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ESPOO Report

Malta-Italy Gas pipeline interconnection

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NON-TECHNICAL SUMMARY

The Malta-Italy Gas pipeline interconnection project, called “Melita TransGas (MTG) Pipeline”, is a strategic gas infrastructure project that will enable the transport of gas from Italian pipeline network to Malta. The MTG project is planned and implemented by a state-owned company “Melita TransGas Company Ltd”, the Maltese Transmission System Operator (TSO). The entry of the pipeline into service is planned for 2025.

Considering the possibility that the MTG Project could originate transboundary effects on areas under Maltese competence, the subject of this report is the *offshore* part of the pipeline that connects Italy and Malta, as well as the analysis and assessment of transboundary impacts related to the pipeline section under Italian jurisdiction.

The Espoo report and procedure are an integrated part of the environmental impact assessment (EIA) procedures and approval processes in the respective countries of origin. Based on the results of each country EIA report, the Espoo report analyses the extent to which activities originating in each country could have a transboundary impact on environmental and socio-economic receptors in neighbouring countries.

Due to the nature of the MTG Project, resulting from the fact that it is being implemented in an area that is subject to the jurisdiction of two countries, the environmental impact assessment documentation, especially the assessment documentation relative to the transboundary context was drafted in a way as to ensure the maximum methodical coherence, while maintaining the differences resulting from differences in national legal systems and administrative practices in individual countries. At the same time, this report, in accordance with the requirements of the Espoo convention and national laws, should serve as a presentation of the information that will allow the countries that will host the planned undertaking to evaluate the possible transboundary impact on the environment. Consequently, this document reflects the information contained in the Italian environmental impact assessment report, especially the information that concerns transboundary impacts.

The main conclusions on transboundary impacts on Malta are summarized in the table below.

Affected Party (AP)	**Party of Origin (PoO) - Italy**
MALTA	The pipeline route crosses the boundary between the Italian and Maltese exclusive economic zones. Potential long-range project impacts include sediment dispersion and underwater noise. Modelling of sediment dispersion shows that significant transboundary impact is unlikely due to the limited duration and range. No significant transboundary impacts on marine mammal and fish populations caused by underwater noise from munitions clearance (detonation) is foreseen since very limited Unexploded ordnance have been detected along the investigated corridor and are located at a significant distance from the proposed route. In the part of Maltese waters that border Italian ones, no Natura 2000 sites were delineated. Considering the nature of the impacts generated as a result of the pipeline and the distance between pipeline in the area of Italian waters and the Maltese Natura 2000 areas, the possibility of transboundary impacts on the Maltese Natura 2000 sites is excluded. Overall, no impacts from the MTG project that originate in Italy will lead to any significant transboundary impacts in Malta.

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1.0 INTRODUCTION

1.1 Reading guide

This report comprises the Espoo documentation of the MTG project. The report is based on the February 2020 project design. The report contains a description of the project-related transboundary impacts, which are caused by project impacts generated in Italy and potentially affecting the marine territories (EEZ and/or territorial waters) of Malta.

The Espoo report has originally been conceptualized to serve as common report for both two countries of origin: Italy and Malta. However, since the publication of the Espoo report in each country is bound to the national EIA process and these processes will start at a different time in each country, this Report concerns the Italian jurisdiction. The Report contains basic information about the MTG project, such as project description, legal framework and Espoo process mechanisms, as well as a chapter on risk assessment and the assessment methods used. The central part of this report in Chapter 0 deals with the assessment of transboundary impacts. The results of the assessment are summarized in the conclusion (Chapter 8.0).

The Espoo report and procedure are an integrated part of the Environmental Impact Assessment (EIA) procedures and approval processes in the respective countries of origin.

1.2 Project background and justification

The "Melita TransGas (MTG) Pipeline" is a strategic gas infrastructure project having the goal to implement a gas connection to the trans-European Natural Gas Network to end Malta's isolation.

The project consists in a 159 km long bidirectional pipeline to be installed between Gela (Sicily) and Delimara (Malta). This interconnection has to be considered as the first part of the project; following the completion of the first phase, the feasibility of a potential second phase allowing a gas flow from Malta to Sicily will be considered. The second phase is still in a conceptual phase and therefore subject to future feasibility studies and market development.

The overall MTG project consists of the following components:

1) a new 151km long 22" concrete coated undersea gas pipeline between the landfall in Gela (Sicily) to the landfall at Delimara (Malta);
2) a fenced terminal station in Gela which connects the gas pipeline project to the SNAM Rete Gas Network in Sicily;
3) three fenced Block Valve Stations along the *onshore* route in Gela in view that the pipeline shall cross two railway lines and three roads;
4) a 22" buried pipeline between the Gela terminal station and the Sicilian shoreline
5) a 22" underground pipeline between the Malta landfall and the Terminal Station at Delimara;
6) a fenced terminal station sited within Delimara Power Station in order to receive gas from Sicily and forward it to the power generation plant.

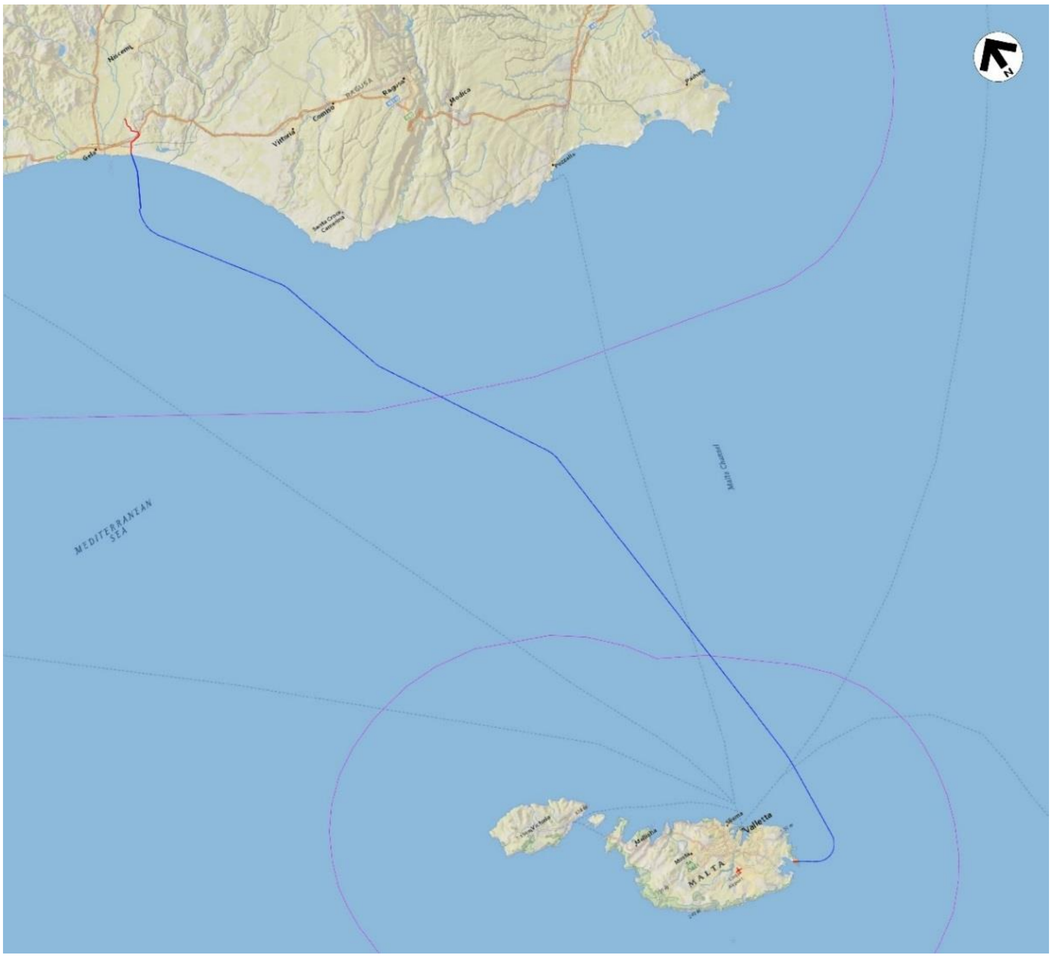

Figure 1.1: Overall Pipeline Routing Map

The new pipeline has been requested by Maltese Government, whose policy aims at reducing the cost of electricity generation and to minimize the environmental impact of the generation of electricity by switching from liquid fuels to natural gas. To meet these objectives the government's policy is promoting independent investment in Malta's energy infrastructure in the form of new facilities, favoring the importation of natural gas and new high efficiency generating plant at the existing Delimara Power Station site.

- The project will connect Malta to the European gas network and contribute to the integration of the Internal Energy Market; moreover, the project shall:
- Replace the importation of LNG for the production of electricity;
- Contribute to the system's overall flexibility and interoperability in that it will offer the possibility of capacity for reverse flows in the future.
- Complement the Energy Union's strategy towards the diversification of sources, routes and suppliers of natural gas.
- Guarantee greater security of energy supply to the island;
- Give Malta easier access to the natural gas resources and market integration;

- Support objectives of sustainability as it will contribute towards the reduction of GHG emissions by delivering natural gas more efficiently;
- Eliminate the need for liquefaction, shipping and re-gasification, as the case with LNG.

MTG project is in line with the conclusions of the European Council of the 4 February 2011, where the Council noted that "No EU Member State should remain isolated from the European gas and Electricity networks after 2015 or see its energy security jeopardized by lack of the appropriate connections"; the October 2014 European Council Conclusions where Malta is specifically mentioned as requiring special attention in the context of PCI implementation; the March 2015 European Council conclusions where the Council called for the acceleration of infrastructure projects, "including interconnections in particular to peripheral regions" and the Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Policy' which calls for the end of energy islands from the main electricity and gas networks.

The project has been identified as a "Project of Common Interest (PCI)" under priority corridor *"North-South gas interconnections in Western Europe"* in 2013 and its PCI status has been reconfirmed in the 2nd, 3rd and 4th PCI lists adopted in November 2015, November 2017 and October 2019 respectively. The current PCI denomination is: 5.19 - Connection of Malta to the European gas network — pipeline interconnection with Italy at Gela.

As stipulated in Regulation 347/2013 on guidelines for Trans-European Energy Infrastructure, projects labelled as PCI benefit from accelerated permit granting, improved regulatory treatment and financial support through grants for both works and studies under the Connecting Europe Facility programme (CEF).

Because of the PCI status, the project may benefit from accelerated planning and permit granting, a single national authority for obtaining permits, improved regulatory conditions, lower administrative costs due to streamlined environmental assessment processes, increased public participation via consultations, and increased visibility to investors.

The anticipated construction time is approximately 2,5 years, and the gas pipeline is planned to be ready for operation in 2025.

2.0 LEGAL FRAMEWORK AND ESPOO CONSULTATION PROCESS

A linear transnational project such as the MTG project must comply with numerous international conventions as well as EU directives and laws and national legislations. This chapter provides an overview of the main legal framework and national approval processes, which apply to the MTG project and which also contains the procedures to be followed under the Espoo Convention. Separate national approval procedures are applied in Italy and Malta.

2.1 The Espoo Convention and Espoo consultation process

2.1.1 The Espoo Convention

The Project is subject to the Environmental Impact Assessment procedure in both countries in which it is developed, as established by the ESPOO Convention on Environmental Impact Assessment in a Transboundary Context[1].

The *Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO 1991 Convention*), known as the Espoo Convention, defines the procedure for the management of transboundary impacts. The Convention was ratified in 1991 in the Finnish city of Espoo (hence the "Espoo Convention") under the auspices of the United Nations Economic Commission for Europe (UNECE), and entered into force in 1997. The last two amendments of ESPOO Convention have been ratified by Italy with Law No. 79/2016 and by Malta with L.N. 412 of 2017.

The ESPOO Convention sets out the obligations of the contracting Parties to assess the environmental impact of certain activities at an early stage of project planning. It also lays down the general obligation of countries to notify and consult one another on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.

The Espoo Convention has extended and strengthened the requirements for consultation on cross-border impacts under Directive 85/337/EEC (as amended by Directive 97/11/EC and Directive 2014/52/EU) adding the types of projects referred to in Annex 1 to those already provided for in the Convention and amending the consultation procedures defined in Articles 7 and 9. The list of the projects included pipelines.

The general purpose of the Espoo Convention is to "*ensure rational development from the ecological point of view, as well as sustainable*" through prevention, reduction and control of significant environmental impacts in a cross-border context resulting from the proposed activities. More specific purposes are "*international co-operation in assessing environmental impact in particular in a transboundary context*" and to " *specifically consider the environmental factors underlying the decision-making process*.

The main mechanisms of the Espoo Convention aimed at achieving the objectives are the following:

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[1] *UNECE, Convention regarding the Environmental Impact Assessment in a Transboundary Context from February 25, 1991 (ESPOO Convention)*

- Obligation to carry out an Environmental Impact Assessment (EIA) procedure. The EIA must be carried out before the decision-making stage.
- Consultations between States. Consultations must take place throughout the Espoo procedure at the different stages (notification, preparation of EIA documentation, consultations on the basis of the documentation produced, final decision, post-project analysis).
- Public participation. Public participation in both Parts of Origin must be facilitated through the Espoo process.
- Bilateral and Multilateral Agreements between States.
- Settlement of disputes.

According to the ESPOO Convention a transboundary impact is “any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party.”. This definition covers projects and impacts that cross national borders and, therefore, does not limit the scope of the Convention to projects that affect areas bordering on borders.

The Party of Origin (PoO) is the Contracting Party or Parties to the Convention, under whose jurisdiction the planned operation is to take place.

The Affected Party (AP) is a Contracting Party or Parties to the Convention that may be exposed to a transboundary impact of the planned activities.

The convention states that the PoOs shall, consistent with the provisions of the convention, ensure that APs are notified of a proposed activity, such as *a large-diameter oil and gas pipelines* (#8 - Appendix 1 of the conventions) that is likely to cause a significant adverse transboundary impact.

2.1.2 The Espoo consultation process

The consultation process foreseen under the Espoo Convention’s Articles 3-6 is coordinated by the Espoo Focal Points in each of the PoOs. The consultation process consists of the following major steps:

- Notification in accordance with Article 3: For a proposed activity listed in Appendix I that is likely to cause a significant adverse transboundary impact, the Party of Origin shall, for the purposes of ensuring adequate and effective consultations under Article 5, notify any Party which it considers may be an affected Party as early as possible, and no later than when it informs its own public about said proposed activity.
- Preparation of the environmental impact assessment documentation (Espoo report) pursuant to Article 4: The Party of Origin shall furnish the affected Party, as appropriate through a joint body where one exists, with the environmental impact assessment documentation. The concerned Parties shall arrange for distribution of the documentation to the authorities and the public of the affected Party in the areas likely to be affected and for the submission of comments to the competent authority of the Party of origin, either directly to this authority or, where appropriate, through the Party of origin within a reasonable time before the final decision is taken on the proposed activity.
- Consultation pursuant to Article 5: The Party of origin shall, after completion of the environmental impact assessment documentation, and without undue delay, enter into consultations with the affected Party concerning, among other issues, the potential

transboundary impact of the proposed activity and measures to reduce or eliminate its impact. Consultations may relate to:

a) Possible alternatives to the proposed activity, including the no-action alternative and possible measures to mitigate significant adverse transboundary impact and to monitor the effects of such measures at the expense of the Party of origin;
b) Other forms of possible mutual assistance in reducing any significant adverse transboundary impact of the proposed activity; and
c) Any other appropriate matters relating to the proposed activity. The Parties shall agree, at the commencement of such consultations, on a reasonable time-frame for the duration of the consultation period. Any such consultations may be conducted through an appropriate joint body, where one exists.

» Final Decision pursuant to Article 6: The Parties shall ensure that, in the final decision on the proposed activity, due account is taken of the outcome of the environmental impact assessment, including the environmental impact assessment documentation, as well as the comments thereon received pursuant to Article 3, paragraph 8, and Article 4, paragraph 2, and the outcome of the consultations as referred to in Article 5. The Party of origin shall provide to the affected Party the final decision on the proposed activity, along with the reasons and considerations on which it was based. If additional information on the significant transboundary impact of a proposed activity, which was not available at the time a decision was made with respect to that activity and which could have materially affected the decision, becomes available to a concerned Party before work on that activity commences, that Party shall immediately inform the other concerned Party or Parties. If one of the concerned Parties so requests, consultations shall be held as to whether the decision needs to be revised.

Pursuant to Art. 9 (4) of the TEN-E Regulation, the Project Promoter of the Project of Common Interest 5.19 is obliged to carry out a public consultation in both Malta and Italy during the pre-application permitting procedure.

Public hearings were held as follows:

» 10th April 2018, Marsaxlokk, Malta
» 17th April 2018, Gela, Sicily, Italy
» 18th April 2018, Palermo, Sicily, Italy
» 19th April 2018, Roma, Italy

In general, the feedback received was positive in both countries with some minor concerns expressed about environmental, archaeological and safety features. Clarifications were requested regarding the advantages of the project for the Maltese and for the territory of Gela. The answers provided have clarified the purpose of the project and the positive effects on the Maltese and Italian side. A public consultation report with the conclusions from this activity was also compiled. All the comments raised were inserted in the FEED's scope of work as to mitigate the impacts envisaged.

All completed and ongoing activities including the marine survey, FEED and environmental studies were conducted in close consultation with the Maltese Authorities, Sicilian Regional Authorities, Central Italian Government Authorities, all interested stakeholders, local communities and NGOs.

MTG Co. is ensuring that the works are conducted hand-in-hand with all the relevant Sicilian Authorities as transparently as possible such that all activities are conducted in the correct manner and within the planned timeframe. Meetings between the Maltese Government representatives, contractors and Sicilian Authorities have started since 2016 and are planned to continue throughout development and the construction of the pipeline.

A second round of public consultations will be held during the statutory procedure of the permitting process in 2020 and 2021 i.e. before the issuance of development permit.

The statutory consultation will be carried out under the EIA Regulations:

- The Maltese interested parties/ general public will be able to submit their comments on the part of the project located within both Italian and Maltese territory.
- Similarly, the Italian interested parties/ general public will be able to submit their comments on the part of the project located within both Italian and Maltese territory.

2.2 Further international legal requirements

2.2.1 The EU Habitats and Wild Birds Directives

Together, the Habitats[2] and Birds[3] Directives form the cornerstone of the legislative framework for protecting and conserving wildlife and habitats in the European Union (EU) and establish the EU-wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments. The aim of the network is to ensure favorable conservation status for the species and habitats, which form the designation basis of the habitats and bird protection sites, across their natural range.

The Natura 2000 network comprises:

- *Bird sites (special bird protection sites (Pol. (OSO, Eng. Birds sites (Special Protection Areas (SPA))*: sites designated for the protection of rare and vulnerable bird species listed in Annex I of the Birds Directive, as well as of regularly occurring migratory bird species. Ramsar sites[4] are also included, as protected wetland areas with special importance for birds, which were outlines as bird sites in Nature 2000; and
- *Habitat areas (special habitat protection areas (Pol. (SOO, Eng. SAC)/sites of community importance of the European Union (Eng. SCI))*: areas designated by the Habitat Directive for the projection of habitats and species.
- *Strictly protected species:* The Habitats Directives Annex IV contains a list of species that are strictly protected across their entire natural range within the EU, both within and outside Natura 2000 sites.

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[2] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

[3] Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds. Amended in 2009 it became the Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

[4] Ramsar sites are identified as part of the UN Convention of the Wetlands of International Importance especially as Waterfowl Habitat (also known as the Ramsar Convention). In the EU all Ramsar sites are included in the network of Special Protection Areas (SPAs) under the Birds Directive.

Italy

The transposition of the Habitat Directive took place in Italy in 1997 through the D.P.R. Regulation September 8, 1997 n. 357 (pdf, 53 KB) amended and supplemented by the D.P.R. 120 of March 12, 2003. Italy has transposed the Birds Directive through Law n. 157 of 11 February 1992 and Regulation D.P.R. 8 September 1997 n. 357, and its subsequent amendments and additions.

Malta

The main implementation of the Habitats and Birds Directives in Maltese legislation is through the L.N . 311 of 2006 (Flora, Fauna and Natural Habitats Protection Regulations) which transposes both directives as well as other conventions on biological diversity and wildlife.

2.2.2 Marine Strategy Framework Directive

The Marine Strategy Framework Directive[5] (MSFD) aims at achieving Good Environmental Status (GES) of the marine waters of the EU by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The Commission also produced a set of detailed criteria and methodological standards to help Member States implement the MSFD. To achieve GES by 2020, each Member State is required to develop a strategy for its marine waters (Marine Strategy).

Italy

The MSFD is implemented in Italian legislation through the Legislative Decree n. 190 of 13th October 2010. The Decree defines the development of marine strategies, in respect of the marine regions/subregions concerned, for italian marine waters; these strategies shall follow a plan of action which consists of a “preparation phase” and a “programme of measures”. The Decree also stated that the Ministry of the Environment and for the Protection of Land and Sea (MATTM) is the Competent Authority for the Marine Strategy, with coordination functions for national activities through a Specific Technical Committee.

Malta

The MSFD is implemented in Maltese legislation through the L.N. 73 of 211 (Marine Policy Framework Regulations).

2.2.3 Water Framework Directive

The Water Framework Directive[6] (WFD) is the legislative framework for protection of water in EU (rivers, lakes, groundwater, inland waters, surface water and coastal waters). The Directive sets a new approach for water management and protection of river basins – the natural geographical and hydrological unit – instead of according to administrative or political boundaries. The overall objective for the Directive is that all waters must achieve “good status”. Good status refers to a good ecological and chemical status. The directive also introduces the ‘the polluter pays’ principle, including the concept of ‘responsibility’ of polluters for the damage caused, connected to the attribution of the costs of repairing the damages to

[5] *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 (Marine Strategy Framework Directive).*

[6] *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*

those that caused them. The Directive covers coastal waters up to 1 nautical mile (NM) off the coast for ecological status and 12 NM for chemical status.

Italy
The WFD in Italy was transposed in 2006, with the legislative Decree no. 152. This decree enabled the establishment of River basin districts and assigned to the District Authority the competence of the development of the River Basin Management Plan.

Malta
The main implementation of the WFD in Maltese legislation is through L.N. 345 of 2015 (Water Policy Framework Regulations).

2.2.4 Barcelona Convention

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, originally the Convention for Protection of the Mediterranean Sea against Pollution, and often simply referred to as the Barcelona Convention, is a regional convention adopted in 1976 to prevent and abate pollution from ships, aircraft and land based sources in the Mediterranean Sea. This includes but is not limited to dumping, run-off and discharges. Signatory parties agreed to cooperate and assist in dealing with pollution emergencies, monitoring and scientific research. The convention was adopted on 16 February 1976 and amended on 10 June 1995. The Barcelona Convention and its protocols form the legal framework of the Mediterranean Action Plan (approved in 1975), developed under the United Nations Environment Programme (UNEP) Regional Seas Programme.

Italy
Italy ratified it on 3 February 1979 by Law No. 30 of 25.1.1979.

Malta
Malta ratified it on 30.12.1977.

2.3 Environmental Impact Assessment (EIA)

The EIA Directive (85/337/EEC) is in force since 1985 and applies to a wide range of defined public and private projects, which are defined in Annexes I and II:

- Mandatory EIA: all projects listed in Annex I are considered as having significant effects on the environment and require an EIA (e.g. long-distance railway lines, motorways and express roads, airports with a basic runway length ≥ 2100 m, installations for the disposal of hazardous waste, installations for the disposal of non-hazardous waste > 100 tonnes/day, waste water treatment plants > 150.000 p.e. (population equivalent)).
- Discretion of Member States (screening): for projects listed in Annex II, the national authorities have to decide whether an EIA is needed. This is done by the "screening procedure", which determines the effects of projects on the basis of thresholds/criteria or a case by case examination. However, the national authorities must take into account the criteria laid down in Annex III. The projects listed in Annex II are in general those not included in Annex I (railways, roads waste disposal installations, waste water treatment plants), but also other types such as urban development projects, flood-relief works, changes of Annex I and II existing projects…).

The EIA Directive of 1985 has been amended three times, by Directive 97/11/EC, Directive 2003/35/EC and Directive 2009/31/EC.

The initial Directive of 1985 and its three amendments have been then codified by Directive 2011/92/EU of 13 December 2011. Directive 2011/92/EU has been amended in 2014 by Directive 2014/52/EU, which constitutes the main European reference on Environmental Impact Assessment.

Italy has transposed the Directive 2014/52/EU with Legislative Decree n.104 of 16 June 2017[7], that amended the National Law on EIA represented by Legislative Decree n.152 of 3rd April 2006[8], Part II, Title III (Environmental Impact Assessment).

The competent authority on EIA Procedure is the Ministry of the Environment and the Protection of the Territory and the Sea (MATTM), which exercises its competences in collaboration with the Ministry of Cultural Heritage and Activities and Tourism (MIBACT).

The contents of the Environmental Impact Assessment Study are defined by art. 11 which amends art. 22 of 152/2006 (Environmental Impact Study) and Annex VII (Contents of the Environmental Impact Study referred to in Article 22).

The Environmental Impact Assessment took into account the National Guidelines of the Ministry of the Environment and the Protection of the Territory and the Sea.

In the definition of the contents of the documentation to be produced, reference was also made to the contents of the MATTM Opinion (Opinion n.2554 of 17/11/2017) referred to the Scoping Procedure (art.21 of Legislative Decree 152/2006 and ss.mm.ii.) and to the documents already submitted to the Italian authorities, in order to take on board comments, methodological guidelines, requirements that emerged in the previous phases of the project.

[7] *Decreto Legislativo 16 giugno 2017, n. 104 - Attuazione della direttiva 2014/52/UE del Parlamento europeo e del Consiglio, del 16 aprile 2014, che modifica la direttiva 2011/92/UE, concernente la valutazione dell'impatto ambientale di determinati progetti pubblici e privati, ai sensi degli articoli 1 e 14 della legge 9 luglio 2015, n. 114. (17G00117) (GU Serie Generale n.156 del 06-07-2017)*

[8] *Decreto legislativo 3 aprile 2006, n. 152 - Norme in materia ambientale (G.U. n. 88 del 14 aprile 2006)*

3.0 ALTERNATIVES

Both EU[9] legislation and the provisions of the Espoo Convention (Article 5) require the developer to assess reasonable alternatives, including the no-action (or zero) alternative.

Within the MTG project, alternatives refer mainly to alternative routes, both offshore and onshore. Except for the zero alternative, there is no technical alternative to a pipeline. This chapter presents the main alternative routes between Sicily and Malta which have been assessed during the planning phase, the methodology applied to the routing assessment and the main conclusion of the study.

The no-action (or zero) alternative means not implementing the project at all, i.e. all activities connected with project would not take place. Consequently, there would be no environmental or social impact (negative or positive) from the project itself.

The zero alternative would therefore mean that Malta would not be connected to the gas network of the European Union (EU) through Italy and as a consequence none of the benefits resulting from the construction and operation of this infrastructure would take place, neither at European level, nor at national level for Malta and Italy.

At European level, the zero alternative would mean missing crucial objectives of European energy policy and indirectly preventing Europe from receiving the general benefits of greater diversification, competition, security of supply and market integration.

At national level, the "zero" alternative would mean the lack of current and future benefits for Malta and Italy, resulting from increased competition, diversification, security of supply, liquidity and integration of the gas market in Italy. The alternative "no plan" would represent moreover for both the Member States an economic opportunity lost, for lacked occasions direct and induced employment.

3.1 Considered route alternatives

The analysis of the alternative routes began from the early stages of the development of the Project and was part of the decision-making process and design up to the current definition, with the aim of:

- Identify the optimal route of the pipeline;
- to minimise the residual environmental and social impact;
- to involve the national, regional and local authorities involved in the implementation of the Project.

The route solution presented at the end of this process is to be considered the result of a continuous process of improvement within the Project, which since the preliminary stages has analyzed the different design and localization aspects, with the aim of minimising the social, environmental and cultural heritage impact. Comments resulting from the public consultation under the ESPOO convention have also be taken into account for the design of the project.

[9] *Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.*

A specific Study of the Alternatives has been annexed to EIA Report, particularly focused on the routing assessment of the different large-scale solution, in order to identify the best possible route of the gas pipeline between Italy (Sicily) and Malta, from a technical and environmental point of view. This Study has developed and detailed the preliminary alternative route evaluation performed under the scoping stage and the MATTM opinion (Parere n.2554 dated 17/11/2017).

The study of alternatives included the following methodological steps:

- The scenario assessment of the environmental and territorial context of reference of the localisation assumptions at wide area level presented during the Scoping phase.
- Analysis of localised hypotheses and identification of the best solution from a technical and environmental point of view.
- Description and in-depth analysis of the design and environmental optimizations of the selected solution.

The marine corridors proposed for the pipeline in the preliminary phase of the Project were assessed on the basis of the following general criteria:

- Minimize the length of the corridor;
- Avoid as far as possible areas with specific geological problems (underwater landslides, areas with faults, areas with high seismicity etc.);
- Avoid/Minimise interference with areas that may damage the integrity of the pipeline;
- Avoid particularly fishing areas;
- Avoid interference with restricted areas (military areas, areas subject to permits for the exploitation of hydrocarbons, etc.);
- Minimize possible interference with particularly sensitive areas in terms of biodiversity such as Sites of Community Importance, Special Protection Areas, biotopes, but also areas with the presence of grasslands of posidonia oceanica along the coast, or areas of nesting potential for Caretta-Caretta;
- Minimize possible interferences with areas of archaeological risk, with the presence of underwater finds, presence of wrecks etc.

Based on these indications, four hypotheses of the offshore route of the gas pipeline have been identified, reported in the following **Errore. L'origine riferimento non è stata trovata.**. These assumptions are:

- Hypotesis 1: OFF_1 – prevalent direction NW (Mazara del Vallo; Sciacca)
- Hypotesis 2: OFF_2 – prevalent direction NNW (Butera)
- Hypotesis 3: OFF_3 – prevalent direction e N (Gela)
- Hypotesis 4: OFF_4 – prevalent direction NNE (Pozzallo)

The landing point in Malta coincides with all four hypotheses ("M").

For each of these *offshore* alternatives, port alternatives and the corresponding *onshore* section were also identified.

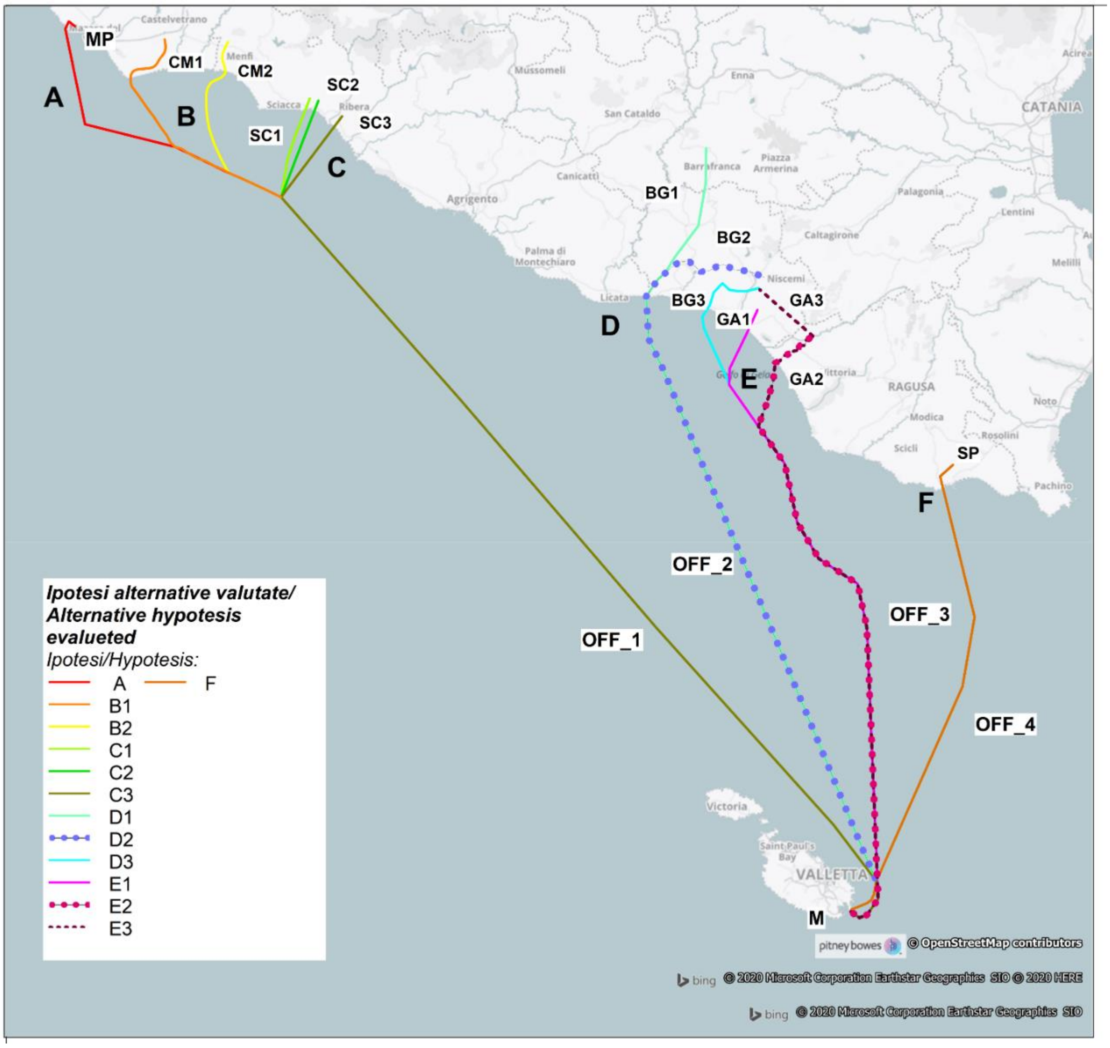

Figure 3.1: Alternative offshore and onshore routes

3.2 Alternative assessment

The study of alternatives is based on a multi-criteria analysis (MCA) to compare and classify alternative localization solutions from an environmental and non-economic point of view.

The analysis was divided into the following phases:

1. Territorial and environmental analysis for each submarine and land route
2. Identification of significant decision-making criteria (Indicators) for comparison between different path solutions
3. Collection and/or calculation of the value of the Indicators (input data);
4. Definition and attribution of a weight to each indicator, in relation to its importance in relation to the others (carrier of weights);
5. Calculation of a global index for each overall path alternative resulting from the weighted sum of the Indicators values;

The selected indicators, divided into parameters, are listed below, both for the *offshore* section and for the *onshore* section.

Tabella 3.1: Indicators and Parameters - OFFSHORE section

INDICATOR	PARAMETER
Protected Areas	Interference with Marine Protected Areas - Malta
	Interference with Marine Protected Areas - Italy
	Interference with other environmental constraints
Biocenosis/Marine Fauna	Potential presence of *Posidonia oceanica*
	Interference with Marine Fauna: Turtles (*Caretta caretta*) distribution
Physical elements	Morphology
	Geologogy/Lithology/Tectonic
	Seismicity
	Presence of submarine Vulcans/*pockmarks*
Antropic Factors	Interference with fishing activities
	Maritime trafic
	Presence of contaminated area (Site of National Interest – SIN) - marine
Technical elements	Length of *offshore* pipeline
	Bathymetry
Infrastructures	Interference with other pipelines
	Interference with marine mining stocks

Tabella 3.2: Indicators and Parameters - ONSHORE section

INDICATOR	PARAMETER
Protected Areas	Interference with Protected Areas
	Interference with other environmental constraints
Physical Elements	Geology/Litology
	Natural risks
	Coastal erosion
Antropic Factors	Land Cover

INDICATOR	PARAMETER
	Presence of touristic areas
	Presence of contaminated area (Site of National Interest – SIN) - terrestrial
Technical elements	Length of *onshore* pipeline
	Use of existent anthropic corridors
Infrastructures	Interference with terrestrial mining stocks
Facilities	Use/modification of existent gas infrastructure
	Distance from actual gas network

The result of multi-criteria analysis is a classification of alternative route, solutions depending on its global score, in which each solution occupies a relative position depending on the level of acceptability and environmental convenience.

A synthesis of the results obtained is given below, with reference to the Figure 3.1.

Considering the paths individually, it can be observed that:

- *Offshore* routes: OFF_4 is the best route, having a Global Index (GI) value of 1,61 (less impact), while OFF_1 is the worst solution (GI=2,79). OFF_3 and OFF_2 have GI<2, so an intermediate position, environmental favorable;
- *Onshore* routes: SC2, SC3 are best alternatives (GI both about 1,50); BG1, BG2, CM1, SP e GA3 are less favorable, with IG >2.

Considering the alternatives as a whole, each one obtained from the combination of *offshore* and *onshore* part of the entire route, it can be noted that:

- Hypothesis E1, E2, D3 and F, essentially based on OFF_3 E OFF_4 and GA1, GA2, SP, BG1 e BG2, have overall Global Idex < 2, represent the best alternative routes. In particular, routes GA1-M e GA2-M (with OFF_3), that form Hypothesis E1 and Hypothesis E2, have the best GI.
- Hypothesis F, formed by SP-M and based on OFF_4, despite the favorable characteristics of the sea rote, has one of the worst onshore tracks, especially penalized by the lack of facilities already available;
- Hypothesis A, formed by MP-M, B formed by CM-M and C formed by SC-M are undoubtedly penalised by the fact that the sea route is represented by OFF_1, the longest marine route.

In conclusion, therefore, the E1 route, immediately followed by the E2 one, are the most favorable ones from the environmental point of view at large scale, as they are the ones that best combine the environmental performance of *onshore* and *offshore* part of the route.

Hypothesis E1 is not free from technical-environmental criticalities, however they have been solved or minimized in the following design phase. These optimizations allowed to minimize the environmental and cultural impact near the Sicilian coast and improve the approach of the route to the morphology of the seabed in the offshore section of competence of the Italian waters. In particular, the route and the construction methods selected for the marine section of the pipeline allow to:

- bypass a marine archaeological area highlighted near the landing at Gela (Italy), by using HDD technology;
- minimize the impact with a contaminated site (SIN) even with the use of special construction techniques (filter barriers) that prevent the dispersion of any pollutants present in the sediment;
- minimize the impact with the SPA denominated ITA050012 again with the use of filter barriers;
- minimize the impact with *Cymodocea Nodosa* extending beyond the limit of SPA ITA050012;
- better approach the morphology of the seabed found during the inspection at sea.

4.0 PROJECT DESCRIPTION

This chapter presents the technical design of the MTG project and outlines the various activities and phases related to construction and operation. The description of construction activities will geographically focus on the *offshore* part, which is the point of origin for potential transboundary impact.

4.1 Abbreviations

AWTI	Above Water Tie-In
A/R	Abandon/Recovery
BVS	Block Valve Station
CWC	Concrete Weight Coating
DWS	Deep Water Spread
EPC	Engineering Procurement and Construction
FEED	Front End Engineering Design
HDD	Horizontal Directional Drilling
KP	Kilometre Progressive
MSL	Mean Sea Level
MT	MicroTunnel
ND	Nominal Diameter
P/L	Pipeline
ROV	Remoted Operated Vehicle
ROW	Right of Way
SMYS	Specified Minimum Yield Strength
SWS	Shallow Water Spread
UXO	Unexploded Ordnance
WD	Water Depth
WT	Wall Thickness

4.2 Pipeline route

The overall route of MTG project is shown in Figure 4.1. Other route alternatives that have been considered are described in Chapter **Errore. L'origine riferimento non è stata trovata.**.

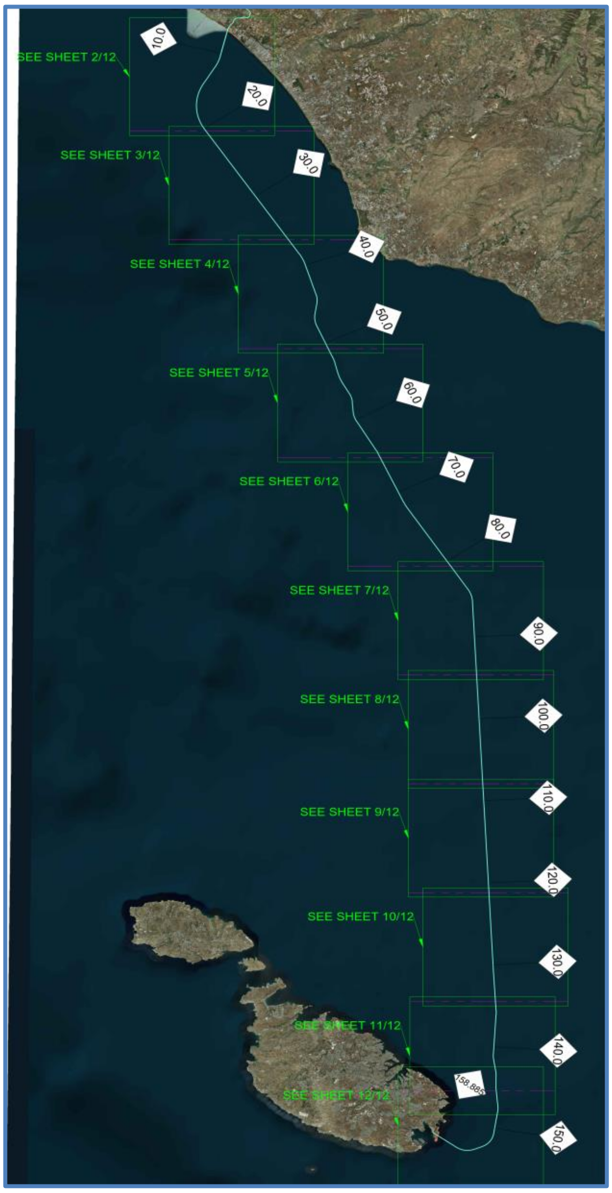

Figure 4.1 - Overall route layout

Trenchless solutions are proposed both in Italian and Malta shore approaches to avoid archaeological and environmental areas in the Italian side and to cross an environmentally sensitive difficult shore approach rocky area in Malta approach.

On the Italian side, from the exit point of the HDD (trenchless solution) up to KP 14.5, the proposed route crosses the ZPS area ITA050012, a SIN area (Site of National Interest) and some vegetation (from scattered to dense) mainly consisting of Cymodocea Nodosa. (KP means Kilometer point and is measured from the connection point of the project to the SNAM Rete Gas network. This point being defined as KP 0.0). Post-trenching is foreseen between offshore HDD bore hole exit (KP 8.362 approx.) and WD=30m, corresponding to KP 15.880 approx.

S-lay installation methodology applies to all remaining pipeline route.

4.2.1 Field surveys

Geophysical and geotechnical surveys have been carried out, starting in December 2018. The survey results provide the basis for the detailed engineering design of the pipeline system and are used together with environmental surveys for the environmental baseline description and in assessing the possible environmental impacts of the pipeline project.

Additional geophysical and/or geotechnical surveys shall be carried out during the pipeline installation phase. This could include a survey for possible UXOs (Unexploded Ordnance).

4.2.1.1 Geophysical surveys

The geophysical investigations included multibeam bathymetry, side scan sonar, magnetometer measurements and Sub Bottom Profiler investigation along the whole offshore pipeline route, in order to provide detailed information regarding the possible occurrence of objects, obstacles and/or hazards (on the seafloor and in the sub-seafloor).

The results of the geophysical surveys were used for optimizing the final route and construction design. This optimisation included identification of possible UXO objects on the seabed for ensuring that they do not pose a risk to the pipeline and identification of possible cultural heritage objects for ensuring that no damage to these takes place..

4.2.1.2 Geotechnical surveys

The geophysical survey was followed by a geotechnical sampling campaign. The locations of the samples were selected after the completion of the geophysical survey and on the basis of the obtained results. The sampling locations were planned along the basic design route at a distance of at least 500m from each cable or pipeline recognized on the surveyed corridor.

The geotechnical investigations included CPT (Cone Penetration Test) measurements along the route. The sampling plan included sixty (60) Piston Cores (PC), thirty (30) Cone Penetration Tests (CPT) and, additionally, five (5) Bore Holes (BH).

4.2.1.3 Environmental surveys

Environmental campaign and locations were planned based upon the results of the geophysical data.

The locations were planned along the survey route keeping in mind to sample at least 500m away from each cable or pipeline present on the surveyed corridor, Ref (Lighthouse procedure in agreement with ICPC Recommendations No.15, Issue 1, and section 3.1.).

A total of forty (40) sediment (plus 3 station only for Benthos) and thirty-five (35) water sampling locations have been performed along the route by means, respectively, of Box corer, Van Veen grab, 5L Niskin bottles and Plankton nets.

4.2.2 Pipeline design

Pipeline Dimensional Data

The line pipe dimensional data are summarized in

Table 4.1, while Table 4.2 presents Pipeline data along the route.

Description	Symbol	Unit	Value
Pipe nominal outside diameter (constant)	OD	mm / inch	559 / 22
Pipe Thickness	T_{hk}	mm	15.9 / 17.5
Internal or external corrosion allowance	C_A	mm	0
Wall thickness fabrication tolerances	t_{tol}	mm	± 1.0

Table 4.1: Pipe Dimensional Data

From KP	To KP	From WD	To WD	max WD in the range	WT	CWC Thk	Pipeline Submerged Weight			Pipe ID
							Empty	Flooded	Operati ng	
[km]	[km]	[m]	[m]	[m]	[m m]:	[mm]:	[kN/m]	[kN/m]	[kN/m]	-
6.+862 End HDD Gela [(4)]	8.+362 Start HDD Gela [(1)]	N/A	N/A	N/A	15. 9	**40**	1.14	3.28	1.25	P0
8.+362 Start HDD Gela [(1)]	8.+612	-12.7	-12.1	-12.7		**40**	1.14	3.28	1.25	
8.+612	11.+000	-12.7	-12.1	-12.7		**120**	4.8	6.94	4.91	P1
11.+000	12.+300	-12.1	-14.3	-14.3		**120**	4.8	6.94	4.91	
12.+300	14.+000	-14.3	-17.8	-17.8		**120**	4.8	6.94	4.91	
14.+000	16.+200	-17.8	-32.5	-32.5		**120**	4.8	6.94	4.91	
16.+200	19.+000	-32.5	-59.8	-59.8		**120**	4.8	6.94	4.91	
19.+000	54.+000	-59.8	-128.5	-128.5		**60**	1.98	4.12	2.09	P2
54.+000	137.+500	-128.5	-127.2	-157.7	17. 5	**40**	1.35	3.46	1.45	P3
137.+500	158.+057 End HDD/ Microtunnel Malta [(4)]	-127.2	-44.4	-127.2	15. 9	**60**	1.98	4.12	2.09	P2
158.+057 End HDD/ Microtunnel Malta [(1)]	159.+257 Start HDD/ Microtunnel Malta [(1)]	N/A	N/A	N/A		**40**	1.14	3.28	1.25	P0

(1) "Start" & "End" is in accordance with the drilling direction expected

Table 4.2 – Pipeline data along the route

Pipeline Steel Data

The line pipe material properties of the selected steel grade are summarized in Table 4.3.

Description	Unit	Value
Steel Grade / SMYS [MPa]	DNV GL 450M FDU	
Steel Density	kg/m^3	7850
Modulus of Elasticity (Young's modulus)	MPa	207000
Poisson's Ratio	-	0.3
SMYS	MPa	450
SMTS	MPa	535

Table 4.3 – Steel Properties

Coating Data

External and internal coating data are reported in Table 4.4.

Coating Layer	Description
External Anti-Corrosion Coating	3LPE, thickness 4.2mm, density 950 kg/m^3
Internal Painting	High performance flow epoxy coat with DFT according to the coating manufacturer's instructions
Concrete Weight Coating	CWC, Density 3040 kg/m^3
Concrete crushing strength:	35 MPa

Table 4.4 – Coating Data

Operational Data

The operational data are reported in Table 4.5.

Description	Unit	Value				
		DM 17/04/2008	EN 1594	ISO 13623	ASME B 31.8	DNVGL ST-F101
Design Pressure; DP	barg	93				
Maximum Pipeline Operating Pressure; MOP	barg	90				
Hydrotest Pressure	barg	130.2				

Table 4.5 – Pipeline Operational Data

Corrosion Allowance Thickness

In accordance with Material Selection Report and FEED Basis Of Design, no corrosion allowance thickness is required during the entire design life of the pipeline.

Soil Geotechnical Parameters

The soil geotechnical parameters have been summarized in the following Table 4.6.

KP (m)		Depth b.s.b.	Surficial Soil		γ'	w	Su	Dr	ϕ
from	to								
(m)	(m)	(m)	Soil Type	Consistency/Density	(kN/m³)	(%)	kPa	(%)	(°)
6.862	15500	0-5	SAND	Loose to medium dense	10.5	-	-	-	42
		5-17.5	SILT	Soft to firm	8.8	30	-	-	28
		17.5-30	CLAY	Firm, plastic	8.2	33	45	-	-
15500	17000	0-1.5	SILT	Extremely soft	5.8-7.0	55-70	2.3+1z	-	-
		1.5-2	SAND	Medium dense	8.5	27	-	30-50	30-34
17000	46500	0-8	CLAY	Extremely soft	5-6.5	65-85	2+1.8z	-	-
46500	50000	0-3.5	CLAY	Extremely soft	5-6.5	65-85	2+1.8z	-	-
		3.5-4	SILT	Soft	5-6.5	65-85	15-35	-	-
		4-4.2	SAND	Loose to medium dense	9	-	-	20-40	28-30
50000	52000	0-0.35	SAND	Loose	8.5	25	-	15-35	28-30+
		0.35-1.3	CLAY	Extremely soft	5-6.5	65-85	2+1.8z	-	-
52000	55000	0-1.75	SILT	Extremely soft	6.0-9.0	35-65	4+1.8z	-	-
55000	63500	0-4	CLAY	Extremely soft	5-6.5	60-80	4+2.5z	-	-
		4.0-9.0	SILT	Soft	6.5-9.2	25-40	10+1.8z	-	-
63500	71500	0-4.5	CLAY	Extremely soft	5-6.5	60-80	4+2.5z	-	-
		4.5-5.7	SILT	Firm to stiff	6-9.0	30-60	60-90	-	-
71500	76000	0-3	CLAY	Extremely soft	5-6.5	60-80	4+2.5z	-	-
		3.0-10	SILT	Soft	6.5-9.2	25-40	20+2.7z		
76000	87000	0-2	SILT	Extremely soft	6.0-9.0	35-65	4+1.8z	-	-
		2-10	SILT	Soft	6.0-9.0	35-65	8.2.7z	-	-
87000	113000	0-0.5	SILT/SAND	Medium dense	7.7-9	25-35	-	30-60	30-36+
113000	119000	0-0.8	SILT	Loose to medium dense	6.5-10	28-34	-	20-60	29-36+
119000	126000	0-0.5	SAND	Loose to medium dense	6.5-10	28-60	-	20-60	29-36+
126000	137000	0-0.5	CLAY	Extremely soft	5.8-8	43-72	5+10z	-	-
		0.5-6.4	SILT	Soft	7.2-9	35-50	20+8Z	-	-
137000	138500	0-0.8	SAND	Loose to medium dense	9.6	23	-	20-40	29-31+
138500	158057	0-0.8	SILT/SAND	Medium dense	7.5-8.3	33-45	-	30-60	30-36+
		0.8-2.4	SAND	Medium dense	7.9-8.7	15-40	-	30-60	30-36+

Z= soil depth below sea bottom (m)

Table 4.6 – Offshore Soil Data

4.3 Construction

4.3.1 Italian shore approach - Gela

A Horizontal Directional Drilling installation method is selected for the 22" pipeline shore approach at Gela.

The 22" pipeline entry point is located at KP 6+862, at a ground level of +10m above the MSL. The drilling section crosses the beach and an underwater archaeological area at a suitable depth (more than 10 m) and ends offshore at KP 8+362 to a water depth of approx. 10m below the MSL.

A pre-trenched transition shall be realized at the offshore exit point to facilitate the installation of the 22" pipeline string from the seafloor into the drilled hole (the pipeline string will be prefabricated offshore by an installation vessel).

The parameters selected for the HDD Preliminary Profile for the Gela shore approach are indicated in Table 4.7.

Table 4.7 - Drilling data

Description	Value
Slope at entry point (deg)	6°
Intermediate slope (deg)	0°
Slope at exit point (deg)	9°
Drilling radius	1500-1200 m
Level in above MSL	+6.1 m
Level out below MSL	-11.3 m
Drill bit diameter	12.25"
Drill rods diameter	6.625"
Diameter of pilot hole (1)	15⅝"
Diameter first reamer	20"
Diameter second reamer	28"
Diameter of final reamer	34"-36"
Drilling horizontal length	1500 m
NOTE 1) The 12¼ inch bit will drill a 15⅝" inch hole, using 6⅝" diameter drill pipe.	

The HDD string preinstalled offshore will be pulled inside the HDD from offshore to shore. The terminal head will be recovered by the lay barge, that will continue the installation of the 22" offshore pipeline toward Malta.

4.3.2 Malta shore approach – Delimara

In Malta the Microtunnel technology was evaluated for the 22" pipeline shore approach.

The 22" offshore pipeline string will be preinstalled on the seafloor close to the drilling exit point located at KP 158+056 to a water depth of approx. 45m below the MSL. The drilled section crosses the Delimara peninsula and ends onshore at KP 159+310 inside the new Delimara Terminal Plant, at a ground level of 6.5m above the MSL.

A pre-trenched transition shall be realized at the exit point offshore to facilitate entry of the 22” pipeline from the seafloor into the drilled microtunnel hole.

The parameters selected for the Drilling Preliminary Profile are indicated in Table 4.8.

Description	MT Value
Slope at entry point (deg)	4°
Slope at exit point (deg)	0°
Minimum curvature	5000 m
MT axis level in below MSL	1.0 m
MT axis level out below MSL	-45.5 m
Tunnel lining outer diameter	3.0 m
Tunnel lining inner diameter	2.4 m
Tunnel curvilinear lenght	1200 m
Lining material	concrete

Table 4.8 – Microtunnel profile parameters

The preinstalled offshore 22” pipe string will be pulled inside the Microtunnel from offshore to shore. The terminal head will be recovered by the lay barge, that will continue the installation of the 22” offshore pipeline towards Italy.

4.3.3 Implementation of the project

The main tasks to be implemented prior to start pipeline installation are:

- pre-lay surveys;
- lay corridor preparation.

4.3.3.1.1 Pre-lay survey

A pre-construction route survey is requested to verify any omission and discrepancies relevant to the Scope of Work and to ascertain the changes if any from the pre-engineering to pre-installation period as well as collect data relevant to installation, if required.

During pre-construction, the as laid position of any seabed facility and their overall layout shall be identified and recorded.

The surveyed corridor shall be extended to include the anchors relocation areas, if anchored lay vessel is part of installation spread.

4.3.3.1.2 Lay corridor preparation works

Modifications of the natural seabed that may be required include:

- Trenching to reduce the actions from waves and current;

- Protection of existing pipelines or cables in connection with crossings;
- Reduction of free span heights to reduce the forces due to over-trawling;
- Smoothing of the pipeline profile to reduce the length of free spans or prevent contact pressures that could damage the coating or dent the pipe steel.

Spans that are unacceptable in the unstressed, air-filled condition must be rectified before installation of the pipeline (pre-lay intervention). Other free span rectification may be postponed until after the pipe string has been laid (post-lay intervention).

The construction of pipeline trenches or the removal of outcrops to reduce free spans are normally achieved by dredging. Depending upon the type and hardness of the seabed soil different dredger types (bucket dredger, cutter-suction dredger, etc.) are deployed. In shallow waters the dredging may be carried out from jackup platforms, or even fixed structures.

As the trench must be sufficiently wide to receive the pipeline, pre-trenching is an attractive option only for shore approaches pipeline installation, or for laying in very shallow water. Such near-coast areas are also the most environmentally sensitive, and pre-trenching is likely to be subject to severe restrictions, including those for the disposal of the dredged material.

More specifically in the Melita Transgas Pipeline pre-trenching may be locally requested at the HDD bore hole offshore exit in Gela shore approach, to smooth the seabed profile in the area.

As regards the Gela approach, backhoe dredger technology is assumed as the preferable one at this stage of the project.

Figure 4.2 – Preparation Works at HDD Offshore Bore Hole Exit – Example of Cutter Suction Dredger Vessel

Figure 4.3 – Preparation Works at HDD Offshore Bore Hole Exit - Example of Backhoe Dredger

As an alternative to the removal of seabed material (seabed profile modification by pre-trenching) suitable support for the pipeline may be created by laying grout bags or gravel installation, either along the entire affected section, or – more likely – as isolated gravel berms.

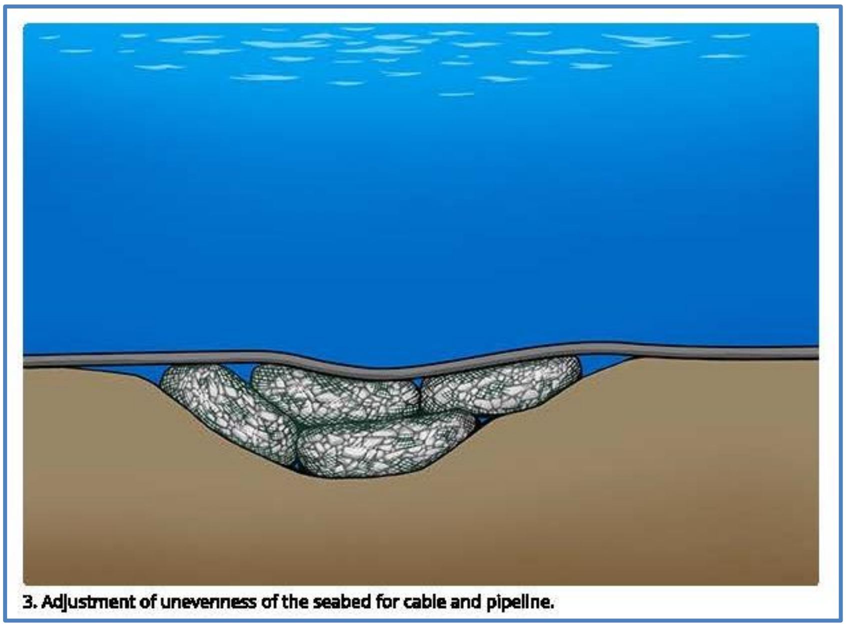

Figure 4.4 – Rock Filter Unit – Example of Pipe Support/Protection

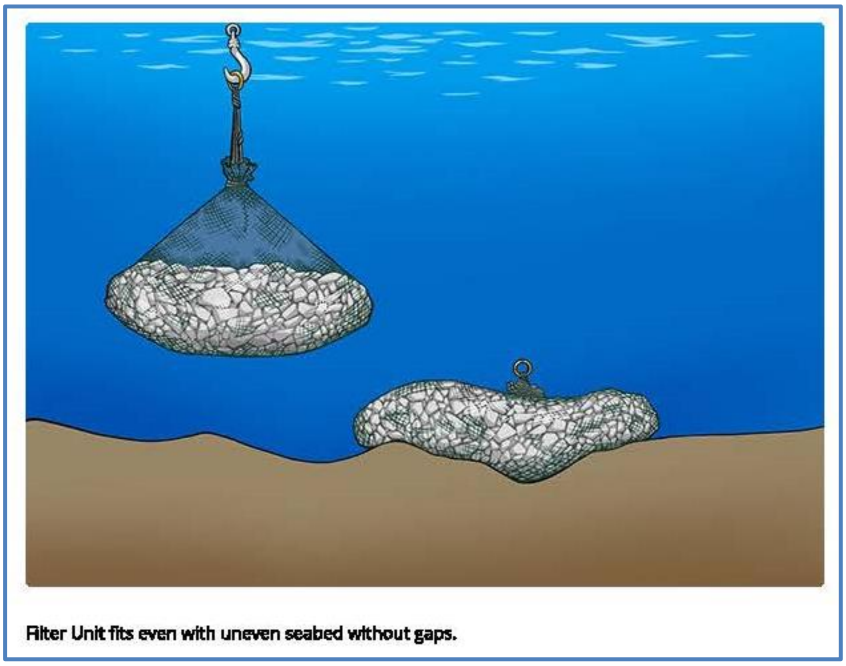

Figure 4.5 - Rock Filter Unit – Example of Single Installation Technology

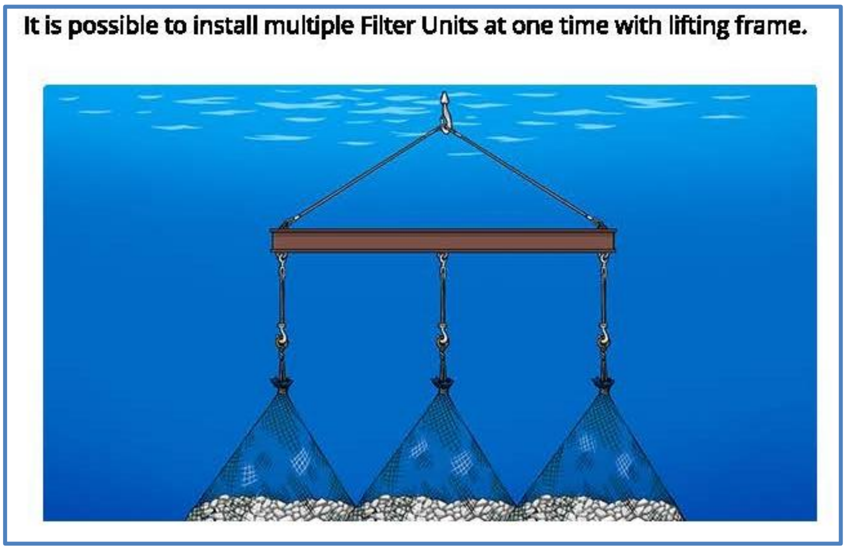

Figure 4.6 - Rock Filter Unit – Example of Multiple Installation Technology

More specifically, in the MTG project, pre-lay supports may be needed in case unallowable free spans are identified in flooded condition along Malta nearshore area from KP 144 to KP 158 approx. Such occurrences may result from:

- On-bottom stress analysis in pipeline flooded condition.
- Unallowable free spans due to VIV (Vortex Induced Vibration) analysis in pipeline empty condition.

The pipeline will have to cross existing cables identified by the route survey. If cable being crossed is abandoned the only concern is that they may prevent trenching of the affected pipeline crossing zone.

On the other hand, the crossing of live cables calls for special measures, including negotiations with the third-party owners. To avoid damage to any of the installations, the lines should be separated by a suitable material, and often the relevant authorities will have specific requirements for the crossing design.

To meet the above requirements, some pre-lay works would be necessary and in particular the installation of some mattresses very close to the crossing to achieve the proper gap between the pipeline with existing facility, as shown in Figure 4.7. Flexible bitumen mattresses are typically used for such task.

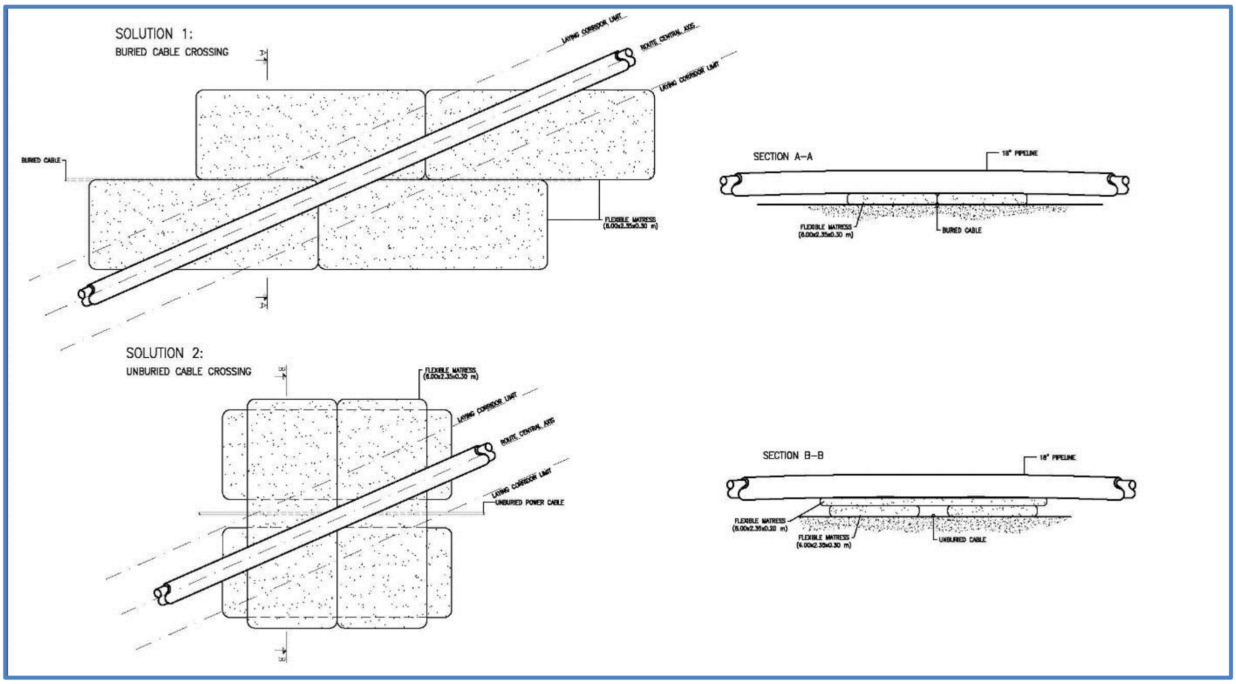

Figure 4.7 – Cable Crossing Design by Mattresses (Typical)

As regards the Melita Transgas Pipeline, 21 cable crossings have been detected; all of them refer to live or out of service cables and 2 of them are unknown.

4.3.3.1.3 Pipeline installation

The S-lay method is the designed installation approach for Melita Transgas Pipeline.

A laybarge is a floating factory where the pipe joints are welded on to the pipeline as it is installed. From the laybarge the pipeline describes an S-curve to the seabed. In the upper part (the overbend) the curvature is controlled by the laybarge stinger, a steel structure protruding from the stern of the vessel, that supports the pipeline on rollers. The curvature in the lower part (the sagbend) is controlled by lay tension transferred to the pipeline by tension machines gripping the pipe string on the laybarge; a typical pipelay free span configuration is illustrated in Figure 4.8.

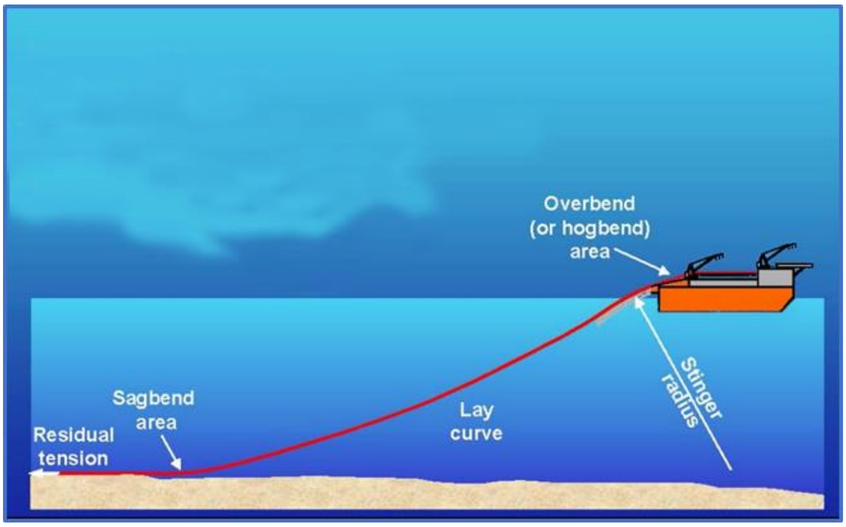

Figure 4.8 – S-lay General Arrangement – Typical Layout

The coated pipe joints are transported to the laybarge on pipe supply ships and stored on deck (Figure 4.9).

Figure 4.9 – S-lay Vessel – Typical Pipe Joint Stacking Area

Some major lay barges have double jointing facilities, implying that two 12.2 m pipe joints are welded together, usually by automatic submerged arc welding before they are transferred to the end of the pipe string on the firing line (Figure 4.10), and welded onto the pipeline.

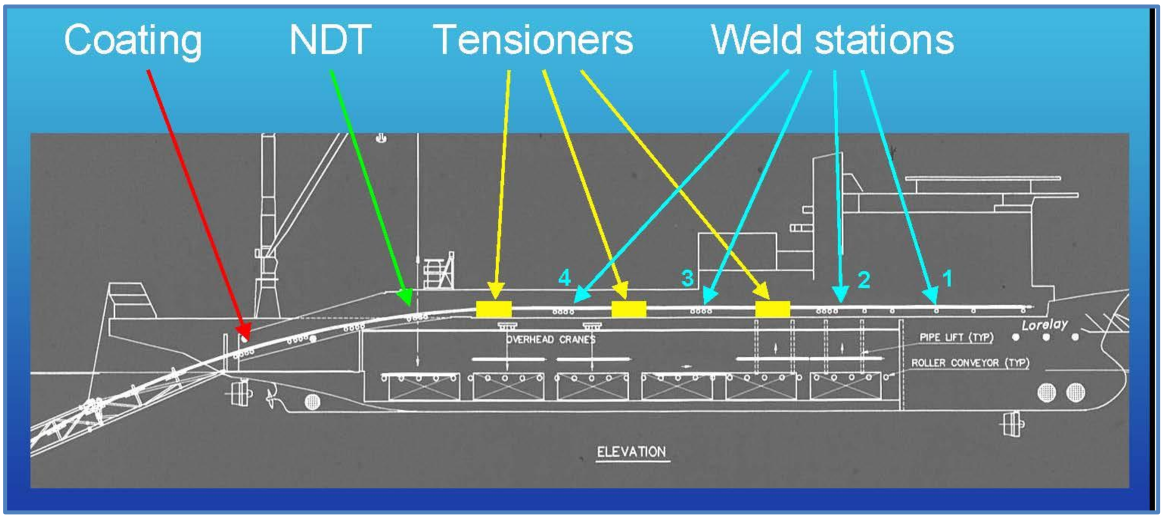

Figure 4.10 – S-lay Vessel – Typical Firing Line Area

The field joint coating, however, is carried out just before the stinger, usually at two stations working in parallel (typical field joint coating is shown in Figure 4.11). To save time, the welding on the firing line is carried out at a number of stations and as the weld is completed the pipeline goes into the tensioners, which are equipped with rolling tracks to allow movement of the pipeline whilst under tension, (Figure 4.12).

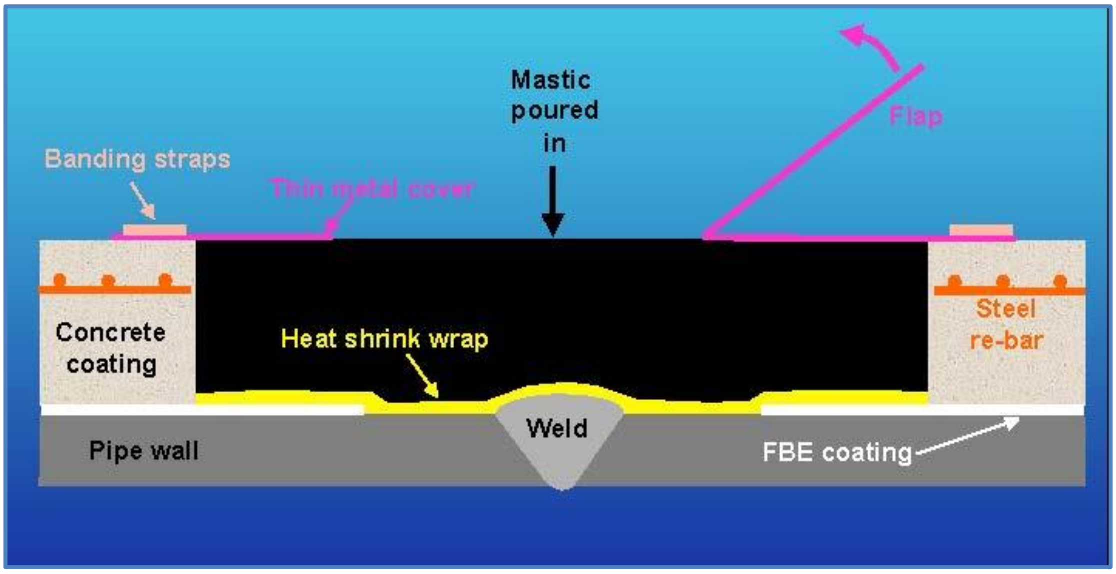

Figure 4.11 – Typical Field Joint Coating Arrangement

Figure 4.12 – S-lay Vessel – Typical Tensioner Arrangement

According to the main route features, the following installation scenario is foreseen at this stage: in the Maltese landing, a pull-in of the pipeline, built on board the S-lay laybarge, is expected inside the micro tunnel. At the end of the pull-in, the laybarge continues the laying up to the depth of 20m, near the Italian coast. In the Italian landing, the pipeline lands through a previously built HDD.

The basic HDD approach involves the laying of a pipeline string built and laid on the seabed in front of the offshore exit of the HDD. The string is then pulled into the HDD with a linear winch positioned close to the LTE. Subsequently, the laybarge retrieves the sea end of the string and proceeds with a traditional S-shaped laying up to a depth of about 20m near the pipeline section coming from Malta. At this point the two pipe sections are joined by means of an out-of-water weld made with AWTI (Above water tie-in) technology.

The different pipeline S-lay processes are shown in the following Figures.

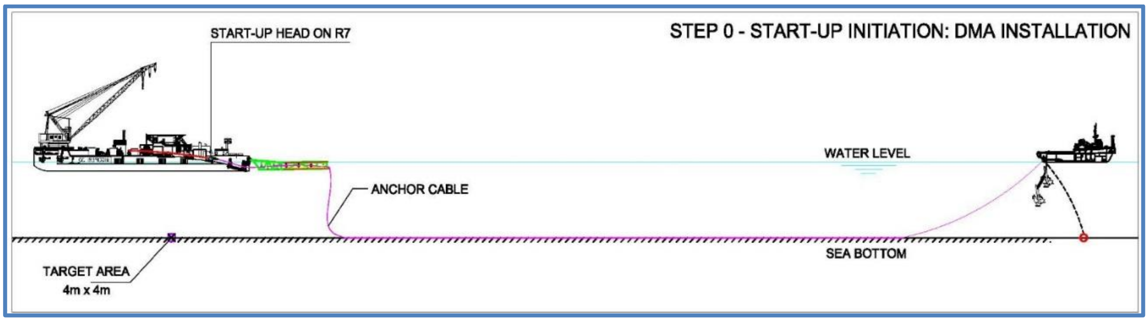

Figure 4.13 – P/L S-lay Process –Start-up - Step 0

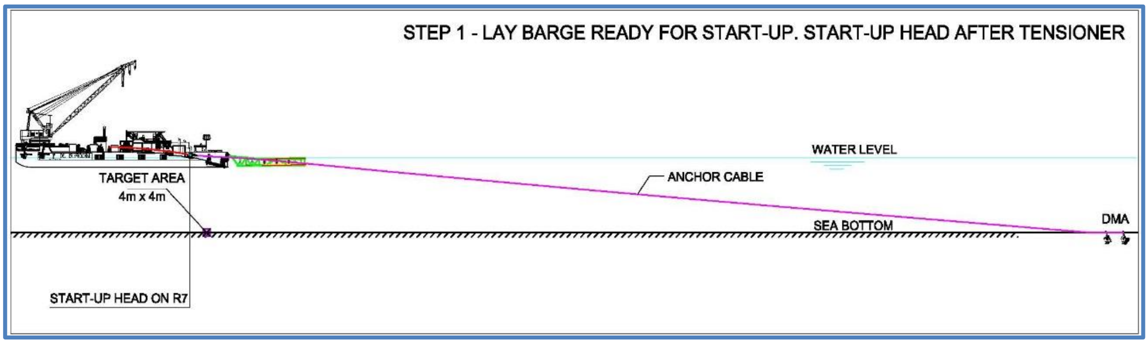

Figure 4.14 – P/L S-lay Process – Start-up - Step 1

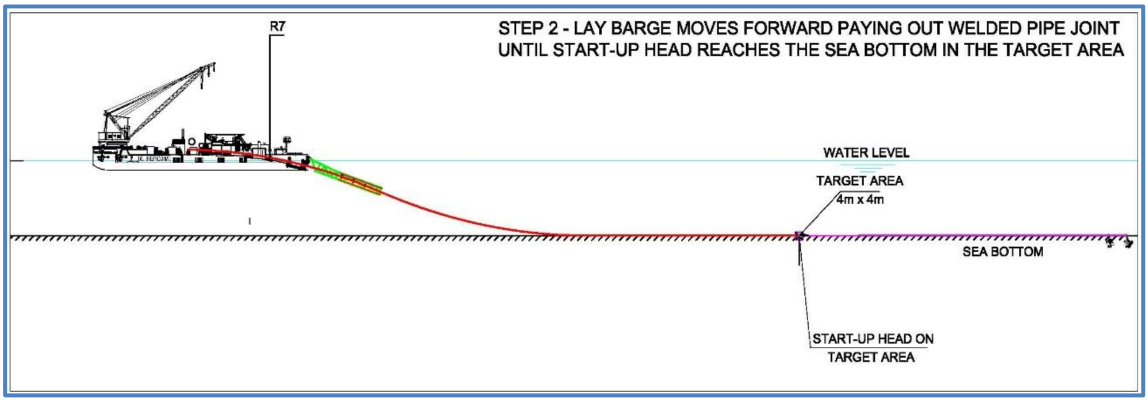

Figure 4.15 – P/L S-lay Process – Start-up - Step 2

4.3.3.1.4 Laydown

The typical laydown process applies as shown in in Figure 4.16 and Figure 4.17:

- All welds and field joint coating are completed;
- Laydown head is welded on the pipeline end at the first welding station along the firing line and Abandon/Recovery (A/R) cable connected at the head.
- Tension is passed from tensioners to A/R winch and tensioners opened.
- Lay barge (with opened tensioners) moves forward spooling A/R cable until laydown head reaches the seabed at the target area.
- Tension on A/R winch is released, A/R cable disconnected from laydown head and rewound on the A/R winch.

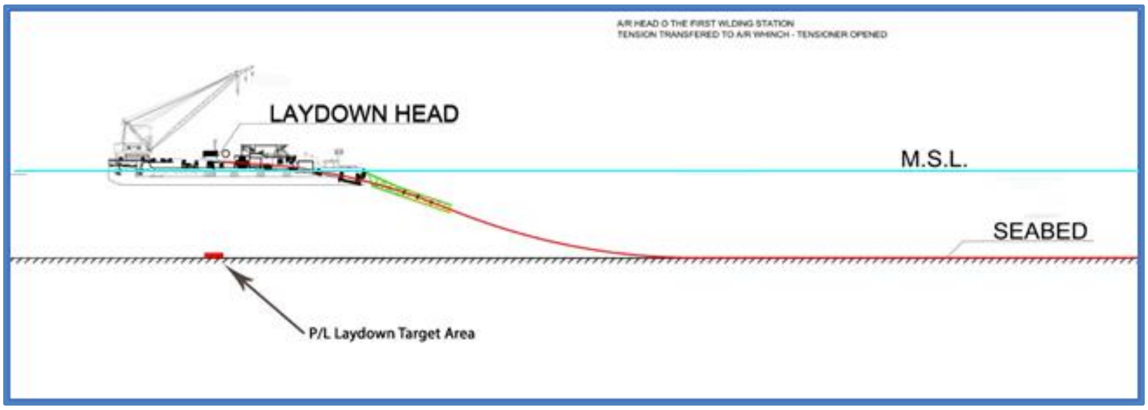

Figure 4.16 – P/L S-lay Process – Laydown - Step 0

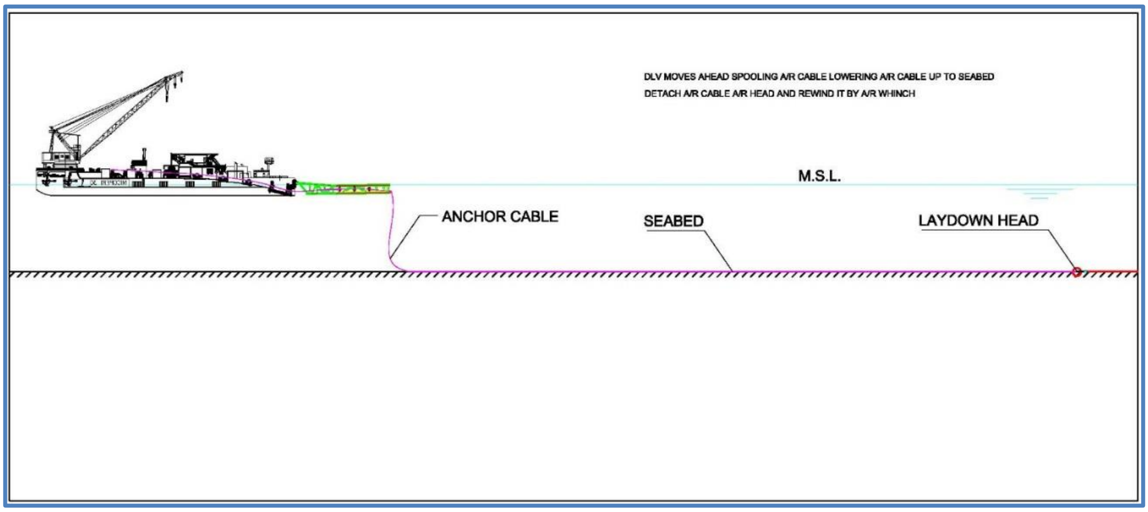

Figure 4.17 – P/L S-lay Process – Laydown - Step 1

According to the Melita Transgas Pipeline foreseen scenario, both shore approaches Pipeline strings are laid down in accordance with described procedure.

The pipeline section coming from Gela and Malta shore approaches are laid down with the stated procedure at the AWTI location in a water depth assessed at this stage to be around KP 14.5 approx. in WD=20m approx.

4.3.3.1.5 Abandonment and Recovery

Like all other offshore operations, pipelaying is weather dependent, and the tolerance depends upon the type and size of the pipelaying vessel and its tensioning capacity in respect of the pipeline sizing. At a certain sea state, it becomes impossible to add more pipes to the string, which is then kept under constant tension by the tensioners. Pipelaying will also have to be suspended if the weather prevents either the tugboats from relocating the anchors, or the supply vessels from mooring at the laybarge to transfer pipes or other essential supplies. If the movements of the laybarge become so large that they may endanger the integrity of the pipeline, the pipe string will have to be temporarily abandoned. A laydown head with an attached cable is welded on to the pipe string, which is lowered to the seabed under tension. The abandonment sequence is as per laydown.

At the return of calm weather, the pipe string is winched back aboard the laybarge, secured by the tensioners, the laydown head removed, and pipelaying resumed.

4.3.3.1.6 Laying Installation Tolerances

Installation tolerances shall be tailored to different situations encountered along the route. In general, a lateral displacement value of ±10m is to be considered, however some locations require more stringent values and in particular:

- The laying corridor at the crossing locations should be 2.5m wide;
- Various target areas (lay down, AWTI location) where the lateral tolerance could be more or less ±1m approx. and ±2m longitudinally;
- Uneven seabed locations (to avoid or minimize size of free span) where tolerances depend from the local situation.

4.3.3.1.7 Laying Major Contingencies

The described abandonment and recovery operations are fairly routine, but they may also be invoked in the case of major mishaps. Weather induced movement or faulty manoeuvring of the laybarge may cause excessive bending of the pipe, resulting in buckling of the pipe wall. As a safeguard, the laybarge may be equipped with a buckle detector, i.e. a gauging device that sounds an alarm if any reduction of the pipe internal diameter is measured (Figure 4.18). The buckle detector is tethered inside the pipeline, trailing the sagbend touch-down point.

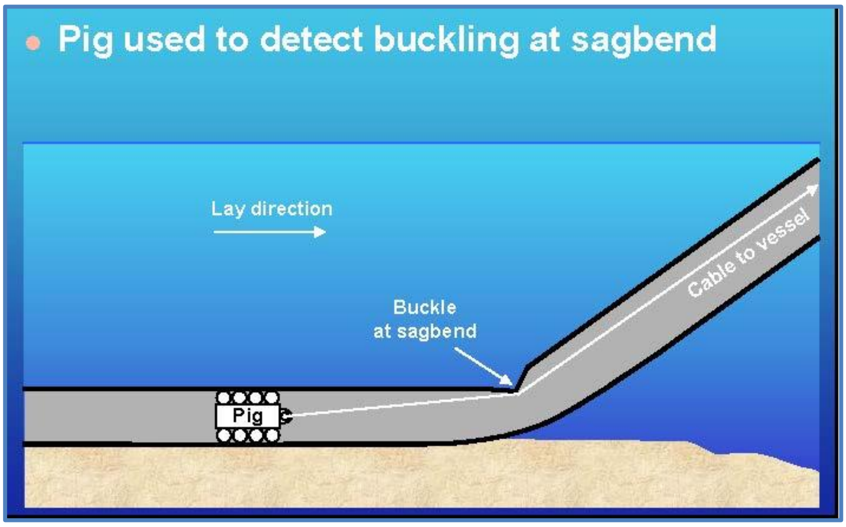

Figure 4.18 – MELITA Transgas Pipeline S-lay Process – Buckle Detector Typical Arrangement

If a buckle is detected, the laybarge is backed up, retrieving the pipeline, and the affected joints are cut out and replaced.

A much more serious situation arises if a buckle results in a leak in the pipe, a so-called wet buckle. The pipeline must then be quickly lowered on to the seabed, or it may simply snap under its own weight.

Recovery of a waterfilled pipeline may not be possible without further buckling, in which case the affected pipe string must first be dewatered. This entails the subsea installation of a pig receiver with dewatering valves (pipeline recovery tool), and possibly also a pig launcher at the other end of the pipe string, if it is located on the seabed. As a contingency against such eventualities the initiation head may be provided with dewatering pigs and valves for pressurisation with air.

A typical wet buckle contingency (WBC) procedure would comprise the following steps:

- Cut off and remove the damaged pipeline section.
- Hook up water pumping spread on a surface vessel to the initiation head.
- Displace the first pre-installed wet buckle pig with raw or inhibited seawater to remove sediment from the pipeline.
- Install the pipeline recovery tool at the cut end of the pipeline.
- Dewater the pipeline with compressed air from the surface vessel, using the second pre-installed wet buckle pig.
- Recover the pipeline to the pipelay vessel using the pipeline recovery tool.
- Depressurise the pipeline and resume pipelaying.

4.3.3.1.8 Post-lay Activities

Post-trenching

Permanent installation of the pipeline below the natural seabed is called trenching. It is named post trenching if it is carried-out on an already laid pipeline.

The pipeline would preferably be flooded and the post-trenching is carried out prior to the hydrotest. However, occurrence of pipeline sections where on-bottom stability in temporary condition is not guaranteed and flooding cannot be done shall require post-trenching of empty pipeline.

This technology could apply:

- to protect the pipeline from hydrodynamic forces;
- to protect the pipeline against mechanical damage;
- to eliminate or reduce free spans;
- to prevent upheaval buckling;
- to increase thermal insulation of the pipeline, as needed.

Post-trenching methods available on the market typically include:

- water-jetting;
- mechanical cutting;
- ploughing.

If required, the trench may be backfilled by ploughing or gravel installation, but often natural backfilling will take place. On sandy seabed natural self-lowering of the pipeline may occur, obviating the need for trenching to ensure stability.

Water-jetting is performed by means of a jet sled, which is riding on the pipeline, guided by rollers at the top and the sides of the pipe. The jet sled is pulled by a trench barge, which also delivers water under pressure. Typical water-jetting sled ejects the water through nozzles at each side of the pipeline. The nozzles may be arranged vertically or mounted on inclined supports of adjustable length. The water liquefies and displaces the seabed soil, leaving a trench into which the pipeline sinks.

An example of jet sled equipment is shown in Figure 4.19, while working scheme in Figure 4.20.

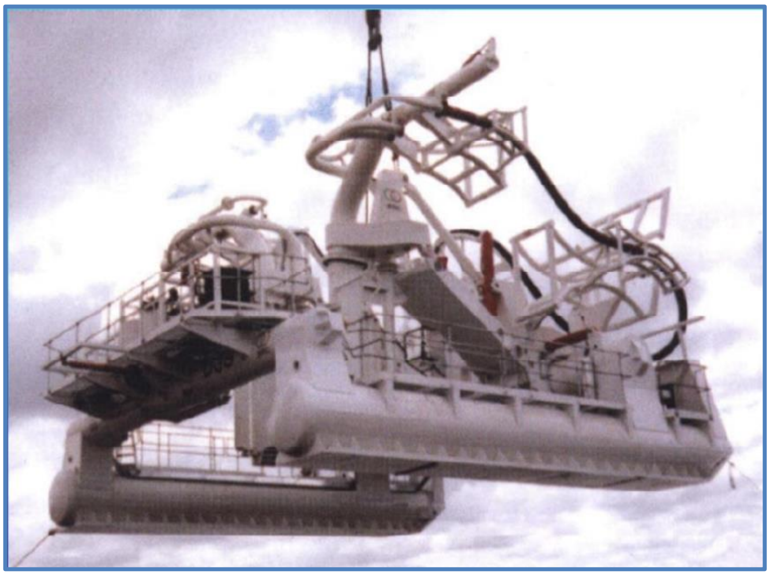

Figure 4.19 - Post-trenching Works – Example of Jet Sled Equipment

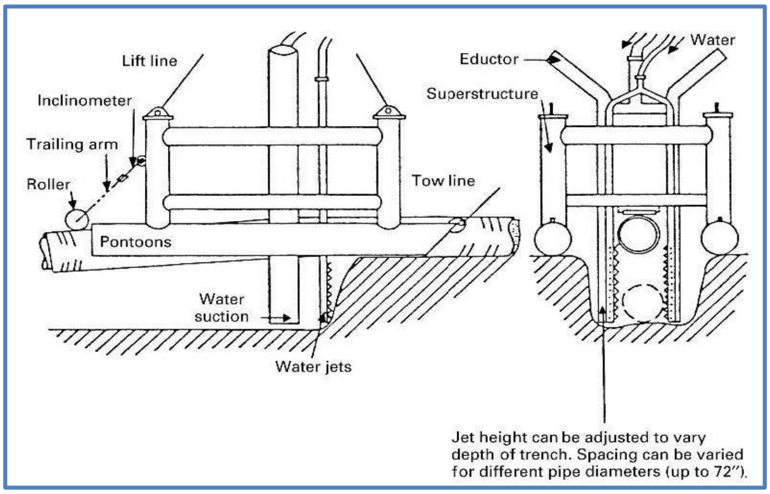

Figure 4.20 - Post-trenching Works – Jet Sled Equipment Working Scheme

Jetting is most efficient in soft or sandy seabed but can also be used in cohesive soils with shear strengths of up to approximately 100 kPa. In stiff clay, mechanical cutting is preferred. The trenching tool rides on the pipeline, being pulled by a trench barge, but instead of water nozzles it is equipped with cutting heads, which excavate a V-shaped ditch in the seabed.

An example of suction cutter equipment is shown in Figure 4.21, while working scheme in Figure 4.22.

Figure 4.21 – Post-trenching Works – Example of Suction Cutter Equipment

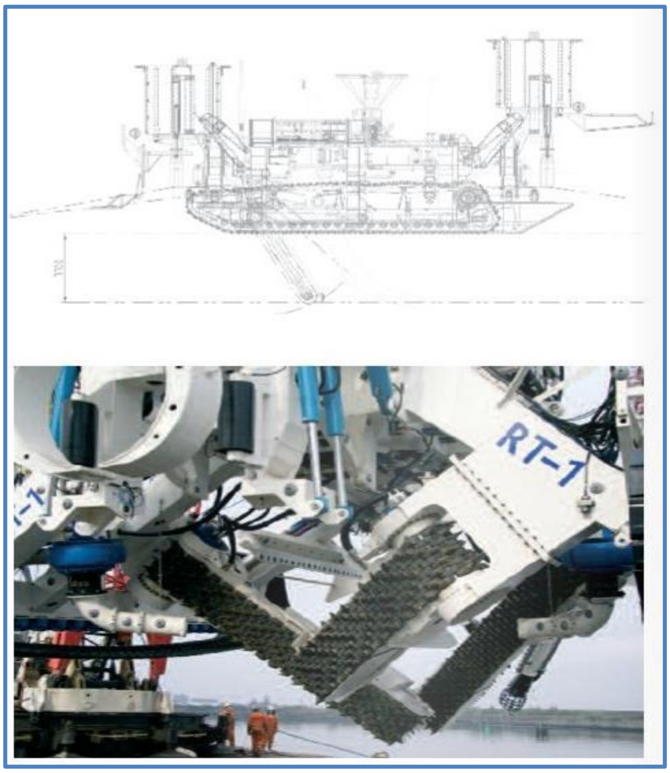

Figure 4.22 – Post-trenching Works – Example of Suction Cutter Working Scheme

Whether jetting or cutting, the trenching vehicle may also be self-propelled on tracks or skids, and remotely operated. This obviates the need for a pull cable, but power and control will still have to be delivered from a surface vessel. In deep waters only remotely operated trenching systems are used, and a recent NORSOK standard U-102 ROV services specifies requirements for such systems.

The trench may also be excavated by a plough, which is clamped around the pipeline is such a way that the shears displace the soil from under the pipeline. Trenching plough being deployed from a trenching vessel depositing it in walls alongside the trench. The plough is supported on skid beams, and is pulled by a surface vessel, being guided along the pipeline by rollers.

An example of plough equipment is shown in Figure 4.23, while working scheme in Figure 4.24.

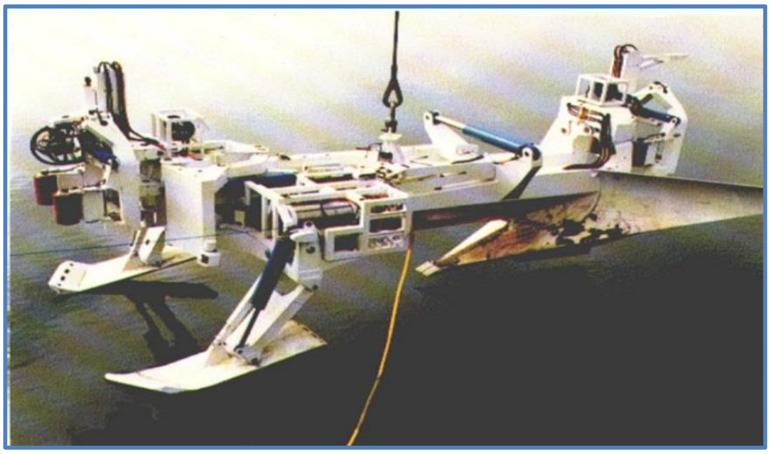

Figure 4.23 – Post-trenching Works – Example of Plough Equipment

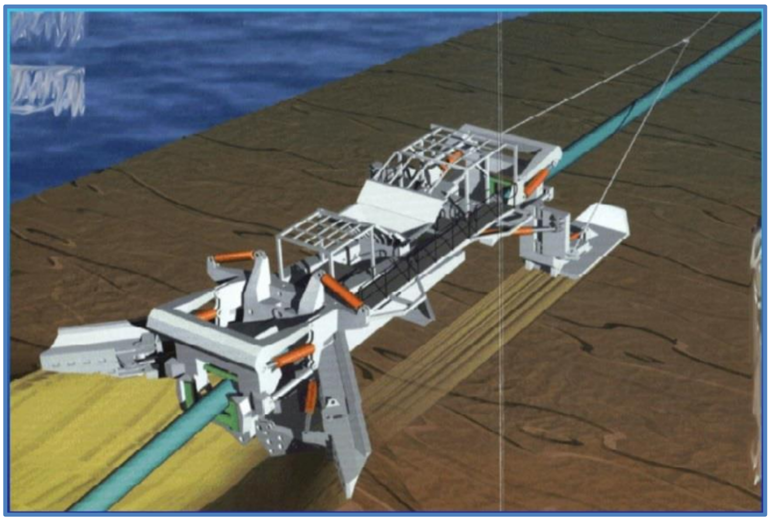

Figure 4.24 – Post-trenching Works – Example of Plough Working Scheme

Trenching ploughs that can deal with all soil types, from soft mud to shale or limestone have been developed. Depending upon the specified trench depth and the nature of the soil more than one pass of the plough may be necessary.

Post-trenching for the project is foreseen on the Italian side between offshore HDD bore hole exit (KP 8.362 approx.) and WD=32m, corresponding to KP 16.200 approx.

The affected section is shown in Figure 4.25.

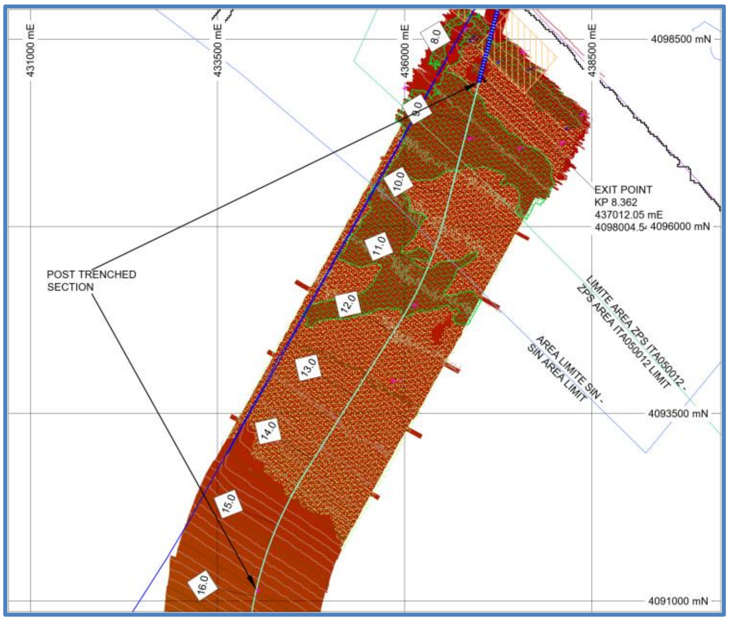

Figure 4.25 – Route Section Subject to Post-trenching

Applied post-trenching technologies shall take care of minimizing the impact on the environment to preserve all the protected species, to avoid the dispersion of possible pollutants present in the SIN area and to preserve the *Cymodocea Nodosa*.

From an environmental point of view the preferable post-trenching technology matching the above requirements could be ploughing; however in case the suction/cutter dredging technology would be selected, based on the final soil characterization, some possible mitigation measures for the environmental impact minimisation may be considered like the use of filter barriers at both sides of the trenching area; a filter barrier scheme is reported in Figure 4.26 while an example is shown in Figure 4.27.

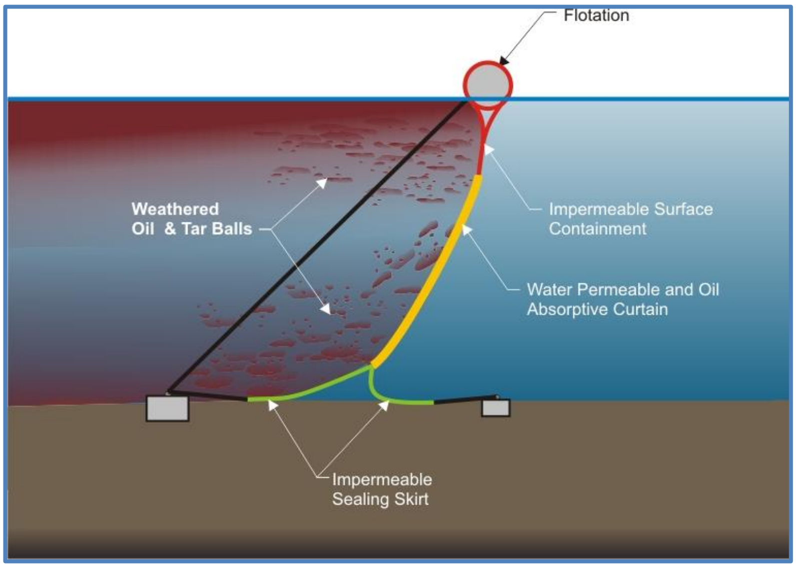

Figure 4.26 – Post-trenching Filter Barrier Schema

Figure 4.27 – Post-trenching Filter Barrier Example

Crossings

After pipeline laying crossing construction finalization, stabilization of as-laid configuration and correction of resulting pipeline free spans would be done.

The stated target can be achieved by covering the crossing area with mattresses and/or gravel installation.

Figure 4.28shows the typical completion of crossing after P/L laying by flexible mattresses.

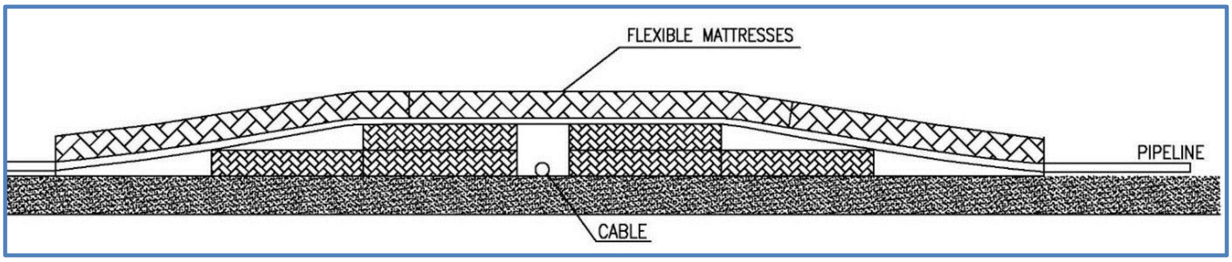

Figure 4.28 – Cable Crossing – Typical Post Pipelay Works by Flexible Mattresses

Mattresses may be concrete fabric (Figure 4.29) or bitumen type (Figure 4.30).

Figure 4.29 – Cable Crossing – Typical Concrete Mattresses

Figure 4.30 – Cable Crossing – Typical Bitumen Mattresses

Figure 4.31 shows the typical completion of crossing after P/L laying by gravel installation.

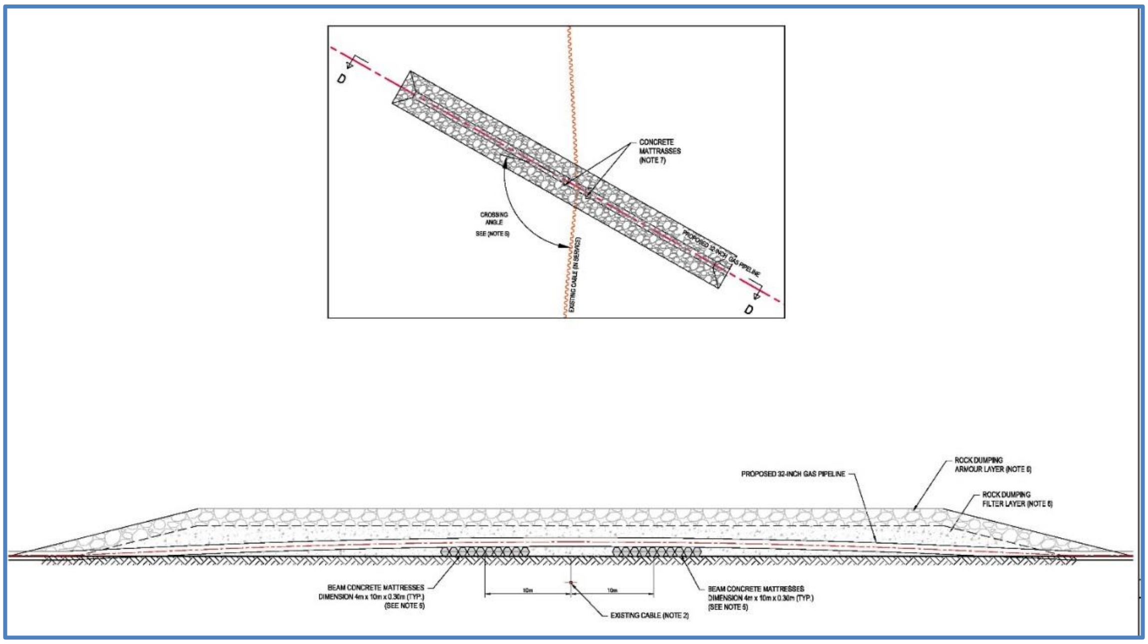

Figure 4.31 – Cable Crossing – Typical Post Pipelay Works by Gravel Installation

Supporting

As-laid pipeline supporting is a typical task in uneven areas where unallowable free spans may occur.

Other application may refer to built-up of counter fill by gravel installation to stabilize support vs. materials sliding along slope & stabilization in soft soil (Figure 4.32)

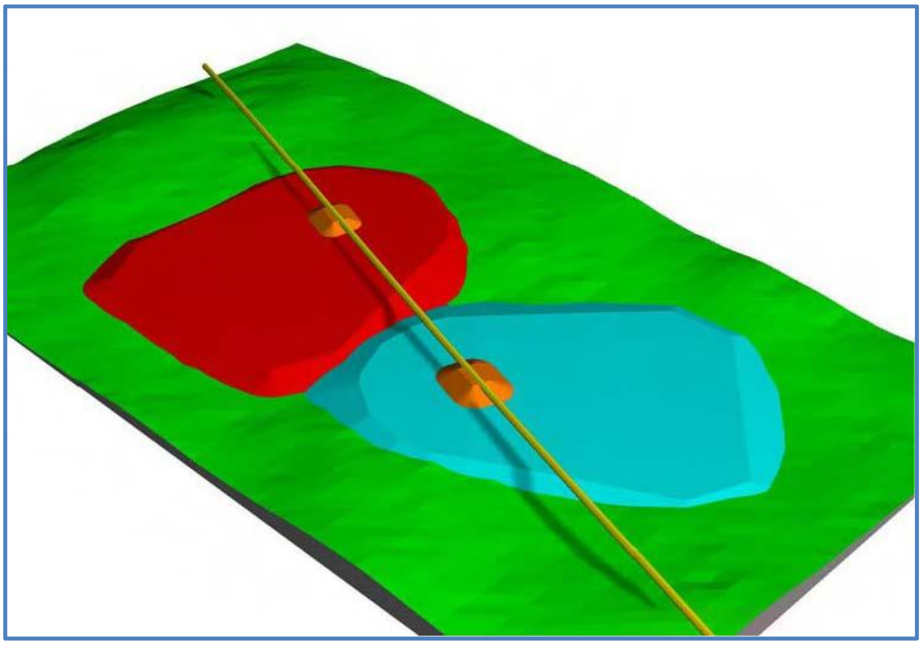

Figure 4.32 – Cable Crossing – Typical Post Pipelay Works by Gravel Installation

Such rectification could be done with grout/sandbags, gravel installation and more seldom by mechanical supports.

Figure 4.33 shows a typical pipe by sand bags scheme; Figure 4.34 shows a typical pipe by grout bags scheme; Figure 4.35 shows a typical grout bags formwork suitable for pipe support.

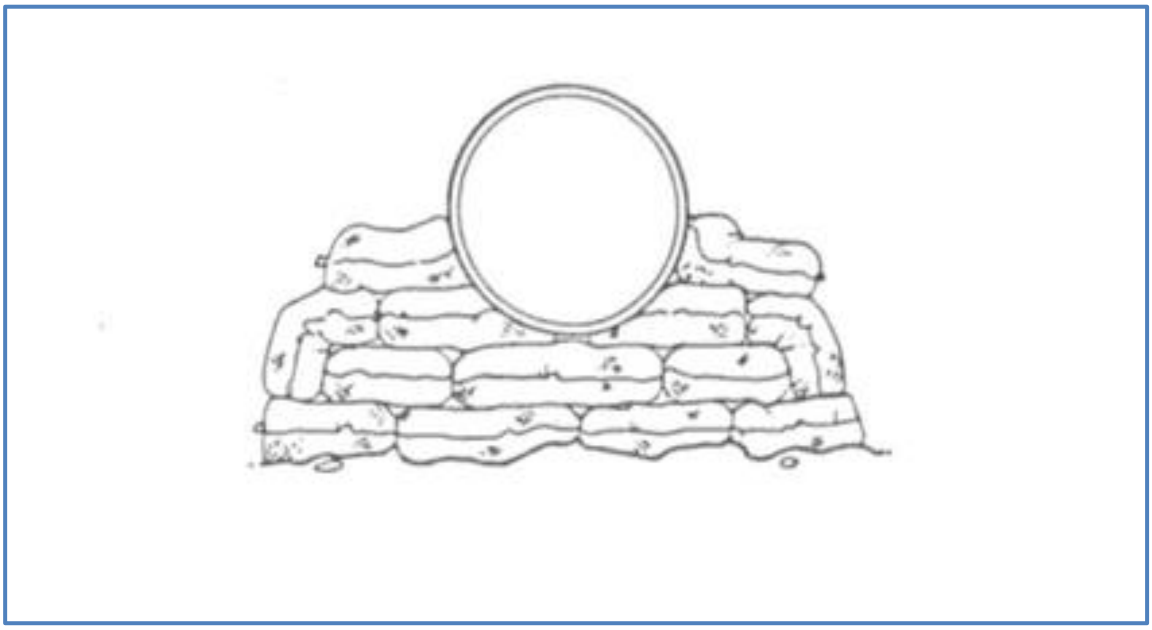

Figure 4.33 – Pipeline Supporting – Typical Post-lay Support by Sandbags

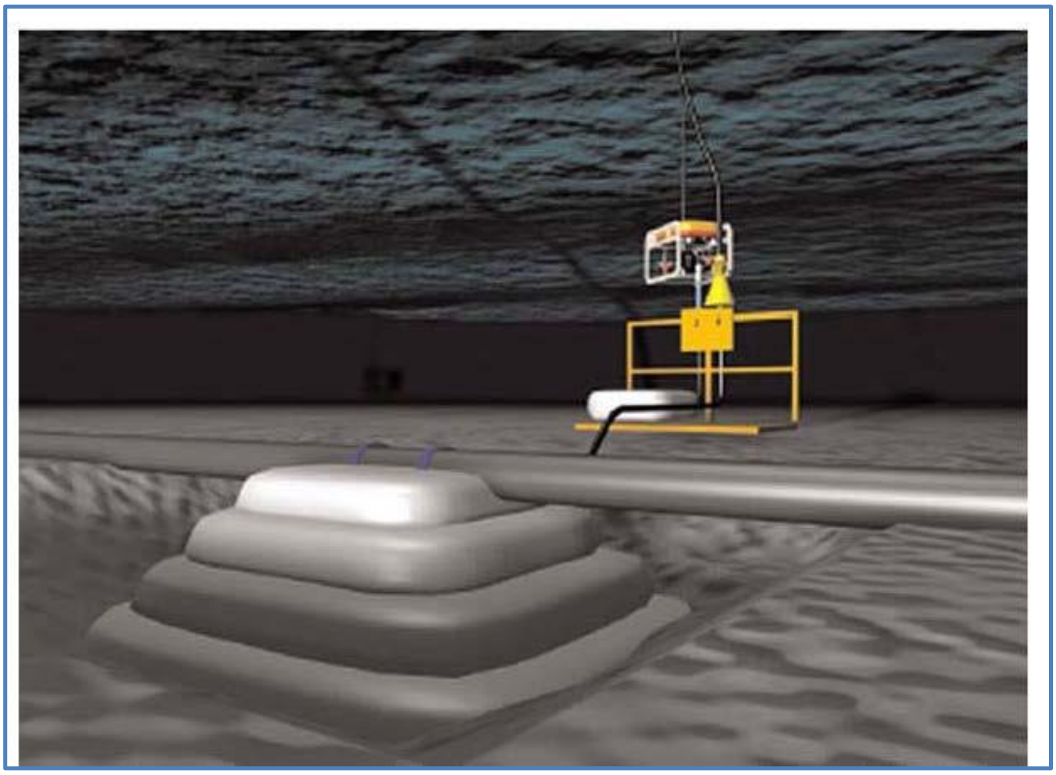

Figure 4.34 – Pipeline Supporting – Typical Post-lay Support by Grout bags

Figure 4.35 – Pipeline Supporting – Typical Post-lay Grout bag Support Formwork

As regards Melita Transgas Pipeline, the uneven areas where post-lay supporting is required are from around KP 144.1 and around KP 144.8 (Figure 4.36).

Figure 4.36 – P/L Supporting – Uneven Seabed from KP 144.1 to KP 144.8

Backfilling

Whether the pipeline is trenched or not, a soil cover may be needed to protect the pipe from mechanical damage from fishing gear or minor anchors, or to prevent upheaval buckling. If natural backfilling cannot be relied upon, such cover will have to be established by gravel installation on the pipeline.

The mere trenching of the pipeline will normally be sufficient to ensure hydrodynamic stability, and if a protection cover is necessary for long-term integrity this will often be achieved by natural backfilling. Indeed, in sandy areas where the trenching is performed by water-jetting, some material will be suspended rather than displaced, and will settle around the pipeline at the bottom of the trench. Seasonal storms will ensure a complete filling of the trench. When the trenching is carried out with a pipeline plough, backfilling may be achieved in the same operation by providing the plough with two sets of shears. The first pair opens up the trench, depositing the displaced sediment alongside. The second pair then scoops the sediment back on top of the pipeline.

If hydrodynamic stability rather than mechanical protection is the only concern, trenching of the pipeline may be obviated by reliance upon self-burial, i.e. the tendency of any heavy object to sink into a sandy seabed due to the scouring action of waves and current. An attractive option is to leave the pipeline waterfilled on the seabed during a winter season, if possible, and the following spring post-trench only those sections that have not embedded themselves sufficiently to be stable when the pipe is emptied. The propensity for self-burial may be enhanced by attaching spoilers in the form of longitudinal fins to the pipeline, but experience with this method is limited to test sections.

As regards the Melita Transgas Pipeline, the pipeline section which may requires artificial backfilling is at the bore hole offshore exit in the Italian shore approach, to reinstate the natural seabed layer.

As regards post-trenched section (up to KP 16 approx.) no artificial backfilling is requested at the moment.

4.3.3.1.9 Protection & Stabilization

Localised covering of the pipeline may be required, for example, to protect against dropped objects from platforms, or to prevent scour in the vicinity of platform legs or other structures on the seabed. In such cases a structural cover is an alternative to gravel installation. The engineered covering may be constituted by structural concrete elements placed over the pipeline, built up by flexible mattresses manufactured from geotextile, bitumen and aggregate or from interlocked concrete blocks. Also sandbags or grout bags placed by divers may be used.

As regards the project, six sections have been selected to be protected with gravel heaps to prevent interference between the new pipeline and possible vessels anchoring. This type of intervention works will have to be installed after the pipe has been laid and before the water filling.

Figure 4.37 shows the six sections interested by intervention works with gravel heaps.

They are typically carried out with gravel installation (see Figure 4.39) or flexible mattresses as shown in (Figure 4.29 and Figure 4.30); concrete structures may also be used for elastic bent curved pipeline section.

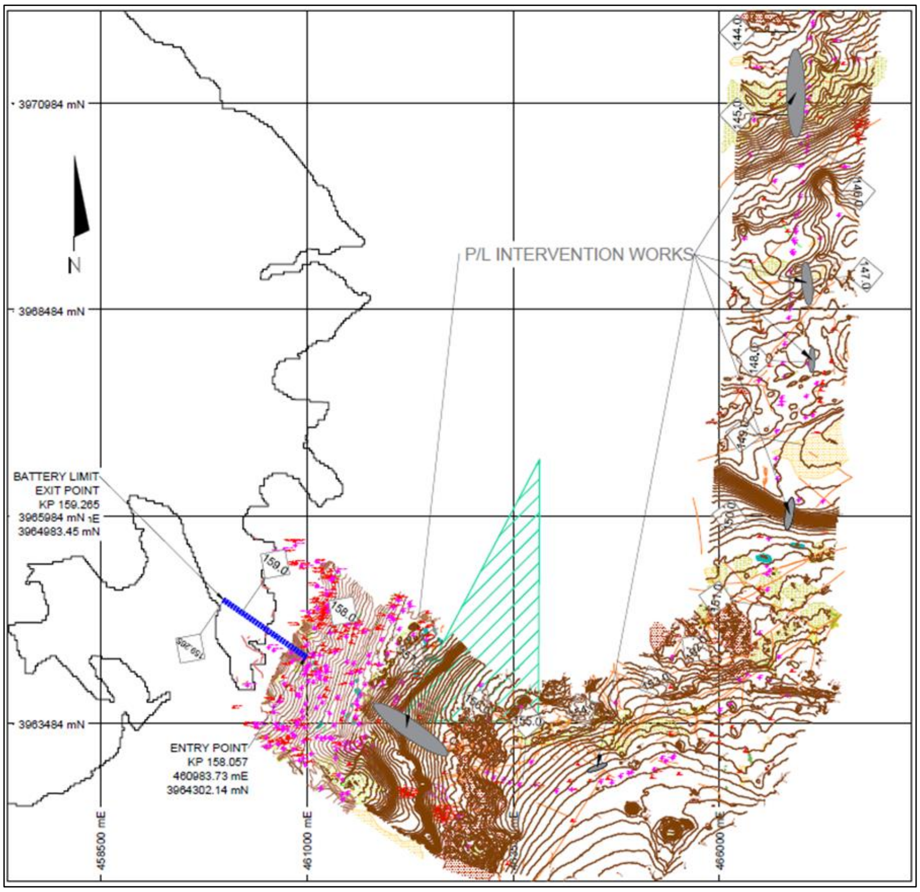

Figure 4.37 – Post-Lay Intervention works with gravel

Temporary supporting could be requested for stabilization purpose vs. on-bottom stability; their main requirement is the possibility to be easily removed.

As regards the project, some temporary supporting (as above mentioned) could be needed at the Italian nearshore (up to KP 10 approx.) for stability purposes dependent on the post-trenching activity schedule.

The area where potential temporary supporting is envisaged is shown in Figure 4.38.

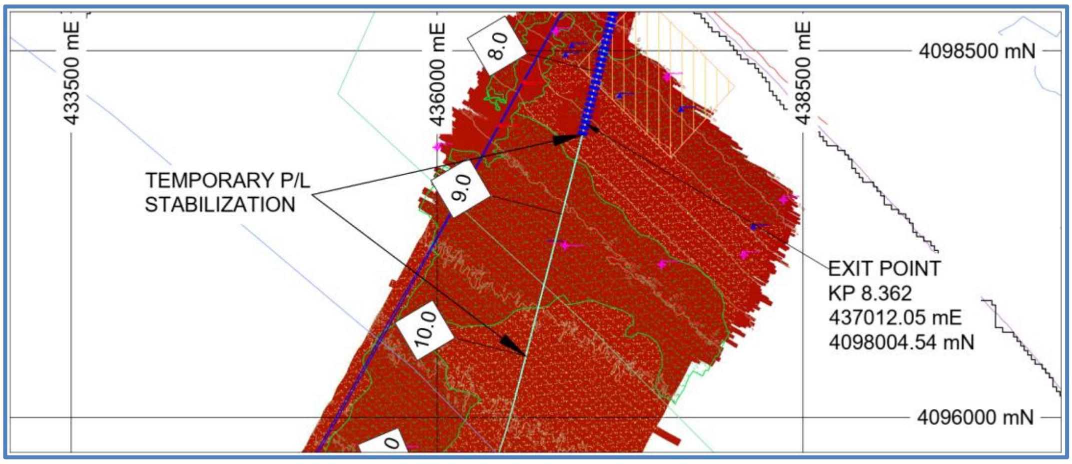

Figure 4.38 – Route Section Subject to Potential Temporary P/L Stabilization

According to the estimated soil characterization and subsequent foreseen operation, bitumen mattresses seem to be the most suitable solution at this stage; removable gravel berm (Figure 4.39) could also be applied.

As regards the project**,** stabilization requirements for the elastic bent curved pipeline section between KP 150.0 and KP 156.0 approx. may be requested, mainly depending from on-bottom laying residual tension and soil conditions.

Removable concrete structures could be the most suitable remedial measure for the related task.

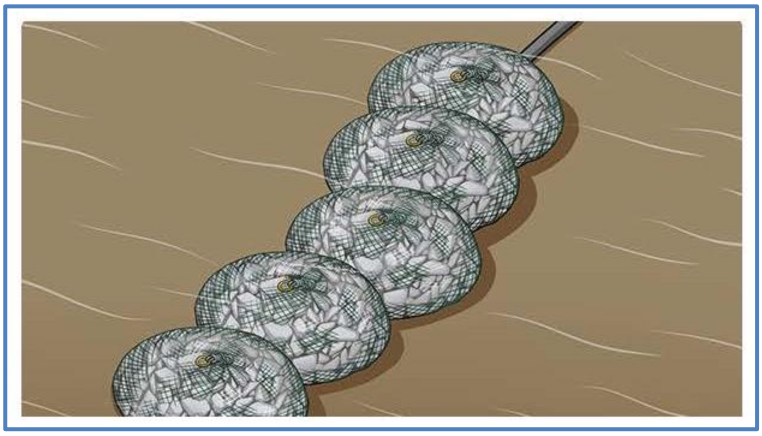

Figure 4.39 - Pipe Protection/Stabilization Remedial Measures – Removable Rock Berm Unit Typical Layout

4.3.3.1.10 Pre-commissioning

Pre-commissioning activities for an offshore pipeline section typically consist of the following phases: flooding, cleaning, gauging, testing, dewatering and drying. Each of these operations involve running a tool (“pig”) through the pipeline. The pigging operations will ensure that the pipeline is filled with clean water in preparation of hydrotesting. Furthermore, debris is removed, and the line is free from potential obstructions.

In summary, pre-commissioning comprises the activities and durations as presented in the following table 3.9.

Table 4.9 - Pre-commissioning activities and durations

Activity	Description	Duration (days)	From / To	Notes
Pre-packing	To prevent excessive pig speeds during flooding	6	Italy / Malta	
Flooding, cleaning & gauging	Remove excessive debris, ensure internal diameter is free from obstructions and excessive ovality	6	Malta / Italy	
Hydrotesting	Prove system strength, pressure containment	7	Italy / Malta	
Dewatering	Dewater and discharge hydrotest water	6	Italy / Malta	
Drying	Remove residual water	16	Italy / Malta	If possible, including onshore sections.
Preservation	Prevent explosive gas – air mixture	2	Italy / Malta	With Nitrogen or vacuum, depending on commissioning philosophy

Territory and project configuration do not allow the drawing of seawater for pre-commissioning purposes from Italy; therefore, the filling operation will be conducted from Malta.

Pipeline pre-packing, hydrotesting, dewatering, and preservation will be performed from the Italian side.

The discharge of hydrotest water in Italy is not currently envisaged and possible, therefore hydrotest water will be disposed in Maltese territory into the sea during dewatering operation. This must take place in compliance with the regulations and environmental laws in force whether they are local or national. It is highlighted that no chemicals are envisaged to be injected in the test water.

The direct discharge into the sea must be controlled by the authorization system of the competent authority which is the ERA (Environmental & Resources Authority) responsible for all environmental permits; therefore, it is not possible to discharge into the sea without the permission of the ERA.

Pre-packing

Pre-packing is performed prior to the flooding activity in order to prevent excessive (uncontrolled) pig speeds down the continental slope during flooding.

An alternative to the pre-packing is the pipeline pre-flooding. This option has been discarded to reduce as much as possible hydrotest water discharge.

Before starting the pipeline pre-packing, a train consisting of 6 bi-directional pigs will be loaded into the pipeline testing head installed in the Italian side.

Pipeline pre-packing is performed by means of oil-free compressed air (class 1 as per ISO 8573.1) and should continue up to the point where the pipeline reaches a suitable packing pressure.

Flooding, cleaning & gauging

Flooding, cleaning & gauging is performed by propelling a train of pigs with filtered and treated seawater from one end of the pipeline to the other. The air in the pipeline is displaced (vented at the downstream end).

All water entering the pipeline shall be filtered and treated to remove particulates and marine life. A water winning spread is used to draw seawater with pumps & fish retaining grid and transport it by means of supply lines to the break tank that is used to remove air bubbles from seawater. Before entering the break tank, water shall be filtered and UV treated. However, to reduce as much as possible their use, water extraction winning point should be located outside the surf zone in an area where clean water can be obtained.

Selection of the water composition is mainly determined by permitting issues. Considering that seawater will remain inside the pipeline for less than 20 days, only filtration and UV treatment are foreseen. No chemicals will be added to hydrotest water.

Water will then be injected into the pipeline with a controlled flow by means of flooding pumps. Each pig shall be separated from others with a slug of filtered and treated seawater of minimum 250 linear meters.

The flooding, cleaning and gauging is considered to be accomplished after pigs have arrived at the pig receiver. Pig speed for this operation should be maintained between 0.3 m/s and 1 m/s

Flooding is necessary to fill the pipeline with seawater and avoiding that huge volumes of air remain entrapped in the pipeline for later hydrotest acceptance criteria.

Cleaning is required to remove any debris (typically weld slag and pipe mill scale, where the latter is expected only in a very limited amount due to the internal coating) from inside the pipeline. One pig separates the air and water, and another series of pigs can be used to clean the internal pipe-wall. To moisten the debris, clean water should be pumped in front of the pig train.

Pipeline internal gauging is used to ensure that the inner diameter of the pipeline is free from obstructions, and excessive ovality. A gauging pig should be equipped with a tracking device to determine its location in case it would not arrive at the pig receiver. If a gauging pig becomes stuck in the pipeline it should be freed, the pipe defect should be located and eliminated, and the gauging operation should be repeated.

An electronic caliper tool can be used as an alternative gauging method. It will be able to locate the defect along the pipeline length.

The pipeline system configuration and the pig train should be designed to allow a bi-directional pigging, useful in case of a stuck pig freeing.

Suitable pig tracking system and pig signalling devices shall be installed on all pigs and along the pipeline to check the pig progress. Signallers that work with radio isotopes should be avoided.

The volume of water ahead and within the pig train will need to be received and collected at the Italian side.

Part of the above mentioned water can be re-used for pressurization purposes. Remaining water shall be disposed of at an authorized treatment plant, according to Italian law.

After the gauging pig has arrived at the pig receiver, its integrity is checked in the presence of the Owner. If the pig shows significant indications of damage, additional runs may be required, or a pipeline repair process must be initiated. If the pig comes out without these indications, then the geometry of the line is acceptable and is possible to perform pipeline hydrotesting.

Hydrotesting

During a hydrotest, pressurization is achieved by pumping water into the tested pipeline section.

According to the applicable codes, the system pressure test should be 1.4 times the design pressure with a hold period of 48 hours.

- Hydrotest activity includes:
- Residual air content check;
- Pressurization up to the test pressure;
- Strength testing;
- Depressurization.

The pressure in the pipeline is increased by high pressure pumps and shall be increased at a ratio not exceeding 1 bar per minute, up to 95% of the test pressure.

The residual air content during pressure testing should not exceed 0.2% of the total volume of the pipeline and be confirmed at 35 bar.

The last 5% of pressurization shall be performed at a ratio not exceeding 0.1 bar per minute, to avoid overpressure risks. Time shall be allowed for temperature and pressure stabilization before the test hold period begins.

The pressure should be continuously recorded during pressurization, stabilization and hold periods. Recording of temperature and pressure shall be done simultaneously and logged at least every 30 minutes during the hold period. Instruments and test equipment that are used for the measurement of pressure, volume and temperature shall be calibrated prior to the test. All instruments and test equipment should have valid calibration certificates and meet requirements according to DNVGL-OS-F101.

De-pressurisation of the pipeline system shall be performed as a controlled operation with consideration for maximum allowable velocities in the pipeline and the discharge piping, never exceeding 1 bar per minute until ambient pressure is attained.

The pressure test is acceptable if the pipeline is free from leaks, and the pressure variation is within the limits determined in DNVGL-OS-F101.

Due to environmental concerns, the base plan chemical treatment does not include dye, so acoustic leak detection equipment capable to detect subsea water drops should be put on standby for use during the hydrotesting phase of the project.

Dewatering

The pipeline will be dewatered from Italy to Malta by launching a train of 8 bi-directional pigs provided with tracking devices.

First four pigs will be driven by filtered freshwater used to remove seawater chlorides from pipe walls while remaining 4 pigs will be driven by technically free (class 1 as per ISO 8573.1) dry compressed air introduced through the temporary testing heads. The dried air will be supplied by a temporary compression station installed in the construction site of the Italian landfall and composed of primary compressors and dryers.

The air dew point shall be at least -20°C at atmospheric pressure.

The dewatering air pressure will be calculated in order to overcome the hydrostatic head of water, the friction loss from the water flow and the pressure to move the pig train with the benefit from the air pressure behind the pig train.

The design of the pig train is critical, particularly for long distance pipelines where propelling a pig train through the pipeline can take considerable time. High seal bi-directional pigs should be used to dewater the pipeline.

Each pig shall be separated from others by a minimum distance of 250 linear meters.

After the train of pigs has been received in temporary testing head in Malta, the pipeline will be depressurized to atmospheric pressure, the pigs will be recovered and inspected.

Pig speed for dewatering operation should be maintained between 0.3 m/s and 1 m/s

On receiving side, the water will be filtered to remove debris and contaminants before its discharge into sea. The volume of water ahead and within the pig train will need to be received and collected at Maltese side for later disposal according to national law.

Since use of chemicals is not foreseen, no further treatments will be performed on the hydrotesting water.

An assessment of the likely dispersion rate and extent should be evaluated as part of the pre-commissioning design activities during the construction stage of the project.

Drying

The dewatering pig train will leave a small film of water, approximately 0.05 mm thick, remaining in the pipe. The purpose of drying is to ensure that off-specification gas is not delivered to the Italian gas grid. This means absence of water in the pipeline to prevent the possible formation of methane-hydrate.

If possible due to construction schedule requirement, drying can include onshore sections.

Drying can be obtained in two different methods:

- Dry air drying. Dry air is injected at Italian side and will be vented at the Maltese side at pipeline open end. Drying should continue until a suitable air dew point at outlet is reached.
- Vacuum drying. The vacuum technique relies on the fact that the boiling point of water varies with pressure, so that whilst water boils at 100°C at atmospheric pressure (1013 mbara), at 8.72 mbara it will boil at 5°C. So, by reducing the pressure in the pipeline down to the saturated vapour pressure for the ambient temperature, the water can be boiled and removed from the

pipeline as a gas with a vacuum pump. A major disadvantage of vacuum drying is that the duration can be very long but it has also to be considered that can be useful for later commissioning operations.

The recommended option is air drying, because the results can be measured (by testing the dewpoint of the air leaving the pipeline) and because this method is the state of the art practice for drying long internally coated pipelines in a short time.

Preservation

On completion of the drying operations and prior to the introduction of hydrocarbons, the pipeline will require a preservation that can be obtained by two different methods:

- Nitrogen preservation. The pipeline will be purged by means of nitrogen to avoid the potentially explosive gas/air interface. If the oxygen level is sufficiently low, nitrogen purging is stopped, pre-commissioning of the pipeline is finished, and commissioning can commence by introducing gas at the Italian side. The gas pressure will be brought up to operating pressure after the nitrogen has been displaced.
- Vacuum preservation. The vacuum is created inside the pipeline (in case the vacuum drying is selected for the complete onshore and offshore section, this step can be avoided) by means of vacuum pumps, removing air until reaching such a low pressure of which there is no more flammability in the gas-air mixture. A small slug of nitrogen is injected in the pipeline before the gas enters in.

After the preservation the pipeline will be ready for gas filling operation.

Test medium

Seawater used to carry out pre-commissioning activities shall be de-aerated and free from debris, sand and silt.

Seawater shall have a minimum quality corresponding to filtration through a 50-micron filter and an average content of suspended matters not exceeding 20 g/m³.

The seawater will be than treated with UV to remove residual bacteria.

Break tanks shall be utilized to allow free air to be removed from the hydrotesting medium prior to injection into the pipeline.

Fresh water will be used to perform pipeline desalination during the dewatering phase. Fresh water will be transported to the Italian landing area by tank truck and stored in special tanks. It will be filtered, UV treated and then injected into the pipeline.

The estimate of the volumes of sea water drawn and then discharged into sea during the different phases of the sealine pre-commissioning are indicated in the following:

- Functional test 1, 200 m³
- Flooding, cleaning and gauging 33,300 m³
- Hydrostatic test 300 m³
- Freshwater 400 m³

The discharge of hydrotest water in Italy is not currently envisaged and possible, therefore hydrotest water will be disposed in Maltese territory directly into the sea during dewatering operation. This must take place in compliance with the regulations and environmental laws in force whether they are local or national. It is highlighted that no chemicals are envisaged to be injected in the test water.

Noise

Pre-commissioning activities are 24-hour operations. The operation is performed by means of diesel pumps and diesel compressors. To limit the disturbance to the close plants/residences, temporary noise barriers will be installed to reduce as much as possible noise, especially during the night.

As a base case, the pre-commissioning equipment will be selected for low noise production and an upgrade (e.g. with muffler) will be implemented where practicable.

In case noise barriers are foreseen, cooling airflow study must be performed during detailed engineering to avoid equipment and compressed air overheating

Exhaust emissions

Pre-commissioning activities are 24-hour operations. The operation is performed by means of diesel pumps and diesel compressors which are stationary and operating for several days continuously.

As a base case, the pre-commissioning equipment will be selected also for low emission rates. A detailed dispersion study should be performed during detailed engineering phase.

4.3.3.2 Installation spread outline data

The number of involved main installation spreads is assessed in this Section, together with their main vessels with most significant requirements.

Two different laying spreads have been identified; first one (SWS) dedicated to the installation in the Italian shore approach and nearshore up to WD=20m approx. (KP 14 approx.) corresponding to actual extreme AWTI location. Second one (DWS) dedicated to the installation of the remaining route from Malta shore approach up to the AWTI location.

Since SWS and DWS spread may work independently, AWTI would be done by the last barge arriving at the AWTI location.

Main requirements for SWS spread are:

- They have a minimum operating draft of 4.5m;
- To be suitable for laying the designed pipeline up to WD=20m approx.

Main requirements for DWS spread are:

- The have a minimum operating draft of 15m;
- To be suitable for carry-out the final laydown with the laydown head to be located in WD=20m approx.

In addition to the above both spread must be well equipped for an AWTI in WD=20m.

It highlighted at this stage that major effort should be given to tailor the two spreads in order to reduce the water depth where AWTI has to be done; this because such operation is actually foreseen at

WD=20m approx., where the pipeline has the highest submerged unit weight (around 600 kg/m) and an air unit weight of 1100kg/m.

One spread is foreseen for post-trenching in the Italian nearshore (up to KP 16 approx.). It should be mobilized as soon as possible the pipeline is laid to avoid the need of temporary pipeline installation.

One multipurpose spread is foreseen for:

- Pre-installation works for crossings preparation works and other potential seabed profile corrections, if any;
- Temporary stabilization/protection works;
- Post-installation works for crossing completion works free spans rectification and pipeline protection/permanent stabilization works.

4.3.4 Construction schedule

Construction activities for the Project will be performed by a specialised EPC Contractor who will be in charge of the final detail design of the system (Engineering), the material specification and supply (Procurement) and the system installation (Construction).

The preliminary schedule will be verified/finalised by the selected EPC Contractor on the basis of his own organization and equipment. However, the following dates for the various milestones shall be guaranteed.

Table 4.10 - Main Construction Milestones

Milestone ID	Milestone description	Completion date
1	EPC Contract Award	01/06/2022
2	Detailed Engineering studies certified completed & start of Material Fabrication	10/02/2023
3	Installation Procedures	17/11/2023
4	UXO surveys	01/03/2024
5	Pre-installation Surveys Including UXO Surveys	23/02/2024
6	Terminals and Block Valve Stations Material supply	01/12/2023
7	Offshore Pipeline Laying	23/09/2024
8	Offshore Pipeline pre-commissioning	18/11/2024
9	Construction of Gela Terminal, BVS and onshore pipeline in Italy	27/09/2024
10	Pre-commissioning of Italian on-shore infrastructure	25/10/2024
11	Construction of Malta Terminal and shore approach	28/02/2025
12	Pre-commissioning of Maltese on-shore infrastructure	28/03/2025
13	Final tie-ins and mechanical completion	18/04/2025
14	Final commissioning	11/07/2025

The first activities will be performed in Malta where preliminary construction works are needed to prepare the site (i.e. new access road construction and land reclamation).

The shore approach in Malta will be done first, because it is required to occupy all the area assigned for the Terminal Station with the drilling equipment (for Microtunneling). Therefore, it is not possible to start the Terminal construction activities before the end of shore approach installations.

The offshore pipeline installation with the barge for large water depths will start from Malta towards Gela.

The construction activities in Gela (near shore, shore approach and onshore) may be performed in parallel with the construction activities in Malta utilizing dedicated teams. The selected period may be adjusted considering possible restriction in the working dates due to the presence of environmental protected areas.

The final pre-commissioning activities (i.e. drying and purging) and the commissioning will be performed on the whole pipeline from one terminal to the other after the final tie-in of the different constructed sections.

4.4 Operation and manteinance

4.4.1 Pipeline System Management

Following the pre-commissioning/commissioning activities, the pipeline will be filled with gas flowing from the Italian National Grid (from Snam Rete Gas interconnection plant at Gela).

During the first phase of activities the gas will always flow from Gela to Malta and the operations will be controlled from the Terminal Plant in Delimara (Malta) where a continuously manned control room will be constructed.

The Melita Transgas Pipeline control can be summarised as follows:

- Control Valves (flow control at SRG plant and pressure control at Gela Terminal) will be used for the normal operation activities in order to manage the requested gas flow rate and pressure in Malta.
- Emergency Shut Down Valves at Gela and Delimara to guarantee a fast isolation of the plants/system in case of overpressure or fire inside the plants.
- Communication and Control System (SCADA) used to monitor and manage the whole the pipeline system from one point (Delimara Terminal). All the process information/data will be acquired/monitored in real time (i.e. pressure, temperature, gas quality, flow rate, etc.) in order to immediately identify any malfunction or trouble and therefore undertake the necessary interventions (e.g. stop the flow, swap the production lines/stand by lines, change the delivery flow rate, etc.). The Melita Transgas Pipeline will be managed in close cooperation with the Dispatching Unit of Snam Rete Gas.

When the gas will be available in Malta, the pipeline may be operated in reverse flow (gas from Malta to Italy). The plants will be equipped to manage the reverse flow phase and therefore the Control System will be set-up (e.g. set points, closure/opening of valves, etc.) to manage this operating condition. Also, in this phase the pipeline system will be monitored/controlled from the Control Room in Delimara.

In addition to the above, Melita Transgas will have inspection and maintenance teams to ensure safe gas transportation.

4.4.2 Inspection, Maintenance and Repair (IMR)

To ensure a safe system, pipelines transporting gas and relevant installations shall be subject to inspection and maintenance in accordance with the applicable codes and best practice.

The pipeline maintenance and inspection programmes are developed to minimise risk associated with long term operation, while minimising costs associated with inspection mobilisation and production loss. Experiences of operators with maintenance and inspection of similar long length gas pipelines has proven that a feasible programme can be developed from existing technology.

The inspection programme considers both internal and external pipe surfaces for onshore and offshore pipelines. The internal inspection and maintenance would be conducted by intelligent pigging, geometry pigging, profile pigging and cleaning pigs to monitor internal corrosion, cross section profile of the pipeline, pipeline profile and external coating breakdown. External inspection and maintenance programmes are performed by an ROV capable of detecting the pipeline location, monitor spans and measure the effectiveness of the cathodic protection system. The external inspection of the onshore pipeline will be performed with a specific visual survey along the route.

4.5 Pipeline system life and de-commissioning

Pipeline system lifetime, despite of the design life, is a function of the continuous technical and strategic objective, that motivated its realization, during the years.

The operation technical parameters are constantly kept under control by carrying out the inspection and the ordinary and extraordinary maintenance operations, which ensure that the gas is transported in safe conditions. If, on the other hand, Melita Transgas Pipeline evaluates that the pipeline and related systems are no longer usable for the transport of gas, they are put out of service. In this case, putting the pipeline out of service consists of carrying out the following main operations:

- empty the pipeline,
- fill the line with inert gas (i.e. Nitrogen) at a pressure of 0.5 bar,
- maintain the cathodic protection in function,
- leave the easement strip and concessions (e.g. at crossings),
- continue the inspections and controls along the line.

Alternatively, the pipeline may be removed, where it is possible.

These two de-commissioning alternatives require different activities with different impacts on the environment and on the territory. If the first alternative (put out of service the pipeline) is less impacting being the works very limited, but the infrastructure will remain in place with the relevant constraints; the second alternative requires works similar to the construction of a new pipeline with the relevant impacts.

It is highlighted that an offshore pipeline with the extension in project is not removable, therefore this activity is applicable only to the onshore pipeline in the sections installed with an open cut method (also the sections installed with trenchless methodology at deep depth cannot be removed).

5.0 RISK ASSESSMENT

5.1 Introduction

This chapter presents a summary of the results of the risk assessment related to the risk of environmental accidents and the risk to the population (third party risk, or societal risk).

Risk is defined as the likelihood of an accidental event combined with the consequence of the event.

For the offshore part of the MTG project, detailed risk analyses have been carried out and documented in the Quantitative Risk Assessment, QRA (Doc. 10-RS-E-2004, Techfem-SpS, 2019).

In the following, a summary of the results of the risk assessment related to the risk of environmental accidents and the risk to the population (third party risk, or societal risk) is provided.

The framework for controlling the risks during construction and operation is the Health, Safety and Environmental Management System of the operator.

5.2 Methodology

5.2.1 Hazards Identification

The possible failure causes leading to unplanned releases of the transported fluid will be identified on the basis of literature data on offshore gas pipeline incidents[10] and HAZID report[11].

The following hazards that may threaten the pipeline integrity are managed adequately through the application of the relevant DNV standards:

- Natural hazards due to current and wave action.
- Pipeline free spanning sections: sections which contain one or more segments of the pipe which can be left unsupported as it can sustain the conditions on its own without supports.
- External interference with fishing activities.
- Operating temperature and pressure conditions.

The following failure causes are identified as applicable and considered in this risk analysis:

- interaction with third party activities (commercial ship traffic);
- corrosion (internal and external);
- mechanical defects;
- natural hazards (storm, scouring);
- other/unknown (sabotage, accidental transported mines, etc.).

[10] *PARLOC, The update of Loss of Containment Data for Offshore pipelines, 2001.*

[11] *Techfem-SpS, Doc.171001-10-R-S-E-2005, HAZID, ENVID Review Reports, 2019.*

5.2.2 Frequency assessment

For offshore pipelines, interaction with third party activities is related to commercial ship traffic and the following initiating events are identified:

- Sinking ships;
- Grounding ships;
- Dropped objects;
- Dropped anchors;
- Dragged anchors.

Release frequencies due to interaction with third party activities related to commercial ship traffic are evaluated by means of mathematical modelling in a dedicated Fishing Activities & Marine Traffic Interaction Assessment Report.

The pipeline damage probability given an interaction is set equal to one (1).

The release frequencies for the following failure causes are estimated from PARLOC 2001 database:

- corrosion;
- mechanical defects;
- natural hazards;
- other/unknown.

The PARLOC database contains incidents and related loss of containment from offshore pipelines operated in the North Sea. It is used since no specific data are available for the South Mediterranean Sea.

In this database, incidents are grouped in the following leak size categories:

- hole size less than 20mm;
- hole size between 20 and 80mm;
- hole size greater than 80mm.

The use of failure statistics from database, in many cases, leads to over-conservative

results since:

- no information on characteristics of transported medium is given;
- databases often refer to the "average" pipeline population and do not take into account pipeline characteristics (e.g. age and quality of pipeline, wall thickness, inspection frequency, etc).

Therefore, in this analysis, engineering judgement is applied to calculate, if necessary, appropriate values.

5.2.3 Consequence assessment

The consequences assessment of subsea gas releases involves several steps; the methodology utilised for the consequence assessment is detailed in the following paragraphs:

- Definition of incident outcome scenarios;
- Underwater dispersion and effects at sea surface;

- Consequences of outcome scenarios.

5.2.3.1 Definition of outcome scenario

In this context, an incident is considered the loss of containment of the transported fluid. The physical manifestation of the release is the incident outcome scenario. Therefore, a single initiating incident (e.g. leak of flammable gas) may in principle have several outcomes (e.g. jet fire, flash fire, harmless dispersion) depending on whether an ignition takes place (immediate or delayed) and on the degree of confinement.

The sequence of events following an initiating event (e.g. external corrosion) determines the occurrence of an incident outcome scenario. The factors and intermediate events concurring to the outcome scenario definition are:

- Size of rupture (pinhole, hole or full bore rupture);
- Type of released fluid (gas, liquid, two-phase);
- Process parameters (i.e. P and T that determine the outflow rate);
- Water depth;
- Atmospheric conditions (i.e. Pasquill stability class and wind speed);
- Likelihood of ignition.

In case of a subsea gas release the type of hazardous scenarios that can occur depend on the behaviour of the gas at sea surface and the level of confinement/congestion encountered by the cloud. In particular, if the gas reaches a congested area at the sea surface and encounters a source of ignition, either a flash fire or an explosion can occur. On the contrary if no congestion/confinement is present, in case of ignition only a flash fire can occur.

The assessment of the consequences of a potential gas release will be performed for three damage categories, according to the hole dimension, selected in compliance to PARLOC 2001 database:

- PINHOLE: 20mm (representative of hole sizes lower than 20mm);
- HOLE: 80mm (representative of hole sizes between 20 and 80mm);
- FULL BORE: internal pipeline diameter (representative of hole sizes greater than 80mm).

The input data necessary for the pipeline release calculations after rupture are the following:

- offshore pipeline profile, diameter, wall thickness, roughness;
- composition of the fluid;
- total mass flowrate at pipeline inlet;
- fluid temperature at pipeline inlet;
- outlet pressure;
- valve position and activation data.

5.2.3.2 Underwater dispersion and effect at sea surface

The subsea dispersion is modelled in order to provide parameters such as plume width, gas volume fraction and mean velocities at the sea surface; these parameters constitute the input to the atmospheric dispersion model.

Subsea dispersion calculations have been performed by means of the computer program POL-PLUME.

According to published literature[12] , the underwater dispersion of the gas from the release point to the surface can be split in three distinct regions:

- Zone of Flow Establishment (ZOFE). At the release source the gas enters the sea in the form of a relatively low-density momentum jet. At some distance above the release point buoyancy forces becomes the major influence in plume characteristics and a radial Gaussian bubble distribution exists. This is the region between the release point and the height at which the dispersion appears to adopt a plume-like structure. At this height the effects of the initial release momentum are considered to be secondary to the momentum induced by the buoyancy.
- Zone of Established Flow (ZOEF). The plume-like region of dispersion that extends from the ZOEF to a depth beneath the free surface that is of the order of one plume diameter. On the basis of experimental evidence, it is generally assumed that this region forms a cone having a total vertex angle of approximately 10°.
- Zone of Surface Flow (ZOSF). Near the surface, the vertical momentum of the plume is converted to a radial flow forming a central boil region slightly wider than the theoretical ZOEF cone at the surface. In this region above the ZOEF, the plume interacts with the surface causing widening of the bubble plume and radial flow of water at surface. The ZOSF has again been predicted on the basis of experimental evidence, since analytical methodologies have not been yet fully tested.

The equations used in the model describe the conservation of mass by incorporating buoyancy terms for a low-density fluid rising through a high density, stationary fluid. The model assumes a unidirectional (vertically upward) bulk flow; the increase in plume width height is empirically evaluated by an entrainment coefficient.

On reaching the surface, the gas will begin to disperse within the atmosphere. The nature of the dispersion depends upon the molecular weight and on the source conditions at the surface. In general, the resulting source has a large diameter, but the gas has a very low velocity.

The parameters that define the input conditions to the atmospheric dispersion model are:

- Mean gas concentration – assumed equal to the void fraction in the rising plume;
- Gas velocity at sea surface – assumed to be the top hat velocity at the sea surface
- Source diameter.

[12] *OTH 95 465, Dispersion of Subsea Releases, Health and Safety Executive, 1995.*

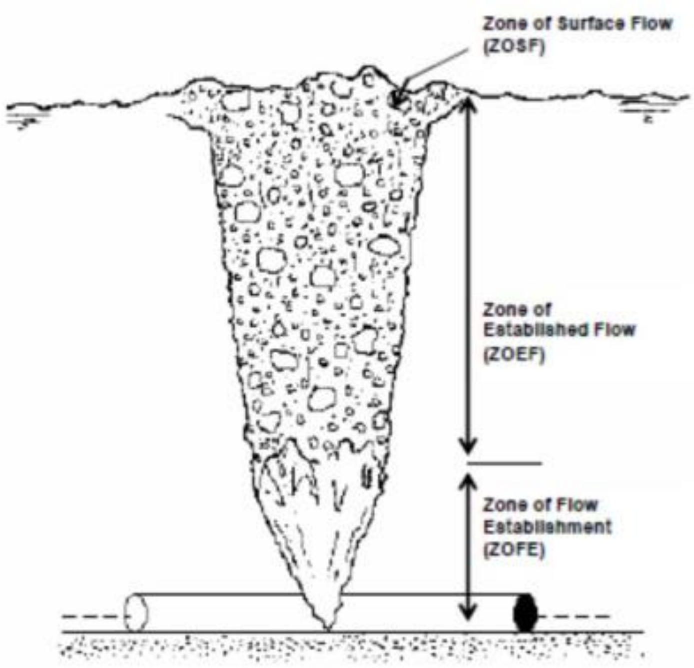

Figure 5.1: Underwater plume dispersion

5.2.3.3 Consequences of the outcome scenarios

Following a loss of containment event from the subsea pipelines, the possible outcome scenarios are:

- Atmospheric dispersion;
- Flash fire.

The effects of outcome scenarios are assessed using the software DNV PHAST 8.11.

The flash fire occurs if a flammable cloud engulfs an ignition source before it is diluted below its flammable limits (delayed ignition).

Flash fires generally have a short duration and therefore do less damage to equipment and structures than to personnel caught in a flash fire. It is conservatively assumed that anyone caught in the flash fire would probably be killed. To determine the area that could be involved in the flash fire and therefore the effect on people, flammable gas dispersion results (distances of LFL/2 concentration) will be considered in the risk analysis.

No congested nor confined areas can be reached by a flammable cloud along the offshore pipeline, thus explosion scenarios cannot occur.

Since the gas is not toxic, atmospheric dispersion has no impact.

Starting from the release frequency evaluated, the frequency of each specific scenario (flash fire and dispersion) will be calculated by Event Tree Analysis, taking into account the probability of ignition.

The following Figure shows the event tree adopted for this project for the offshore section, only the flash fire scenario is considered, since the gas reaches the sea surface at low velocity and no congested/confined region is present.

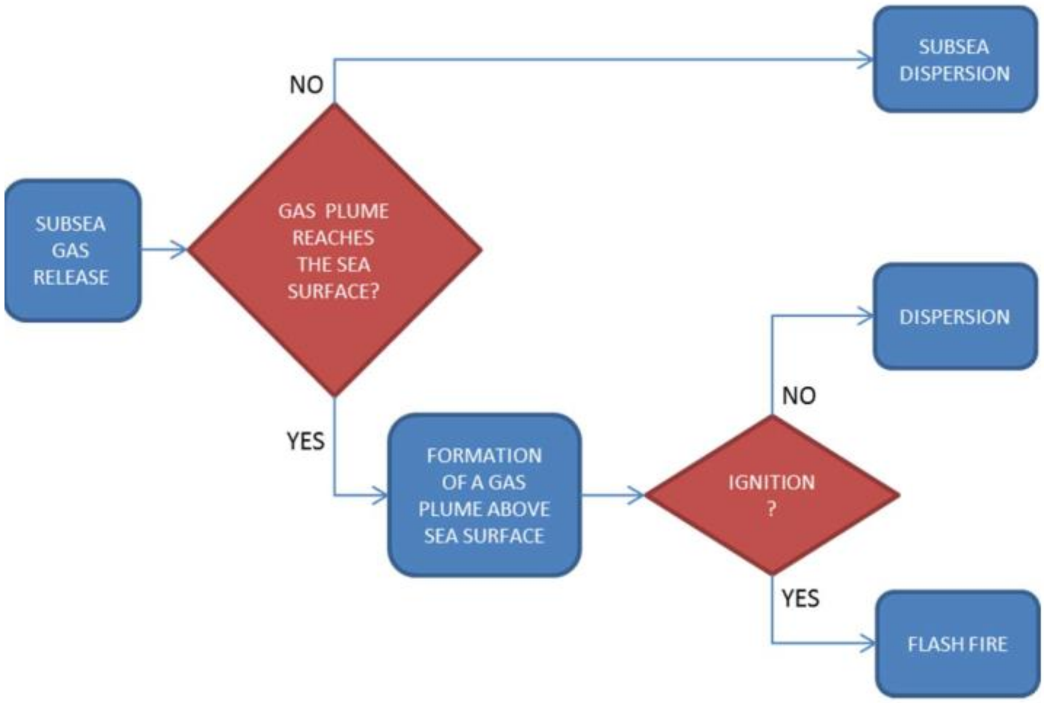

Figure 5.2: Event tree for subsea release

Assuming the plume reaching the sea surface probability is one (1), flash fire is the only possible scenario *offshore* that has an impact on people.

These may occur if the mixed gas cloud engulfs an ignition source while drifting due to the wind. The only ignition source that the mixed gas cloud might encounter is a ship navigating across the hazardous area. The hazardous area is assumed to be the cloud envelope at LFL/2 gas concentration.

In order to assess the ignition probability, two contributions have been evaluated:

- probability of a ship crossing the hazardous area in the time interval of cloud persistence;
- conditional probability of delayed ignition given a ship present in the area

As per international best practice, the individual scenario will be considered credible when its frequency of occurrence will be higher than 1.00 E-07 event/year, which is the threshold value separating possible events from unrealistic occurrences. Therefore, following ETA, each scenario with associated frequency of occurrence lower than 1.00 E-07 event/year (less than one occurrence in 10 million years) will not be further analysed.

5.2.4 Risk evaluation

5.2.4.1 Risk to people (Social Risk)

Risk to people is quantified in terms of damage to people (i.e. death) caused by the exposure to thermal radiation following the ignition of the released gas.

The most exposed Company and/or 3rd party people is represented by crew members/passengers on-board of vessels crossing the pipelines. Thus, for the offshore section the adopted methodology foresees to quantify the risk level for people in terms of Social Risk (SR).

Social risk, F(N), is defined as the frequency and the number of people suffering a given level of harm in a given population from the realization of specified hazards. The harm considered in this study is the death.

$$F(N) = \sum_{ij}(f_{ij}(n_{ij}))$$

Where:

f_{ij} frequency of the final event i-th scenario and the j-th atmospheric condition

n_{ij}, the number of deaths, corresponding to each final fij, obtained as

$$n_{ij} = \int_{area} V(A) \cdot N \cdot dA$$

where:

$V_{ij}(A)$ vulnerability in the hazardous area determined by the *i*-th scenario and the *j*-th atmospheric condition

N_{ij} density of population in the hazardous area determined by the *i*-th scenario and the *j*-th atmospheric condition

In this analysis, to be more conservative, the worst atmospheric stability class and wind velocity that gives the longest flammable cloud extension has been considered, setting to 1 the wind probability.

Ignition probability is related to the presence of a vessel over the hazardous area.

The density of population in the hazardous area is determined based on the number of crossings within the hazardous area. In case the section runs parallel to a shipping lane parallel traffic has been taken into account for the evaluation of the population density.

The number of deaths corresponding to flash fire scenarios occurring in the offshore sections is conservatively assumed to be the average number of individuals present on board and according to the ship type distribution in each sensitive section.

The probability of death is assumed equal to 1 inside the flame envelope and 0 outside. However, realistically not all people on board will be on the vessel deck in case of an incident and therefore directly exposed to the effects of thermal radiation, thus vulnerability considers that some people on board will not be directly exposed to thermal radiation.

Individuals Vulnerability levels will be defined on the basis of results of Fishing Activities and Marine Traffic Interaction Assessment. In case this will be not possible, a vulnerability equal to 1 will be conservatively assumed for all the people on board the vessel.

5.2.4.2 Risk to environment

A semi-quantitative approach has been adopted by means of the risk matrix methodology to predict the risk level for the environment.

5.2.4.3 Risk tolerability criteria

Individual Risk

For onshore workers, the Risk Tolerability Criteria to be used for Individual risks evaluation are exposed in Table 5.1 below and include the contribution of both immediate and delayed risks.

Risk Zone	Risk tolerability criteria (occ/yr)
Low Risk Area	Risk < 1.00e-06
Medium Risk Area	1.00e-06 ≤ Risk < 1.00e-03
High Risk Area	Risk ≥ 1.00e-03

Table 5.1 –Tolerability Criteria for Individual Risk per annum

Risk to Groups (Societal Risk)

The social risk is intended to limit the total risk of death imposed by the facility on its workers and third parties. This is expressed, as shown in the following figure, as an FN diagram in which the fatality frequency per year per system (F) is represented versus the number of fatalities (N) For Social risk, the following Risk Tolerability Criteria is used:

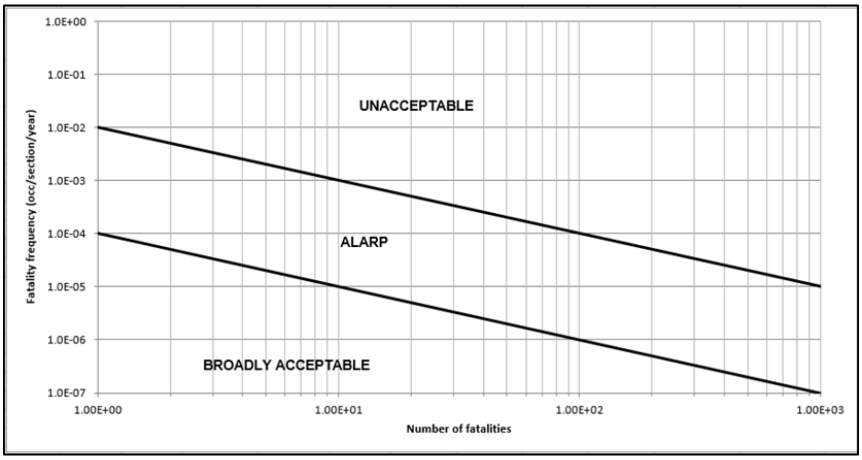

Figure 5.2 – FN Curve

Risk to environment

The risk Tolerability Criteria used for Environmental risks evaluation (Onshore & Offshore section) are reported as follows:

Severity	Environment	A	B	C	D	E
		<10-6 occ/y	10-6 to 10-4 occ/y	10-4 to 10-3 occ/y	10-3 to 1 occ/y	>1 occ/y
1	**Slight effect** No stakeholder impact or temporary impact on the area Involved area < 0.25 km^2 Spill (1) < $1m^3$ – no sensitive impact on ground			***Low Risk Area***		
2	**Minor effect** Some local stakeholder concern or 1 year for natural recovery or impact on small no. of not compromises species. Involved area < 2.5 km^2 Spill (1) < $10m^3$ – impact on localized ground					
3	**Local effect** Regional stakeholder concern or 1-2 years for natural recovery or 1 week for clean-up or threatening to some species or impact on protected natural areas. Involved area < 25 km^2 – Spill (1) < 100 m^3			Medium risk area		
4	**Major effect** National stakeholder concern or impact on licenses or 2-5 years for natural recovery or up to 5 months for clean-up or threatening to biodiversity or impact on interesting areas for science. Involved area < 250 km^2 – Spill (1) < 1000 m^3					
5	**Extensive effect** International stakeholder concern or impact on licenses/acquisitions or >5 years for natural recovery or > 5 months for clean-up or reduction of biodiversity or impact on special conservation Involved area > 250 km^2 – Spill (1) > 1000 m^3				High Risk Area	

Table 5.3 – Environmental Risk Matrix

5.3 Quantitative Risk assessment

5.3.1 Frequency Assessment

5.3.1.1 Frequency assessment from database

Corrosion

Two cases of leakages due to corrosion for pipeline longer than 5 km are reported in literature[13]. These cases involved steel gas pipeline with diameter size (< 12”) smaller than Melita sealine.

In this study, according to Design of the MTG Project, the frequency of release due to corrosion is considered negligible for the following reasons:

The transported medium is dry and sweet natural gas. Since there is no free water (even considering the maximum water dew point of -5°C at 70 bar), no corrosion mechanism is expected, and no corrosion allowance is foreseen for onshore/offshore pipeline;

- The external corrosion is hindered by the external corrosion coating (3LPE, thickness 3.5 mm) in combination with the cathodic protection system for both onshore and offshore.

Mechanical defects

Mechanical failure frequency can be divided in material defects (defects produced during fabrication process) and construction faults. As reported in literature[13], two incidents due to material defects, and no incident due to construction faults, have been experienced for an operating experience of 292,745 km·year. This leads to the conclusion that frequency of release due to mechanical defects is a very rare event, and can be neglected since the all materials, manufacturing methods and procedures will comply with recognised standards, practises or purchasers’ specifications.

Natural hazards

13 incidents are reported in literature[13], but none of these causing loss of containments from steel pipelines. Thus, this failure cause can be reasonably neglected.

Other/Unknown

Other/unknown causes include all the incidents for which no specific causes have been identified. Sabotage, Military exercises and/or accidental transported mines could represent possible other/unknow causes, but they are considered very unlikely.

5.3.1.2 Frequency Interaction with third party activities

AIS Data

The main hazards on the pipelines associated with marine ship traffic are:

- Sinking vessels: this scenario refers to the possibility of a ship sinking while crossing above the sealine;

[13] *PARLOC, 2001. The update of Loss of Containment Data for Offshore pipelines*

- Interaction with anchors: this scenario derives from anchoring operations caused by collisions, machine failures, or other accidents. These emergency situations could induce the vessel crew to drop the anchor in unplanned areas;
- Dropped objects from commercial vessels: in this case, reference objects are containers lost from commercial vessels crossing the pipeline route which could hit the pipeline;
- Grounding vessels: this kind of interaction occurs in areas where the water depth is comparable with the draft of the ships crossing the pipeline.
- Fishing gear impact: this scenario derives from fishing activities. In areas characterised by trawling activities, trawl ground gears could impact onto the sealine, potentially causing damage. However, since the pipeline is provided with concrete protection, such a scenario is neglected in the present analysis.

Input AIS data have been gathered for the area of interest in the period of one year (2018). The only relevant exposed third parties along the offshore pipeline route are represented by commercial and fishing activities.

The ship characteristics used in the present analysis and relevant to each ship class are reported in Table 5.4.

Ship class	GT Ships Class	Avg. Length	Avg. Width	Draft	Avg. Speed
		(m)	(m)	(m)	(m s^{-1})
1	100 – 500	50.33	9.55	1.96	3.56
2	500 – 1600	46.31	9.33	5.48	2.48
3	1600 – 10000	86.90	17.58	5.50	4.45
4	10000 – 60000	142.68	35.19	7.04	6.11
5	> 60000	292.00	45.00	17.00	6.72

Table 5.4 – Reference vessel parameters

Ship traffic in the study area mainly consists of cargo, tanker and fishing vessels. Several categories have been analysed in this report, and they are listed in Table 5.5, along with the mean numbers of individuals on-board for each type of vessel, assumed for the present study.

The results of the analysis carried out on AIS data is summarized below. In particular, the traffic data provides information about:

- Number of ship crossings per KP split by GT class;
- Number of ship crossings per KP split by the Ship types indicated in Table 5.5.

Ship type	Individuals per vessel
Fishing vessel	10
Cargo	20
Tanker	30

Ship type	Individuals per vessel
Other	50
Passenger	1000

Table 5.5 – Individuals on-board per vessel type

Sensitive Sections

In order to simplify the calculations, while identifying the most crowded areas at the same time, the entire route of the sealine has been split in sensitive sections. Sensitive sections are pipeline sections crossed by intense ship traffic. The identification of the location and length of the sensitive sections is based on the following criteria:

» A value of 150 ships/KP/year is defined as characteristic value. This value corresponds roughly to less than 0.5 ships/KP/day and is considered as a threshold to distinguish if one section is sufficiently crowded to require attention;
» The number of sections and the associated lengths are determined where ship traffic exceeds the above threshold;
» Different sections which are closer than 5 km are merged.

Based on these guidelines, a total number of three sensitive sections have been identifited. The main characteristics of these 3 sections are listed in Table 5.6. Data related to the type of ships passing through the above sections (expressed as percentage) are shown in Table 5.7.

Sec. ID	From KP	To KP	Sec. length (km)	Min Water Depth (m)	Ship Cross. N° (Ships/Sec./year)	Max Ship Cross. N° (Ships/KP/year)
1	37	52	15	104	4172	384
2	65	112	47	137	20361	858
3	121	152	31	60	12552	1091

Table 5.6 – Sensitive sections data.

Sec. ID	Cargo	Fishing Vessel	Tanker	Passenger	Other
1	53.5%	2.8%	21.2%	0.5%	22.1%
2	41.3%	0.4%	34.0%	0.4%	23.9%
3	20.7%	6.4%	44.1%	5.7%	23.0%

Table 5.7 – Ships Type (%) crossing sensitive sections.

The interaction between the pipeline and the ship traffic has been evaluated. The interaction frequency (interaction/year) assessment investigated the following hazardous scenario:

- Sinking vessels;
- Grounding vessels;
- Interaction with anchors;
- Dropped objects from commercial vessels.

Referring to the last two scenarios, hereafter the characteristics about containers and anchors are listed. For the anchors, the volume can be derived from the mass, assuming that they are made from iron, with an average density of 8000 kg m^{-3}.

Since the minimum water depth of the three identified sections (60 m) is far greater than the maximum draft of the ships (17 m, GT Class 5), the interaction frequency at the sensitive sections for the grounding vessel scenario is 0. For all the other scenarios, the interaction frequency for each sensitive section has been derived by the sum of the interactions related to all the GT Classes involved.

GT Class	Mass (kg)	Length (m)	Width (m)	Height (m)	Dredging length (m)
1	900	1.13	0.58	0.84	25
2	1400	1.19	0.65	0.91	50
3	3060	1.69	0.88	1.26	100
4	8700	2.44	1.27	1.83	500
5	26000	3.43	1.81	2.64	1000

Table 5.8 – Reference anchors parameters.

Container Size	Height (m)	Width (m)	Length (m)	Max total mass (kg)
40 ft	2.438	2.438	12.192	30480

Table 5.9 – Typical container parameters.

Dropped anchors and dragged anchors frequency

The calculated probability of dropped anchors and dragged anchors, classified by GT Ship Class, are given in Table 5.10.

GT Class	$P_{geom} \cdot L_{tot}$ (m)	$P_{geom,drop} \cdot L_{tot}$ (m)	Dropped Anchor Probability (−)	Dragged Anchor Probability (−)
1	26.69	4.51	16.9%	83.1%
2	51.75	4.69	9.1%	90.9%
3	102.25	6.19	6.1%	93.9%
4	503.00	8.44	1.7%	98.3%
5	1003.99	11.41	1.1%	98.9%

Table 5.10 – Percentage classification of dropped anchors and dragged anchors scenario.

5.3.1.3 Impact energy from dropped objects/anchors

The calculated relationship between the impact energy a generic dropping object and the percentage deformation of pipeline diameter is depicted in Table 5.11, taking into account the additional impact capacity provided by the concrete protection, and considering the minimum WT (15.88 mm).

With reference to these values, it is possible to sort the damage extent of dropped anchors and containers. The results are presented in Table 5.12. The results show that dropped objects scenario causes Full Bore rupture in 100% of cases, while dropped anchors scenario causes Full Bore rupture only for GT Classes 4 and 5. Therefore, after splitting the interaction with anchors frequency as per Table 5.10, the derived dropped anchors frequency has been calculated by summing only the frequencies of GT Classes 4 and 5, for each sensitive section. A 100% of Full-Bore probability has been assigned to the frequencies thus obtained.

5.3.1.4 Release Frequency

The release rates (occurrence/ section/year) for the analysed rupture scenario (pinhole, hole, full bore) are calculated from the interaction frequency and from percentage release frequency associated. They are reported in Table 5.13 for each sensitive section.

δ/D (%)	Impact Energy (kJ)	Release Scenario
< 5	< 63	No damage
5 – 10	63 – 89	Pinhole
10 – 20	89 – 162	Hole
> 20	> 162	Full Bore

Table 5.11 – Impact capacity and damage classification of sealine shielded with concrete coating

Impacting Object	Impact Energy (kJ)	Release Scenario
40 ft Container	251	Full Bore
GTR 1 Anchor	12	No damage
GTR 2 Anchor	26	No damage
GTR 3 Anchor	61	No damage
GTR 4 Anchor	239	Full Bore
GTR 5 Anchor	> 1000	Full Bore

Table 5.12 – Impacting object and damage classification.

Sec. ID	Release rate, λ (occ./sec./year)		
	Pinhole	Hole	Full Bore
1	3.35E-08	3.35E-08	1.12E-06
2	1.59E-07	1.59E-07	4.88E-06
3	2.09E-07	2.09E-07	4.38E-06

Table 5.13 – Release rate for each sensitive section.

5.3.2 Consequence Assessment

The results of the underwater gas plume achieved by POLPLUME simulation are shown in Table 5.14. These data have been used as input data for the DNV Phast 8.11 simulation, whose results for the two analysed weather conditions are shown in Table 5.15.

Sec. ID	Min. Water Depth (m)	Hole Size	Mass Flow (kg s^{-1})	Pre-dilution Air Rate (kg s^{-1})	Final Velocity (m s^{-1})
1	100	Pinhole	4.97	342.17	0.95
		Hole	79.44	865.17	2.33
		Full Bore	3395.75	0.00	6.91
2	137	Pinhole	4.97	549.40	0.86
		Hole	79.45	1432.20	2.13
		Full Bore	3395.81	0.00	5.09
3	60	Pinhole	4.97	148.60	1.11
		Hole	79.46	342.43	2.71
		Full Bore	3395.87	0.00	11.24

Table 5.14 – Output results from POLPLUME software.

Sec. ID	Hole Size	LFL/2 distance downwind (m)	
		2F	10D
1	Pinhole	7	6
	Hole	49	80
	Full Bore	292	370
2	Pinhole	0	0
	Hole	45	74
	Full Bore	294	376
3	Pinhole	12	20
	Hole	55	92
	Full Bore	286	357

Table 5.15 – Output results from DNV Phast 8.11 software.

5.3.3 Risk Assessment

The offshore risk assessment considered hereafter is performed by using the maximum cloud dimensions given by the 10/D case only, since it gives the greatest distances, and therefore a conservative approach has been applied.

5.3.3.1 Risk to groups (Social Risk)

To evaluate the social risk, the persistence time values for the considered release scenarios (pinhole, hole, full bore) has been assumed. They are shown in Table 5.16.

Release Scenario	Persistence time, Δt (h)
Pinhole	24
Hole	12
Full Bore Rupture	6

Table 5.16 – Persistence time for each release scenario.

In Table 5.17 the maximum number of ships X crossing the hazardous area in the persistence time are listed for each sensitive section and each release scenario.

Sec. ID	Hole Size	N (ship/h)	X (ship)
1	Pinhole	2.63E-04	6.31E-03
	Hole	3.51E-03	4.21E-02

Sec. ID	Hole Size	*N* (ship/h)	*X* (ship)
	Full Bore	1.62E-02	9.73E-02
2	Pinhole	0.00E+00	0.00E+00
	Hole	7.25E-03	8.70E-02
	Full Bore	3.68E-02	2.21E-01
3	Pinhole	2.49E-03	5.98E-02
	Hole	1.15E-02	1.37E-01
	Full Bore	4.45E-02	2.67E-01

Table 5.17 – Maximum number of ships crossing the hazardous area in the persistence time.

The probability of ignition can be then assessed by means of the parameter X and the conditional probability of ignition. Results are presented in Table 5.18 along with the fatality frequency, f_{ij}, and the cumulative F_{ij} related to each sensitive section.

Sec. ID	Hole Size	Conditional Probability of ignition, $P(t)$	Ignition Probability, P_{ign}	f_{ij} (occ./sec./year)	Cumulative F_{ij} (occ./sec./year)
1	Pinhole	2.76E-02	1.74E-04	5.82E-12	9.01E-08
	Hole	3.11E-01	1.31E-02	4.38E-10	
	Full Bore	8.22E-01	8.00E-02	8.97E-08	
2	Pinhole	0.00E+00	0.00E+00	0.00E+00	8.95E-07
	Hole	2.92E-01	2.54E-02	4.02E-09	
	Full Bore	8.27E-01	1.83E-01	8.91E-07	
3	Pinhole	8.90E-02	5.32E-03	1.11E-09	9.59E-07
	Hole	3.49E-01	4.79E-02	1.00E-08	
	Full Bore	8.11E-01	2.16E-01	9.48E-07	

Table 5.18 – Ignition probability and fatality frequency.

From the cumulative F_{ij} it is possible to finally assess the societal risk by means of the F-N curve of each sensitive section. The method consists in multiplying these F_{ij} values by the percentage of ships which can cause at least n_{ij} deaths. In other words, since 10 deaths is the minimum n_{ij} number of possible deaths which can be experienced in the present study, the related f_{ij} frequency will be equal to the 100% of the F_{ij} cumulative. The other n_{ij} (20, 30, etc.) will be related to the percentage of ships which can cause at least those fatalities, multiplied by the respective cumulative F_{ij}. The results of societal risk for the 10/D weather condition (the worst case) are presented in Table 5.19 and depicted in Figure 5.3.

n_{ij} (deaths/sec./year)	Sec. ID 1	Sec.ID 2	Sec. ID 3	Total
10	9.01E-08	8.95E-07	9.59E-07	1.94E-06
20	8.76E-08	8.92E-07	8.98E-07	1.88E-06
30	3.94E-08	5.22E-07	6.99E-07	1.26E-06
50	2.03E-08	2.17E-07	2.76E-07	5.13E-07
1000	4.54E-10	3.17E-09	5.46E-08	5.82E-08

Table 5.19 – F-N curve of each sensitive section (weather condition: 10/D).

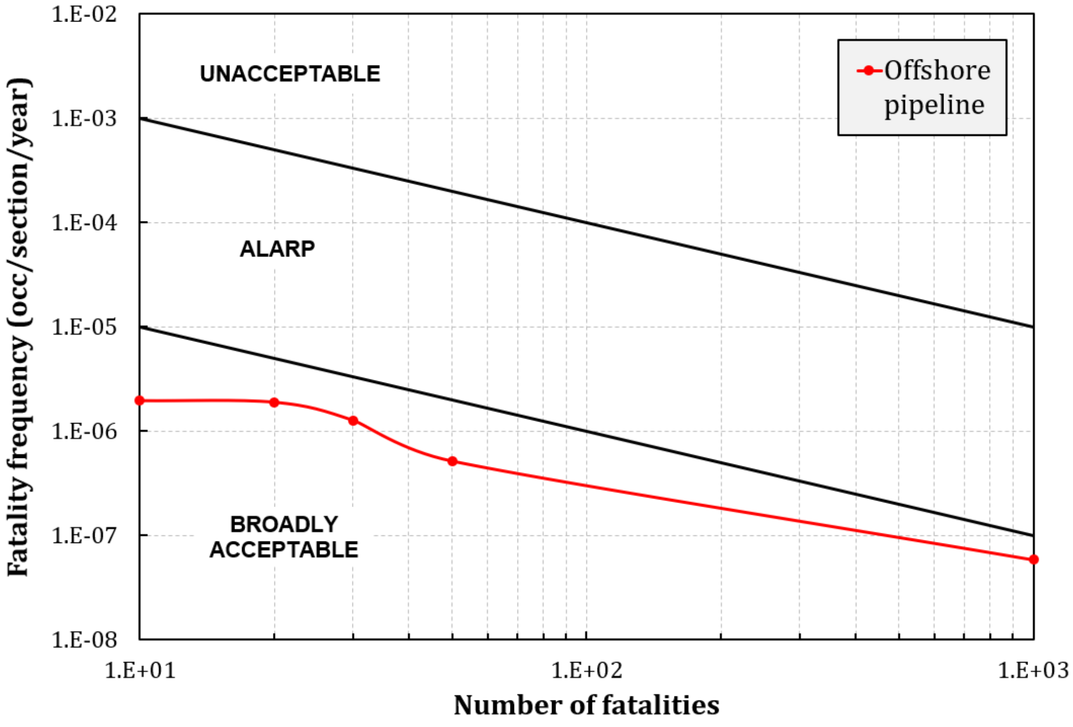

Figure 5.3 – F-N curve of the offshore pipeline route (weather condition: 10/D).

5.3.3.2 Risk to environment

The risk tolerability criteria used for environmental risks evaluation is reported in 5.2.4.3. The Frequency ranking is established based on the release rate, λ. The involved area used for the Severity ranking is conservatively assumed as a circular area, with a diameter equal to the maximum dimension of the flammable cloud, for each release scenario. Based on risk matrix, the resulted environmental risk is reported in Table 5.20.

Sec. ID	Hole Size	Frequency Class	Severity Class	Risk Class
1	Pinhole	A	1	Low
	Hole	A	1	Low
	Full Bore	B	1	Low
2	Pinhole	A	1	Low
	Hole	A	1	Low
	Full Bore	B	1	Low
3	Pinhole	A	1	Low
	Hole	A	1	Low
	Full Bore	B	1	Low

Table 5.20 – Risk to environment – Offshore Pipeline.

6.0 TRANSBOUNDARY IMPACT ASSESSMENT

6.1 Introduction

The MTG pipeline linking Italy and Malta is a new interconnection between two different European countries, with the aim of ending the isolation of the island of Malta from the European Gas Network through the supply of natural gas from Sicily to Malta. Given this strategic role, the project is included in the list of European Projects of Community Interest (European Project of Common Interest - in short PCI with the name: 5.19 Delimara Malta - Gela Sicily, Italy, therefore particular attention was given to the related potential cross-border impacts.

The Project is subject to the Environmental Impact Assessment procedure in both States in which it is developed, as established by the ESPOO Convention on Environmental Impact Assessment in a Transboundary Context, contained in Directive 2014/52/EU, ratified by Italy with Law No. 79/2016 and by Malta with Law No. 412/2017.

The standards of international financial institutions also require that the analysis of cross-border impacts is adequately addressed during the Environmental Impact Assessment (EIA) process for the project as a whole.

Given the characteristics of the project and the potential direct and indirect impacts on both Countries, the project can be considered a *large-scale transboundary project.* Transboundary scale projects are projects implemented in at least two Member States or which have at least two Parts of Origin (PoO) and which are likely to cause significant environmental effects or significant transboundary impacts.

According to the ESPOO Convention a transboundary impact is "*any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Part*.".

The Party of Origin (PoO) is the Contracting Party or Parties to the Convention, under whose jurisdiction the planned operation is to take place. The Affected Party (AP) is a Contracting Party or Parties to the Convention that may be exposed to a transboundary impact of the planned activities.

This chapter presents the assessment of MTG project transboundary impacts on Maltese competence areas impacts related to the pipeline section under Italian jurisdiction, as resulted from the assessment of EIA and from the global assessment of the project.

6.2 Transboundary impact assessment

As stated in the introductory chapter, the Guidance on the Application of the Environmental impact Assessment Procedure for Large-scale Transboundary Projects, defined them as projects which are implemented in at least two Member States or having at least two Parties of Origin, and which are likely to cause significant effects on the environment or significant adverse transboundary impacts.

As the Melita TransGas Project interest multiple countries and is being constructed among a dynamic marine environment, there is the potential for some Project activities to generate transboundary impacts, although they are expected minor. Such impacts may arise from Project activities which traverse country boundaries, or impacts that are originated within one country, which have the ability to exceed national borders.

It is acknowledged that some Project Activities will cross EEZ boundaries of Italy and Malta. This includes Project-related marine supply vessel movements which are likely to use existing international shipping routes to and from selected ports.

Transboundary potential negative effects of MTG Project will be limited to the following ones.

6.2.1 Interference with international fishing fleets

The General Commission for Fisheries in the Mediterranean (GFCM), a body within the FAO, has divided the Mediterranean into geographical sub-areas (GSA). The offshore pipeline route is in GSA 15 and 16.

In the GSA 16 area there are some hundreds of vessels using trawl nets, which are those of greatest interest as far as the pipeline is concerned, while in the GSA 15 there are fewer vessels with these characteristics. In both areas no dredger was detected, another type of ship that could interact with the underwater pipeline.

The project could generate potential effects on international fishing fleets from temporary loss or restricted access to established fishing grounds during project construction.

Effects could be categorized as negligible to minor owing to spatial adaptability and target species versatility of the fishing fleets, for the temporary nature of the effect and the small area occupied by the Project construction spread compared to the extent of the total fishing grounds available.

6.2.2 Air emissions generated from vessels

The construction phase of the pipeline will generate air emissions related to the pipe-laying and other vessels throughout the phase.

The probability that these gases generate a cross-border impact is a function of the residence time (duration in the atmosphere after release), estimated as 1-2 days for most of the gases emitted by vessels. In fact, the dispersion of these emissions into the offshore environment is rapid, and background levels are also reached near the source.

Given the short duration of the impact and as it will be limited to the surrounding of the work areas, the expected cross-border impact of emissions of vessels into the atmosphere is estimated to be not relevant.

6.2.3 Underwater noise generated from vessels

The construction of the pipeline could produce impacts on fish and marine mammals from underwater noise generated from such as pipe-laying and vessel movements. Noise levels associated with such activities are most likely to cause harassment reactions rather than strong behavioral reactions and injury.

The noise emitted by the vessel during the laying operation is essentially due to the propulsion and direction of the same and it is a non-impulsive type.

The prevalent and representative Mediterranean cetacean population consists, with reference to auditory sensitivity, of species belonging to the medium frequency category (frequency band between 150 Hz and 160 KHz). In relation to the threshold values associated with the type of non-impulsive noise, it is estimated that there will be no impacts for cetacean species, in terms of permanent and temporary loss of hearing sensitivity.

Experience in marine acoustic modelling has suggested that pipe-laying may generate noise impacts at a range of approximately 0.5 km.

Given that the main impact radius associated with construction noise is 0.5 km in noise sensitive fishes, there is no significant impacts upon fishes migration and therefore upon fishing activities across EEZ boundaries.

6.2.4 Production of waste from vessels

Waste material will be generated on-board the pipe-laying and other vessels throughout the Construction Phase. Materials will be adequately transported to the pipe-laying vessel by the supply vessel, for management and disposal on shore, according to current legislation.

Adherence to MARPOL[14] requirements will enable significant adverse transboundary impacts associated with occasional discharge of waste in marine environment to be avoided; all hazardous waste will be disposed of at licensed facilities. Therefore, transboundary impact of waste material discharge could be assessed as not relevant.

6.2.5 Movement of suspended sediment

During the pipe-laying activities some small-scale movement of suspended sediment across the boundary of the two countries waters could occur. In this area of the project no excavation operation is foreseen since the pipeline will be simply laid on the sea bottom, so the resuspended sediment will be negligible and limited to the working area.

Due to the laying methodology, to the short and completely reversible characteristics of the effect and to the absence of sensible receptors, the impact could be considered as negligible.

6.2.6 Water discharge due to offshore pipeline hydrotesting

In the pre-commissioning phase, seawater consumption is foreseen for hydrotesting activities related to the offshore pipeline. A potential transboundary impact is represented by the water discharge in Maltese territory.

Impacts on the Maltese marine ecosystem are limited to a potential change in water quality and associated effects and depend on which substances are added to the seawater following intake (and run off from the pipe interior). Seawater intake will take place at the Maltese landfall, with seawater being filtered; no treatment chemicals of any nature will be added.

Under this scenario impacts could only arise from the discharge of materials cleaned from the interior of the pipe with the first batch of pigs pushing pressure test water along the pipe. These materials are

[14] International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes I, IV and V, each of which includes specific waste management provisions, as well as relevant national requirements of the recipient country.

chemically inert and will be filtered at the pig receiver before getting into the temporary discharge pipe to remove remaining solids drawn from the pipe interior, so that the only release to the Malta Sea will be Maltese Sea water, with broadly similar physic-chemical and biological composition (i.e. no alien organisms).

Given these considerations, no relevant environmental effects are expected.

6.2.7 Unplanned events

Unplanned events, such as the accidental release of fuel from the construction vessels into the sea, would result in spills being transported by marine currents.

The likelihood of transboundary effects resulting from such an unplanned event, however, is low owing to the relatively small volumes of hydrocarbons onboard and the nature of the hydrocarbon (diesel is a non-persistent oil that tends to evaporate and disperse rapidly).

The adoption by project vessels of oil spill prevention and response plans, shipboard oil pollution emergency plans, and crew training programs will reduce the likelihood of a spill, and minimize the extent and fate of any spill that does occur by the deployment of spill response procedures.

6.2.8 Minimizing Transboundary Impacts

In order to minimize the transboundary impacts, all the following steps need to be followed according to the above-mentioned Guidance:

- Step 1: Notification of transmittal and information (Art. 7.1 and 7.2 EIAD - Art.3 Espoo)
- Step 2: Determination of the content and extent of the matters of the EIA information scoping (Art. 7.1 and 7.2 EIAD - Art. 3 Espoo)
- Step 3: Preparation of the EIA information/report by the developer (Art. 5.1 and 5.3 and Annex IV EIAD – Art. 4 and Appendix II Espoo)
- Step 4: Public participation – information and consultation (Art.6 and 7.3 EIAD Art.3.8, 2.2, 2.6 and 4.2 Espoo)
- Step 5: Consultation between concerned Parties (Art.7.4 EIAD – Art.5 Espoo)
- Step 6: Decision-making: examination of the information gathered and final decision (Art. 8 EIAD – Art.6.1 Espoo)
- Step 7: Information on final decision (Art. 9 EIAD – Art.6.2 Espoo)

All the above steps are currently being followed in order to ensure the project does not impose any transboundary effects.

Specifically, for the development of the EIA studies there has been continuous and close cooperation from all the stakeholders with Melita TransGas Ltd for setting out the scope of the EIA and ensure the uniformity of its content. All information's from baseline studies, bibliography and public consultations are being transmitted to the partners through the project coordinator in order to ensure close cooperation and engagement of all the partners.

6.2.9 Positive Transboundary Impacts

Transboundary potential positive effects of Melita TransGas Project have also to be reminded:

- **Market integration**:
  - The pipeline will eliminate Malta's isolation from the European Gas Network and contribute to the integration of the Internal Energy Market
  - The physical interconnection would replace the need for shipping of LNG
  - The pipeline will contribute to the overall flexibility and interoperability of the system as it will offer future possibility of capacity for reverse flows.
- **Competition:** The project is expected to contribute to the diversification of counterparties, import sources and import routes.
- **Security of Supply:** It will provide for diversification of energy sources, will facilitate the formulation and implementation of preventive and emergency action plans and is a more reliable, secure and energy efficient form of transport of fuel.
- **Solidarity:** The project will allow Malta better access to Natural Gas resources at a lower cost.
- **Sustainability:** The project is expected to remove emissions from shipping transport and for liquefaction of part of supply, while generating environmental landscape benefits**.**

6.3 Cumulative impacts

Concerning cumulative impact from the MTG route throughout the Central Mediterranean Sea in combination with other plans and projects, it can be ruled out.

With regard to the activities already carried out on the territory, the assessments carried out in the EIA for all environmental components take into account the background values representative of the current conditions of the area in question and, therefore, already consider "the cumulative effect".

In the event that one or more of these projects are carried out in the same period as the MELITA project, there may be an overlap of the yard activities and a potential cumulative effect of the following environmental impacts:

- Emissions of gas pollutants from vehicles and machinery
- Noise emissions from machinery and equipment
- Clouding of water by suspension of sediment
- Interference with maritime traffic (goods and passengers)
- Interference with fishing activities

It should be noted, however, that the mitigation of these impacts will be ensured by the implementation of the mitigation measures that will be taken during all implementation phases.

Cumulative impacts caused by the MTG project itself when considering all impacts from the entire project have also been assessed. Landfall construction is planned to occur simultaneously in the nearshore areas of Italy and Malta, but due to the distance between the landfall areas, cumulative impacts can be excluded. Offshore construction will occur as a continuous, linear process. Potential short-term impacts during offshore construction have been assessed not to be significant. As pipe-lay will occur as a continuous, linear process, cumulative impacts within the project are unlikely. Long-term or permanent impacts have been assessed not to be significant in any given country nor in the entire project area.

As such, cumulative impacts from the project as a whole can be excluded.

7.0 ENVIRONMENTAL MONITORING

European legislation in the field of environmental impact assessments sets out the basic rules for monitoring environmental impacts as related to the implementation and operation of assessed projects, indicating the obligation to monitor those impacts that have a significant negative impact on the environment. These rules correspond to the requirements laid down by the Espoo Convention, Article 9, part. c, which indicates that, in connection with an environmental impact assessment, an environmental program may be prepared, if such monitoring is relevant to the project. The national legal basis for presenting the monitoring proposal is art. 22 of D.Lgs 152/2006 as amended by D.Lgs 104/2017.

The monitoring program is aimed at verifying whether the project's impacts were properly identified and assessed and ensuring that the mitigation measures implemented are functioning as planned. In addition, the monitoring programme can be used to monitor the change to a receptor impacted to some degree by the project.

EIA Report presents a proposal for an environmental monitoring programme (EMP). The detailed planning and execution of the programme will be established in consultation with the competent authorities. During this dialogue with the authorities, monitoring locations, procedures, and periods will be decided.

The impact of the *offshore* pipeline project in relation to the marine ecosystem is mainly attributable to the construction phase, because of the dredging activities and laying operations of the submarine pipeline on the seabed which may cause the following potential impacts:

- alteration of quality characteristics and increase in turbidity in coastal marine waters
- interference with the characteristics of the current biocoenoses

The impact assessment, including the modelling results of sediment spill, show that the project will not generate significant impacts on the marine environment.

A monitoring of component “marine ecosystem” is foreseen in order to characterize and monitor the quality of the ecosystem from the point of view of marine waters, sediments and biota, the areas directly affected by the installation of the submarine pipeline and in the surrounding areas which may be affected by the disturbances associated with the construction of the work.

The monitoring of the marine ecosystem includes surveys on the different matrices that make up the ecosystem, in order to provide a complete picture of the state of quality and assess the changes during the phase of construction and operation. The marine ecosystem surveys will be localized in Italian territorial waters and will concern:

A. Physical analysis - water chemistry
B. Physical analysis - sediment chemistry
C. Benthic community analysis
D. Analysis of phanerogams
E. Verification of the presence of marine cetaceans
F. Tides measurements
G. Tissue surveys of fish species

The environmental monitoring project will be divided into three distinct phases:

- Ante-operam monitoring, which ends before the start of construction activities;
- Monitoring in progress, covering the whole period of the pipeline installation
- Post - operam monitoring, which roughly covers the first 2 years of the operating phase.

8.0 CONCLUSION

Construction and operation of the Melita TransGas (MTG) natural gas pipeline in the Central Mediterranean Sea is unavoidably associated with impacts on the marine environment. Each impact is characterized by its intensity, range and duration, and the resulting environmental effect depends strongly on the sensitivity of the receptor towards the impact.

Based on the results of the Italian Environmental Impact Assessment (EIA report), the present Espoo report analysed how far activities in the Italian waters have an impact on receptors in Malta waters and Country. The main conclusions are summarized below.

Like Italy, Malta is a Party of Origin (PoO) and an Affected Party (AP) in the Espoo process. Due to the nature and intensity of effects, the only place on the MTG route where transboundary impacts may occur due to activities that fall under Italian jurisdiction are the waters boundaries between two Countries. It should be pointed out that in this border area the cross-border impacts resulting from the laying of the pipeline will be reciprocal between the two nations.

Project impacts that can potentially have a long range include sediment dispersion and underwater noise. It can be concluded from the assessment that significant impacts from activities in Italian waters across the borders to Maltese waters will not occur, in relation to the temporary and circumscribed nature of the impacts, which can be considered reversible in the short term.

Concerning the noise generated during pipeline construction, the environmental elements/receptors of potential project impacts are fish and mammal populations. Nevertheless, due to the density of the mammals in the waters that are subject to impacts, the likelihood of the most vulnerable receptors being impacted is very low. All of these circumstances, as well as the implementation of mitigation measures allow for the conclusion that there will be no significant transboundary impact.

In the Maltese open sea waters neighbouring the MTG project under Italian jurisdiction there are no Natura 2000 areas, and the closest Natura 2000 area is outside the range of impact generated by construction activities and operation phase activities related to MTG project.

The restriction zone around the pipeline for commercial fishery in Italian waters will also affect Maltese fishing activities. Restrictions will be imposed on only a very small fraction of the available fishing grounds, and thus, the impact on the Maltese commercial fishery is assessed to be not significant.

In the pre-commissioning phase, seawater use is foreseen for hydrotesting activities related to the *offshore* pipeline, which will eventually be discharged in Maltese waters. Since seawater intake will take place at the Maltese landfall, with seawater being filtered and no treatment chemicals of any nature will be added, the only release to the Malta Sea will be Maltese Sea water, with broadly similar physical,chemical and biological composition (i.e. no alien organisms). Given these considerations, no relevant environmental effects are expected.

Overall, no impacts from the MTG project that originate in Italy will lead to any significant transboundary impacts in Malta.

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