into drainage pond in a closed system. After the established parameters are analysed, it will be discharged either to the retention pond or, should values exceed the limits, it will be evacuated as waste and loaded in cisterns and transported by authorised operators for treatment to special locations for this purpose.

During maintenance activities, parts of the GTP installations will be washed both inside and outside and the resulting water will be also collected in the drainage pond and analysed. If the limits are exceeded, the water will be evacuated as waste and loaded in cisterns and transported by authorised operators for treatment to special locations for this purpose. If the limits are not exceeded, this will be evacuated into the retention pond.

The water collected in the retention pond will not be evacuated but, depending on the need, it will be evacuated as waste and transported by authorised operators to a treatment station based on contract.

9.2.3 Management and mitigation measures

In order to prevent pollution of water and, soil and geological environment against pollution, the following measures will be observed during construction, operation and decommissioning:

- Special measures shall be taken in order not to affect the quality of the groundwater bodies located on the site of the gas treatment station and the surface water bodies under crossed by the onshore segment of the upstream supply pipeline; the measures will be included in the water management permits to be sent by the “Romanian Waters” National Administration;

- Fine nets will be deployed on the sides of the working corridor when installing the pipeline in the Balta Mare pond in order to reduce the area that will be affected by increased turbidity and total suspended solids; the nets will be installed from the centre of the working corridor to its exterior, so that most of the aquatic fauna will also be pushed outside of the area that will be affected by the works;
- The excess back-fill from the Balta Mare pond will be spread across the entire working corridor within that area, to prevent the formation of back-fill dams within the pond;
- The compaction areas will be limited to the extent of the open trench along the entire length of the pipeline; the back-fill will be loosened and raked at a depth of 10-30 cm, prior to laying down the vegetal layer. These measures will reduce the impact on water infiltration rates;
- The initial configuration of the micro-relief will be remade. In this way, the smaller floodable areas will be restored, and they will also serve as breeding habitat for amphibian species;
- There will be no storage of materials, waste or parking/washing machineries is areas which are not specifically designed for these activities;
- Appropriate handling of the substances used for maintenance activities for Project c, observing the optimal dose of substances in order to avoid accidental leakage on soil surface or into water bodies;
- The wastewater resulted from cleaning or washing vehicles and construction equipment will be collected in tanks and in the septic truck;
- Discharge of wastewater, residues or other waste into groundwater or into surface water will be avoided;
- When opting for the variant for installing the pipeline by the technique of HDD, water-based drilling muds will be used as much as possible and the synthetic substances will be used, if applicable, in quantities strictly necessary for operating the drill;
- Plans to prevent and control accidental pollution will be developed;
- If accidental pollution takes place, immediate measures will be taken in order to remove the pollution generating factors and the authorities responsible for water protection will be informed;
- Appropriate maintenance of machineries and avoidance of fuel and oil leakage;
- The fuels, oils and hazardous chemical substances will be stored in tanks and in sealed containers provided with retention basins, so that no leakage could occur;
- Used oil, when generated, will be collected in special containers for this purpose and will be subsequently handed over to specialized units;
- Strict management of all types of generated waste, selective collection and waste recycling/disposal by authorized operators;
- Measures to mitigate impact during the construction/operation/decommissioning; and
- Restoring the fertile soil layer in areas where soil was affected by works of excavation, storage of materials, parking of machineries.

9.2.4 Residual impacts

The following residual impacts have been identified for the Project:

- The construction/decommissioning works (land excavation, handling of construction materials, traffic in construction site area and in working corridor area) generate air emissions (NOx, CO, SOx etc.) and solid particles (powders) that can reach the soil, subsequently migrating to surface waters or into groundwater by means of precipitation sweeping the surface of the building site area, the access roads and the working corridor.

> The construction equipment and the transportation means can represent water pollution sources by accidental discharge of certain materials, fuels, oils etc. on soil and infiltration into surface waters or into groundwater and into the geological environment respectively.

> The storm water sweeping the construction village platform, the sanitary or industrial wastewater (if it is not appropriately collected and treated) can infiltrate into soil, water bodies and into geological environment, leading to their pollution.

> The physical (mechanical) impact upon soil is represented by removal of the fertile soil layer, having a depth of 50 cm – 60 cm in the areas for locating the constructions, the arrangements and the GTP installations, which will have a surface of approximately 34,400 m^2 and by the access roads during the construction/decommissioning phase.

> The area corresponding to the open trench will have a lower water infiltration ratio, due to the required compaction works that will take place during the installation of the onshore pipeline.

> The waste resulted from both technological processes and sanitary ones by inappropriate storage on soil surface can lead to its contamination, subsequently migrating to surface waters or groundwater and into geologic environment respectively, by means of precipitations washing the surface of the site, of the site management area, of the access roads and of the working corridor.

> When opting for the variant for installing the pipeline by the technique of directed horizontal drill, the loss of drilling muds can represent a pollution source for water, soil and geological environment.

> During operation, the potential pollution sources for water, soil and geological environment will be represented by current or maintenance activities, that could generate emissions of atmospheric pollutants and particulate matter, accidental leakage of fuels, automotive lubricants or chemical hazardous substances used on site. They can infiltrate into soil, water bodies and into geological environment, leading to them being loaded with pollutants.

> During the operation of the onshore pipeline, a localised increase in temperature will occur in the groundwater and sand that cover the pipeline.

9.3 Biodiversity Features

9.3.1 Discussion of potential impacts

9.3.2 Introduction

Potential impacts to terrestrial and intertidal ecology and biodiversity associated with construction, operation and decommissioning of the onshore pipeline and GTP include:

> Temporary loss and destruction of sensitive habitat such as 1410 Mediterranean salt meadows habitat (*Juncetalia maritimi*);

> Permanent loss and/or fragmentation of habitat if not replaced or if recoverability of habitat is significantly reduced;

> Temporary loss of habitat and/or disturbance due to noise, vibration and light on protected species such as European ground squirrel (*Spermophilus citellus*), European pond turtle (*Emys orbicularis*), Caspian whipsnake (*Dolichophis caspius*) and bats (*Chiroptera* spp.);

> Disturbance caused by the light associated with works during construction and operation on light sensitive species such as the moth *Catopta thrips;*

> Impacts upon adjoining habitats from uncontrolled activities of construction workforce;

- Killing or injuring of species due to construction works;
- Potential effects on habitats and species resulting from a fuel or chemical spill; and
- Introduction of terrestrial or intertidal alien invasive species from vehicles /vessels or materials which have come from outside the local or Romanian area.

9.3.2.1 Characterisation of the onshore MGD Project area – Protected sites

The proposed project overlaps several protected areas under the EU Natura 2000 network and is partly located in the Danube Delta Biosphere Reserve (both its land and its marine economic areas):

- The proposed project overlaps over the following protected natural sites of community importance: ROSCI0065 Danube Delta and ROSCI0066 - Danube Delta - marine area;
- The proposed project overlaps the following avifauna protection areas: ROSPA0031 Danube Delta and Razim Sinoe Complex and ROSPA0076 Black Sea; and
- Approximately 6.5 km southwest of the proposed onshore development site is the special protection area ROSPA0060 Tasaul and Corbu lakes.

The GTP is located inside ROSPA0031 and in the immediate vicinity of ROSCI0065. Further details, and maps of the protected sites in relation to the proposed project area, are presented in Chapter 6.

9.3.2.2 Characterisation of the onshore MGD Project area – Habitats and plant species of community importance

The route of the upstream below ground supply pipeline Ana- GTP overlaps in the pipeline corridor the ROSCI0065 – Danube Delta. In the area of the beach, the route of the pipeline partially overlaps (81 m^2) the ROSCI0066 – Danube Delta – marine area as well.

According to the topographic surveys performed in 2017 by S.C. EXPERT SERV S.R.L. Ploiesti, the shoreline on the date when the topographic survey was conducted for the urbanism certificate no. 138/29.08.2017 for area of the connection pipeline section was located at about 1 m east of the western limit of the Z.U.P. area of the pipeline section. The area overlapping ROSCI0065 is covered by Habitat 1140 Sand and boggy areas that are not covered by sea water during reflux. The coast area between Corbu and Capul Midiais generally stable, having a slight tendency of sand accumulation here and there.

No species of community importance of the Standard Form of ROSCI0066 were identified on the surface of the proposed project - onshore area.

According to the Natura 2000 Standard Form, the vascular plant species of community importance mentioned in the Standard Form of ROSCI0065 – Danube Delta are: *Alovandra vesiculosa*, *Centaurea jankae, Centaurea pontica*, *Echium russicum*, *Marsilea quadrifolia* and there are also 29 habitats (plant associations/communities) of community importance mentioned here.

The field investigations (Photo 9.1) to identify types of habitats (plant associations/communities) and vascular plants of community importance were performed by AUDITECO team in 2015 (April 3rd-6th, 2015, May 1st-4th, 2015 and May 29th – June 1st, 2015), in 2016 (July 25th-27th, August 19th-22nd, September 16th-19th,) and in 2017 (April 18th-21st, , May 26th-29th, and June 16th-19th,) and they were performed without any limitations. The interval April 3rd-6th 2015 was an exception, when the access in the study area was restricted as a result of large flooded surfaces and of suboptimal climate conditions (low temperatures), so that species of vascular plants could develop and thus could be inventoried. The areas surveyed are shown in Figures 9.8 and 9.9.

The main investigation method on site was that of linear transect (including diurnal transects performed by boat on the surface of Balta Mare on May 3rd, 2015) and that of phytocoenologia surveying.

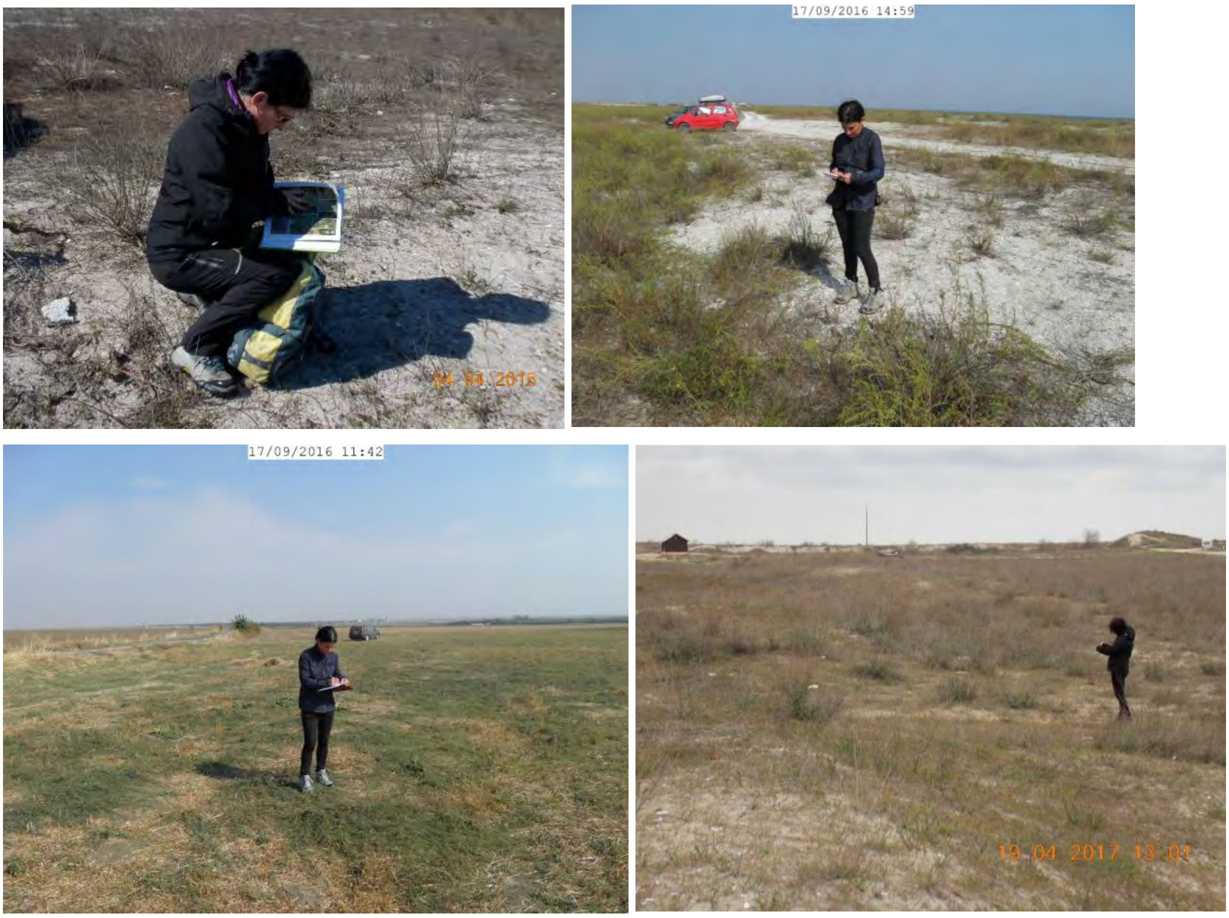


Photo 9.1 Botanist Oana Zamfirescu during surveys (2015, 2016, 2017)

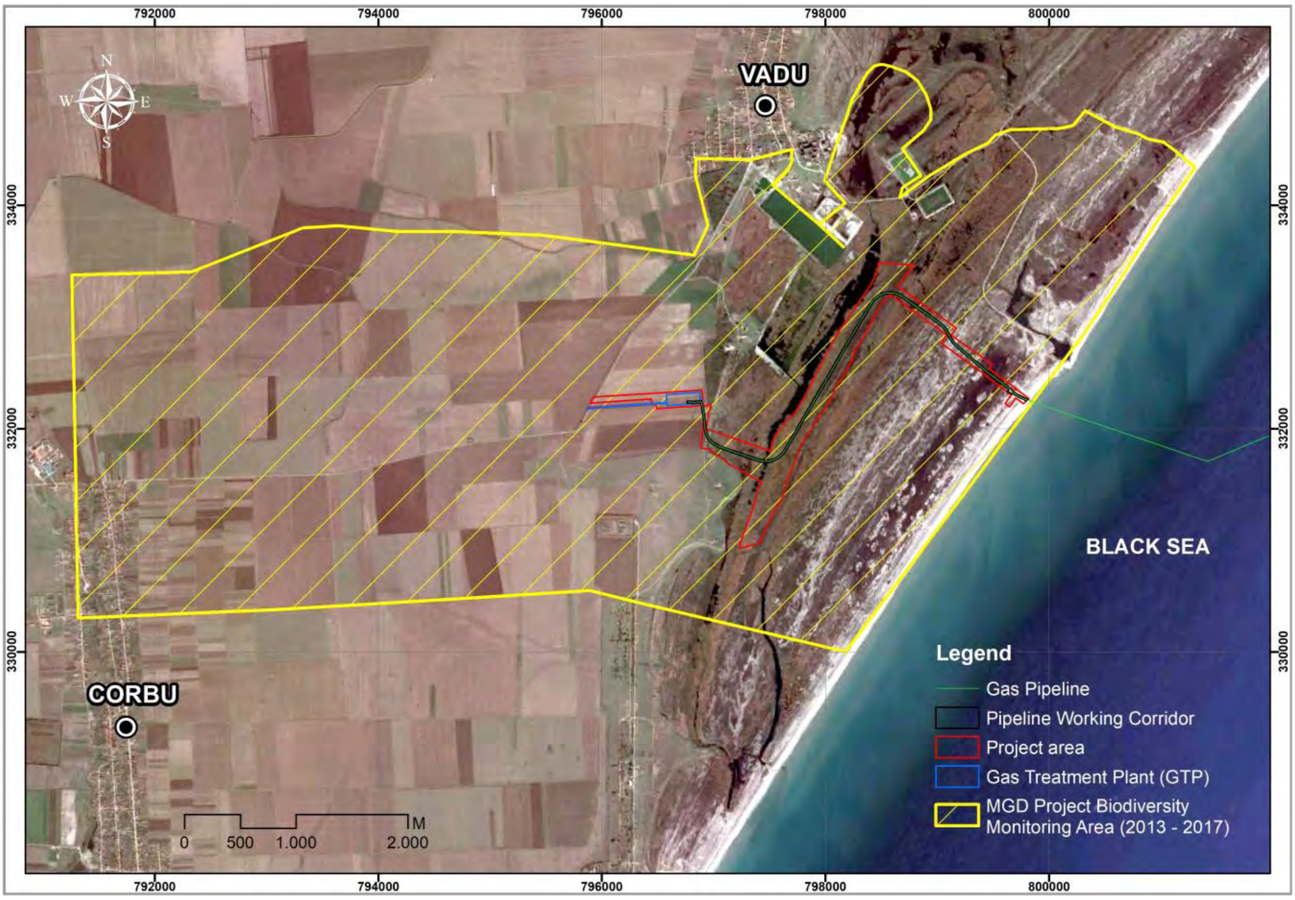


Figure 9.8 MGD Project Biodiversity Monitoring Area (2013-2017)

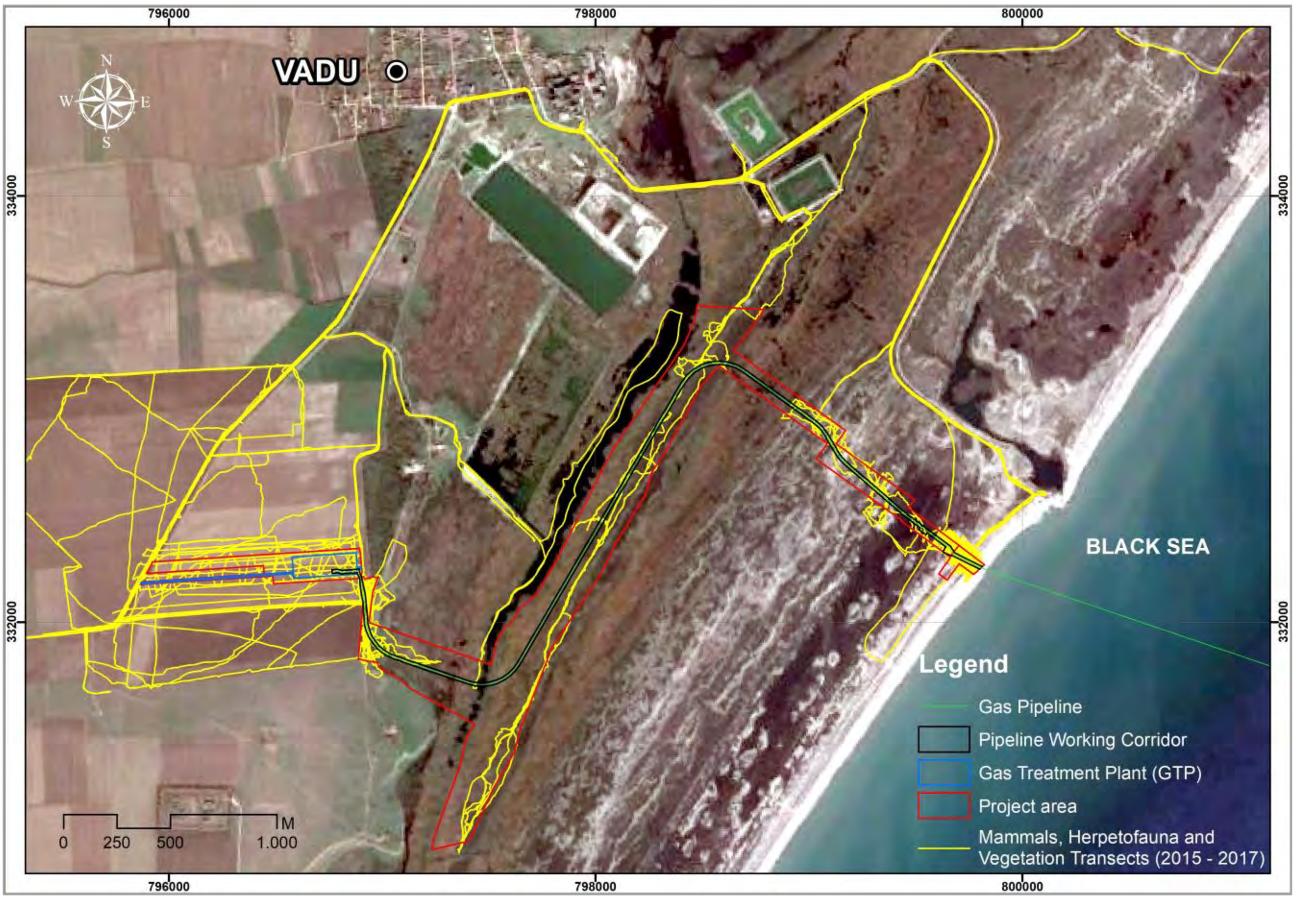


Figure 9.9 Transects for mammals, herpetofauna and vegetation during the monitoring campaigns from 2015-2017

All types of plants and vegetal associations on the route of the pipeline and in the area of the Natural gas treatment station were identified. Figure 9.10 presents the distribution map of the plant associations identified in the proposed project area whilst Photos 9.2 and 9.3 describe the condition of the area.

Among these, the association *Artemisio santonicae – Juncetum maritimi*, associations of *Juncus maritimus* and *Juncus litoralis* fall within the habitat of community importance 1410 - Salt Meadows of Mediterranean type (*Juncetalia maritimi*).

This habitat is found in the area of the Section I of pipeline and in the area of the connection pipeline section. During site monitoring performed by AUDITECO team in 2015, 2016 and 2017, no species of plants of community importance mentioned in the Standard form of ROSCI0065 Danube Delta was identified in the PP areaThe following species of vascular plants identified in the beach area are listed on the Red List of Vascular Plants in Romania (Oltean&al., 1999): *Crambe maritima* L. - Status: Endangered (EN), *Dianthus bessarabicus* – conservation status EN (Endangered), *Elymus farctus* - Status: Critically endangered (CR), *Eryngium maritimum* - Status: Vulnerable (VU). None of them are species of community interest according to Habitats Directive.

Of these species, only Crambe maritima and Eryngium maritimum were identified in the footprint of the pipeline corridor and are mentioned in the Standard Form of ROSCI0065 – Danube Delta at the category – Other important species of flora or fauna.

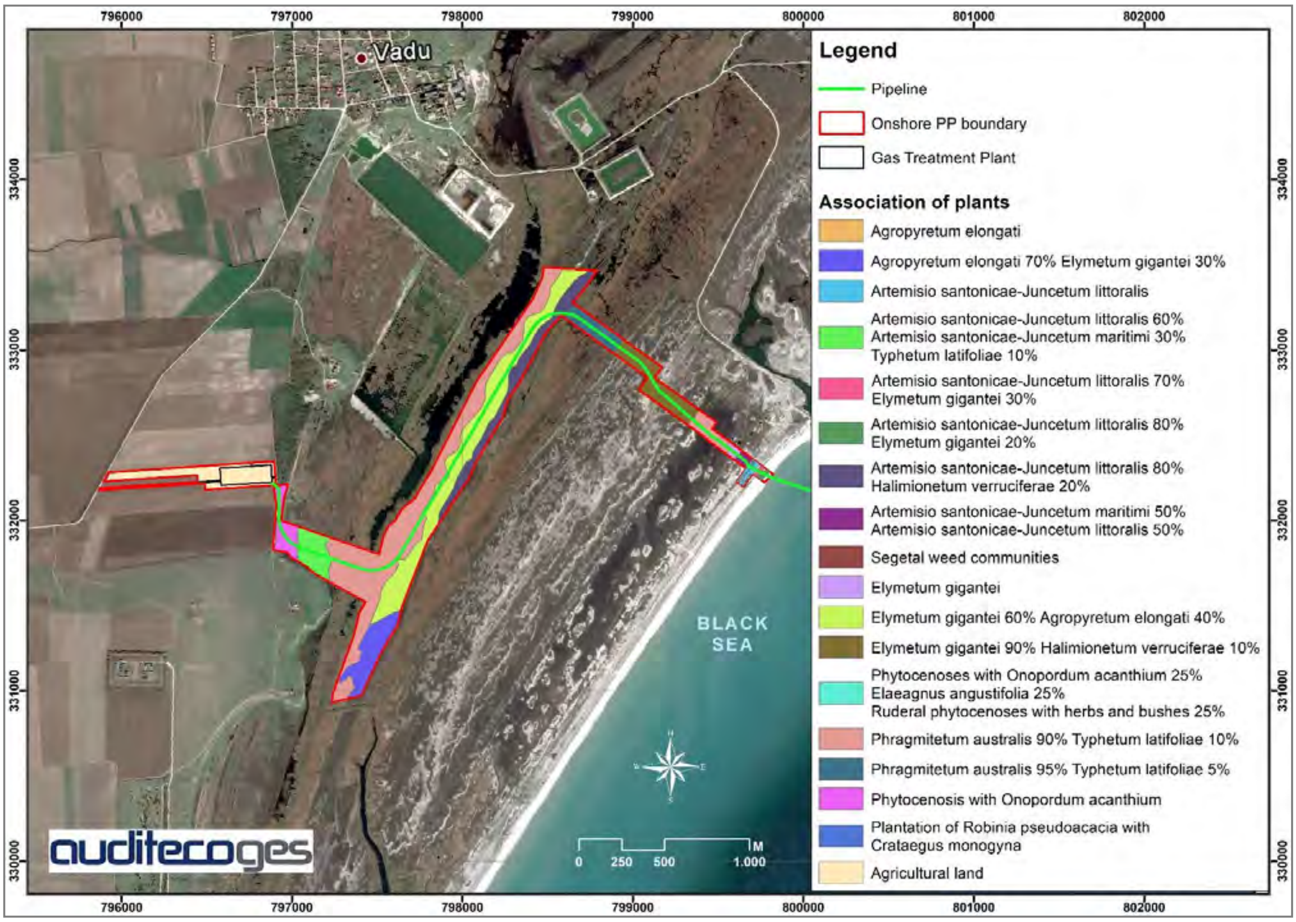


Figure 9.10 Distribution of plant associations in area of the MGD Project

Photo 9.2 Plant association *Artemisio santonicae-Juncetum littoralis* Association (which is part of 1410 Natura 2000 habitat) in the area of the beach pipeline corridor footprint - 17.09.2016 (photo: Oana Zamfirescu)

Photo 9.3 Plant association *Artemisio santonicae-Juncetum littoralis* Association (which is part of 1410 Natura 2000 habitat) in the area of the beach pipeline corridor footprint - 17.09.2016 (photo: Oana Zamfirescu)

Photo 9.4 Plant association *Artemisio santonicae-Juncetum maritimi* – which is part of 1410 Natura 2000 habitat– in the area of pipeline corridor footprint 04.04.2015 (photo: Oana Zamfirescu)

Photo 9.5 Plant association *Artemisio santonicae-Juncetum maritimi* – which is part of 1410 Natura 2000 habitat– in the area of pipeline corridor footprint

9.3.2.3 Characterisation of the onshore MGD Project area – Mammal species of community importance

According to Natura 2000 Form for ROSCI0065 Danube Delta, the following mammal species of community importance are likely to be found in the Project's onshore area: 1337 — Castor *(Castor fiber),* 2609 – Romanian hamster (*Mesocricetus newtoni),* 1356* — * European mink, Russian mink, Small otter, Water polecat *(Mustela lutreola)*, 2633 — Steppe polecat *(Mustela eversmanii),* 2635 — Marbled polecat *(Vormela peregusna)*, 1335 — European ground squirrel, European souslik *(Spermophilus citellus)*, 1355 — Otter *(Lutra lutra).*

The field surveys performed by RSK team in 2013 in the MGD Project area took place between May 13th and 16th, 2013 and on May 22nd, 2013. The purpose of this monitoring was to offer a representative imagine for the abundance and diversity of the species of mammals in the investigated area and to give recommendations on the final design of the pipeline route.

The field surveys performed by AUDITECO team in 2015 over three months, during the intervals April 3rd-6th, 2015, May 1st-4th, 2015 and May 29th – June 1st, 2015 took place without limitations, except for the interval April 3rd-6th, 2015 when the access to the studied area was restricted because of large flooded surfaces and the activity of mammal species was reduced because of suboptimal climate conditions (low temperatures between 6 and 9^{o}C).

In 2016 and 2017, the site investigations performed by AUDITECO team took place between the following intervals: July 25th-27th, 2016, August 19th-22nd, 2016 and September 16th-18th, 2016, April 19th-21st, 2017, May 26th-29th, 2017 and June 16th-19th, 2017 and took place without significant limitations. The areas surveyed are shown in Figure 9.9.

In the Flora and fauna monitoring report (2013) - developed by RSK, the presence of mammal species of community importance was identified on the surface they monitored: *Lutra lutra* and *Spermophilus citellus*.

The European ground squirrel was identified in the area of the agricultural lands close to Vadu locality, close to the former Rare Metal Plant and in the onshore areas on Chituc sand bank (especially those next to the access roads).

According to the conclusions of RSK monitoring of 2013, the otter occupies many of the aquatic habitats, both close to Vadu village and close to the ponds located in the most eastern part of their monitoring area (fishery) and even in a small bay in the Black Sea. Obvious traces (recent faeces) were discovered in those areas located outside the Project area at approximately 500 m and 1000 m respectively north from it, but the cameras installed did not record any otter during monitoring. Most probably, this is because of the abundance of live pray, which resulted in the bait in the traps (unfrozen fish) having been completely not tempting for this species.

During the monitoring made by AUDITECO, the presence in the MGD Project onshore area was identified for the same species of community importance identified by RSK team in 2013 as well, *Lutra lutra* and *Spermophilus citellus.*

The European ground squirrel was identified in the area included between the extraction plant for rare metals and its two settling ponds (close to the road), in the area of the access road towards the restaurant on the beach and on the surface and in the vicinity of the P264/1 parcel. On P264/1 parcel burrows were identified, and they continue towards west towards agricultural or grass land lots. During the monitoring activities performed by AUDITECO in 2016, it was identified the presence of burrows in the agricultural land lots and of the GTP of *Spermophilus citellus* (European ground squirrel) - species of community importance. Burrows of European ground squirrel were identified in several locations in the area of the agricultural land lots, in the southern and western part of the false acacia forest, on the roads next to the acacia plantation. In 2016, in the GTP area, only one burrow of European ground squirrel (*Spermophilus citellus) was noticed.* However, the active presence of the species was not recorded, no European ground squirrel was noticed using this burrow.

During the monitoring activities performed by AUDITECO in 2017, the presence of *Spermophilus citellus* species was not indicated at the GTP location.

Related to the otter, no shelters were found in the MGD Project onshore area. Obvious traces (recent faeces) were discovered on the concrete road from Vadu village to the beach and in the Southern corner of the settling pond of Rompetrol Rafinare, communicating with Balta Mare (all locations being outside the Project footprint area). Also, obvious traces were noticed (marks on soil) in the area between Balta Mare and Balta de Mijloc, this area being most probably used by otters when moving from one pond to the other. . However, no otter specimen was directly identified in the mentioned areas, although within the site investigations performed by AUDITECO team 2015, night monitoring was performed where faeces was found by RSK team in 2013. Probably due to the intense road traffic of tourists who travelled from Vadu village to the beach area, the otters have moved from these areas to other areas more to the north.

Photo 9.6 Traces of otters (Lutra lutra) identified in the area of Balta Mare and Balta Mica ponds

Photo 9.7 Otter burrow identified outside the MGD Project area, near a bridge of the concrete road from Vadu village to the beach

Figure 9.11 shows the distribution of recorded mammal species in relation to the project area.

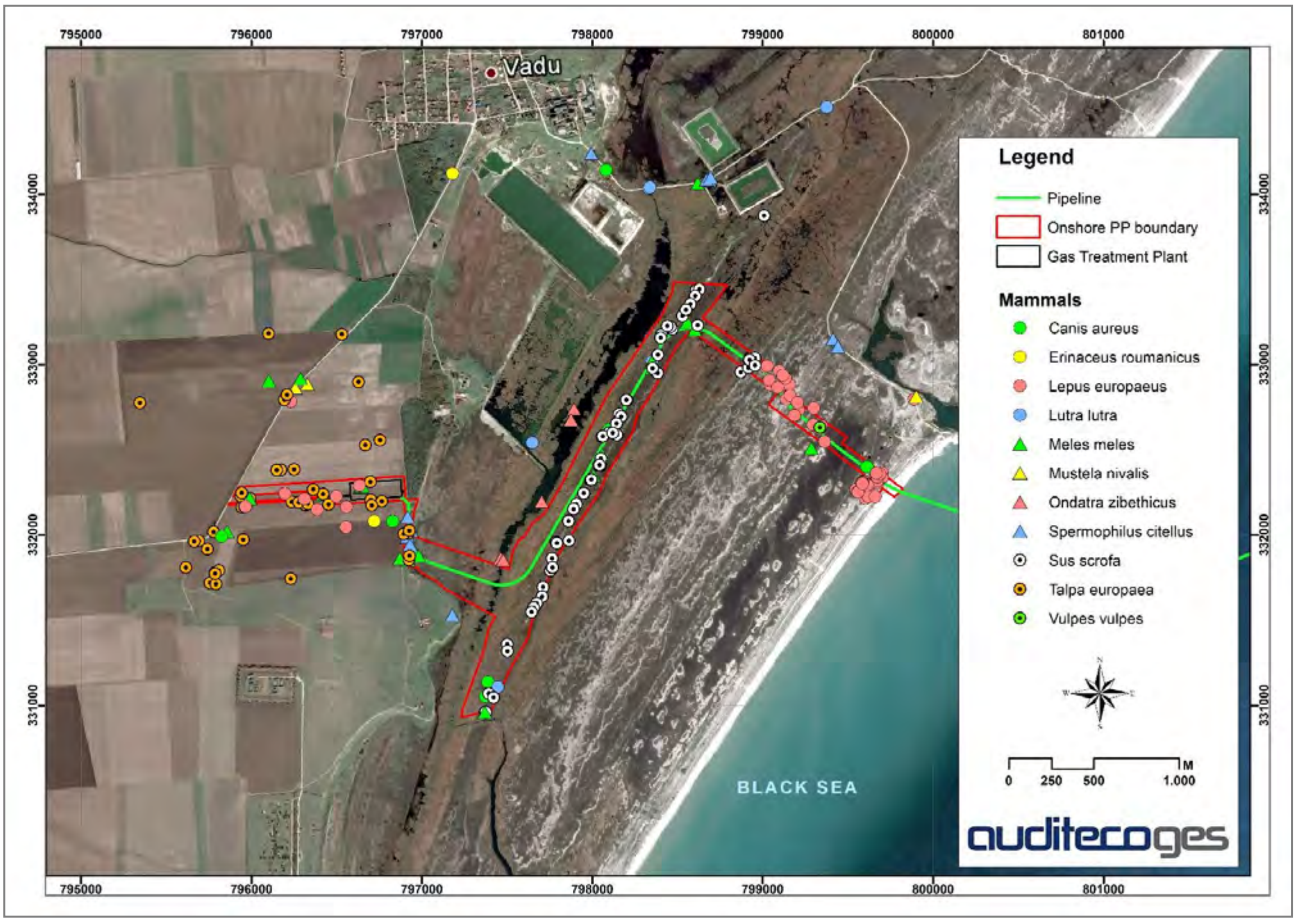


Figure 9.11 Locations of mammal species identified in the proposed project area

9.3.2.4 Characterisation of the onshore MGD Project area – Amphibian and reptile species of community importance

According to the Natura 2000 Standard Form of the ROSCI0065 Danube Delta, it is likely to find the following amphibian and reptile species of community importance in ROSCI0065 and in its vicinity as well: 1188 - European fire-bellied toad *(Bombina bombina)*, 1220 — European pond turtle *(Emys orbicularis)*, 1219 — Spur-thighed tortoise *(Testudo graeca)*, 1993 — *Danube crested newt (Triturus cristatus dobrogicus)*, 0001 — Meadow viper *(Vipera ursinii (Vipera ursinii moldavica, Vipera ursinii renardi* and/or intermediary forms).

The field investigations performed by RSK team in the MGD Project onshore area took place between May 13th and 16th, 2013 and on May 22nd, 2013.

The investigations on site performed by AUDITECO team (Photo 9.8) during the intervals April 3rd-6th, 2015, May 1st-4th, 2015 and May 29th – June 1st, 2015 took place without limitations, except for the interval April 3rd-6th, 2015, when the access to the pipeline corridor footprint area was restricted because of large flooded surfaces and the species of amphibians and reptiles were lowly active because of suboptimal climate conditions (low temperatures between 6 and 9°C). Between May 29th – June 1st, 2015 the climate conditions were also less favourable for observing species of amphibians and reptiles, because of relatively high temperatures during the day (up to 25 °C). However, unlike the time period in April, the flooded surfaces in the MGD Project area were much more restrictive and the access was therefore easier. The areas surveyed are shown in Figure 9.9.

Photo 9.8 Expert in mammals and herpetofauna Stefan Zamfirescu during different monitoring campaigns from 2015, 2016 and 2017

In the Flora and fauna monitoring report (RSK, 2013), the presence of the following species of community importance was identified in an area including the area of Section I as well as extending to the north and to the west from it: the European pond turtle *(Emys orbicularis)* (shell) and the Spur-thighed tortoise *(Testudo graeca)*.

During the site investigations performed by AUDITECO team in 2015, in the MGD Project area, the presence of the following species of amphibians and reptiles of community importance was identified in the area of the pipeline corridor footprint: European fire-bellied toad *(Bombina bombina)*, the European pond turtle *(Emys orbicularis)* and the Spur-thighed tortoise *(Testudo graeca)*.

- *Bombina bombina* was observed on wide surfaces in the wetlands in the eastern and in the western part of the pipeline corridor footprint respectively and in the wetlands in the northern, central-eastern and southern parts of pipeline corridor. It is important to mention that a large part of the surfaces where the presence of this species was identified in the area of the pipeline corridor are areals temporarily flooded, which have constantly reduced their surface throughout the monitoring time period. The individuals of this species usually retire to permanently wet areas during the summer-autumn interval;
- Specimens of *Emys orbicularis* were identified in the perimeter of the pipeline corridor only in its western part in the same area where the presence of *Bombina bombina* was also identified and also in the the south of the plot of land located in MGD Project eastern extremity, located next to the beach. Other specimens were noticed in the wetlands located to the eastern part of the former settling ponds

of the Rare Metal Factory. An individual was also identifiedcin a concrete-covered basin located in front of the southern access gate in the former Rare Metal Factory; and

- Specimens of *Testudo graeca* were identified mostlyin the beach area and in the pipeline corridor inflection area, at half the distance between the beach and the area included between Balta Mare and Balta de Mijloc. Other specimens were identified in the area between Balta Mare and Balta de Mijloc.

As a result of the monitoring campaigns performed by AUDITECO and RSK in the GTP area no species of reptiles and amphibians of community importance were observed

Figure 9.12 shows the distribution of recorded amphibian and reptile species in relation to the project areas.

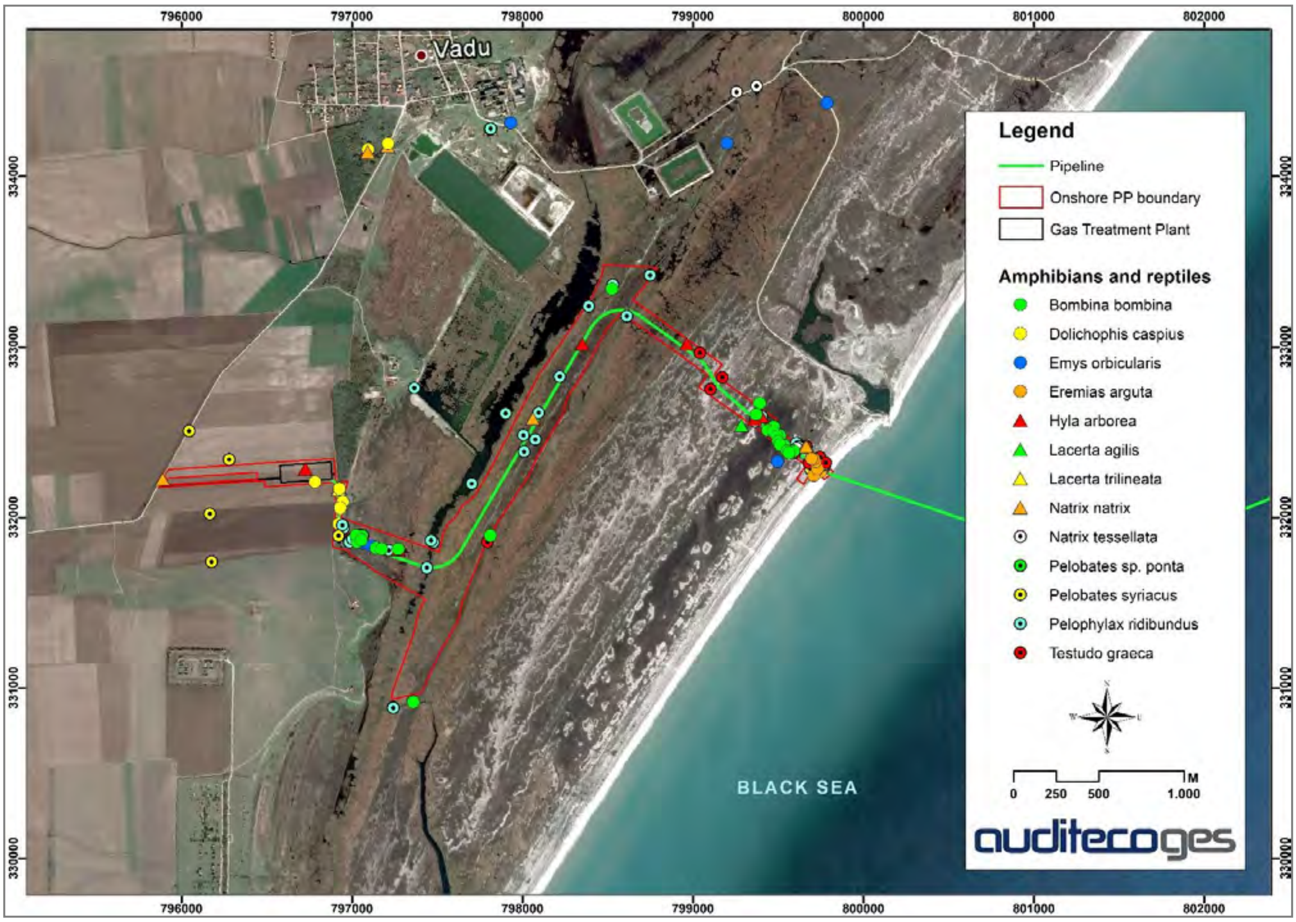


Figure 9.12 Locations of species of amphibians and reptiles identified in the proposed project area

9.3.2.5 Characterisation of the onshore MGD Project area – Invertebrate species of community importance

According to Natura 2000 Form for the ROSCI0065 Danube Delta, it is likely to find the following invertebrate species in the PP onshore area: 1060 — *(Lycaena dispar),* 1037 — *(Ophiogomphus cecilia)*, 4027 — *(Arytrura musculus),* 4028 — *(Catopta thrips)*, 4036 — *(Leptidea morsei)*, 4030 — Danube Clouded Yellow *(Colias myrmidone)*, 1089 — *(Morimus funereus)*, 1082 — Water beetle *(Graphoderus bilineatus)*, 4064 — Striped nerite *(Theodoxus transversalis)*, 4056 — Ramshorn snai *(Anisus vorticulus)* and 4045 — Ornate bluet *(Coenagrion ornatum)*.

The invertebrate species of community importance in the MGD Project onshore area were monitored in the following intervals: in 2015 (May 1st-4th) 2015, July 27th-28th, August 19th-20th, 2016, May 5th-8th, 2017 and June 1st-5th 2017 by AUDITECO team. The areas surveyed are shown in Figure 9.13. The main method used on site in order to gather information on these species was that of pedestrian linear transect (Photo 9.9).

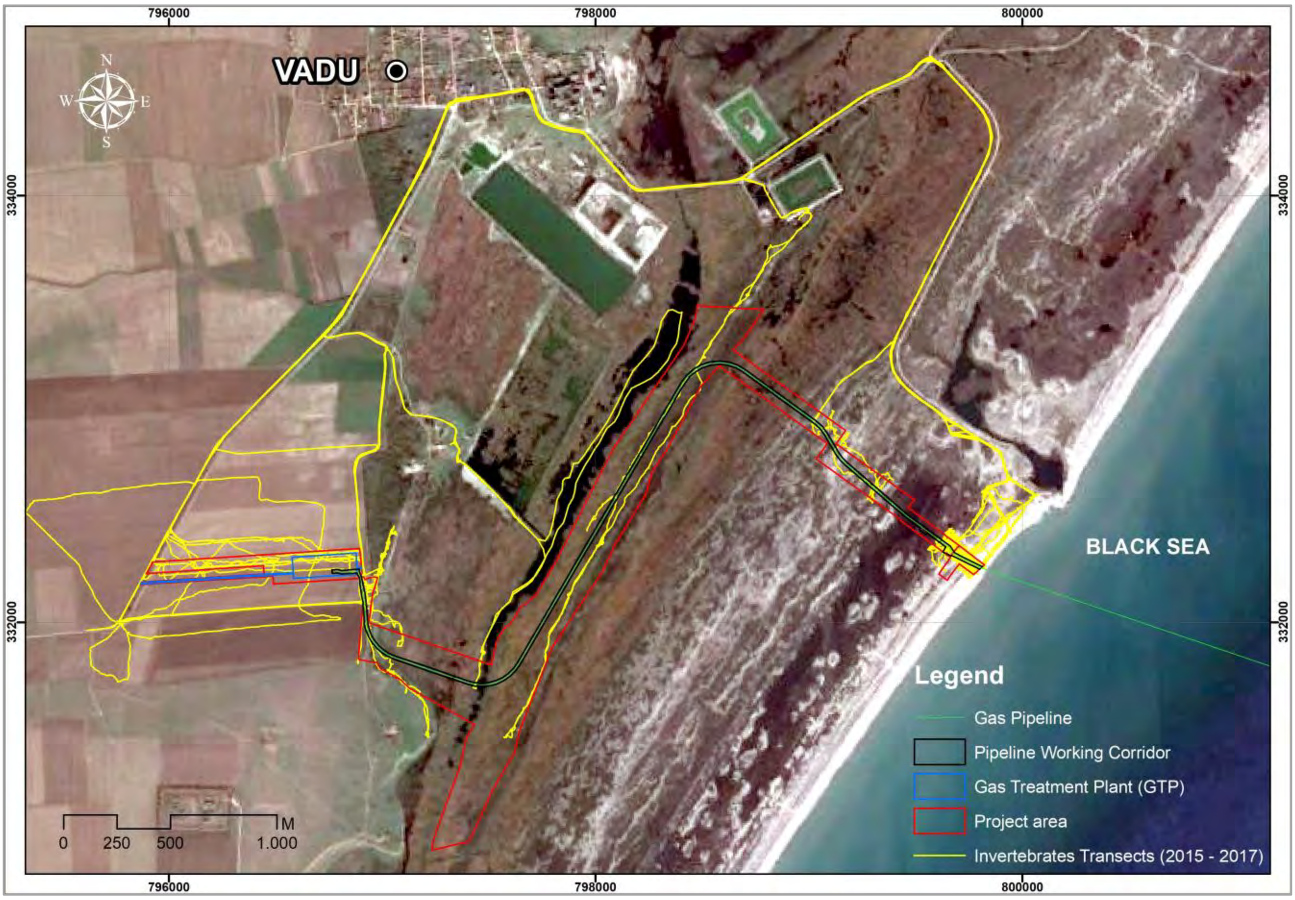


Figure 9.13 Transects for Invertebrates during the monitoring campaigns from 2015-2017

Photo 9.9 Enthomologist Irinel Popescu during different monitoring campaigns from 2015, 2016 and 2017

In the area of the steep located in the western part of the pipeline corridor, close to the GTP and near the western limit of ROSCI0065 – Danube Delta at about 100 – 150 m eastwards, three species of community importance were identified in 2016: *Lycaena dispar*, *Catopta thrips* and *Helix pomatia* and in 2017 only two of these species of community importance were identified: *Lycaena dispar* and *Helix pomatia.*

9.3.2.6 Characterisation of the onshore MGD Project area – fish species of community importance

According to Natura 2000 Standard Form for the ROSCI0065, it is likely to find the following fish species in the MGD Project onshore area: 1130 — asp *(Aspius aspius)*, 1134 — European bitterling *(Rhodeus sericeus amarus)*, 1146 — golden spined loach *(Sabanejewia aurata),* 1160 — streber *(Zingel streber)*, 2555 — Balon's ruffe *(Gymnocephalus baloni),* 2511 — Kessler's gudgeon *(Gobio kessleri)*, 1159 — common zingel *(Zingel zingel)*, 1124 — White-finned gudgeon *(Gobio albipinnatus)*, 1157 — Schraetzer *(Gymnocephalus schraetzer)*, 4120 — Black Sea shad *(Alosa tanaica)*, 2522 — sabre carp *(Pelecus cultratus)*, 2491 — Pontic shad *(Alosa pontica (immaculata))*, 2011 — European mudminnow *(Umbra krameri)*, 1145 — European weatherfish or European weather loach *(Misgurnus fossilis)* and 1149 — spined loach *(Cobitis taenia)*.

In order to gather information about the possible presence of these fish species of community importance, two transects were performed by boat on the surface of Balta Mare in the area of the the pipeline corridor footprint. When these transects were performed on May 3rd and 13th, 2015 **no specimens of these species were identified** and their presence in the ponds crossed by the Project (Balta Mare and Balta de Mijloc) is highly unlikely.

9.3.2.1 Characterisation of the onshore MGD Project area – bird species of community importance

Taking into account that all of the bird species of community importance listed in the Natura 2000 Standard Form of the ROSPA0076 Black Sea are also found the Natura 2000 Standard Form of the ROSPA0031 Danube Delta and the Razim-Sinoie Complex and that due to the location of the below ground pipeline route for natural gas transportation inside ROSPA0031 and in ROSPA0076's immediate vicinity, the birds of the two protected natural areas freely cross the MGD Project area, consequently they were uniformly analysed.

In order to monitor bird species, monitoring campaigns (Photo 9.10) took place in the following time periods:

> 2015: January 22nd, January 28th, January 29th, February 11th, February 19th, February 27th, 2015 and March 10th, March 21st, April 20th, April 30th, May 13th and May 14th, 2015 respectively.

> 2016: October 22nd, October 31st, November 5th, December 15th, December 27th,

> 2017: January 3rd, January 15th, February 4th, February 17th, March 9th, March 17th, March 25th, April 9th, April 14th, April 26th, May 17th, May 23rd, June 5th, June 21st.

The areas surveyed are shown in Figure 9.14 and 9.15. During the monitoring campaigns of 2015 and 2016 performed by AUDITECO, the same types of species were basically registered as those identified in 2017.

Table 9.15 presents the bird species **listed in Appendix I of the Council Directive 2009/147/EC** observed in the area of the three components of the proposed project and in its vicinity by AUDITECO team during the monitoring campaigns of January 2016 – 2017.

Following the monitoring activities performed by AUDITECO team in the MGD Project onshore area and in its vicinity, the following species of birds listed in Annexe I of Council Directive 2009/147/EC were identified or nesting: purple heron (*Ardea purpurea*), Eurasian bittern (*Botaurus stellaris*), white stork (*Ciconia ciconia*), ferruginous duck (*Aythya nyroca*), western marsh harrier (*Circus aeruginosus*), pied avocet (*Recurvirostra avosetta*), black-winged stilt (*Himantopus himantopus*), common tern (*Sterna hirundo*), calandra lark (*Melanocorypha calandra*), tawny pipit (*Anthus campestris*), red-backed shrike (*Lanius collurio*), lesser grey shrike (*Lanius minor*) and red-footed falcon (*Falco vespertinus*). Also, the following species were identified nesting: common shelduck (*Tadorna tadorna*), Eurasian skylark (*Alauda arvensis*), gadwall (*Anas strepera*) and corn bunting (*Miliaria calandra*).

In the area of the GTP, no bird species listed in Appendix I of Council Directive 2009/147/EC were registered nesting.

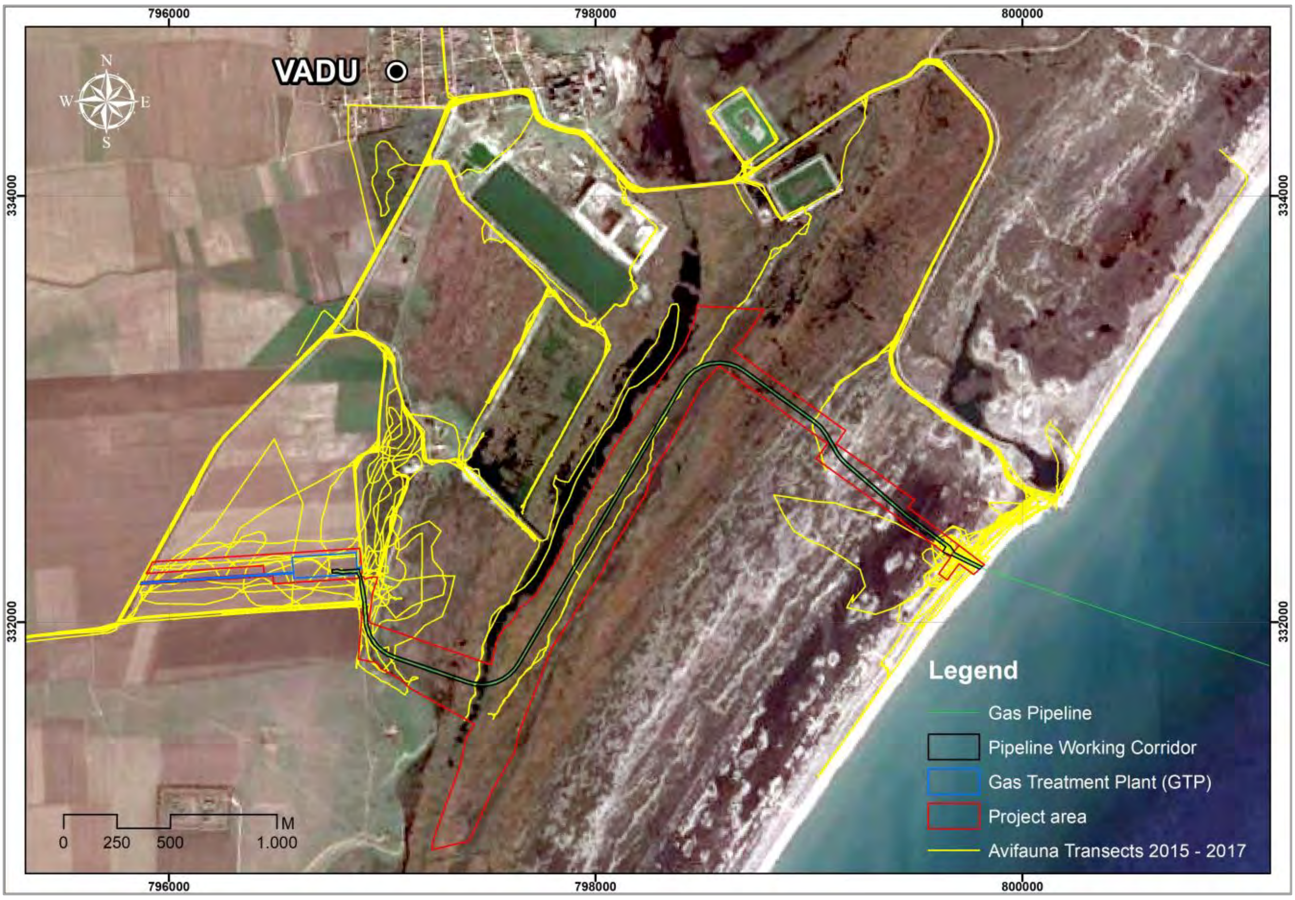


Figure 9.14 Transects for avifauna during the monitoring campaigns from 2015-2017

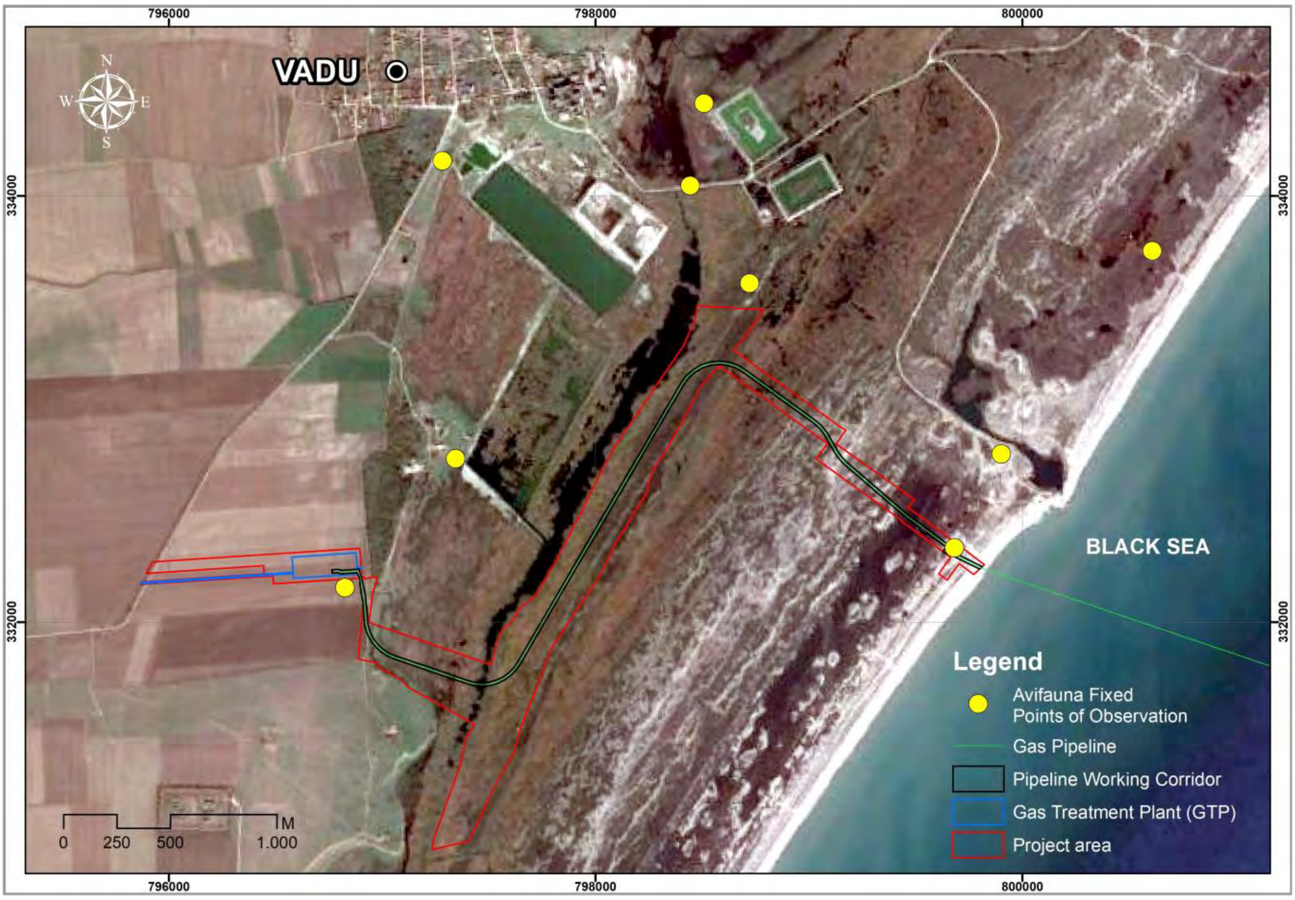


Figure 9.15 Fixed Observation Points for avifauna during the monitoring campaigns from 2015-2017

Photo 9.10 Ornithologist Gabriel Banica during different monitoring campaigns from 2015, 2016 and 2017

Table 9.15 Bird species listed in Appendix I of the Council Directive 2009/147/EC noticed in the area of the GTP and in its vicinity by the AUDITECO team in 2016-2017

No.	Species of birds from Annex I of Birds Directive 2009/147/EC and from the Natura 2000 Standard Forms for ROSPA0031 and ROSPA0076 identified in the MGD Project Area by RSK and Auditeco ornithologist teams																						
	Scientific name	2013				2014	2015					2016						2017					
		Jan	Mar	Apr	May	Nov	Jan	Feb	Mar	Apr	May	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	*Alcedo atthis*	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	*Ardea purpurea*	-	-	10	2	-	-	-	-	-	5	-	1	-	-	-	-	-	-	-	1	-	-
3	*Ardeola ralloides*	-	-	3	6	-	-	-	-	2	-	-	1	-	-	-	-	-	-	-	1	-	-
4	*Anthus campestris*	-	-	2	3	-	-	-	-	8	16	4	4	4	-	-	-	-	-	-	-	3	-
5	*Aquila pomarina*	-	1	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
6	*Aythya nyroca*	2	-	79	42	-	-	-	110	70	110	-	-	-	-	-	-	-	-	-	-	-	-
7	*Botaurus stellaris*	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-
8	*Buteo rufinus*	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	1	-	-
9	*Chlidonias niger*	-	-	6	3	-	-	-	-	1	8	-	-	-	-	-	-	-	-	-	-	-	-
10	*Chlidonias hybridus*	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	4	-
11	*Ciconia ciconia*	-	-	5	4	-	-	-	1	5	2	-	1	-	-	-	-	-	-	1	-	6	-
12	*Circus aeruginosus*	12	-	15	11	-	-	-	1	5	2	2	2	2	4	3	3	8	3	5	8	3	5
13	*Circus cyaneus*	4	-	-	-	-	1	1	-	1	-	-	-	-	-	-	1	4	2	1	-	-	-
14	*Cygnus cygnus*	-	-	-	-	-			-		-	-	-	-	-	-	24	48	82	-	-	-	-
15	*Circus macrouros*	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-
16	*Circus pygargus*	-	-	-	-	-	1	1	-	1		1		-	-	-	-	-	-	-	-	-	-
17	*Coracias garrulus*	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	*Dendrocopos syriacus*	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-
19	*Egretta alba*	-	14	1	1	-	-	-	-	-	-	1		5	2	-	-	-	-	-	-	-	-
20	*Egretta garzetta*	-	2	12	-	-	-	-	3	16	5		3	2	8	4	-	-	-	4	-	-	1
21	*Falco columbarius*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	*Falco peregrinus*		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

No.	Species of birds from Annex I of Birds Directive 2009/147/EC and from the Natura 2000 Standard Forms for ROSPA0031 and ROSPA0076 identified in the MGD Project Area by RSK and Auditeco ornithologist teams																						
	Scientific name	2013				2014	2015					2016						2017					
		Jan	Mar	Apr	May	Nov	Jan	Feb	Mar	Apr	May	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
23	*Falco vespertinus*	-	-	3	-	-	-	-	-	-	10	12	20	2	-	-	-	-	-	-	6	16	14
24	*Gavia arctica*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
25	*Glareola pratincola*	-	-	5	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	*Haliaeetus albicilla*	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
27	*Himantopus himantopus*	-	-	66	5	-	-	-	-	20	70	-	-	-	-	-	-	-	-	-	-	-	-
28	*Lanius collurio*	-	-	-	4	-	-	-	-	-	16	6	6	-	-	-	-	-	-	-	-	-	-
29	*Lanius minor*	-	-	-	1	-	-	-	-	-	28	8	8	-	-	-	-	-	-	-	-	-	-
30	*Larus genei*	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	*Larus melanocephalus*	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	2	-	-
32	*Larus minutus*	-	32	709	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	22	-
33	*Melanocorypha calandra*	250	1	-	4	-	2	3	4	30	20	4	22	20	12	28	-	-	-	-	-	-	-
34	*Nycticorax nycticorax*	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	*Pelecanus crispus*	-	-	8	4	-	-	-	7	-	1	12	6	-	-	-	-	-	-	6	12	-	-
36	*Pelecanus onocrotalus*	-	-	289	131	-	-	-	-	-	1	15	-	-	-	-	-	-	-	24	1	47	-
37	*Phalacrocorax pygmaeus*	-	-	-	-	15	-	-	-	-	6	-	-	-	18	9	-	4	-	-	-	-	-
38	*Phalacrocorax carbo sinensis*	-	-	-	-	-	-	-	-	-		7	-	8	-	-	-	-	-	-	-	-	-
39	*Philomachus pugnax*	-	30	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	*Platalea leucorodia*	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	*Plegadis falcinellus*	-	-	-	14	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-
42	*Recurvirostra avosetta*	-	-	-	4	55	-	-	-	50	220	-	-	-	-	-	-	-	-	-	-	-	-
43	*Sterna albifrons*	-	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-

No.	Species of birds from Annex I of Birds Directive 2009/147/EC and from the Natura 2000 Standard Forms for ROSPA0031 and ROSPA0076 identified in the MGD Project Area by RSK and Auditeco ornithologist teams																						
	Scientific name	2013				2014	2015					2016						2017					
		Jan	Mar	Apr	May	Nov	Jan	Feb	Mar	Apr	May	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
44	*Sterna caspia*	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	*Sterna hiroundo*	-	-	36	783	-	-	-	-	127	760	8	4	-	-	-	-	-	-	-	-	29	44
46	*Sterna sandvicensis*	-	-	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

9.3.3 Potential impacts upon onshore biodiversity

Table 9.16 presents the assessment of potential impacts on onshore biodiversity.

Table 9.16 Types of impact likely to affect the protected natural areas of community importance

Receptor/Impact target	Phase of the project	Potential impact
Biodiversity (*Percentage of the surface of the habitats of community importance to be lost*)	Construction/ Decommission	As a result of detailed field investigations, only the following habitat of community importance was identified in the MGD Project area: 1410 Salt Meadows of Mediterranean type (*Juncetalia maritimi*). However, due to the fact that the shoreline of Black Sea is constantly changing the Project may affect habitat 1140 Sand areas that are not covered by sea water during reflux on a very little surface. The project footprint overlaps approximatively 7,840 m^2 from this habitat which represents 0,017% from the total surface of 4,540.37 ha which this habitat occupies inside ROSCI0065 – Danube Delta. However, taking into consideration that horizontal directional drilling will be performed on a surface overlapping one of the areas which this habitat occupies inside the footprint of the project, the total temporary affected surface will represent 5,932 m^2 which represent 0,013% from the 4,540.37 ha which this habitat occupies inside ROSCI0065 – Danube Delta. No habitat of community importance was identified on the surface corresponding to the GTP. On the surface temporarily affected by works, the habitats of community importance will be regenerated in approximately 5 (five) years after the installation of the onshore segment of the upstream gas transmission pipeline.
Biodiversity (*The percentage to be lost from the surfaces of the habitats used for food, rest and reproduction needs of the species of community importance*)	Construction/ Operation/ Decommission	A surface of 3.4 ha will be permanently lost from agricultural land representing feeding habitat for a series of species of birds/fauna of community importance. This surface represents the built surface of the GTP. The species of birds/fauna of community importance use the entire area of the agricultural land located between Vadu and Corbu villages for feeding and nesting.
	Construction/ Decommission	The maximum surface of habitats (including those of community importance) that are used or that can be used for food, rest and reproduction needs by the species of community importance, surface which will be temporarily affected by the MGD Project implementation is approximately 10.3 ha within ROSCI0065 Danube Delta (approximately 0.002% of the total surface of the habitats) and 0.01 ha within the ROSCI0066 Danube Delta – marine area (less than 0.001 % of the total surface of habitats). This surface represents the area temporarily occupied by the working corridor needed for locating the onshore segment of the Ana Platform – GTP pipeline. The surface of habitats from Natura 2000 sites to be temporarily lost represents a very low percentage of the total surface of the habitats in these sites and in the vicinity of the working corridor, similar habitats exist on large surfaces. Also, the revegetation of the surfaces temporarily affected by works and the habitat recovery will start in the first vegetative season after the onshore segment of the upstream supply pipeline pipeline was installed.
Biodiversity (*Fragmentation of habitats of community importance - expressed in percentages*)	Construction/ Decommission	The fragmentation of the habitat of community importance 1410 Salt Meadows of Mediterranean type (*Juncetalia maritimi*) will be temporary and this habitat will likely regenerate in 5 years.
Biodiversity (*Duration or persistence of fragmentation*)	Construction/ Decommission	Under normal conditions, after pipeline installation works are completed, on the surface temporarily affected by the interspecific relations among the flora species making up the habitat of community importance 1410 Salt Meadows of Mediterranean type (Juncetalia maritimi) are estimated to recover in approximately 5 years. The fragmentation of the habitat of community importance 1140 Sand and boggy areas that are not covered by sea water is estimated to be temporary, only during construction.
Biodiversity (*Duration or persistence of disturbance*	Construction/ Decommission	The disturbing impact caused by noise, light and vibrations upon the species of community importance identified in the area of the onshore segment of the upstream supply pipeline will be short This could be higher if the works take place in the spring-summer season, when reproduction takes place for most species of community importance identified on site.

Receptor/Impact target	Phase of the project	Potential impact
caused to the species of community importance, distance to the protected natural area of community importance)	Construction/ Decommission	The transportation activities for materials necessary for pipeline installation from the site management area to the area of the working corridor corresponding to the onshore pipeline for gas transportation can also represent a disturbing factor upon species of community importance (Spermophilus citellus, Emys orbicularis, Dolichophis caspius, chiroptere) observed in the immediate vicinity or even crossing the exploitation roads outside the route of the onshore pipeline for gas transportation. This effect can be magnified if the installation works for the of the onshore segment of the upstream gas transmisison pipeline are performed in spring-summer, when the the traffic intensity in the area is much higher than in other times of the year, because of the great number of tourists choosing Vadu beach as summer destination.
	Construction/ Operation/ Decommission	The disturbing impact caused by the noise, light and vibrations associated with works in the activities of construction/decommissioning phase and in the activities related to GTP operation can be generated upon the species of community importance red-footed falcon (*Falco vespertinus*) nesting in the false acacia forest located in the immediate vicinity of the MGD Project. The impact could be higher in the spring-summer season, when the reproduction of these species takes place. The activities in the construction/decommission phase and the activities during GTP operation can represent a disturbing factor upon European ground squirrel (*Spermophilus citellus*) species of community importance. The active presence of these species was not confirmed on the GTP surface and no specimens were noticed using the nests identified on the MGD Project surface or in its vicinity.
	Construction/ Operation/ Decommission	The disturbing impact caused by the light associated with works in the activities of construction/decommissioning and the activities related to GTP operation can be generated upon the *Catopta thrips*, a species of moth of community importance, that was identified in the vicinity of the GTP.
Biodiversity (*Changes in population density (no. of individuals/surface*)	Construction/ Operation/ Decommission	Taking into account that by building the GTP, part of the feeding and/or resting and/or reproduction habitat used by species of community importance identified in the area of the GTP will be lost, a change of the density of these populations cannot be excluded in the long term.
	Construction/ Decommission	During construction/decommission, the density changes are estimated to be mostly caused by individuals using the area of the GTP and the immediate vicinity for feeding that will move to more quiet areas. The individuals will move because of disturbing activities (noise, light, vibrations) performed during construction and decommissioning respectively. Another factor that could cause changes in population density, but having much lower influence (as MGD Project area is used only for feeding) is the direct mortality of the individuals that could be crushed by machines or buried during the construction works performed or involuntarily/voluntarily caught by the workers present in the building site area. The impact upon the density of these species can be higher if the works are performed during reproduction time (spring-summer). In the short term, the density could be affected for populations of species of community importance identified in the area of the GTP, whose active presence was confirmed by monitoring activities in the field: *Falco vespertinus*, *Anthus campestris*, *Melanocorypha calandra*, *Miliaria calandra*, *Lycaena dispar*, *Catopta thrips*. As regards to the bird species of community importance, in the short term it is possible to lose 2-4 nests of tawny pipit (*Anthus campestris*), calandra lark (*Melanocorypha calandra*) and corn bunting (*Milaria calandra*) species widely spread in Dobrogea and in other regions as well, as they use the entire area of agricultural land located between Vadu and Corbu villages for feeding and nesting. No specimens of the *Spermophilus citellus* were registered in the area of the GTP during monitoring on site, but the density of this population may be affected in the short term if they use the burrows identified in the MGD Project area.
	Construction/ Decommission	In the short term, the density of populations of species of community importance identified in the area of the onshore pipeline corridor footprint area could be affected (*Spermophilus citellus*, *Lutra lutra*, *Bombina bombina*, *Testudo graeca*, *Emys orbicularis*, *Pelobates syriacus*, *Hyla arborea*, *Lacerta agilis*, *Lacerta trilineata*, *Natrix tessellata*, *Dolichophis caspius* and bird species of community importance using the MGD project area for feeding and reproduction). The presence of fish species of community importance in the MGD Project area is unlikely. The density changes are caused by the direct mortality of the individuals that can be crushed by machines or buried as a result of construction works performed or as a result of their involuntary/voluntary catchment by the workers present in the working area. For aquatic species, short-term changes of water turbidity are added to the factors above. The impact upon the density of these species can be higher if the works are performed during reproduction time (spring-summer) or hibernation time (October - May), when certain species (e.g. *Testudo graeca*) bury in the sand.

Receptor/Impact target	Phase of the project	Potential impact
Biodiversity (*Time scale for replacing species/ habitats affected by the PP implementation*)	Construction/ Decommission	There are no habitats of community importance in the area of the GTP. The habitats of community importance identified in the area of the pipeline corridor footprint will be affected temporarily (in the short term) by works corresponding to pipeline construction. The flora species affected by the construction works will recover starting with the first vegetative season after works implementation and for habitats this time period is approximated to 5 years, time when the interspecific relations among the flora species from this habitat will recover. As regards to fauna, the potentially affected individuals are estimated to be replaced after 1-2 reproduction seasons.

9.3.4 Management and mitigation measures

The following measures have been identified for reducing the impact of the activities to be performed during the construction, operation and decommission of the MGD Project, in order to maintain the favourable conservation status of the habitats and species of European importance from the Natura 2000 sites ROSCI0065 Danube Delta, ROSPA0031 Danube Delta and the Razim-Sinoie Complex, ROSPA0076 Black Sea and ROSCI0066 – Danube Delta - marine area.

According to GEO no. 57/2007, for the species of terrestrial, aquatic species of plants and wild animals, except for bird species, including those provided in appendices no. 4 A (species of community importance) and 4 B (species of national importance) and according to the National Red List as well for the species living both in protected natural areas and outside them, the following actions are forbidden:

- Any type of gathering, capturing, killing, destroying or causing injury to the specimens existing in their natural environment, in any of the stages of their biological cycle;
- Deliberate disturbing during reproduction, development, hibernation and migration;
- Deliberately damaging, destroying and/or gathering nests and/or eggs from the natural landscape;
- Damaging and/or destroying places for reproduction or for rest; and
- Uncontrolled storage of waste resulted from households and from specific activities. It is mandatory to arrange a special place for waste storage and to ensure its transportation as soon as possible, so that it does not endanger the birds in the area.

For all bird species, the following actions are forbidden:

- Deliberately killing or capturing them, regardless of the used method;
- Deliberately damaging, destroying and/or gathering nests and/or eggs from the natural landscape;
- Gathering eggs from the natural landscape and keeping them, even if they are empty;
- Deliberate perturbation, especially during reproduction, development and migration time periods;
- Owning individuals of the species for which hunting and capturing are forbidden; and
- Trading, owning and/or transporting them in order to be traded alive or dead or acting like this for any easily identifiable parts or products originating in them.

Table 9.17 shows the specific management and mitigation measures to be applied for each phase of the project.

Table 9.17 Measures for Mitigation of the Estimated Potential Impact of the Project Implementation upon Habitats and Species of Community Importance in the Area of Interest

No.	Estimated potential impact	No.	Impact mitigation measures	Observance of measure implementation	Supervision	Implementation time period
1	Temporary loss of a small surface of the habitat of community importance 1410 Salt Mediterranean Meadows (***Juncetalia Maritimi***) and its temporary fragmentation	1.1	Minimizing the surfaces which are digged as well as surfaces covered by excavated soil.	Constructor	BSOG	During construction
		1.2	Removal of the vegetal soil layer and its storage separately from the filling soil in order to be used for the revegetation of the habitat surfaces affected by pipeline installation;			Before start of construction works
		1.3	Covering the vegetal soil layer in order to prevent the erosion and transportation processes that can affect it and that can reduce the number of seeds and bulbs available for revegetation.			During construction
		1.4	The habitat surface affected by works will be revegetated using exclusively seeds and bulbs preserved in the vegetal soil layer that was removed and stored separately; the voluntary or accidental use of species that are not native will be avoided under any situation.			At the end of the construction time period
2	Temporary loss of certain surfaces of the habitats used for food, rest and reproduction needs of the species of community importance	2.1	The levelling activities will be limited, in order to preserve as well as possible the local topographic features, which have an important role in ensuring some wet habitats (especially temporarily flooded areas) for certain species of community importance.	Constructor	BSOG	During construction
		2.2	Reducing the surfaces which are digged during construction works the surfaces covered by excavated soil.			During construction
		2.3	Removal of the vegetal soil layer and depositing it separately from the filling soil in order to be used for the revegetation of the habitat surfaces affected by pipeline installation;			Before start of construction works
		2.4	Covering the vegetal soil layer in order to prevent the erosion and transportation processes that can affect it and that can reduce the number of seeds and bulbs available for revegetation.			During construction
		2.5	The habitat surface affected by works will be revegetated using exclusively seeds and bulbs preserved in the vegetal soil layer that was removed and stored separately; the voluntary or accidental use of species that are not native will be avoided under any situation.			At the end of the construction time period

No.	Estimated potential impact	No.	Impact mitigation measures	Observance of measure implementation	Supervision	Implementation time period
3	Changes in population density (no. of individuals/ surface) General aspects	**3.1**	Appointing a biodiversity expert to train the personnel performing activities on the Project surface in order to ensure minimization of impact upon biodiversity and to ensure monitoring of activities are performed. This expert will be informed by the site management team whenever specimens of the specific fauna in the area and will act in order to adequately and temporarily remove the identified specimens from the implementation area of the Project. BSOGBSOG must record written details about the actions performed in order to limit impact upon biodiversity (data, measures that were implemented, means that were used). It will be possible to make available these records for EPA Constanta or other competent environmental authorities, should they be requested.	Constructor and BSOG	BSOG	Before the start of the construction works and throughout their duration
4	Changes in population density (no. of individuals/ surface) *Spermophilus citellus*	**4.1**	Marking the working area of the Project the by fences made of thick net and relocation of the individuals that use this surface (if applicable).	Constructor and BSOG	BSOG	Before start of construction works
		4.2	The Project implementation area will affect a surface as small as possible and it will not exceed the Project perimeter.			During construction
		4.3	Preserving and using the surface soil layer (first 30 cm); which will be separately stored in a specially designated area inside the Project perimeter and it will be covered by protection foils of dark colour that will prevent wind-generated erosion and growth of invasive plant species on its surface.			During construction
		4.4	Imposing speed limits in order to observe and avoid accidents/deaths of specimens of different species of avifauna or fauna. ;			During construction
		4.5	Respecting the provisions of GEO no. 57/2007.			Permanently
5	Changes in population density (no. of individuals/ surface): *Bombina bombina,* *Testudo graeca,* *Emys orbicularis,* *Pelobates syriacus,*	**5.1**	The Project implementation area should be priory investigated in order to relocate the found specimens in a location outside this area. To that effect it is opportune to subsequently isolate this area by net fences that should prevent individuals to enter from outside (the delimitation using net fences will be performed in stages, in parallel with the installation works for the pipeline and in this way the habitats are fragmented for short distances from the working area and for low time ranges).	Constructor and BSOG	BSOG	Before start of construction works
		5.2	The site management and excavation activities should affect a surface as small as possible;			During construction
		5.3	Preserving and using the surface soil layer (first 30 cm);			
		5.4	Imposing speed limits in order to observe and avoid accidents/deaths of specimens of different species of avifauna or fauna;			
		5.5	Respecting the provisions of GEO no. 57/2007			Permanently

No.	Estimated potential impact	No.	Impact mitigation measures	Observance of measure implementation	Supervision	Implementation time period
	Hyla arborea, *Lacerta trilineata,* *Natrix tessellata,* *Dolichophis caspius*	5.6	At the end of the works for the pipeline, the original configuration of the micro-relief should be re-established. In this way, the floodable areas will be kept and they will serve as breeding habitat for amphibian species.			At the end of the construction time period
6	Changes in population density (no. of individuals/ surface) – ***Lutra lutra***	6.1	Otters use the MGD Project area for feeding and reproduction, but in the Project footprint area except for traces of otters, which demonstrate the fact that they use the ponds for fishing, no holts have been identified. Delimiting the working corridor of the pipeline by thick wire fences and relocating individuals - if any identified. The delimitation using wire fences will be performed stage by stage, in parallel with the works for installing the pipeline, the habitats being thus fragmented only for short distances from the working corridor and for reduced time intervals.	Constructor and BSOG	BSOG	Before start of construction works
		6.2	The excavations and the working corridor of the pipeline should affect a surface that is as little as possible.			During construction
		6.3	Keeping and using the vegetal soil layer in order to favour the rapid growth of the characteristic vegetation, important component of the habitats that are favourable to analysed species.			During construction
		6.4	Respecting the provisions of GEO no. 57/2007			Permanently
7	Changes in population density (no. of individuals/ surface) – bird species of community importance	7.1	Taking into account that the presence of the group of red-footed falcons (*Falco vespertinus*) is tightly connected to the presence of the Corvidae species (*e.g. hooded crow, rook etc.*), as the red-footed falcons use former nests of Corvidae located in the false acacia forest, should be forbidden to kill or to deliberately capture the specimens, deliberately damaging, destroying and/or gathering nests and/or eggs from the natural landscape for Corvidae species identified in the Project area.	Constructor and BSOG	BSOG	Permanently

No.	Estimated potential impact	No.	Impact mitigation measures	Observance of measure implementation	Supervision	Implementation time period
	Falco vespertinus	7.2	The Project implementation area should be priory investigated in order to relocate the specimens found here outside this area before the activities start.			Before start of construction works
		7.3	Training a designated person from the team of the Constructor's workers, who should investigate the project implementation area in order to relocate the specimens encountered outside it.			During construction
		7.4	Respecting the provisions of GEO no. 57/2007, presented at the beginning of this chapter.			Permanently
		7.5	The perimeter of the implementation area of GTP will not be exceeded and no intervention will be made under any circumstance in the false acacia forest located in the GTP eastern vicinity.	Constructor and BSOG	BSOG	Permanently
		7.6	Along the GTP perimeter, there will be constructed a buffer - barrier made up of grassy vegetation, mature trees and native scrubs (e.g.: *Crategus monogyna*, *Fraxinus ornus, Salix sp., Tilia sp. etc.),* having a few meters width, in order to reduce noise and vibrations generated by the activities performed in the GTP during operation.	Constructor and BSOG	BSOG	During construction
		7.7	No raw materials/waste will be stored in the false acacia forest in the eastern part of the GTP site.	Constructor and BSOG	BSOG	During construction and operation
8	Changes in population density (no. of individuals/ surface) – species of invertebrates de of community importance *Lycaena dispar, Catopta thrips, Helix pomatia*	8.1	It is forbidden to use insecticides, raticides and pesticides on the Project surface.	Constructor and BSOG	BSOG	During construction, operation and decommissioning

No.	Estimated potential impact	No.	Impact mitigation measures	Observance of measure implementation	Supervision	Implementation time period
9	Disturbance of Species of Community Importance Caused by Noise, Light and Vibrations	**9.1**	Using silencers and noise screens for equipment: compressors, gas turbines, generators, pumps etc. in order to reduce the estimated noise level; building noise absorbing panels if after installing and testing the actual machineries of the GTP, exceeding values are identified for the noise levels provided by the Romanian legislation in force.	Constructor	BSOG	During construction, operation and decommissioning
		9.2	Avoid working at night. If light is used at night, its use in excess will be avoided and the light sources will be directed to the site management area and shadowed by matt screens towards its external areas;			
		9.3	No species of moth *(Catopta thrips)* attracted by the light associated with works during construction/operation phase will be captured/killed.			
		9.4	The activities for transporting materials will be planned so that the vehicles limit their tours to the minimum necessary for works performance.			

9.4 Landscape

9.4.1 Introduction

Potential impacts on the landscape associated with construction, operation and decommissioning of the onshore pipeline and the GTP include:

- Temporary impact on the visual amenity and landscape during the construction phase at the pipeline landfall, along the new onshore pipeline route and at the GTP;
- After construction of the GTP and through its 10-15 year operational period, long-term changes to the landscape will be generated by the presence of the facilities and buildings at the GTP site as well as the new maintenance access road along the pipeline route; and
- Temporary impact on the visual amenity and landscape at the decommissioning phase while the GTP is dismantled and removed and the onshore MGD Project footprint re-landscaped as closely as possible to its original condition.

9.4.2 Discussion of potential impacts

9.4.2.1 Character of the general landscape

According to the "2013 Environmental Report" of the Constanta county, the plateau relief (Casimcea Plateau and Southern Dobrogea Plateau) is predominant, one of them having low altitudes below 200 m. The Casimcea Plateau is located in the northern part of the county and the Southern Dobrogea Plateau is located in the southern part of the county. The Southern Dobrogea Plateau is similar to a high plain, having calcareous aspect.

The natural landscape of the county offers many touristic objectives, such as the Black Sea resorts, natural reservations, agricultural land plots where wind farm have been built etc.

The seaside area has a length of 244 km and is divided into two 2 sectors: low beaches (located between Sulina and Cap Midia) and high beaches (in the southern part, between Cap Midia and Vama Veche). The seaside of the Black Sea is made up in the northern part by sand belts, separating lakes fro the sea and in the southern part there is a vertical cliff made up of limestone and loess that are 15 – 30 m high.

The following natural reservations can be found in Constanta county:

- Fântânita – Murfatlar reservation, spread on 19.7 ha and included in Murfatlar forest (having a surface of 641 ha);
- Seaside dunes at Agigea, spread on about 25 ha;
- Hagieni Forest, spread on 584 ha. The forestry reservation includes three parts: a central part of 100 ha covered by oaks and Carpinus orientalis, alternating with clearings, the western part including rocky valleys and having a surface of 28 ha, and the northern part named "Cascaia";
- The Techirghiol Lake, having a surface of 10.7 km^2, represents the largest saline lake in the country; and
- The canaries at Hârsova are spread on 5.3 ha and have been declared a natural monument;

Of the total surface of 707,129 ha of the county, a surface of about 80 % (558,204 ha) is represented by agricultural land. In terms of forestry fund, in 2013, the surface covered by forests was 38,116 ha. In terms of green areas, at the end of 2013, the surface of the green areas in municipalities and towns was 946 ha.

The landscape in Vadu village and the MGD Project area is characterised by the structural and functional relations of the natural protected areas of community importance that led to three groups of ecosystems in the area: natural ecosystems, anthropized ecosystems and artificial or anthropic ecosystems.

The natural ecosystems in the studied area are represented by natural wet surfaces with reed (the two pods and the corresponding marshy habitats) and sandy surfaces with coast vegetation. The anthropized ecosystems are those where human intervention is partially felt, and within the studied area they are represented by overgrazed areas and the neighbouring agricultural land. People altered them by changing the natural biotope in order to create appropriate conditions for certain crop species or for certain animal species – grazing lands, agricultural land plots. The artificial ecosystems are represented by the former settling ponds of the Rare Metal Plant and by the self-treatment ponds of ROMPETROL RAFINARE S.A., all of them used as habitats for feeding and nesting by the bird species identified in the PP area - onshore.

9.4.2.2 Features of the landscape in the proposed project area

The landscape in Vadu village and the MGD Project onshore area is characterised by the structural and functional relations of the natural protected areas of community importance that led to three groups of ecosystems in the area: natural ecosystems, anthropized ecosystems and artificial or anthropic ecosystems.

The natural ecosystems in the studied area are represented by natural wet surfaces with reed (the two pods and the corresponding marshy habitats) and sandy surfaces with coast vegetation. The anthropized ecosystems are those where human intervention is partially felt, and within the studied area they are represented by overgrazed areas and the neighbouring agricultural land.

People altered them by changing the natural biotope in order to create appropriate conditions for certain crop species or for certain animal species – grazing lands, agricultural land plots. The artificial ecosystems are represented by the former settling ponds of the Rare Metal Plant and by the self-treatment ponds of ROMPETROL RAFINARE S.A., all of them used as habitats for feeding and nesting by the bird species identified in the MGD Project area.

From a topographic point of view, the site overlaps two large units of relief: eastern extremity of Podisul Casimcei – Prispa Hamangia (subunit of Dobrogei Plateau) and Danube Delta, characterised in this area by marshes and pools belonging to Razim-Sinoe lagoon complex. The site is practically between the isohypsis of 30 m (at west) and the isohypsis of 0 m (at east).

According to the topographical survey performed by the GTP designer on site in 2017, the land elevation related to Black Sea level varies between 11.59 m and 19.,66 m and the lowest value is registered in the north-east corner and the highest value in the south west corner.

The transition between the two relief units mentioned above, the Dobrogea Plateau and the marsh in the eastern part of the site, is abrupt across the acacia forest located in the immediate proximity, where the route of the Section I for the pipeline starts.

The difference in level between the two relief units is about 10 m and the versant is subject to wind and rain erosion. Thus, a clough was identified at the southern limit of the acacia forest, under the versant chine. This clough was recently formed as a result of the action of the two above mentioned factors.

The marsh belonging to the Razim-Sinoe lagoon complex is located between the shore of the Black Sea and the chine of Prispa Hamangia and is covered by halophyla vegetation. Section I passes through the marsh area and under crosses Balta Mare and Balta de Mijloc and continues in the coast area by the connection section.

9.4.2.3 Land use in the proposed project area

Figure 9.16 presents the current land use situation according to the official data in the CORINE LAND COVER – 2012 (http://land.copernicus.eu/). The proposed project onshore area falls within several land use categories. The area of the GTP falls within the category of non- irrigated arable land. Section I falls within the category of inland marshes and salt marshes and the land-fall section overlaps a sandy beach and dunes.

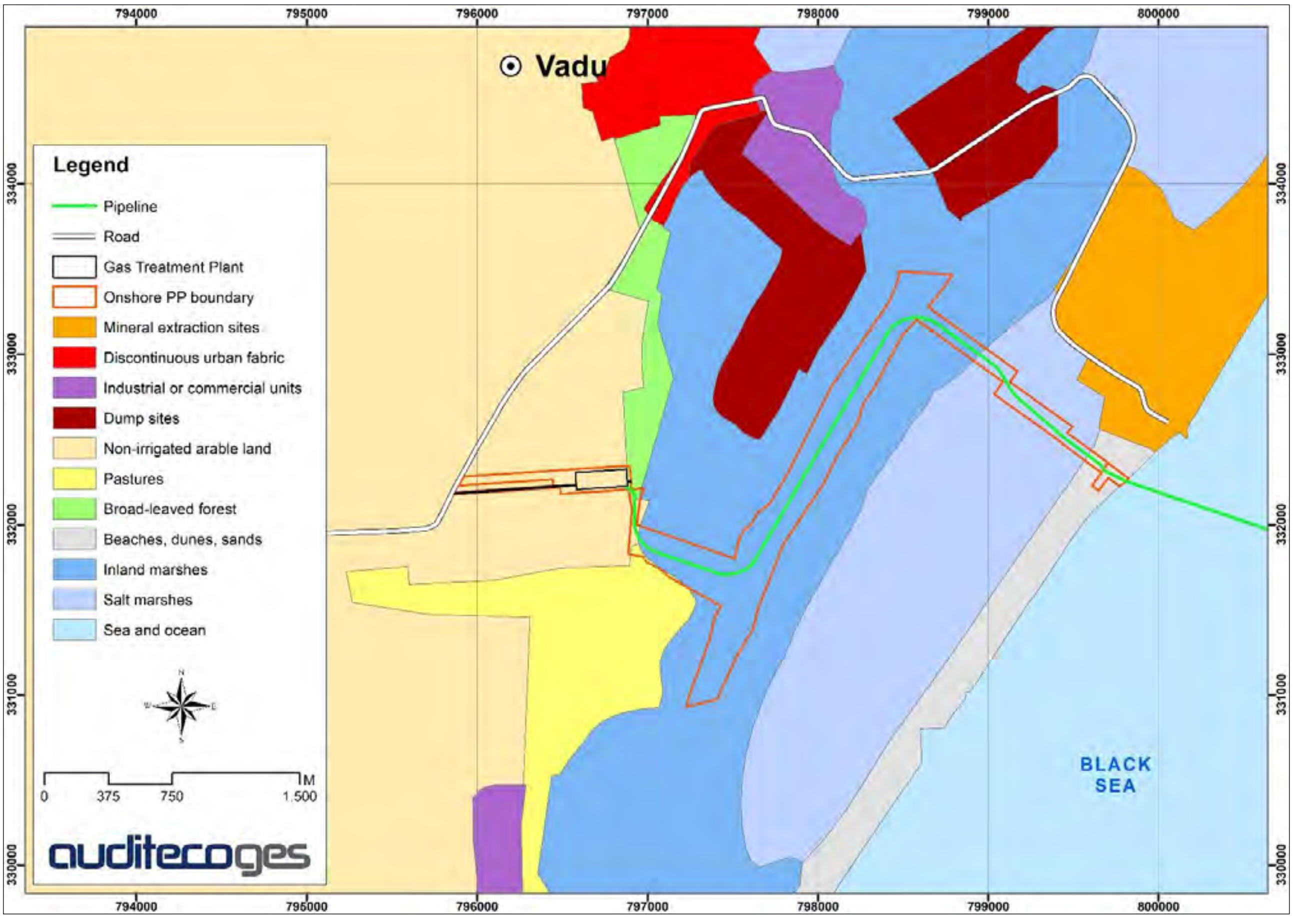


Figure 9.16 Land use in the proposed project onshore area and vicinities (source: CORINE LAND COVER, 2012)

9.4.2.4 Vegetation in the proposed project onshore area

During the monitoring activities performed on site by the AUDITECO team, all vasculary species in the studied MGD Project onshore area were inventoried, phyto-cenologic surveys were carried out and a map was developed including the distribution of the vegetal associations in the MGD Project area.

The false acacia forest in the eastern vicinity of the GTP is made up of the following main species:

> Tree species: false acacia (*Robinia pseudacacia*);

> Scrub species: hawthorn (*Crataegus monogyna*); and

> Grass species: *Achillea setacea*, *Descurainia sophia*, *Onoordum acanthium*, *Xanthium spinosum*, *Cirsium arvense*, *Euphorbia cyparissias*, *Hordeum murinum*, *Lamium album*, *Daucus carota*.

The false acacia (Photo 9.11) originates in North America and it was introduced in Europe in 1601. It develops on sandy soils with course texture, loose and non-carbonic. It has high consumption of nutritive substances, so that the repeated respective culture depletes the soil. In many European countries, including Romania, it is considered an invasive species.

The agricultural lands neighbouring the GTP area are cultivated annually with cereals, peas etc.

The area crossed by Section I is a marshy area characterized by bushes and vegetation characteristic for pools and wet areas and by vegetation characteristic of saline soils.

Photo 9.11 Acacia (*Robinia pseudacacia*) plantation with hawthorn (*Crategus monogyna*) in the eastern vicinity of the GTP area

9.4.2.5 Aspects related to the landscape of the localities close to the proposed project area

The landscape in Vadu village is characterised by the structural and functional relations of the natural protected areas of community importance that have led to three groups of ecosystems in the area: natural ecosystems, anthropized ecosystems and artificial or anthropic ecosystems.

The natural ecosystems are represented by natural wet surfaces with reed (the two ponds and the corresponding marshy habitats) and sandy surfaces with coast vegetation. The anthropized ecosystems are those where human intervention is partially felt, and within the studied area they are represented by overgrazed areas and the neighbouring agricultural land. People altered them by changing the natural biotope in order to create appropriate conditions for certain crop species or for certain animal species – grazing lands, agricultural land plots.

The artificial ecosystems are represented by the former settling ponds of the Rare Metal Plant and by the self-treatment ponds of ROMPETROL RAFINARE S.A., all of them used as habitats for feeding and nesting by the bird species identified in the MGD Project area.

As a conclusion, the landscape in the area of the Vadu village is characterised by an overlap of natural and industrial elements, the presence of the former Rare Metal Plant in Vadu and the self-treatment ponds of ROMPETROL RAFINARE S.A. being dominant (Photos 9.12 and 9.13).

Photo 9.12 The former Rare Metal Plant in Vadu and in the forefront, a self-treatment pond of ROMPETROL RAFINARE S.A. – view from the south towards the north

Photo 9.13 The former Rare Metal Plant in Vadu and in the forefront the associated settling ponds – view from the dam of a settling basin

9.4.2.6 Landscape and visual impact assessment methodology

In order to quantify the effects of the change proposed by the onshore MGD Project implementation, the landscape and the visual impact in the area of the proposed project – onshore area were analysed by collecting information and data from the field and from other available studies, by analysing the satellite images and by processing photographic images. The information used was collected during the site visits made by the AUDITECO team between years 2014 -2017.

The landscape assessment was conducted using the methodology for assessing visual impacts developed by the Landscape Institute of Environmental Management and Assessment[16]: Guidelines for landscape and visual impact assessment – third edition.

The Guidelines for landscape and visual impact assessment (GLVIA) is a tool used in order to identify and assess the significance of the impact and of the changes resulting from developments both upon the landscape as a natural resource and upon the public's perception upon the resulted changes.

The guidelines specify that the following principles are applied in order to assess the impact upon the landscape and the visual impact:

> Avoidance of numeric criteria or of weighting criteria, as that can suggest a false level of precision in professional judgement; and

> In order to assess criteria, use of rating and not of marks is recommended.

The landscape is considered an independent resource and thus, the nature of the effects upon the pleasant character of the view perceived by the public must be assessed. There are cases when important landscape changes can occur, but the localisation of the proposed development can be in an area that is not very visible to the public.

For most environmental aspects, the assessment of the impact can be made based on technical guidelines and on legislative documents imposing limits, for example for air emissions or for noise levels. The assessment of the impact upon the landscape is different: a part of it is based on quantitative measures – e.g. how many trees are cut in order to make room for new constructions – but it is mostly based on a qualitative assessment, e.g. what kind of effect is generated by introducing a new development in the landscape or how the use of land is changed.

These types of assessment emphasize the judgement and the professional experience of the experts assessing the landscape/visual impact and highlight the selection of the appropriate approach and methods.

In order to select the route of the natural gas transportation pipeline and of the GTP location to have an impact as low as possible upon the landscape, during the phase of selecting the land lots, BSOG analysed the most appropriate alternatives in terms of landscape changes.

According to Law no. 451/202002, the definition of the landscape is the following: the landscape represents part of the territory perceived as such by the population, whose character is the result of the action and interaction of natural and/or human factors.

In order to assess the significance, a two-stage approach is adopted: during the first stage, the significance of each effect is analysed in terms of landscape vulnerability degree and the second stage consists in establishing the magnitude of the effect.

The vulnerability degree for each component (receptor) of the landscape is assessed based on the following factors: sensitivity of the receptor to the type of change resulted from proposed proposal (investment) and form the value and importance of the receptor.

The nature of the effect is assessed based on the following factors: scale and size of the effect (such as complete disappearance of a landscape component or a minor change), the geographic extension area to be affected, the duration and reversibility of the effect.

[16] https://www.landscapeinstitute.org/PDF/Contribute/GLVIA3consultationdraftformembers.pdf

The vulnerability degree for each component (receptor) of the landscape is assessed based on the following factors: sensitivity of the receptor to the type of change resulted from proposed project (investment) and form the value and importance of the receptor.

The components of the landscape are quantifiable elements, such as hills, plateaus, valleys, forests, bushes, roads etc. or features such as tranquillity or character, singularity of a landscape created by characteristic models/textures occurring constantly.

The vulnerability degree of the landscape can be described as high, medium, low or negligible, depending on the extent to which a certain landscape or area can integrate the change resulted from implementing the proposed investment without any effects upon the landscape character.

The following terminology is used in order to describe the degree of vulnerability for the landscape:

- negligible: where the landscape structures are very few or they do not exist and the form of the relief and of the ground is masked by the way the land is used; where the lack of management and the human intervention lead to landscape degradation;
- low/medium: where a recognised landscape structure exists and where characteristic patterns and combinations of relief forms and the way the land is used exist as well. Part of the landscape structure can be masked by the way the land is used; in case there are certain characteristics that deserve to be preserved and some features that lower the landscape value; and
- high: where there is a strong landscape structure, the landscape characteristic patterns (textures) and a balanced combination between the relief form and the way the land is used. It includes features that are worth being preserved and elements creating the specific atmosphere/the singularity of the place.

Landscape importance/value

The landscape value refers to designation of areas that are protected at local, national or international level and to the value of the landscape character including individual landscape elements. Establishing the value of landscape components (receptors) contributes to the identification of their importance under the territory planning context and of their importance from local, national or international points of view. Complex relations exist between the vulnerability and importance of the landscape components, for example, it is not absolutely necessary for a valuable landscape to have high vulnerability by default. The landscapes recognized at national level, such as National Parks and the Biosphere Reserves, have the highest importance level. However, the significance of the effect upon them depends on the nature of the effect and on the landscape vulnerability.

The nature of the effect

Each effect upon receptors (landscape components) is assessed in terms of magnitude (extent), geographical extension of the influence area, duration and reversibility.

Magnitude

The magnitude of the effect refers to the dimension of the change felt. This can be described as high, medium, low or negligible.

The geographical extension area over which the effects upon the landscape will be felt is different from its magnitude. For example, there can occur a moderate loss of landscape elements on an extended geographical area or a proposed developed significantly affecting a local area. The extent of the effects can vary depending on the nature of the Law no. 451/2002, but in general the effects can have an extent to the following scales: within the site of the PP, in the immediate vicinity of the site, at the level of the type of landscape where the Law no. 451/2002 is located or to a wider scale, covering a few types of landscape.

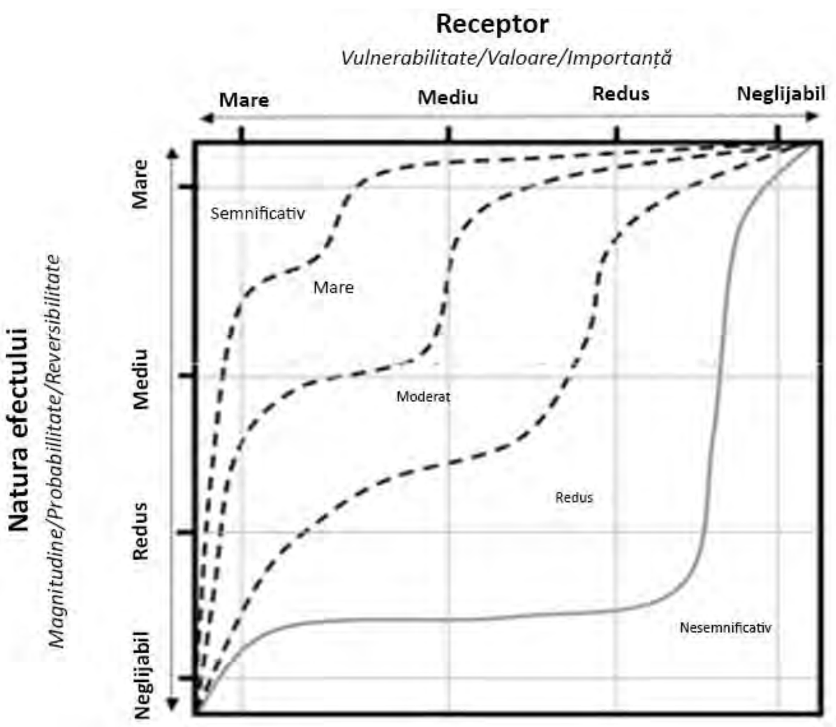
Duration or reversibility of effects upon landscape are separated and connected at the same time, the duration refers to a scale on short, medium or long term; short term could be between zero and five years, the medium term could be between 15 and 20 years and long term could be over 50 years. *Reversibility* refers to the life duration of the PP and to the fact that once disappeared, the landscape can come back to its initial form.

The nature of the effect can be characterised as high, medium, low or negligible.

In order to establish the significance of the effect, a combination is made between the assessment of the vulnerability degree/importance/value of the landscape components and that of the nature of the effect (magnitude, area of geographical extension/probability/reversibility) offers the significance of the effect, as it can be noticed in Table 9.18 and Figure 9.17.

Table 9.18 Methodology to assess the type of impact upon landscape

Nature of effect/Vulnerability degree	Negligible	Low	Medium	High
Negligible	Insignificant impact	Negligible/low impact	Low impact	Low/moderate impact
Low	Insignificant/low impact	Low impact	Low/moderate impact	Moderate impact
Medium	Low impact	Low/moderate impact	Moderate impact	Moderate/high impact
High	Low/moderate impact	Moderate impact	Moderate/high impact	Significant impact



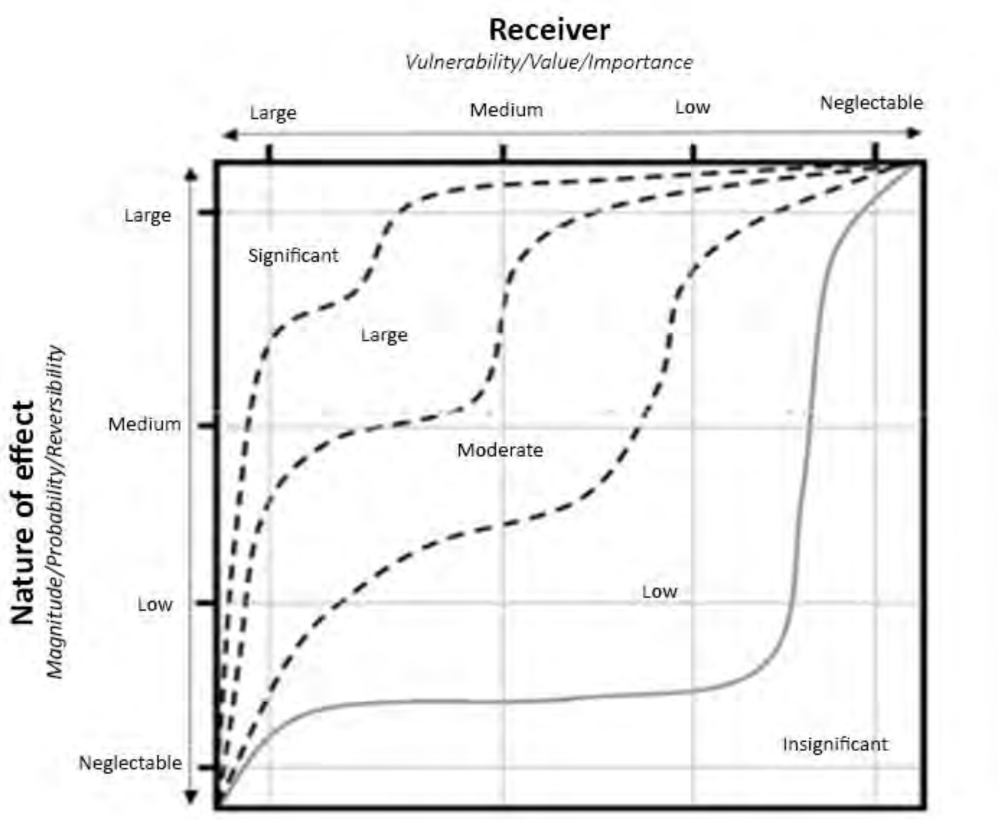


Figure 9.17 Landscape impact assessment methodology (source: IEMA (2011) – Figure 6.3 – www.iema.net)

In order to assess the types of impact that will result from the implementation of the MGD Project, the following scale presented in Table 9.19 below was used for assigning ratings.

Table 9.19 Rating scale for landscape impact assessment

Level of Impact upon Landscape	Explanation
Insignificant or negligible impact	Generally, the proposed investment is integrated within the landscape context, would have low effect upon vicinities and would affect a few visual receptors
Low impact	The proposed investment would have a minimum effect upon the landscape and would affect a very small number of receptors
Moderate impact	The proposed investment would have a noticeable effect upon the landscape and would affect a few sensitive receptors, thus changing the character of the landscape or of the view
High impact	The proposed investment would have a noticeable effect upon the landscape and would affect more receptors, thus changing the character of the landscape and of the view
Significant impact	The proposed investment would change the character and the appearance of the landscape for a long time or permanently. It would affect many receptors and thus, the character of the landscape or of the view would be altered

9.4.2.7 Landscape impacts

The description of the types of impact estimated based on the vulnerability degree/nature of the effect in the MGD Project area is presented in Table 9.20.

Table 9.20 Characterisation of the impact upon landscape in the PP onshore area

Landscape element (receptor)	Vulnerability degree of the receptor	Type of impact	The nature of the effect	Impact level
Form of the land	Low	MGD Project Area has a small inclination angle, with a slope slightly decreasing from the western part towards the east.	Low	Very low
Land use	Low	Changing the destination of the lands from agricultural land in GTP area and unincorporated area to land for yards-constructions and to land located in incorporated area-isolated body: area for technical and urbanistic equipment.	Medium	Moderate
Forestry vegetation	Insignificant	No tree or scrub is located in the MGD Project area. No intervention will be made upon the forestry vegetation in the false acacia forest located in the western part.	Neglectable	Insignificant
Water bodies	Low	There are two pools in the MGD Project area – Balta Mare and Balta de Mijloc. No substantial change is estimated as a result of MGD Project implementation	Low	Low
Localities	Low	The MGD Project area is located outside localities and the closest localities are Vadu and Corbu villages, at a distance of over 2 and 5 km respectively.	Low	Insignificant
Protected natural areas	Medium	The MGD Project area partially overlaps: Danube Delta Biosphere Reserve, ROSCI0066 – Danube Delta, ROSPA0031 Danube Delta and Razim-Sinoe Complex, ROSPA0076 Black Sea and ROSCI0066 Danube Delta – maritime area.	Low	Low
Landscape character	Medium	The landscape in the MGD Project area is characterized by plateau relief, with flat or slightly inclined areas, covering tens of square kilometres, cultivated with mono-crops that interfere with the Black Sea line and the marshes with reed beds of the Danube Delta Reserve. Despite that, the landscape character is fragmented by anthropic interventions, such as the former Rare Metal Plant, its settling ponds and wastewater self treatment ponds of ROMPETROL RAFINARE SA, elements that degrade the landscape.	Medium	Low/Moderate

As regards the form of the land, it was considered that the vulnerability degree is reduced as there is a recognised landscape structure (Dobrogea Plateau) as well as characteristic patterns. These patterns are given by the combination of the hilly relief of the plateau with the textures and colours of the agricultural crops. However, there are features decreasing the quality of the landscape, such as anthropic interventions: the settling ponds and the former Rare Metal Plant, which reduce the value of the landscape. The site is not located in any area having special landscape value or protected natural area and it has no high value or importance. The MGD Project effects will not exceed the Project area in terms of geographical extent. For this reason, the nature of the effect was considered low and the impact was considered very low.

In terms of land use, the vulnerability degree was considered low, as half of the surface for the area where the GTP is to be built will still be cultivated with agricultural crops. The nature of the effect was considered medium as in terms of reversibility, the Project will have effects on medium term (10- 15 years), after which the land could return to its initial form. The level of the impact was considered moderate.

The forestry vegetation is another component of the landscape in the MGD Project area. However, taking into account that this will not suffer any change as a result of the Project implementation in any of its phases, the impact was considered as insignificant.

In the Project area there are surface water bodies only in the area of the pipeline corridor- Balta Mare sand Balta de Mijloc ponds, but it was considered that they will not suffer any significant changes as a result of proposed project implementation and the impact was considered as low.

The neighbouring localities are located at over 2 km from the MGD Project area and the impact upon them was considered as low.

The MGD Project area partially overlaps: Danube Delta Biosphere Reserve, ROSCI0065 – Danube Delta, ROSPA0031 Danube Delta and Razim-Sinoe Complex, ROSPA0076 Black Sea and ROSCI0066 – Danube Delta – maritime area, and the impact upon this landscape component was considered low.

The landscape in the MGD Project area is characterized by plateau relief, with flat or slightly inclined areas, covering tens of square kilometres, cultivated with mono-crops that interfere with the Black Sea line and the marshes and reed beds of the Danube Delta Reserve. Despite that, the landscape character is fragmented by manmade structures, such as the former Rare Metal Plant, its settling ponds and wastewater self treatment ponds of Rompetrol Rafinare, elements that degrade the landscape.

The main negative impact during operation relates to landscape change by altering the land use and by introducing a new element in the landscape, the gas treatment plant. Taking into account that the GTP structures will be integrated in the landscape of Vadu village, characterized from the landscape point of view by a mixture of natural and industrial elements, it can be considered that the general impact upon landscape will be direct, negative, on medium term, with a reversible character and of low intensity.

During the construction/decommissioning phase, it is considered that the landscape impact is represented by the presence of the site management and of the activities related to it. The impact will be direct, low and on short term. During the operation of the onshore segment (underground) of the Ana Platfrom – GTP pipeline, the impact is considered insignificant.

9.4.2.8 Visual impact

The visual impact assessment refers to the manner in which people are affected by changes of the character of the views with which they come into contact and to the way they perceive the changes in the surrounding landscape.

The visual impact assessment refers to: the extent of the geographical area where the change will be visible, various groups of sensitive receptors that can come into contact with the visual change, the nature of the view and of the pleasant character of the view from the points where the receptors come into contact with the visual change and the nature of the visual change.

The visual impact of the pipeline for natural gas transportation will occur only during its construction and decommission, as during operation the pipeline will be buried and the visual impact will be insignificant.

9.4.2.8.1 Operational phase

The approach was as follows: Only the visual impact generated by the GTP was assessed, as the other components are below-ground and the only impact will be in the construction period, which is negative, direct and temporary. Although the site is not located in a residential area, the visual impact in the immediate vicinity of the GTP, at a distance of 2 km from the Plant and at over 2 km from the GTP. This approach was considered sufficient in over to offer a general overview and at the same time a detailed view upon the visual impact created by the GTP.

9.4.2.8.2 Identification of sensitive receptors

The potential sensitive receptors identified during this assessment include the public or the local community in closed localities, visitors, tourists or commuters. The studied area was established at 5 km around the area of the GTP.

No sensitive receptors are located in the immediate vicinity of the GTP area (residential areas). The plots in the immediate vicinity of the GTP are agricultural lands and the closest residential area is considered a farm located at about 400 m north from the GTP area, from where the GTP area would be seen permanently, this sensitive receptor has practically the highest vulnerability to the change proposed by the GTP. Thus, the proposed investment would create a large extent of the proposed change and it would cause a high impact as well.

At about 500 m north-eastwards from the GTP area, another farm is located and it could be partially considered a sensitive receptor but only the stack of the GTP would be visible from this receptor. The GTP area is practically protected both by the false acacia forest located in the western part and by the fact that the farm is located as an altitude 10 m lower than the GTP area and it has no direct view to the GTP area. For this receptor a medium magnitude of the proposed change and a medium impact are considered.

At about 700 m south from the site there are three sheepfolds that can be considered sensitive receptors as well. Only two of them have direct view to the GTP area, while the elevation of the third one is too low and located at an angle from which the GTP area cannot be seen. Thus, the proposed investment would create a large extent of the proposed change and it would cause a high impact as well for the two sheepfolds.

For the sensitive receptors located within 2 km from the site of the GTP, mainly from the Vadu village located at approximatively 2 km north from the site, the impact will be low, as the view of the GTP is visible only from certain locations. From the Vadu village, the GTP stack will be partially visible from the exit from Vadu towards Corbu, on the DC 83 road, in the area of the settling pond of Rompetrol Rafinare . The remaining installations are protected by another false acacia forest located in the immediate vicinity of the Vadu village. Thus, the proposed investment would create a change of a low magnitude and it would generate a low impact.

For the sensitive receptors located at a distance of over 2 km from the GTP site, the GTP will not be visible for all observation points located within a radius of over 2 km because of the form of the relief. From Corbu village, located at about 5 km west, the GTP will not be visible because of the elevation difference.

The main group of sensitive receptors to be affected by the GTP construction are the public or the local community in the neighbouring villages, the visitors, the tourists or other types of groups entering into contact with the landscape in the GTP area by means of the DC 83 Corbu-Vadu access road.

The DC 83 Corbu-Vadu access road starts from Corbu village located at an elevation of about 20-30 m and it ascends towards Vadu village until it reaches an altitude of 62 m. From this point a part of the GTP area can be seen, mainly the GTP stack, after which the road descends down to 26 m in front of the GTP area.

The GTP will not be located close to the road, but at about 600 m eastwards from the road, on a plot of land descending in altitude from 30 m across the communal road to about 11 m altitude at the location of the GTP stack. TheGTP will be located in the immediate vicinity of the false acacia forest and its installations of are estimated not to exceed the height of the false acacia forest (about 10-11 m), except for the gas discharge stack. Although its height is 50 m, it is about 1 m thick.

Practically, for the receptors located at a higher distance than 2 km, it will be possible to distinguish the GTP area only from certain points and one of those points is the Vadu beach area. From the Vadu beach area, from the area of the beach restaurant that can be considered a sensitive receptor due to the difference in altitude and to the acacia plantation, the GTP is not visible, except from the stack whose thickness is low enough so that it cannot be easily noticed. At this distance (over 3 km) and considering the stack has a thickness below

1 m, it is considered that the proposed investment would create an insignificant landscape change and it would generate an insignificant impact.

9.4.2.8.3 Visual impact assessment

The extent (magnitude) of the visual impact can be: insignificant, low, medium or high, depending on the following factors:

- What percentage of the existing view would change as a result of the proposed investment;
- The number of features or elements of the view that would change;
- The calibration of the proposed investment depending on the existing view;
- Viewing point; and
- How beneficial the nature of the impact is.

The vulnerability degree of the viewing point depends on several factors:

- Localisation of the viewing point: the points closer to the site area are usually more vulnerable;
- Number of lookers (sensitive receptors) currently using the respective observation point; certain viewing points are used by the public more often, while other observation points are harder to reach;
- Types of viewing points: the residential properties are more vulnerable to visual impact, as their inhabitants are regularly exposed to this impact and during extended time periods;
- Movement of the viewers related to the observation point; and
- Cultural significance of the viewing point, including its inclusion in tourist guidebooks and maps as well as its association with elements of cultural-historical interest.

Similarly to the impact upon landscape, Table 9.21 and Table 9.22 present ratings assigned to the visual impact assessment.

Table 9.21 Assessment of visual impact types

Level of Impact upon Landscape	Explanation
Insignificant/negligible impact	When the change is so small that actually there is no change that can be visually perceived
Low impact	When the proposed development is only a minor component of a wider view that can be unnoticed by the regular viewer or when the observation of the proposed development does not affect the overall quality of the view
Medium impact	when the proposed development represents a visible and easily recognisable change, but it is not an intrusive element into the general view
Significant impact	when the proposed development represents a significant element of the landscape, which can be immediately noticed and which affects the viewer's overall impression about the landscape

Table 9.22 The analysis of the visual impact upon sensitive receptors

Distance from sensitive receptors	Vulnerability degree of the viewing point	Extent of change	Type of impact
Immediate vicinity	High	High	Significant
At a distance of 2 km from the GTP site	Low	Low	Very low
At a distance of 2 km from the GTP site	Negligible	Negligible	Insignificant

The main type of negative impact forecast during construction phase upon the visual comfort of tourists, residents and visitors is the presence of the construction site, of heavy vehicles, of construction activities and of materials stored/site management. The main negative impact during operation relates to the presence of the GTP itself, that can be perceived by sensitive receptors as a permanent, significant change. The impact in the immediate vicinity of the GTP is considered significant, direct, reversible, negative.

9.4.3 Management and mitigation measures

During the construction of the MGD Project – Onshore Component, the following measures are proposed in order to mitigate the impact upon the landscape and the visual impact:

> The Contractor will be bound by contract to adopt a best management practices in constructions and the site management, in order to avoid any significant visual impact and any significant impact upon the landscape.

During operation

> Along the GTP perimeter, there will be constructed a buffer - barrier made up of grassy vegetation, mature trees and native scrubs (e.g.: *Crategus monogyna, Fraxinus ornus*, *Salix sp*., *Tilia sp*. etc.) having a width of a few meters in order to reduce part of the impact upon the landscape; and

> Careful selection of the types of light sources and installation of light sources so that the pollution caused by light will not to disturb the sensitive receptors identified in the Project vicinity.

During the detailed design stage, careful selection of the form, materials and finishings, of colours and textures for all installations/constructions of the GTP in order to properly integrate it into the landscape.

9.5 Noise and Vibration

9.5.1 Introduction

Potential noise and vibration impacts associated with construction, operation and decommissioning of the onshore pipeline and the GTP include:

> Construction and decommissioning traffic and activities will create airborne noise that may cause a disturbance to local communities;

> Construction and decommissioning traffic and activities will create airborne noise and vibration that may cause a disturbance to sensitive mammal and bird species, such as the red-footed falcon (*Falco vespertinus*) species of community importance which is known to nest in the plantation of acacias located in the immediate vicinity of the GTP.

> Noise generated by normal GTP operations may disturb local communities and tourism.

>

9.5.2 Discussion of potential impacts

9.5.2.1 Sources of noise and vibrations during construction

The proposed project is not located in a residential area and the closest residential area is located at over 2 km north from the proposed site. There are no sensitive receptors in the immediate vicinity of the site.

During construction, the following activities that can represent noise sources for sensitive receptors were identified:

- Transportation of materials, pieces of equipment and installations necessary for performing works;
- Construction activities performed on the building site, during site management.

9.5.2.2 Sources of noise and vibrations during operation

The sources of noise and vibrations during the operational stage of the GTP are described in Table 9.23 and Figure 9.18 presents their locations within the future GTP.

Table 9.23 - Sources of noise during GTP operation

Run. No.	Source	Emission at 1 m dBA	Way of operation
1	2 electro-generators GP-G-60-1A/1B	79 at 1 m from the walls, 97 at the exhaust pipeline	continuous
2	TEG regeneration module GP-Z-45-01	80 at 1 m from the walls	continuous
3	Compressor module GP-Z-32-01	75 at 1 m from the walls	continuous
4	Turbines GP-WC-32-01	80 at the discharge surface	continuous
5	Pumps for the LP KO Drum GP-P-35-01-A/B Pumps for the HP KO Drum GP-P-35-02-A/B	75 to 1m 75 to 1m	continuous continuous
6	Electro-generator group GP-Z-63-01	80 at 1 m from the walls	spare
7	2 pumps for fire water GP-P-40-01A/B	80 at the walls	spare
8	MEG regeneration module GP-Z-44-01	80 at the walls	continuous
9	Pumps for transferring MEG GP-P-44-01 A/B Pumps for injecting MEG GP-P-44-02 A/B Pumps for loading MEG GP-P-44-03 A/B	75 to 1m 69 to 1m 80 to 1m	continuous continuous continuous
10	Pumps for transferring Diesel fuel GD-P-53-01 A/B	76 to 1m	continuous
11	Phase separator GP-V-44-01	76 to 1m	continuous
12	Inert gas generator GP-Z-52-01	80 to 1m	spare
13	Instrumental air module GP-Z-51-01	80 to 1m	spare

The emission values at 1 m were established considering the information below, made available by BSOG:

> According to the design document developed by the designer of the GTP (document A-200283-S00-M-SPEC-003), the maximum noise level for the pumps should not exceed the maximum limit of 80 dBA, at a metre from the aggregate limit. Also, according to the document Philosophy of mechanical Design, A-200283-S00-M-PHIL-003, the maximum noise level for rotating pieces of equipment should not exceed the limit of maximum 80 dBA, at a metre from the aggregate limit; and

> The level of the acoustic pressure was taken from producers providing similar pieces of equipment.

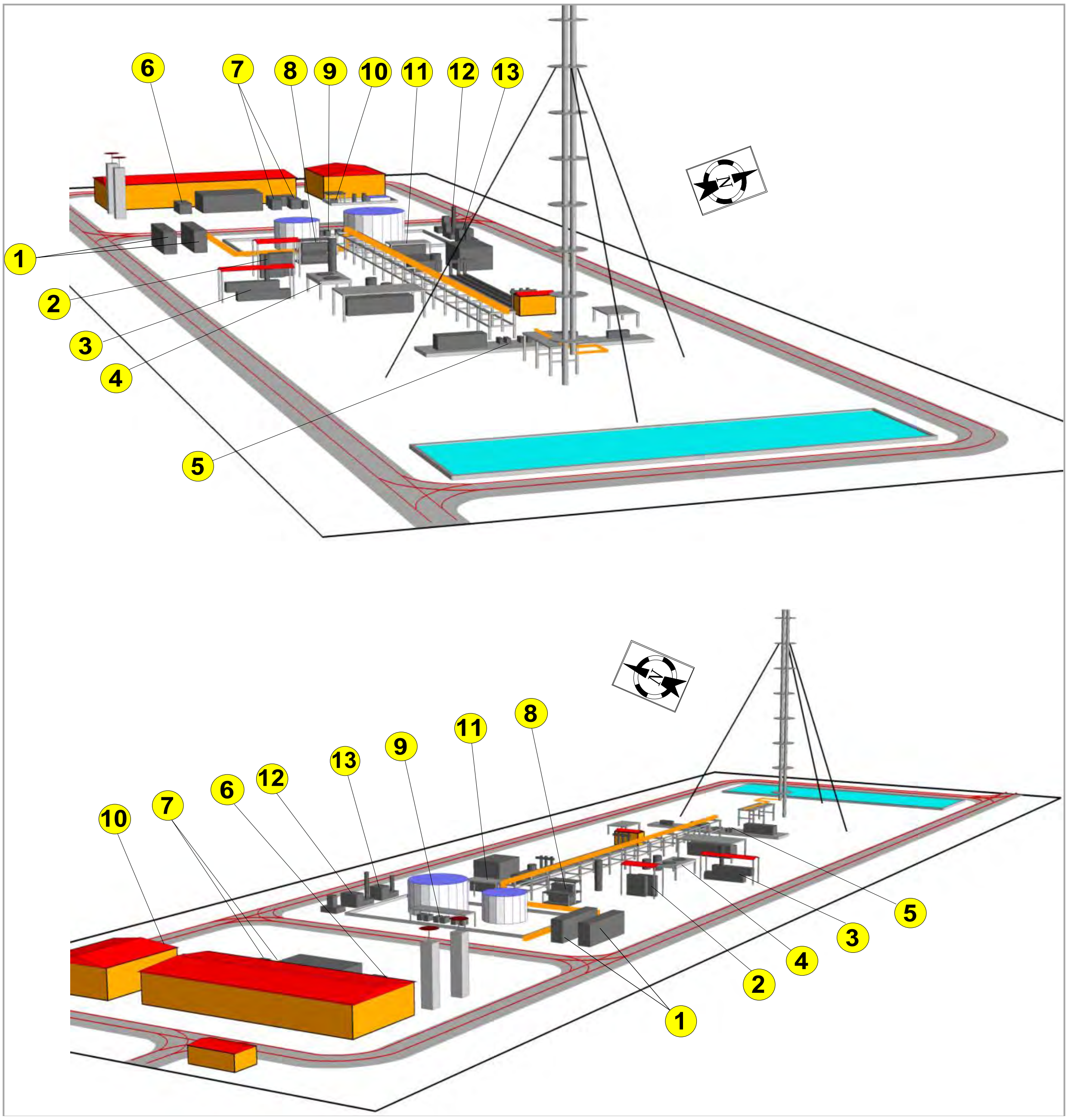


Figure 9.18 3D representation of the digital model of GTP, indicating the noise sources associated with its operation

9.5.2.3 *Identification of sensitive receptors*

During the operation time period, the GTP is considered the only noise source within the MGD Project the sources of noise and vibrations within the GTP are treated below. For the pipeline no sources of noise and vibrations exist during operation.

The GTP is not located in a residential area. However, the closest sensitive receptors, namely: Vadu village (although located at over 2 km N), the closest farms located in the NV, NE, SV and SE and the beach restaurant located on Vadu beach were taken into account in order to estimate whether the noise level generated by the

GTP will exceed the limits imposed by the Romanian legislation. Figure 9.19 presents the locations of the sensitive locations:

Table 9.24 below includes the values identified at the sensitive receptors presented above during two situations: during the normal operation situation and during the emergency operation situation (when the spare pieces of equipment operate).

Table 9.24 - Estimated values for the noise level reaching the sensitive receptors around GTP

Run. No.	Receptor dBA	Leq, normal dBA	Leq, emergency dBA	Limit as per SR10009/2017 dBA
1	Vadu	27.5	28.5	**50.0**
2	N-E farm	40.5	41.1	**50.0**
3	N-W farm	41.5	42.0	**50.0**
4	S-E farm	38.3	39.0	**50.0**
5	S-V farm	34.8	35.5	**50.0**
6	Restaurant on the beach	23.5	24.0	**50.0**
7	GTP (south part)	73.0	73.2	**65.0**

As it can be noticed in the table, all values identified at the sensitive receptors chosen in the area are characterised by levels sound pressure, continuously equivalent, weighed A, **at much lower values that the limit imposed by SR 10009-2016, 50 dBA respectively.** There will be no exceedence of the limits imposed by Romanian legislation.

For the area of sensitive receptors presented in Figure 9.19, a noise map was also developed (Figure 9.20).

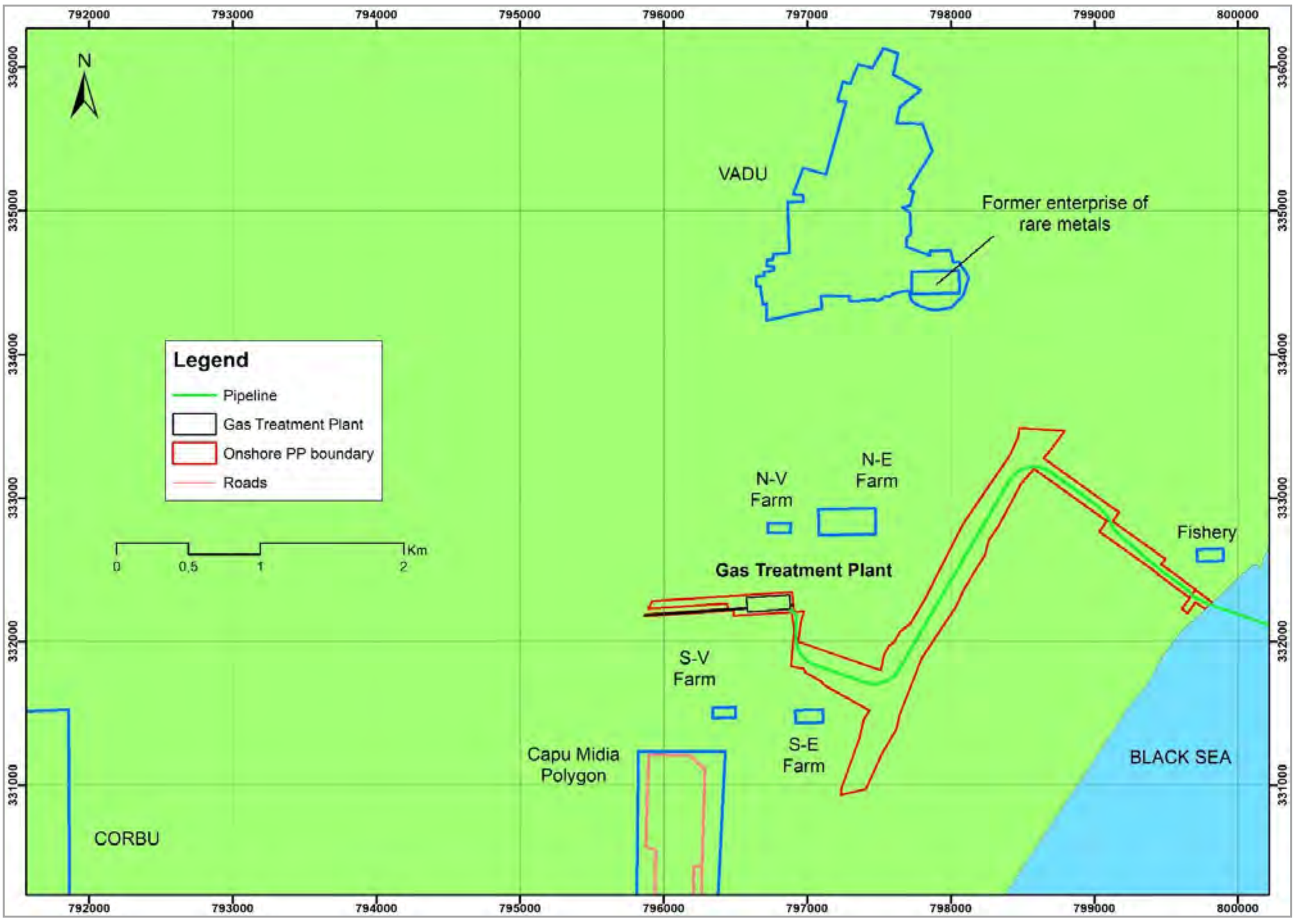


Figure 9.19 Location in the territory of the PP and of the sensitive receptors in its vicinity as well

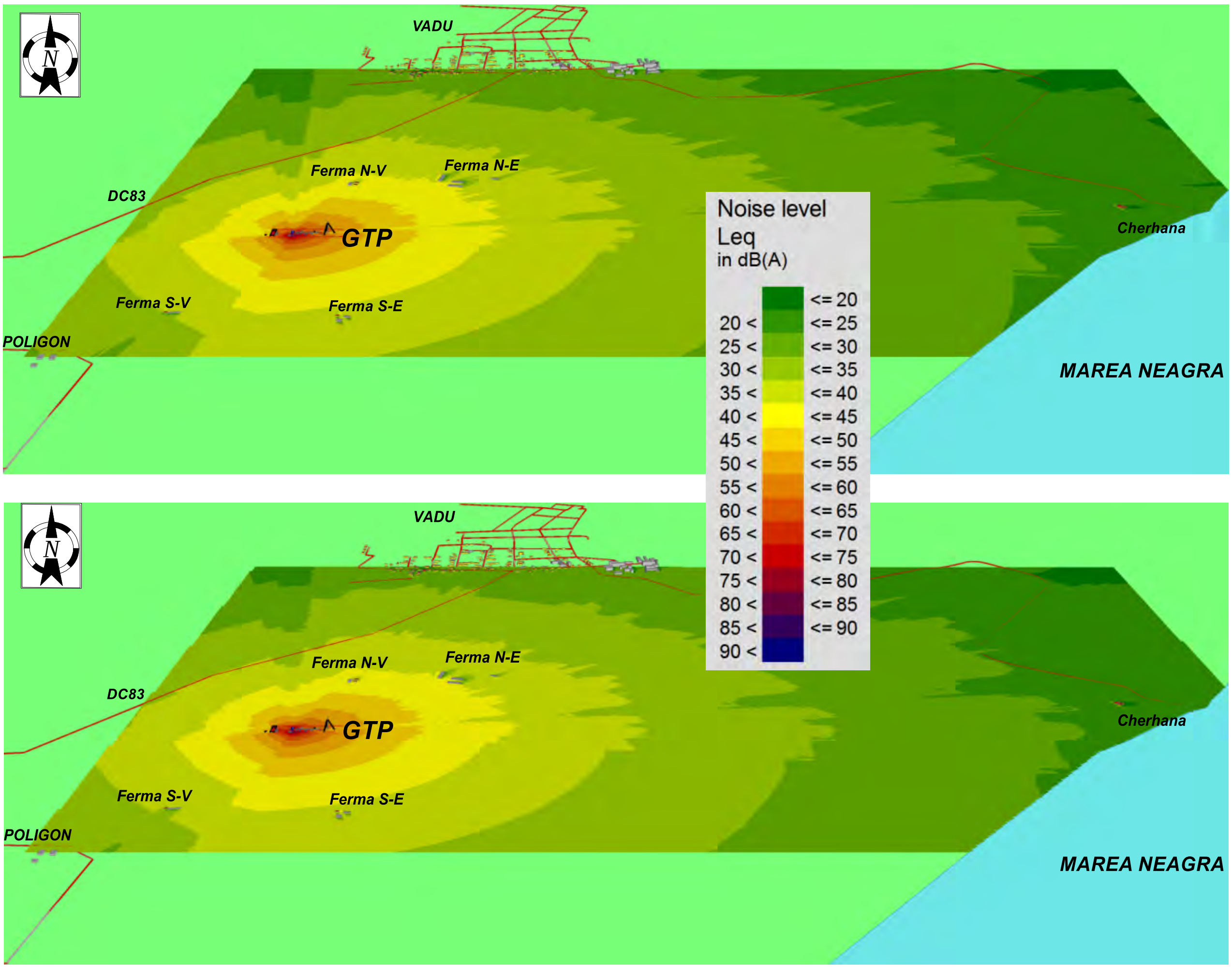


Figure 9.20 Distribution of noise levels in 3D presentation, in the area including the GTP and the closest sensitive receptors. The upper part of the figure presents the situation where only the sources operating continuously were taken into account and the lower part of the figure presents the situation when all sources located on the GTP territory would operate in parallel.

9.5.2.4 Modelling the level of the noise generated during operation

In order to estimate the noise level during operation, considering all noise sources and their estimated acoustic pressure and the way of operation as well (continuous or intermittent), a series of maps containing the distribution of noise levels on the territory of the GTP were generated using the SoundPLAN software (Figure 9.21).

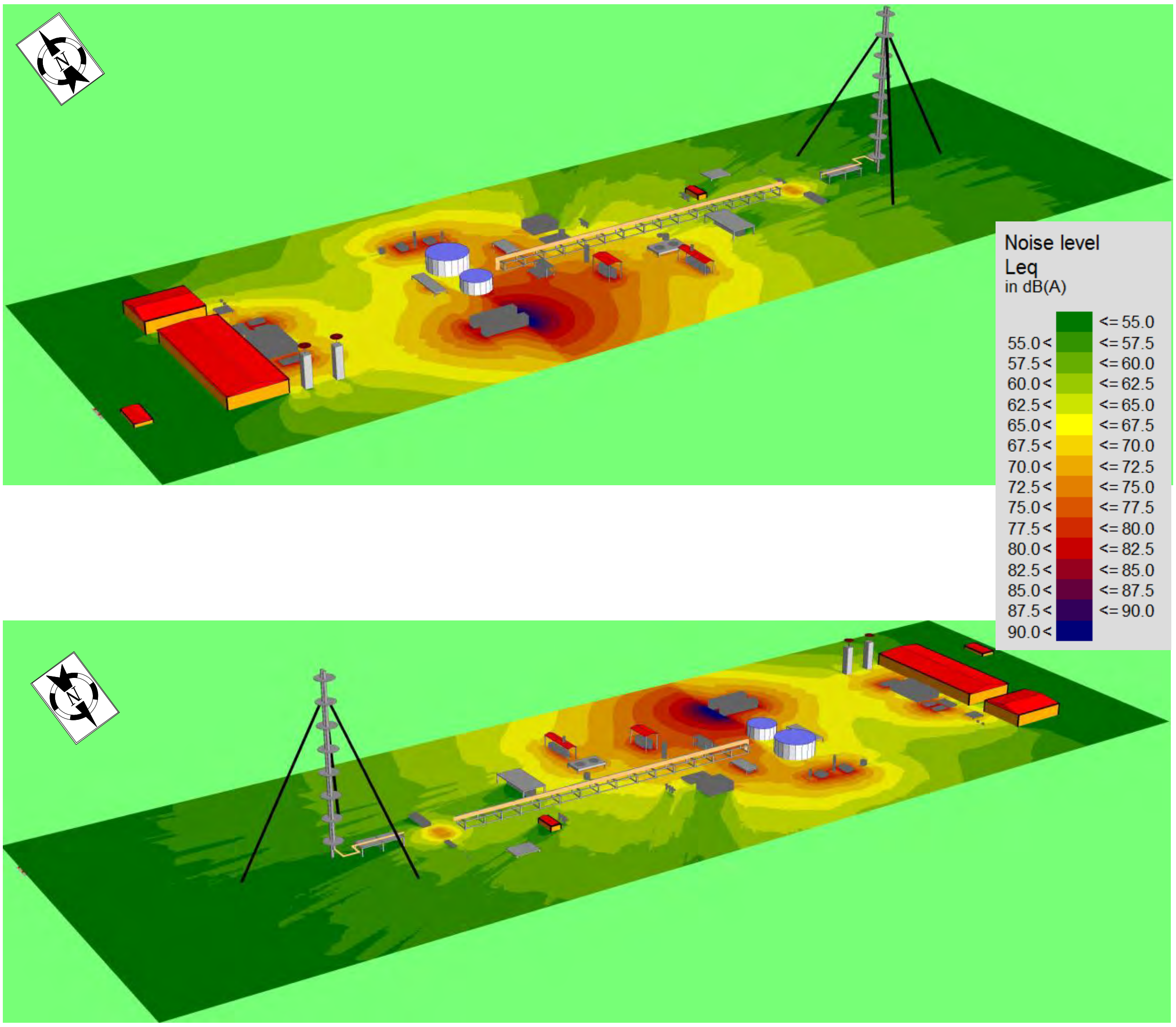


Figure 9.21 Distribution of the noise levels on the GTP territory, in 3D representation, in order to justify the assignment of acoustic powers for the sources in accordance with the noise limits imposed to equipment suppliers

One can notice that the noise level under normal operation conditions **does not exceed the limit of 65 dBA** (which is imposed by Romanian legislation at the boundary of the site) on GTP boundary, except for the SE part. After the mitigation measures are in place, the noise map would look like the one from Figure 9.22.

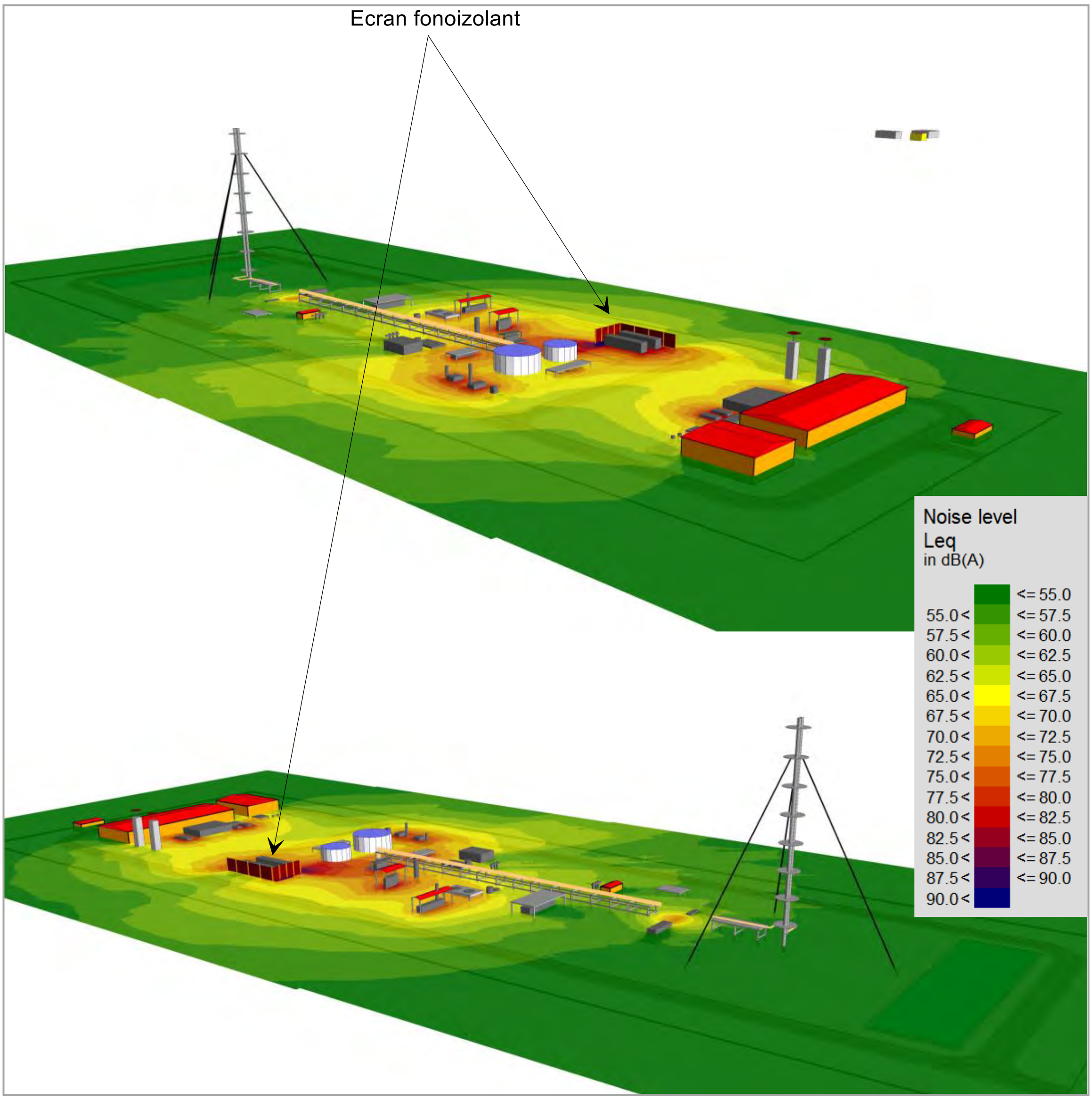


Figure 9.22 Reduction of noise levels at the limit of the GTP, by appropriately locating a sound insulating screen which is 5 m high

9.5.3 Management and mitigation measures

The following measures for impact reduction are recommended in order to reduce the level of noise and vibrations during construction, and the potential negative impacts on sensitive receptors:

> Transporting materials, pieces of equipment and installations and performing works during the daytime, between -7.00 and 23.00 and avoiding transportation between 23:00 and 7:00 whenever possible;

> Developing a work management plan in order to establish the order for work execution and a plan for maintaining and checking the machineries and pieces of equipment used, that should consider the generated noise level; and

> Using machineries and transportation means having low noise levels.

The following measures for mitigating noise impact during operation are recommended:

- Reduction of transportation frequency at night, between 23:00 and 7:00 and application of additional measures for reducing speed;
- Limiting the speed of vehicles and heavy vehicles on the access road;
- The transportation activities will be planned so that the vehicles limit their tours to the minimum necessary for works performance, in order to reduce the discomfort for the local population;
- Installing silencers on the routes of the burned gases towards the evacuation stacks;
- Installing cases or acoustic screens wherever possible (aggregates: pumps, power generators, turbines etc.); and
- Monitoring noise emissions in order to check the observance of the limits imposed by the applicable legislation depending on the given situation; if following the monitoring exceeding values occur, as registered after modelling, building a sound insulating screen which is 5 m high, as indicated by the simulation in Figure 9.22.

9.6 Waste Generation

9.6.1 Introduction

Wastes will be generated during the construction, commissioning, operation and decommissioning of the onshore infrastructure. The main sources of wastes that will require management include:

- Waste materials (hazardous and non-hazardous) from GTP construction and decommissioning;
- Routine wastes (hazardous and non-hazardous) through the GTP operational phase; and
- Infrastructure removed during decommissioning.

9.6.2 Waste management during construction and decommissioning

The main waste sources during the construction of the onshore segment (underground) of the Ana Platform - GTP pipeline and of the GTP can be:

- Technological processes during construction works (raw material transportation and storage, assembly of GTP installations, installation of the pipeline and of its accessories etc.); and
- Ancillary activities performed during site organization.

According to the provisions of GD no. 856/2002, the project owner (BSOG), through its contractors has the obligation to keep an evidence of the waste management for each type of waste. Contracts will be concluded with certified operators in order to transport waste for recovery/elimination.
The generation of the following waste types is anticipated, depending on activities:

- Inert waste (soil and stones) form excavation activities;
- Paper/cardboard and plastic packaging resulted from various construction materials;
- Domestic waste resulted from the activity of the personnel inside the site area;
- Hazardous waste resulted from the contact with hazardous chemicals (textile materials used for cleaning, personal protective equipment, contaminated packaging, containers for transportation etc.);
- Absorbent waste, filtering materials (including oil filters without any other specification), polishing materials, protective clothing contaminated with hazardous substances; and

> Waste resulted from welding, iron and steel waste, wooden packages, metallic packages, synthetic engine oils, transmission and grease oils etc.

9.6.3 Waste management during operation

The main waste sources during the operation of the proposed project are the activities inside the GTP and the office activities performed in the administrative building, the maintenance and current repair works performed inside the GTP or other intervention works if it is damaged. The quantities of waste produced during pipeline operation will be small and it will be possible to collect it selectively after each minor maintenance work, for submitting it with a view to being turned into profit/eliminated by authorised operators.

Within the GTP, relatively low quantities of waste are generally estimated, taking into account the specificity of the activities. Contracts will be concluded with specialized units for picking up, turning into profit and eliminating waste. During GTP decommission, the main sources of waste will be:

> Works for decommissioning GTP installations; and

> Related activities performed during site management for GTP decommission.

Table 9.28 includes the codes and quantities of waste estimated to be generated during execution and operational phases.

Table 9.28 Codes and estimative quantities of waste generated within the GTP

Project phase	Name of the generated waste	Physical condition (Solid-S, Liquid-L, Semisolid-SS)	Waste code (EWC according to GD 856/2002)	M.U.	Estimative quantity
All					
	Paper and cardboard	S	20 01 01	t/month	1
	Plastic packaging	S	15 01 02	t/month	0.1
	Packaging containing residues or contaminated with hazardous substances	S	15 01 10* (hazardous waste)	t/month	0.05
	Absorbent materials, filtering materials (including oil filters without any other specification), polishing materials, protective clothing contaminated with hazardous substances	S	15 02 02* (hazardous waste)	t	0.05
	Mixed municipal waste	S	20 03 01	t/month	0.5
Construction Construction/ Decommission	Waste from welding activities	S	12 01 13	t/month	0.1
	Iron and steel	S	17 04 05	t	0.5
	Wood packaging	S	15 01 03	t	0.1
	Metallic packaging	S	15 01 04	t	0.2
	Synthetic oils for engine, transmission and lubricating	L	13 02 06* (hazardous waste)	t/month	0.05
Operation/ Duty	Paint and lacquer waste containing organic solvents or other hazardous substances	L	08 01 11* (hazardous waste)	t/month	0.05
	Paint and lacquer waste	L	08 01 12	t/month	0.05
	Waste resulted from electric and electronic equipment	S	16 02 13*	t/month	0.01

The waste will be managed as follows:

- The soil and rock waste resulted from land excavation works for assembly/decommissioning of the installations for the GTP and the pipeline will be subsequently used in order to fill in excavations or will be disposed of using certified operators and authorized landfills;
- The drilling waste and muds resulted from using the technique of directed horizontal drilling (if it will be one of the technologies chosen for building the pipeline) will be stored in the drilling installation in order to be reused;
- The mixed municipal waste (generated during construction/implementation/decommissioning) will be collected inside the site organization in special designed places for temporary storage of waste and from there they will be handed over to certified operators for waste disposal;
- The recyclable waste, such as paper and cardboard, metallic and plastic materials and electrical and electronic equipment waste (generated during construction/operation/decommissioning) will be selectively collected and temporarily stored within the site organization area and they will be subsequently disposed of for recovery; and
- The hazardous waste and packaging for toxic and hazardous substances as well (generated during construction/operation/decommissioning) will be safely stored temporarily in the site area and subsequently handed over to certified operators for final storage, recycling or incineration. As the case may be, the waste fuels and used oils will be collected in sealed metallic containers and handed over to specialized units for recovery or incineration. Both during site management and during GTP operation, the quantities that are turned to profit will be recorded in accordance with the provisions of GD no. 235/2007.

In order to reduce the quantities of waste generated during MGD Project implementation, actions will be taken as follows:

- Use of technologies leading to a consumption of raw materials and energy that is as low as possible;
- Maintaining installations, machineries and transportation means in good operation condition, having technical revisions and oil changes performed in specialized workshops;
- During construction/operation/decommissioning, considering the complexity of the activities performed, it is recommended to appoint a person responsible for environmental protection. His/her role will be to ensure that the activities for MGD Project implementations are performed causing an environmental impact as low as possible; and
- During GTP operation, waste management records will be kept according to the GD no. 856/2002, and reporting obligations will be observed, obligations in the regulation documents to be subsequently obtained.

10 OFFSHORE SOCIO-ECONOMIC IMPACT ASSESSMENT, MITIGATION AND MONITORING

10.1 Introduction

The current chapter presents the possible offshore socio–economic impacts generated by the MDG Project. The impacts have been analysed considering all the previous documents prepared by BSOG, including the ENVID report and the ESIA scoping report where potential socio-economic risks have been formulated. Some of these risks are not included in this report due to the fact that there are no elements proving their occurrence or there are not solid arguments for considering them as important and significant.

10.2 Fisheries

10.2.1 Introduction

Fishing represents a relevant economic activity along the shore line. There are two main types of fishing activities that could be affected by the Offshore Component of MGD Project: large ship, commercial fishing and small, often times informal fishing. It is noted that illegal fishing is a known and permanently present activity. Currently there are 151 officially registered ships in the Romanian fishing fleet (which is about 1% of the total registered fishing boats in Black Sea), with much larger number of small fishing boats that practice informal/illegal fishing activities. To assess the impact on this sector and on those connected to it, the analysis relies on data provided by the Romanian Naval Authorities as well as on primary data collected during discussion with local stakeholders from Vadu and Corbu villages. Verbal information collected during field visits revealed that fishing activities may offer an additional income for the locals. Given this context, this section considers the possible impact the construction, operation and decommissioning phases could have on local and regional fishermen and related businesses.

10.2.2 Regulatory control

To mediate the impacts of overfishing and promote a sustainable management of resources in Black Sea, the Ministry of Environment issues an annual Order that prohibited fishing in certain periods. For 2018 prohibitions were the following:

1. A general temporary prohibition period for all species for a period of 60 days between 1 April and 30 May, applicable in natural fish habitats;
2. A general temporary prohibition period for all species for a period of 45 days between 1 April and 15 May, applicable in waters which represent the state border (e.g. the coastal Black Sea);
3. Permanent prohibited fishing of dolphins and sturgeon all year round, although exceptions are made for scientific fishing of sturgeon;
4. Additional prohibition periods include:
   - Fishing for shark between 1 January and 31 January and also between 15 October and 30 November inclusively;
   - Fishing for frog fish between 1 May and 31 May, inclusively; and
   - Fishing for brill is subject to applicable EU Regulations and forbidden between 1 April and 1 July.

All other marine species, excluding those mentioned above, may be fished throughout the year. Fishing for *Rapana* using a beam trawl is allowed all year round; however, NAFA must be notified at every ship port entrance and exit (with the exception of the Danube Delta Biosphere Reserve) to ensure any accidental brill catches are discovered.

On the marine territory of DDBR (along the coastline up to Capu Midia and up to the 20 meters isobath, some 7 km away from the shoreline) fishing of turbot and *Rapana* is prohibited.

10.2.3 Discussion of potential impacts

The identified impacts should be considered along different types of infrastructure making up the Offshore Component of MGD Project and the possible affected parties: large fishing vessels and small local fishing vessels.

10.2.3.1 Ana and Doina wells and Ana Platform

- Impact on owners of large fishing ships (especially those relying on side trawling method in the permitted areas) – could result from restricted area of fishing (due to establishment of safety exclusion zones) during the construction, operation and decommissioning phases since the ships may be required to reroute their fishing trails. This can lead to an increase in the operational costs. The impact will be higher during the construction and decommissioning phases due to larger security perimeters required; and
- Impact on local fishermen – there is no foreseeable social impact since both wells and platform are 100 km from the shore line.

10.2.3.2 Pipelines

- Impact on owners of large fishing ships (especially those relying on side trawling method in the permitted areas) results from applied restriction during the construction phase to the area next to the pipeline route. This can require rerouting and could possibly increase the operational costs. Similar restriction would apply for side trawling type of fishing along the pipeline during the operation and decommissioning phases. Similar to the construction phase, this can require rerouting, thus increase the operational costs; and
- Impact on local fishermen – the assessment of impacts on local fishermen is addressed in an additional environmental and social information and assessment document (AESIA).

10.2.4 Management, mitigation and residual impacts

To mitigate the above-mentioned impacts, measures outlined in Table 10.1 will be implemented.

Table 10.1 Relevant mitigation for key impacts, and conclusions on impact

Impact description	Management and mitigation	Residual impact
Potential requirements for rerouting could occur for large fishing ships during the construction, operation and decommissioning phases of Ana and Doina wells, Ana platform and offshore part of the pipeline. The fishing routes are approved by the Romanian Naval Authority.	Communication with fishing ships will be done by the Romanian Naval Authority. BSOG has already obtained the necessary permits for the construction of offshore section and once the construction finalized, the restrictions will be imposed and communicated to Naval authority. The Naval authority will send notifications to all the appropriate shipping journals and charts, ensuring all navigational aids are in place and used/maintained appropriately, the establishment of safety exclusion zones around construction vessels and the drilling rig, and around seabed infrastructure once installed. In addition, subsea structures will be 'fishing friendly'	Fishing trawlers (where and if allowed for by law) would have to consider the location of the wells, platform and pipeline as permanent, thus adapt their routes for longer periods.

10.2.5 Cumulative impacts

The pipeline route crosses an area of military shooting polygon and is located near the offshore Lebada production plant, owned by OMVP. The pipeline crosses two existing subsea pipelines of OMVP.

No major social cumulative impacts can be defined for the current Project. The only minor social cumulative impact that is to be considered is the increased restrictions on the project area of influence due to other restrictions imposed already by the other existing pipelines and the military activity in the area. Still, this impact is not significant since the MDG Project has a relative small offshore impact.

10.2.6 Transboundary impacts (where relevant)

As the MDG Project is entirely developed within the Romanian territorial waters, no transboundary impacts are foreseen.

10.3 Shipping

10.3.1 Introduction

As described in chapter 7.1.2 there are three main navigation routes on which MDG Project might have a potential negative impact during construction and operation period. These routes are:

- Route No. 1 is used by an estimated 160 vessels per year between the Bosphorus Channel and Ukraine ports. This route passes the Ana Wellhead Platform location to the west at a mean distance of 0.1 nm;
- Route No. 2 is used by an estimated 10 vessels per year between Midia and Poti. This route passes the location to the north at a mean distance of 0.9 nm; and

> Route No. 3 is used by an estimated 822 vessels per year between Constanta and Novorossiysk. This route passes the location to the south at a mean distance of 1.5 nm.

10.3.2 Regulatory control

The national and international naval legislation requires a strict monitoring and delineation of naval routes. The naval traffic in the Black Sea is constantly monitored both by the Romanian Naval Authority.

10.3.3 Discussion of potential impacts

The Romanian Naval Authority has no special fishing and navigation restrictions in the project area with the exception of the two OMVP subsea pipelines and the territory of the Military Authority. Here, fishing and anchoring are strictly forbidden.

There are two recommended routes that may be used for fishing and navigation, one recommended by the Romanian Naval Authority and one recommended by the Bulgaria Naval Authority. These are outside the MDG Project area, thus avoiding any interference with the project activities.

10.3.4 Management, mitigation and residual impacts

In order to mitigate the impacts, the following measures will be implemented:

Impact description	Management and mitigation	Residual impact
Temporary navigation restrictions during construction period	Cooperate with the Romanian Naval Authorities in defining the permits conditions for navigation safety and establishing exclusion areas around the subsea infrastructure by BSOG and by the Marine Hydrographic Directorate) Sending notifications to all the appropriate shipping journals and charts, ensuring all navigational aids are in place and used/maintained appropriately, the establishment of safety exclusion zones around construction vessels and the drilling rig, and around seabed infrastructure once installed. In addition, subsea structures will be ‘fishing friendly	No residual impacts

10.4 Other Sea Users

There are no significant social impacts on other sea users identified due to project’s activities. Still, in order to avoid any situation of conflict due to miscommunication or misunderstanding, BSOG will prepare a stakeholder engagement plan where it will indicate the engagement needs with other sea users.

11 ONSHORE SOCIO-ECONOMIC IMPACT ASSESSMENT, MITIGATION AND MONITORING

11.1 Introduction

This part presents main social impacts identified for the onshore part of the project. It is divided between positive and negative impacts and structured along the main socio-economic sectors. For each sector the analysis discusses the main impacts identified. Impact ratings, summary of mitigations, residual impacts and indicators for monitoring are further on summarized in a table which accompanies the detailed description.

The impacts have been analysed considering all the previous documents prepared by BSOG, including the ENVID report, the ESIA scoping report and the Romanian EIA report, where potential socio-economic risks have been formulated. Some of these risks are not included in this report due to the fact that there are no elements proving their occurrence or there are not solid arguments for considering them as important and significant.

Based on the collected data, there are four sectors affected by the onshore part of the project:

- Land, infrastructure and agriculture;
- Economic activities;
- Culture, tourism and recreational sites; and
- Employment and labour force.

It is important to highlight at this point that there are no clear regulatory requirements for a SIA in Romanian legislation. In this context, with the exception of labour code, which has clear stipulation regarding applicable norms, for all the other sectors discussed below, the generic legislative requirements discussed in Chapter 2 will apply. Beside these, the EBRD requirements set in the Environmental and Social Policy – 2014 are also applicable to this project.

11.2 Land usage and infrastructure

11.2.1 Introduction

From the total available agriculture area approximately 90% are used for agriculture and farming while 9% as pastures. In this context, considering land usage and subsequent impact on land we should consider the project's impact on agriculture and grazing activities in the region.

Agriculture activities are one of the most important sources of income for inhabitants of Corbu Commune with 58.6% of the total land being agriculture land, it is used mostly under lease agreement with only 10% owned by private persons. For the deployment of the onshore project components BSOG acquired 14 land plots (10 for the pipeline route and 4 for the GTP deployment). All land plots were acquired by BSOG through direct negotiations with land owners. Given that surrounding lands are either private property or public lands accessible for grazing or other activities, a social impact assessment must consider project's deployment impacts.

Local road infrastructure will also be impacted by the project related activities, especially by the pipeline crossing of public lands and by the movement of heavy machineries to and from the construction camp/sie organization.

11.2.2 Discussion of potential impacts

There are four types of social impacts connected to the different types of land the project affects, specifically:

- *The lands crossed by the pipeline or used for the deployment of the GTP, property of BSOG*. Since the lands are in private property of BSOG and its partners in the Concession, the social impact during the construction, operation and decommissioning phases should have no negative implications. Prior to the beginning of works, the land plots acquired for the deployment of the GTP are left for agricultural use to the previous owner. While it is an informal agreement between parties, this is a positive impact for the previous owner since it offers him the possibility to use the land for agricultural activities until the project activities begin. BSOG will inform the land users of the start date of construction work approximately six months in advance;

- *Private or public lands crossed by the pipeline for which BSOG have the right of use or appropriate authorization for the duration of the project.* The exception from this category are public roads. Since the usage of roads could be of higher importance, public roads will be considered in a separate point. There are three types of land plots in this category*:*
    - Vadu beach section (used for the beach crossing) in the state property for which BSOG will obtain the required right of way from the Ministry of Finance, thus no significant social impact related to obtaining the right of use can be highlighted;
    - 50 m long and 20 m wide plot of land in private property for which a right of use was signed between BSOG and the owner. Given the right of use from the owner of the land plot no further social implications to be considered;
    - A land plot (P248/29) over which an easement right has been granted through the initial Ownership Certificate.
- *The lands where neither the pipeline nor the GTP are planned to be deployed, but which could be directly affected by the Project because of immediate proximity.*
    - Throughout the construction phase, unexpected by possible damage of crops or agriculture cultures may occur along the perimeter of the GTP. Heavy machinery manoeuvring as well as intense access to the construction camp located on the GTP premises could produce damages to the close located cultures. However, it has to be noted that BSOG owns enough land to accommodate the manoiuvering and storage of machinery and equipment (besides the GTP and pipeline layouts)
    - Temporary pollution can occur during the construction/decommissioning phases of the GTP mostly related to the construction dust, diesel exhausting coming from heavy machineries or accidental oil/waste/wastewater spills from the construction site could affect the near located agriculture land and crop cultures. However, it has to be noted that out of the 15 private land plots to be occupied by the Onshore Component (pipeline and GTP), 6 of them, making up 2/3 out of the entire land area can not be used for farming/grazing.
    - During the operational phase of the Project a possible risk may occur in case of emergency works, required on a segment of the pipeline or the GTP, that would require usage or access to private/public property in the proximity of the pipeline or the GTP. These types of interventions may damage the agriculture crops on those properties, access routes to them or the existing infrastructure on the property.
    - Throughout the entire lifecycle of the project, the property value of the near located land plots could decrease. It can occur because of the decreased desirability of a land plot located close to an industrial unit, associated explosion or pollution risks.

11.2.3 Management, mitigation and residual impacts

To mitigate the above-mentioned impacts, measures outlined in Table 11.1 will be implemented.

Table 11.1 Relevant mitigation for key impacts, and conclusions on impact

Impact description	Management and mitigation	Residual impact
Limited or temporary restricted access to agriculture lands, pastures, private properties, public space caused by the crossing of public roads. Relevant for the construction and decommissioning phases.	- Alternative access to the private land plots will be ensured during the construction work; - The planned schedule of works will be announced in advance as well as the alternative access routes; - Roads will be repaired to the pre-intervention state.	No residual impact
Usage of 6 km segment of DJ226 road and 4 km segment of DC83 road to access construction camp. Transportation of equipment and technical units on this road may cause temporal congestion in Corbu and restricted communication between Vadu and Corbu villages.	- Announcing the schedule of expected transportation in advance to local authorities and local community - Schedule the transportation for the least “crowded” period of the day (ex. after 8 pm). - Ensure the presence of a police crew in order to address any possible road congestion problems.	No residual impact
Usage of a 2.5 km segment of the DC83 road and 5.5 km segment of the Vadu beach access road (unnamed road) for the transportation of the construction equipment and machineries to the main work site on the Vadu beach. Due to width of the road, transportation of equipment will lead to a temporary blockage of the road. This in turn will restrict communication between Vadu and Corbu villages as well as communication with the Vadu beach.	- Announcing the schedule of transportation in advance to local community and local authorities. - Schedule the transportation for the least “crowded” period of the day (ex. 6 am). Avoid transportation during hours when pupils are transported to and from Corbu secondary school to Vadu.	No residual impact
Usage of the 8 km segment of the road between the construction camp and the Vadu beach by heavy machineries and transportation trucks can lead to a further deterioration of the road infrastructure, which will limit the accessibility of to the Vadu beach as well as the connection between Corbu and Vadu villages.	- Assessing the quality of the road before starting of works and in case any damages result from the usage of the road by machineries, those should be mitigated by BSOG; - Alternatively, an improvement of the road infrastructure (or contribution to this) should be considered by the BSOG, this will ensure also higher acceptance	No residual impact

Impact description	Management and mitigation	Residual impact
	from the local community of the project.	
Loss of crops or other agriculture related goods due to accidental oil spills, dust pollution during construction works, waste spill from the construction camp/site organization or GTP or any unintentional damage crossing the property perimeter of BSOG.	- BSOG will try to mitigate the situation directly with the affected part - BSOG will also include in the tender dossiers for the contractors the responsibilities of compensating affected parties in case such accidental situation occurs. - BSOG will properly monitor the implementation of any damages and the compensation mechanism adopted by the contractors - BSOG has adopted a grievance mechanism that allows any affected party to file in an official complaint	No residual impact
Unexpected but possible risk may occur in case an emergency intervention at the GTP or on the onshore section of the pipeline will require access to private lands and property. It may lead to financial losses related to crop or fence damage.	- In such case direct settlement will try to be reached with the affected party and proper compensation at full replacement costs will be provided for all damages.	No residual impact
Private owners of the land plots located in the immediate proximity of the GTP may face situations where their land value is decreasing due to GTP's operation and related risks.	- case by case analysis and proper compensations provided to land owners if decrease in property value is proven	The permanent/long terms existence of a GTP next to the land plots

11.3 Community, local economic activities and national economy

11.3.1 Introduction

Agriculture, commercial units (stores, pharmacies, funeral houses), foodservice industry and tourist related services are the most important economic activities in Corbu Commune. As outlined in the baseline section, both Vadu and Corbu villages' inhabitants rely on agriculture as their main source of income. Sea fishing offers additional income to some inhabitants and provides fresh products to local restaurants. Service sector is also active through goods and grocery stores, pharmacies, funeral houses, restaurants and guest houses or camping sites for tourists. Detailed description of the socio-economic structure of the communities can be found in the base-line part of the analysis.

11.3.2 Discussion of potential impacts

Considering all project's phases, both positive and negative social impacts can be defined:

Positive impacts for the local and national economy:

> *Taxes paid to local and national authorities;*

> *Due to its character, the project is also aiming at supporting the national energy sector by providing alternative resources of gas, thus being a strategic component in the national strategy for energy security;*

> *Supporting the local consumption;*

> *Improvements to roads and other social infrastructure in the impacted community – BSOG has developed and is already implementing a community social responsibility programme. This is focusing on supporting the needs of the local community via engaging in creating or improving the social infrastructure in Corbu and Vadu;*

> *Create local employment opportunities;*

> *Develop new practices and possibility of sharing knowledge and experience, providing training opportunities for future professionals in the oil and gas sector; and*

> *Contributing* to development and /or improvements to national legislation on oil and gas.

Negative impacts for local and national economy:

> *Impacts on commercial activity*

  - The beach crossing stage of the construction/decommissioning phase could decrease the number of tourists in the Corbu Commune.

> *Impacts on guest houses and camping sites*

  - Camping and tourist activities on the beach are prohibited but do take place as described in Section 7.2.4. Decreasing number of tourist due to the works on the Vadu beach segment could have a negative impact on the income of the guest houses and camping sites that rely on tourist inflow for their income. This impact will be the strongest during the construction/decommissioning phase when the beach related works will take place.

> *Impacts on local restaurants*

  - Decreasing revenues due to temporary diminished number of tourist visiting Vadu beach. This impact will be limited to the construction/decommissioning phases and only during the beach crossing stage of the Project.
  - Movement of heavy machineries and trucks can affect the inflow of costumers to the Moesia restaurant due to its location right next to the road used to access Vadu beach from construction camp. This in turn can lead to a diminished income for the owner.

11.3.3 Management, mitigation and residual impacts

To mitigate the above-mentioned impacts, measures outlined in Table 11.2 will be considered.

Table 11.2 Relevant mitigation for key impacts, and conclusions on impact

Impact description	Management and mitigation	Residual impact
Diminishing commercial activity and revenues for the local businesses due to a potential decreasing number of tourists during the beach crossing stage of the construction / decommissioning phase.	- Scheduling the construction works in low tourist season; If not possible, conduct an assessment on local businesses and determine the economic displacement situations. Based on this, provide proper compensations at full replacement costs, in line with EBRD PR5 requirements.	No residual impact

11.4 Culture, tourism and recreational sites

11.4.1 Introduction

According to the Environmental Report prepared by Auditeco there are 22 cultural heritage items located in Corbu Commune. 10 are located in Corbu village and 12 in Vadu village areas. Out of the 22 only one is a national cultural heritage item, the rest being local items. All 22 are archaeological monuments and will not be affected by the Project.The most popular touristic attraction in the area are Grindul Chituc, Corbu Lake, Corbu Beach and Vadu Beach.

Vadu beach, which is the one to be crossed by the pipeline, is located in the Danube Delta Biosphere Reserve. Touristic activities and camping are forbidden in this area and a permit is required for entering the beach. According to the owner of an authorized touristic accommodation unit in Corbu village, the inspections are rare. However, in the last years, the number of tourists increased significantly during summer. Despite the fact that camping is forbidden on the beach, different types of accommodation units for the tourists were developed in both Corbu and in Vadu villages. According to Corbu Municipality there are 3 authorized accommodation units and other approximately 70 unauthorized units in Corbu Commune with an average of 16 beds/accommodation unit. Usually, an accommodation unit has around 2-3 locals as employees.

Some of the touristic units provide different facilitates for tourists such as pools, playground areas, AC, Wi-Fi or breakfast. In general, the earnings resulted from a touristic unit providing this type of facilities should be at around 10,000 – 15,000 EUR/season but the real earnings are approximately 4,000 to 5,000 EUR. These amounts were estimated by the owner of an authorized touristic accommodation unit in Corbu village. The difference might be due to the fact that the owners of the accommodation units providing these type facilities cannot raise the price above the market price in the region.

11.4.2 Discussion of potential impacts

With around 3000 tourists visiting Corbu Commune during the summer weekends, Vadu and Corbu villages benefit quite significantly from the tourist related activities. Vadu beach is one of the important attraction for the locals as well as tourists that visit the region. Given the planned works on and close to the Vadu beach during the construction/decommissioning phases of the project, there could be identified a series of possible social impacts:

- Restrict or close public access to the Vadu beach during the movement of heavy machineries and pipes to the beach section in work. This impact would be temporary and would affect those tourists or locals that would consider moving to the beach at the same time as the movement of the machineries;
- Noise and dust pollution as result of construction/decommissioning works on the beach or near the beach segment of the pipe-line. This could have an impact on the quality of leisure time for the people on the beach; and
- An impact on the touristic image of the beach. Constructon activities near the beach and in nearshore sea areas may alter the positive image Vadu beach has a “relatively wild and unaffected by human activities”. This could alter the positive image of the beach and decrease the number of tourists in the area, impact incomes of the local community members relying on tourism.

11.4.3 Management, mitigation and residual impacts

To mitigate the above-mentioned impacts, measures outlined in Table 11.3 will be considered.

Table 11.3 Relevant mitigation for key impacts, and conclusions on impact

Impact description	Management and mitigation	Residual impact
Movement of heavy machineries and pipeline in the vicinity of the beach or access road connecting	Develop a schedule that avoids high traffic on the road accessing the beach. If not	No residual impact

Impact description	Management and mitigation	Residual impact
Vadu village and Vadu beach. This can create discomfort and unpleasant experiences to the tourists or locals going to the beach of the near located restaurant.	possible, design the schedule for moving the machineries earlier in the morning so that main traffic would be avoided.	
Noise and dust pollution can lead to a worse quality of leisure time for the people visiting the beach.	- Develop a schedule the construction works (for the beach section) when the number of visitors is lower. - If not possible, to ensure that works are done in the period of the day when the least people are visiting the beach	No residual impact
Works on the beach as well as close to the beach can damage the image of the Vadu beach as “relatively wild and unaffected by human activities place”. That in turn may lead to a possible decrease of tourist activities in the region.	- Ensure that Reinstatement Management Plan is properly implemented so that the beach and the close located area keeps its initial appearance	Reduce the reputation of the beach for a longer period

11.5 Employment

BSOG confirmed their interest in creating local employment opportunities by supporting as much as possible, within the limits of the existing legislation, involvement of local economic agents throughout different phases of the project. However, there is no conclusive evidence that employment will be created locally throughout the construction, operation or decommissioning phases. Regardless of this, the Project will have a positive impact on the employment situation and subsequent taxes and levies at the regional or national level. The project creates employment opportunities, the most significant effect being during the construction and decommissioning phases when a larger number of workers will be involved in the onshore and offshore parts as compared to operational phase of the project. For all the workers employed throughout all three phases of the project, the appropriate legal provisions stipulated by the existing labour code will apply.

11.6 Cumulative Impacts

Given the limited extent of the onshore works, significant negative cumulative impacts are not anticipated. It should be noted that there will be additional employment at the local level, and economic benefit at a higher level.

12 RESIDUAL IMPACTS AND CONCLUSIONS

Throughout the development of the MGD Project, environmental and social considerations have been of key importance to BSOG and its contractors. Development of an economically robust project is the ultimate priority, but BSOG understands that this cannot be at the cost of environmental or social sensitivities in the marine or terrestrial environment. To ensure a robust ESIA is conducted for the MGD Project, a number of studies have been conducted, which include:

- Baseline survey work;
- Atmospheric emissions modelling;
- Underwater noise propagation modelling;
- Airborne noise modelling; and
- Statutory EIAs for the offshore and onshore components.

Having developed robust environmental and social baselines for the marine and terrestrial environment, and informed by an ENVID exercise, the MGD Project team were able to develop a set of targeted mitigation measures to limit the potential for significant impact. On the basis of the known sensitivities, the potential impact mechanisms and the identified control measures, the following key residual impacts are predicted:

- Offshore environmental receptors/issues
  - Air quality
    - A limited installation and drilling period combined with limited operational emissions and the dispersive offshore environmental regime mean that **residual impacts will be not significant**.
  - Marine water quality
    - Limited discharges to sea will occur during the installation and drilling period, and what does occur will be rapidly dispersed in the low sensitivity environment. No routine operational discharges to sea will take place during the operational phase, other than open deck drainage. With appropriate control measures, **residual impacts will be not significant**.
  - Seabed habitats
    - Despite the moderate seabed sensitivity identified from field and baseline work, and a limited footprint of activity, and the absence of ongoing operational interaction, means that **residual impacts will be not significant**.
  - Biodiversity features
    - Features of particular interest in the Project area are marine mammals and fish, which are susceptible to Project activities that emit noise. Informed by noise modelling, noise emissions will be so limited that impacts on marine species are not anticipated. Disturbance of spawning habitat for fish will also be very limited. With appropriate control measures, **residual impacts will be not significant**.
  - Waste generation
    - BSOG and its contractors will manage waste in accordance with company policies, legislative requirements, and international best practice, **and residual impacts will be not significant**.

- o Accidental events
  - Catastrophic releases of hydrocarbons from gas developments (such as MGD) do not result in surface slicks or beached oil, and there is not expected to be any meaningful interaction with sensitive receptors or locations should any release of diesel occur. Smaller spills, such as of chemicals being used in the project, will be small in extent and rapidly dispersed in the offshore environment. With control measures, including adoption of industry best practice in design, te likelihood of any release is particularly small, and **residual impacts will be not significant**.

> Onshore environmental receptors/issues

- o Air quality and greenhouse gas footprint
  - Taking into account the composition of the natural gas in Ana and Doina deposits that is to be treated, the Project will contribute during the operational phase to the improvement of the general air quality, through the reduction of emissions generated by the energy sector. This is because the burning process for the natural gas generates carbon dioxide, nitrogen oxides and sulphur oxides at quantities significantly lower than those generated by burning coal or oil. **Residual impacts will therefore be positive, and not significant**.
- o Water and soil quality
  - Whilst there will be possible water run-off during construction and operation, mitigation measures will be in place to limit the potential to interact with sensitive features, and **residual impacts will be not significant**.
- o Biodiversity features
  - A number of features of biodiversity importance, including birds, have been identified in the Project area. The construction and operations will not impact on the ability of any of these features to breed, feed or grow, and **residual impacts will be not significant**.
- o Landscape
  - With adoption of best practice in design, and measures such as screening the GTP using natural vegetation, the visual impact of the GTP on the natural landscape will **be not significant**.
- o Noise and vibration
  - Noise emissions are inevitable from construction and operation works. With a combination of working hours planned to avoid the most sensitive areas and hours and with design measures to limit noise emissions, the **residual impact will be not significant**.
- o Waste generation
  - BSOG and its contractors will manage waste in accordance with company policies, legislative requirements, and international best practice, and **residual impacts will be not significant**.

> Offshore social receptors

- o Fisheries
  - Disruption offshore and nearshore could occur during drilling and installation activities, but the durations are limited and scope for impact equally small. It is possible that a number of fishing vessels may have to amend fishing routes slightly in response to the surface laid pipeline and the platform, but this will not affect where they can fish,

or the success rate of catches. In combination with ongoing stakeholder engagement and identified control measures, **residual impacts will be not significant**.

- Shipping
  - Disruption could occur during drilling and installation activities, but the durations are limited and scope for impact equally small. It is possible that a number of vessels may have to amend routes slightly in response to the platform, but this will not affect any existing key routes. **Residual impacts will therefore be not significant**.

> Onshore social receptors

- Land use and infrastructure
  - The MGD Project has adopted extensive mitigation measures to ensure that there is no substantial disruption to existing activities in the vicinity of the onshore operations. **Residual impacts will be not significant**.
- Community and economy
  - Recognising the importance of protecting local communities, BSOG has undertaken extensive stakeholder engagement during the Project. Resulting from this, a number of mitigation measures, such as careful scheduling of activities, have been proposed. Adoption of these measures will mean that **residual impacts will be not significant**.
- Culture and tourism
  - With substantial tourist activity in local villages, the Project has adopted a set of mitigation measures that will limit the potential for disturbance to normal activities. This includes scheduling activities outside of the peak tourist periods, wherever possible. Adoption of these measures will mean that **residual impacts will be not significant**.

> Cumulative and transboundary impacts

- No significant cumulative and transboundary have been identified for routine or accidental events, either offshore or onshore.

The mitigation measures on which the residual impact conclusions are based are critical to those conclusions. Ensuring that these measures are enacted through the Project is therefore equally critical to ensuring the Project does not significantly impact upon environment or social receptors. BSOG, certified to ISO 14001:2015, will manage implementation of the measures through an Environmental and Social Management System (ESMS) and Corporate Social Responsibility (CSR) procedures specific to MGD Project. Where contractors are required to execute Project activities, BSOG will require adherence with measures outlined herein.

Given the low sensitivity of the receiving environment and the focussed mitigation measures that will be adopted where there is the potential for impact, **the MGD Project will result in no significant impact** to the marine or terrestrial environment at any phase of the Project.

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APPENDIX A APPLICABLE INTERNATIONAL AND ROMANIAN LEGISLATION

Appendix A.1 Applicable International legislation

Appendix A.1.1 EU Regulations and Directives

- Directive 2014/52/EU, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment;
- Regulation (EU) no. 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC;
- Regulation (EU) no. 601/2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council;
- Regulation (EC) no. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) no. 1907/2006;
- Regulation (EC) no. 1907/2006 concerning the registration, evaluation, authorization and restriction of chemicals, establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (REACH);
- Regulation (EC) no. 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC;
- Regulation (EC) no. 850/2004 on persistent organic pollutants and amending Directive 79/117/EEC;
- Regulation (EC) no. 850/2004 on persistent organic pollutants and amending Directive 79/117/EEC;
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds;
- Directive 94/22/EC on the conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons;
- EIA Directive 85/337/EEC;
- Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmers relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC;
- Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Eurat
- Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants;
- Directive 122/2003 regarding the control of high-activity sealed radioactive sources and orphan sources;

- Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy;
- Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability regarding the prevention and remedying of environmental damage;
- Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds;
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora;
- Council Directive 2006/105/EC of 20 November 2006 adapting Directives 73/239/EEC, 74/557/EEC and 2002/83/EC in the field of environment, by reason of the accession of Bulgaria and Romania;
- Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment;
- Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations;
- Council Regulation (EEC) No 793/93 of 23 March 1993 on the evaluation and control of the risks of existing substances;
- Commission Regulation (EC) No 1488/94 of 28 June 1994 laying down the principles for the assessment of risks to man and the environment of existing substances in accordance with Council Regulation (EEC) No 793/93;
- Council Directive 76/769/EEC of 27 July 1976 on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations;
- Commission Directive 91/155/EEC of 5 March 1991 defining and laying down the detailed arrangements for the system of specific information relating to dangerous preparations in implementation of Article 10 of Directive 88/379/EEC;
- Commission Directive 93/67/EEC of 20 July 1993 laying down the principles for assessment of risks to man and the environment of substances notified in accordance with Council Directive 67/548/EEC;
- Regulation (EC) no. 850/2004 on persistent organic pollutants and amending Directive 79/117/EEC;
- Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment;
- Regulation (EU) No. 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC.
- Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control;
- Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006.

Appendix A.1.2 International Conventions and Protocols

- United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters 1998, ratified by Law no. 86/2000 (Aarhus Convention);
- The 1991 UNECE Convention on Environmental Impact Assessment in a Transboundary Context, ratified by Law no. 22/2001 (Espoo Convention);
- IMO Convention for the Prevention of Pollution from Ships, 1973 and the Additional Protocol from 1978, ratified by Law no. 6/1993 (MARPOL 73/78);
- IMO Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, ratified by Government Ordinance no. 14/2000 (OPRC Convention);
- International Convention on Civil Liability for Oil Pollution Damage, 1992, ratified by Government Ordinance no. 15/2000 (CLC Convention);
- European Convention on the Protection of the Archaeological Heritage, 1992, ratified by Law no. 150/1997 (La Valetta Convention);
- European Landscape Convention, 2000, ratified by Law no. 451/2002 (Florence Convention);
- Convention on the Conservation of European Wildlife and Natural Habitats, 1979, ratified by Law no. 13/1993 (Bern Convention);
- United Nations Framework Convention on Climate Change - Ratified by Romania by Law no. 24/1994 on 12.05.1994
- Stockholm Convention on Persistent Organic Pollutants Ratified by Romania by Law 261/2004;
- Kyoto Protocol Ratified by Romania by Law no. 3/2001 on 16.02.2001;
- World Heritage Convention Ratified by Romania by Decree no. 187/1990 on 31.03.1990;
- London Convention Ratified by Romania by Law no. 6/1993;
- Vienna Convention for the protection of the ozone layer;
- Montreal Protocol on Substances that Deplete the Ozone Layer;
- Washington Convention - Ratified by Romania by Law no.69/1994 on 12.08.1994
- Convention on Biological Diversity, 1992, ratified by Law no. 58/1994 (CBD);
- Convention on Conservation of Migratory Species of Wild Animals, 1979, ratified by Law no. 13/1998 (Bonn Convention);
- The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), 2001, established under the auspices of the Bonn Convention (UNEP/CMS);
- Convention on the Protection of the Black Sea Against Pollution, 1992, Bucharest, ratified by Law no. 98/1992 and related Protocols;
- Convention on the Protection of the Black Sea against Pollution, 1992, Bucharest, ratified by Law no. 98/1992 and related Black Sea Biodiversity and Landscape Conservation Protocol, ratified by Law no. 218/2011;
- The 1991 United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, ratified by Law no. 22/2001;

- The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), 2001, established under the auspices of the Bonn Convention (UNEP/CMS).

Appendix A.2 Applicable Romanian Legislation

Appendix A.2.1 General

- Law no. 50/1991 regarding the authorization of execution of construction works;
- Government Decision no. 839/2009 for the approval of the Methodological Norms of application of Law no. 50/1991;
- Law no. 350/2001 regarding territorial landscape and urbanism;
- Order no. 233/2016 for the approval of the Methodological Norms of application of Law no. 350/2001;
- Law no. 213/1998 on public property assets;
- Law no. 24/2000 on the legislative techniques norms for drafting legal enactments;
- Government Decision no. 852/2008 for the approval of norms and criteria for certifying touristic resorts;
- Government Decision no. 711/1999 for the approval of the term of the concession agreement of certain public property assets, directly attributed to the National Company "Romanian Waters";
- Law no. 395/2004 regarding the hydrographic maritime activity;
- Government Decision no. 573/2002 on the approval of the authorization procedures for corporate entities operation;
- Government Decision no. 525/1996 for the approval of the general urbanism regulation;
- Land Law no. 18/1991;
- Government Decision no. 140/2008 regarding the establishments of some measures concerning the application of REGULATION (EC) No 166/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC
- Emergency Government Ordinance no. 82/2011 regarding certain measures for organizing land improvement activities;
- Cadastre and Real Estate Publicity Law no. 7/1996;
- Law no. 597/2001 regarding certain protection and permitting of constructions measures in the coastal area of the Black Sea;
- Government Decision no. 241/2006 for the approval of the lease of Black Sea's beach, public property of the State, under the management of the National Administration Romanian Waters;
- Emergency Government Ordinance no. 105/2001 on Romania's state border;
- Law no. 227/2015 on the Fiscal Code;
- Law no. 287/2009 regarding the Civil Cod;
- Order no. 700/2014 for the approval of the Regulation re the approval, acceptance and registration in the cadastre and land book inventory.

Appendix A.2.2 Environmental

- Government Decision no. 445/2009 on environmental impact assessment pertaining to certain public and private projects;
- Order no. 1798/2007 on the approval of the procedure for issuing the environmental agreement;
- Order no. 818/2003 on the approval of the procedure for issuing the integrated environmental permit;
- Order no 864/2002 on the environmental impact assessment procedure in transboundary context and public participation to the decision-making for the projects likely to have a transboundary impact;
- Government Decision no. 856/2008 regarding the management of waste from extractive industries;
- Order no. 175/2005 regarding the reporting procedure for the environmental protection activities conducted by the economic agents with an industrial activity;
- Order no. 184/1997 on the approval of the environmental balance elaboration procedure;
- Order no. 818/2003 concerning approval of the Procedure for the grant of the integrated environmental permit;
- Order no. 135/2010 approving the Methodology for the application of the environmental impact assessment for public and private projects;
- Government Decision no. 971/2011 for the amendment and supplementation of 1.284/2007 regarding the declaration of Special protection areas as integrant parts of the European ecological network 'Natura 2000" in Romania;
- Order no. 863/2002 approving the Methodological guides applicable to the stages of the environmental impact assessment framework procedure;
- Law no. 188/2018 on limiting the air emissions of certain pollutants generated by burning installations with medium capacities;
- Order 36/2004 on the approval of the General Technical Guide on the application of the environment integrated authorization issuing procedure;
- Government Decision no. 1.284/2007 declaring the avifaunistic areas under special protection as an integrant part of the European environment network Natura 2000 in Romania
- Order no. 119/2014 approving the Hygiene Norms and public health on the living environment of the population
- Law no. 6/1993 regarding the Romanian acceptance of the MARPOL Convention;
- Law no. 82/1993 on the establishment of the "Danube Delta" Biosphere Reserve;
- Law no. 17/1990 on the legal regime of internal waters, territorial sea, the contiguous zone and exclusive economic zone of Romania;
- Ordinance no. 18/2016 on the landscape of the spatial marine planning;
- Emergency Government Ordinance no. 71/2010 on the establishment of the marine strategy framework;
- Emergency Government Ordinance no. 68/2007 concerning the environmental liability with respect to the prevention and repair of environmental damage;
- Emergency Government Ordinance no. 57/2007 on the regime of protected natural areas, the preservation of natural habitats, wild flora and fauna;

- Order no. 454/2013 for the approval of instructions regarding the organization and performance of the public tender for the awarding of the lease agreements of the Black Sea's beach, of the lease Framework agreement and the List of free beach areas proposed to be leased;
- Emergency Government Ordinance no. 195/2005 on environmental protection;
- Emergency Government Ordinance no. 202/2002 regarding the integrated management of the coastal area;
- Government Decision no. 1756/2006 on the limitation of level of noise emission in the environment by equipment for use outside buildings;
- Order no. 325/2001 regarding the approval technical instructions for the application of the provisions of GD 472/2000 regarding water protection measures to ensure the quality of the water resources. (NTPA 012/2001) and for the amendment of Order 242/1990;
- Government Decision no. 663/2016 setting up the protected natural areas and declaring special protection areas, as integral part of the European ecological network Natura 2000 in Romania;
- Government Decision no. 1284/2007 regarding the institution of bird protection areas as integral part of Natura 2000 European ecological network in Romania;
- Government Decision no. 1076/2004 establishing the procedure for environmental assessment for plans and programs;
- Government Decision no. 749/2004 regarding the responsibilities, criteria and method of delimitation of the land stripe located in the immediate proximity of the coastal area, for the purpose of preserving the ambient conditions and the patrimonial and landscaping value in the areas close to the shore;
- Government Decision no. 1232/2000 for the approval of the Methodological norms for the implementation of the International Convention on civil liability for oil pollution damage;
- Emergency Government Ordinance no. 152/2005 on the integrated pollution prevention and control;
- Order no. 46/2016 establishing protected natural areas and declaring the sites of community importance as an integral part of the European ecological network Natura 2000 in Romania;
- Order no. approving the Methodology for the information and consultation of the public regarding the development or revising of the spatial planning of the territory and zoning plans;
- Order no. 19/2010 approving the Methodological Guidelines regarding the appropriate assessment of potential effects of plans and programs upon protected natural areas of community importance;
- Order no. 1964/2007 on the institution of the protected natural area regime for sites of community importance as integral part of Natura 2000 European ecological network in Romania;
- Order no. 995/2006 approving the list of plans and programs subject to the provisions of GD no. 1076/2004;
- Government Decision no. 351/2005 on the approval of the gradual elimination of discharges, emissions and losses of priority dangerous substances
- Order no. 278/1997 on the approval of the framework methodology for the elaboration of prevention and control plans for accidental pollution caused by the use of potentially polluting water;
- Order no. 117/2006 approving the Guide regarding the applicability of the environmental assessment procedure for plans and programs;
- Order no. 756/1997 approving the Regulation on the assessment of environmental pollution;

- Order no. 536/1997 approving the Hygiene norms and recommendations on the living environment of the population;
- Government Decision no. 763/2015 approving the Plan of Management and associated Regulation of the Danube Delta Biosphere Reserve;
- Government Decision no. 248/2004 for adopting certain measures for the application of Law no. 82/1993 on the establishment of Danube Delta Biosphere Reserve;
- Law no. 59/2016 on the control of major-accident hazards involving dangerous substances (SEVESO III);
- Order no. 142/2004 on approving Safety Report Assessment Procedure for activities posing major accident hazards involving hazardous substances;
- Order 156/2017 on approving the methodology for elaboration of the emergency plans in case of accidents involving hazardous substances
- Emergency Government Ordinance no. 196/2005 on the Environmental Fund;
- Government Decision no. 477/2009 establishing the applicable sanctions for failure to comply with the provisions of Regulation no. 1907/2006/EC concerning the Registration, Evaluation, Authorization and Restriction of Chemicals, establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC;
- Government Decision no. 1132/2008 on batteries and accumulators regime and on waste of batteries and accumulators
- Government Decision no. 173/2000 for the regulation of the special management and control regime of polychlorinated biphenyls and other similar chemical compounds;
- Government Decision no. 124/2003 regarding the prevention, reduction and control of environment pollution with asbestos;
- Order no. 1030/2009 on the approval of the regulatory health projects location, planning, construction and operation objectives that conducts health risk for the population;
- Order no. 30/1995 for approving the Specifications regarding the approval of urbanism documentation and special planning, as well as TD for the authorization of constructions;
- The Water's Law no. 107/1996;
- Order no. 799/2012 regarding the approval of the normative for the content of technical documentation needed for obtaining water management permits and authorizations;
- Order no. 662/2006 for the approval of the Procedure and competencies for the issuance of water management permits and authorizations;
- Government Decision no. 472/2000 regarding water protection measure to ensure the quality of the water resources
- Order no. 873/2012 for the approval of the notice Procedure from water management point of view;
- Ordinance no. 43/2000 on the protection of the archaeological heritage and declaring certain archaeological sites as national interest areas Ministry of Culture;
- Law no. 422/2001 on the protection of historical monuments;
- Decision no. 2314/2004 on the approval of the list of historical monuments and missing monuments;

- > Order no. 2562/2010 on the approval of the Procedure re the issuance of the authorization to perform archaeological investigation works;
- > Law no. 5/2000 on the approval of the Spatial Planning of the National Territory - Section III - protected areas;
- > Law no. 458/2002 on the drinking water quality;
- > Governmental Decision no. 100/2002 approving the Quality norms of surface waters that are to be used for drinking and the Norms on the measurement methods and the frequency of sampling and assaying of the surface waters samples collected from waters;
- > Order no. 1406/2003 approving the Methodology for the quick assessment of environmental and human health hazards;
- > Order no. 811/1999 approving the Notification procedure for the commissioning or operation of certain works located on water or related to water;
- > Order no. 15/2006 re the approval of the Procedure for the temporary suspension of the water management authorizations and of the Procedure for amending and withdrawal of water management permits and authorizations;
- > Government Decision no. 201/2002 on the quality required of shellfish waters;
- > Government Decision no. 1593/2002 regarding the approval of the National preparation, response and cooperation plan in the event of oil pollution impacting the sea;
- > NTPA 011/2002 – TECHNICAL NORMS regarding collection/treatment and discharge of municipal waste water;
- > Order no. 161/2006 regarding surface waters quality classification in order to establish the ecological status of the water bodies;
- > NTPA 002/2002 – Regulation the conditions for discharging waste waters in municipal sewage systems for straight into the water treatment stations;
- > NTPA 001/2002 – Regulation on establishing the limits for discharging the industrial and municipal waste waters when discharged in natural receptors;
- > Government Decision no. 188/2002 On the approval of the norms regarding the discharging conditions of urban waste water into the aquatic environment
- > Order no. 135/84/76/1284/2010 for the approval of the methodology for environmental impact assessment for public and private projects.

Appendix A.2.3 Oil and Gas

- > The Petroleum Law no. 238/2004;
- > Government Decision no. 2075/2004 on the Methodological Norms of the application of the Petroleum Law;
- > Gas Law 351/2004;
- > Order no. 196/2006 regarding the approval of the norms and updated technical prescriptions, specific to the safety and protection areas related to the National Transportation System for crude oil, gasoline, ethane and condensate;

- Order no. 101/1997 approving the Technical Instructions for the evaluation, classification, confirmation of the geological resources and oil reserves and the framework of geological resources and oil reserves evaluation studies;
- Law no. 123/2012 on electricity and natural gas;
- Methodological Norms of application of Petroleum Law no. 238/2004;
- Law no. 165/2016 re the safety of offshore petroleum operations;
- Emergency Government Ordinance no. 19/2006 regarding the use of the Black Sea's beach and the control of activities performed on the beach;
- Order no. 232/2016 on the approval of the Framework Contract for circulating oil and petroleum products through the oil terminal for 2017;
- Law no. 256/2018 regarding certain measures required for the implementation of petroleum operations by the titleholders of petroleum agreements relating to offshore petroleum blocks;
- Order 89/2018 regarding the approval of the Technical guidelines regarding the design, execution and exploitation of natural gas supply systems;
- Law no. 185/2016 regarding certain measures for the implementing of national importance projects in the domain of natural gas;

Appendix A.2.4 Emissions and Air Quality

- Law no. 278/2013 on industrial emissions;
- Government Decision no. 780/2006 establishing a scheme for greenhouse gas emission allowance trading;
- Order no. 462/1993 approving the Technical conditions for atmospheric protection and Methodological guidelines for determining atmospheric pollutants emissions from stationary sources;
- Order no. 3420/2012 approving the Procedure for issuing the authorization for greenhouse gas emissions for 2013 - 2020;
- GD 570/2016 on the approval of the gradual elimination of discharges, emissions and losses of priority dangerous substances;
- Law no. 601/2012 on monitoring and greenhouse gas reporting under the EU Emissions Trading Scheme (ETS);
- Law 104/2011 on the quality of the ambient air.

Appendix A.2.5 Soil / Contaminated Land

- Government Decision no. 1408/2007 on the methods of investigation and assessment of soil and subsoil pollution;
- Government Decision no. 1403/2007 on the rehabilitation of the areas where the soil, subsoil and ecosystems were affected.

Appendix A.2.6 Wastes and Chemical Substances

- Law no. 249/2015 relating to packaging and packaging waste;
- Law no. 211/2011 on waste regime;

- Government Decision no. 11/2003 regarding safe management of radioactive waste
- Law no. 360/2003 in relation to waste and hazardous materials management;
- Government Decision no. 570 / 2016 regarding the approval of the Program for controlled elimination of evacuations, emissions and losses of priority dangerous substances and other measures concerning the main pollutants;
- Government Decision no. 1061/2008 on the transport of hazardous and non-hazardous waste on the Romanian territory;
- Government Decision no. 235/2007 regarding management of waste oils;
- Government Decision no. 856/2002 on waste management evidence and approving the waste list, including hazardous waste;
- Order no. 1084/2003 approving the Notification procedures for activities posing major accident hazards involving dangerous substances and the respective major accidents;
- Order no. 757/2004 approving the Technical norms on waste storage.

Appendix A.2.7 Noise

- Government Decision no. 321/2005 in relation to the assessment and management of environmental noise;
- STAS 10009-88" Urban acoustic" established the admissible limits of the noise level in urban environment;
- Order no. 678/2006 the calculus methods for the noise indicators caused by the road, railroads, flight traffic, and also by the industrial activities.

Appendix A.2.8 Cultural Heritage

- Law no. 442/2001 on the protection of historical monuments;
- Law no. 182/2000 on the protection of the national cultural movable heritage;
- Government Ordinance no. 68/1994 on the protection of national cultural heritage;
- Order no. 2361/2010 approving the List of Historical Monuments 2010;
- Order no. 2260/2008 approving the Methodological norms for classification and evidence of historical monuments;
- Order no. 2392/2004 regarding the Standards and procedures in archaeology;
- Order no. 2682/2003 approving the Methodological guidelines regarding the classification and recording of the historical monuments, the List of Historical Monuments, the Analytical record card for historical monuments and the Minimal record card for recording historical monuments.

Appendix A.2.9 Social

- Law no. 86/2000, for ratification of the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, signed in Aarhus on 25 June 1998 (Aarhus Convention);
- Law no. 544/2011 regarding the free access to information of public interest;
- Government Decision no. 878/2005 on right to access to environmental information;

- Emergency Government Ordinance no. 195/2005, related to environmental protection;
- Order no. 2701/2010 on the methodology regarding the mechanism of information and consultation of the public on the occasion of preparing or revising the zonal planning and urbanism plans provides the legal framework for performing the information disclosure and public consultation as a prerequisite for approving any urbanism and zonal planning documents;
- Government Decision no. 1516/2008 on the approval of the Frame-regulation of urbanism for the Delta Danube Biosphere Reserve
- Law no. 52/2003 on decisional transparency in public administration;
- The Romanian Constitution.
- Government Ordinance no. 43/1997 on roads regime;
- Government Ordinance no. 42/1997 on naval transport;
- Government Decision no. 245/2003 approving the Regulation for applying Government Ordinance no. 42/1997 on naval transport.

Appendix A.2.10 Health and Safety

- Law no. 64/2008 on the safe operation of pressure vessels, lifting equipment and fuel-consuming devices;
- Law no. 319/2006 on safety and health at work, which transposes Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work;
- Order no. 136/2018 on approval of the Radiological Safety Fundamental Norms;
- Law no. 307/2006 on fire safety;
- Order no. 129/2016 for the approval of the Methodological Norms regarding the approval and authorization of fire safety and civil protection
- The Labor Code, approved by Law no. 53/2003;
- Government Decision no. 571/2016 approving the categories of buildings and facilities which are subject to endorsement and/or authorization for fire safety;
- Government Decision no. 1050/2006 on the minimum requirements for improving the safety and health protection of workers in the mineral-extracting industries through drilling;
- Government Decision no. 971/2006 on the minimum requirements for the provision of safety and/or health signs at work;
- Government Decision no. 1091/2006 on the minimum safety and health requirements for the workplace;
- Order no. 163/2007 approving the General fire safety norms;
- Government Decision no. 1425/2006 for approving the Methodological Norms for application of Law no. 319/2006;
- Government Decision no. 1146/2006 on the minimum safety and health requirements for using work equipment, transposing Directive 1989/655/CEE on the minimum requirements for using work equipment by workers;
- Government Decision no. 1136/2006 on the minimum requirements for protection of safety and health protection of workers against hazards arisen from exposure to electromagnetic fields during work;

- Government Decision no. 493/2006 on the minimum requirements for protection of safety and health protection of workers against hazards arisen from exposure to noise;
- Government Decision no. 1048/2006 on the minimum requirements for personal protective equipment worn by workers;
- Government Decision no. 1058/2006 on the minimum requirements for health & safety of workers, working in potential explosive atmospheres;
- Government Decision no. 1028/2006 on the minimum requirements for health & safety of workers, working with Video Display Units (VDU);
- Government Decision no. 1051/2006 on the minimum requirements for health & safety of workers involved in manual handling of loads;
- Government Decision no. 1093/2006 on the minimum requirements for health & safety protection of workers exposed to carcinogenic or mutagenic agents at workplace;
- Government Decision no. 1218/2006 on the minimum requirements for health & safety protection of employees exposed to hazards arisen from chemical agents;
- Government Decision no. 355/2007 regarding workers health surveillance;
- Order no. 427/2002 regarding minimal First Aid Kit inventory for workplaces without specialized medical assistance;
- Order no. 3/2007 regarding approval of template for Reporting of LTI Incidents;
- Government Decision no. 600/2007 regarding protection of young employees against economic exploitation;
- Order no. 242/2007 regarding nomination of H&S Coordinator during execution stage of projects using construction sites;
- Order no. 867/2007 regarding approval of Romanian standards list harmonized with European standards referring to pressurized equipment;
- Government Decision no. 557/2007 on the minimum requirements for health & safety protection of special types of employees (fixed term contract employees/ temporary employees hired via crewing agencies);
- INSEMEX Order no. 1636/2007 regarding rules for management of equipment which are working in potential explosive atmospheres;
- INSEMEX Order no. 1637/2007 regarding general rules for management of search and rescue activities in companies with potential hazard of emission of noxious/ explosive/ flammable gases;
- Government Decision no. 937/2010 regarding the classification, packaging and marketing of hazardous products
- INSEMEX Order no. 1638/2007 regarding rules for technical management of ventilation systems installed in potential explosive/toxic atmospheres;
- Government Decision no. 300/2006 on the minimum health & safety requirements for temporary construction sites;
- Government Emergency Decision no. 99/2000 regarding applicable control measures for health & safety protection of workers during extreme weather conditions periods;
- Government Emergency Decision no. 96/2003 regarding protection of new and expectant mothers in the workplace;

- Government Decision no. 1876/2005 on the minimum health & safety protection of employees exposed to vibration;
- Government Decision no. 115/2004 on establishing of essential PPE safety requirements and conditions for admittance on national market;
- ISCIR PT C4 - Technical Rules for control of pressurized storage vessels;
- ISCIR PT C7 - Technical Rules for control of pressure safety devices;
- ISCIR PT C6 - Technical Rules for pressurized metallic pipelines;
- ISCIR PT R1 - Technical Rules for cranes and auxiliary lifting devices;
- ISCIR PT R2 - Technical Rules for management of lifting devices;
- ISCIR PT R4 - Technical Rules for self-elevating platforms.

APPENDIX B ESIA SCOPING REPORT FOR DOINA DEVELOPMENT CONCEPT, DECEMBER 2008

APPENDIX C PIPELINE ROUTE SELECTION APPRAISAL REPORT, MAY 2014