ESIA Italy
Annex 2 Alternative Assessment
TABLE OF CONTENTS

1 INTRODUCTION 6

1.1 Scope of Work 6

1.2 ESIA Procedure 8

1.2.1 No Project alternative 8

1.2.1.1 European benefits 9

1.2.1.2 No project alternative – consequences for Europe 12

1.2.1.3 Italian benefits 12

1.2.1.4 No project alternative – consequences for Italy 13

1.2.1.5 Conclusions 14

1.3 Report Structure 14

1.4 Abbreviations and Definitions 15

1.5 Glossary of Terms 16

2 SUMMARY OF THE ALTERNATIVE ASSESSMENT PROCESS 18

2.1 Definition of the Study Area 18

2.2 Regulations and Guidelines 19

2.2.1 Alternatives Assessment Process within the Overall ESIA Process 19

2.2.2 EBRD Performance Requirements (PR) 20

2.2.3 Technical Regulations and Guidelines 21

2.3 Approach & Methodology 21

3 ALTERNATIVE ASSESSMENT IN THE INDUSTRIAL AREA OF BRINDISI 23

4 PHASE 1: MACRO – CORRIDOR SELECTION 26

4.1 Description of the overall Macro-Corridor investigation process 26

4.2 Step 1: Land use analysis and identification of Macro – Corridors 27

4.2.1 Methodology 27

4.2.2 Results 28

4.3 Step 2: Constraints mapping 31

4.3.1 Methodology 31

4.3.2 Results – Protected Areas 32

4.3.3 Results – Hydrogeological Risk 35

4.3.4 Results – PUTT/p constraints 37

4.3.5 Conclusions of the constraint analysis 40

4.4 Step 3: Expert – Based Analysis 40

4.4.1 Methodology 40

4.4.2 Results 43

4.5 Conclusions of the Macro–Corridor Investigation 47

5 PHASE 2: LANDFALL AND OFFSHORE ROUTE SELECTION 48

6 PHASE 3: PRT LOCATION AND ONSHORE ROUTE SELECTION 54
Project Title: Trans Adriatic Pipeline – TAP
Document Title: ESIA Italy - Annex 2 Alternative Assessment

6.1 PRT LOCATION SELECTION 54
6.2 Onshore Route Selection: Onshore Base Case Route 56
6.3 Comparison of PRT and Route Options 62
7 CONCLUSIONS: SELECTED ESIA BASE CASE ALTERNATIVE 63

APPENDICES

Appendix 1 - Alternative Assessment Development Process
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Regulatory / Code Reference</td>
<td>21</td>
</tr>
<tr>
<td>4-1</td>
<td>Land Use - Analysis results</td>
<td>30</td>
</tr>
<tr>
<td>4-2</td>
<td>Protected Areas - Analysis results</td>
<td>33</td>
</tr>
<tr>
<td>4-3</td>
<td>Posidonia oceanica - Analysis results</td>
<td>35</td>
</tr>
<tr>
<td>4-4</td>
<td>Hydrogeological Risk - Analysis results</td>
<td>36</td>
</tr>
<tr>
<td>4-5</td>
<td>PUTT/p constraints - Analysis results</td>
<td>39</td>
</tr>
<tr>
<td>4-6</td>
<td>Summary of the analysis results</td>
<td>40</td>
</tr>
<tr>
<td>4-7</td>
<td>List of the constraints and corresponding weights in the alternative</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>assessment</td>
<td></td>
</tr>
<tr>
<td>4-8</td>
<td>Summary of Weighted Maps Analysis</td>
<td>46</td>
</tr>
<tr>
<td>5-1</td>
<td>Environmental, Social, Cultural heritage and Technical constraints</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>considered for the landfall selection</td>
<td></td>
</tr>
<tr>
<td>5-2</td>
<td>Ranking comparison between the landfall alternatives and colour coding</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>explanation</td>
<td></td>
</tr>
<tr>
<td>5-3</td>
<td>Ranking comparison between the landfall alternatives</td>
<td>53</td>
</tr>
<tr>
<td>6-1</td>
<td>Environmental and Local constrains considered during PRT selection</td>
<td>54</td>
</tr>
<tr>
<td>6-2</td>
<td>Environmental Social and Cultural heritage constraints considered during</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Onshore Route Selection</td>
<td></td>
</tr>
<tr>
<td>6-3</td>
<td>Environmental Social and Cultural heritage constraints considered during</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Onshore Route Selection</td>
<td></td>
</tr>
</tbody>
</table>
PROJECT TITLE: Trans Adriatic Pipeline – TAP

DOCUMENT TITLE: ESIA Italy - Annex 2 Alternative Assessment

LIST OF FIGURES

Figure 1-1 Strategic Suppliers of Energy 9
Figure 1-2 Strategic Project 10
Figure 2-1 Study area of the Alternative Assessment (Red box) 19
Figure 2-2 Alternative Selection Process Flow Chart 22
Figure 3-1 Alternatives in the Industrial Area of Brindisi 23
Figure 4-1 Macro – Corridor Investigation Flow-Chart 27
Figure 4-2 Commercial, Industrial & Services Land Use Map. 28
Figure 4-3 Residential Land Use Map 29
Figure 4-4 Built-up Land Use Map. Arrows: grey suitable, red unsuitable. 30
Figure 4-5 Map of Protected Areas (Cumulative Analysis) 33
Figure 4-6 Map of Posidoniac oceanaica. Arrows: grey suitable, red unsuitable (Cumulative Analysis) 34
Figure 4-7 Hydrogeological Hazard Map. Arrows: grey suitable, red unsuitable (Cumulative Analysis) 36
Figure 4-8 Maps of selected items from Thematic Territorial Urban Plan (PUTT/p) (Cumulative Analysis) 38
Figure 4-9 Maps of selected items from Thematic Territorial Urban Plan (PUTT/p) (Cumulative Analysis) 39
Figure 4-10 Maximum Weighting Value map (1km² gridded mesh) 44
Figure 4-11 Sum of Weighting Levels map 45
Figure 4-12 Weight map resulting from the sum of each single layer 46
Figure 5-1 PG3 Constraint within Corridor D 49
Figure 5-2 Possible Landfall Micro - Corridors 50
Figure 5-3 Constraints on the Micro - Corridors 51
Figure 5-4 Possible Nearshore Route Paths 52
Figure 6-1 Landscape Constraint 55
Figure 6-2 PRT Option A and PRT Option B Outside the Landscape Constraint 56
Figure 6-3 Base Case Route East section 58
Figure 6-4 New Route, North and South sections 59
Figure 6-5 Archaeological Constraints 60
Figure 6-6 Southern Route 61
Figure 7-1 Southern Route 64

LIST OF BOXES

Box 1-1 Prescriptions of the Urban Instruments Plan and Natura 2000 Directive 7
Box 3-1 Critical issues related to each of the alternatives analysed in the industrial area of Brindisi 24
Box 5-1 Survey on Posidonia oceanica within Macro-Corridor D 48
INTRODUCTION

1.1 Scope of Work

This Report presents the Alternative Assessment performed by TAP AG for the Italian section of the Trans-Adriatic Pipeline (TAP) project, intended to transport gas from Azerbaijan through Greece, Albania and to Italy (opening the “Southern Gas Corridor”).

The Base Case solution presented as a conclusion of this report is considered to be the result of a continuous improvement process within the Project, which from its preliminary phases has analysed the different design and locational aspects in order to minimize social, environmental and cultural heritage impacts.

The aim of this document is to describe the most recent Alternative Assessment activities undertaken in the period 2012-2013, in order to reconsider the whole route selection process that had been conducted up to the point of the original ESIA submission (in March 2012) in order to reorganise and analyse the available information within a systematic evaluation process.

TAP AG’s analysis of alternatives in fact started in the early phases of the project development (Feasibility Studies of 2003-2005) and was undertaken as part of the project design/decision-making process through to the definition of the actual project concept. As detailed in Appendix 1, in the earlier phase of the Alternative Assessment process, TAP AG focused on potential landfalls options in Brindisi, but due to technical and environmental constraints, these options were found not feasible. The analysis of landfall alternatives in Brindisi focused on the industrial area. A summary of the analysis undertaken for this area is reported in Section 3 of this Annex.

With regard to the most recent stage of project development (Basic Engineering Phase) TAP AG applied for the Italian EIA Procedure, submitting an ESIA on 15th March 2012. These assessment activities carried out up to the first ESIA submission are summarised in Appendix 1.

This Report focuses on the Analysis of Alternatives and is included in the Environmental and Social Impact Assessment Study, describing the effort of TAP AG to:

- identify the optimal pipeline route;
- minimize residual environmental, social and cultural heritage impacts;
- engage national, regional and local authorities, non-governmental organizations and local communities.

The Alternative Assessment covers the selection of the (onshore and offshore) pipeline route, including landfall of pipeline offshore section and siting of the Pipeline Receiving Terminal (PRT). This process clarifies the justifications for the choice of the new Base Case presented herein. The methodology followed during this process is presented in Section 2 of this Annex.
The prescriptions of the Thematic Territorial Urban Planning (PUTT/p - which is a Regional Planning Instrument), Regional Law 12/2012 and Natura 2000 Directive build a major milestone in the Alternative Assessment (see Box 1-1) and are addressed in this Report.

Moreover, this Report is aimed at addressing a specific prescription of the Ministry of Cultural Heritage Scoping Advice, which requires inclusion in the ESIA of a detailed Alternative Assessment on the alternatives considered by TAP AG.

**Box 1-1 Prescriptions of the Urban Instruments Plan and Natura 2000 Directive**

| Thematic Territorial Urban Planning (PUTT/p): | Art. 5.07 of the Technical Implementation Rules (NTA), "regional/public works and works of public interest (as defined by the legislation in force) are possible to realize notwithstanding the requirements, included in Title III” of NTA and related to ATD. Such works shall: - "be compatible with the purposes of protection and enhancement of the landscape and environmental resources in the places provided; - "be absolutely necessary or of best interests of the resident population"; - "have no alternative locations. The exemption….is granted by the Regional Council for public works"
| Regional Law 12/2012, “Apulia landscape and monumental olive trees safeguard”: | Art. 2, bullet a), "the authorization might be released after the alternative assessment ("alternative zero" included) and exclusively concerning projects of public utility and/or of public interest and/or public service)."
| Directive 92/43/EEC (Natura 2000), “Conservation of natural habitats and of wild fauna and flora”: | Art. 6, bullet 3. Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.
| Bullet 4. If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.
| (*"3. Qualiasi piano o progetto non direttamente connesso e necessario alla gestione del sito ma che possa avere incidenze significative su tale sito, singolarmente o congiuntamente ad altri piani e progetti, forma oggetto di una opportuna valutazione dell'incidenza che ha sul sito, tenendo conto degli obiettivi di conservazione del medesimo. Alla luce delle conclusioni della valutazione dell'incidenza sul sito e fatto salvo il paragrafo 4, le autorità nazionali competenti danno il loro accordo su tale piano o progetto soltanto dopo aver avuto la certezza che esso non pregiudicherà l'integrità del sito in causa e, se del caso, previo parere dell'opinione pubblica.
| 4. Qualora, nonostante conclusioni negative della valutazione dell'incidenza sul sito e in mancanza di soluzioni alternative, un piano o progetto debba essere realizzato per motivi imperativi di rilevante interesse pubblico, inclusi motivi di natura sociale o economica, lo Stato membro adotta ogni misura compensativa necessaria per garantire che la coerenza globale di Natura 2000 sia tutelata. Lo Stato membro informa la Commissione delle misure compensative adottate")
1.2  ESIA Procedure

TAP AG applied for the Italian Scoping Procedure (voluntary procedure, according Italian EIA Law/Regulation, under art. 21 of D.Lgs 152/06 and further amendments) in May 2011.

The scoping documentation was disclosed to the Stakeholders (details are reported in Section 7) and published on TAP AG’s website.

Official Scoping Advice was issued by the Italian Ministry of Environment in November 2011 (Advice prot. DVA-2011-0029847 dated 29 November 2011) and by the Italian Ministry of Cultural Heritage in February 2012 (Advice prot. DG/PBAAC/34.19.04/5466/2012 dated 22 February 2012).

TAP AG applied for the Italian EIA Procedure, submitting an ESIA on 15th March 2012. After this submission TAP AG obtained from the Ministry of Environment three suspensions of the EIA procedure (the first one until 17th September 2012, the second one until 10th December 2012 and the third one until 10th September 2013), in order to integrate and modify the presented documentation, considering the Scoping Advice of the Italian Ministry of Environment and Ministry of Cultural Heritage, comments received from the Stakeholders (Authorities and the Public) and considering the Project Design amendments that occurred subsequent to the original ESIA submission.

The present document reflects the above and is part of the updated version of the ESIA, which replaces the previous (2012) ESIA of the Italian section of the Trans Adriatic Pipeline (TAP) Project.

1.2.1  No Project alternative

A “No Project” Alternative for the TAP Project would mean that no gas would be supplied from Azerbaijan through Greece, Albania and then Italy to the European Union gas network; therefore, none of all the consequential benefits caused by the construction and operation of this infrastructure would occur. The benefits deriving from the realization of the TAP Project span from the European to the Italian level.
1.2.1.1 European benefits

Achievement of EU energy policy goals

Europe currently relies on Russia, Africa and the North Sea for gas supplies through several existing pipelines, Russia being its key provider. At the EU level, supplies are diversified along three corridors: the Northern Corridor from Norway, the Eastern Corridor from Russia, the Mediterranean Corridor from Africa and through the import of liquefied natural gas (LNG); however, single source dependency still prevails in some regions. The document “Communication on energy infrastructure priorities for 2020 and beyond”\(^1\) sets the framework for the EU energy priorities towards 2020. Diversification, competition and security of supply represent the core of these priorities. In relation to diversification of supplies, European Union countries should implement infrastructure allowing physical access to at least two different sources.

Figure 1-1 Strategic Suppliers of Energy

At the same time, the balancing role of gas for variable electricity generation and the infrastructure standards introduced in the Security of Gas Supply Regulation¹ impose additional flexibility requirements and increase the need for bi-directional pipelines, enhanced storage capacities and flexible supply, such as LNG/CNG (Liquefied Natural Gas/Compressed Natural Gas).

In order to achieve these objectives, the following priority corridors have been identified at the European Union level (Figure 1-2):

- The Southern Corridor, to further diversify sources at the EU level and to bring gas from the Caspian Basin to the EU;
- Linking the Baltic, Black, Adriatic and Aegean Seas, in particular through the implementation of BEMIP and the North-South Corridor in Central Eastern and South-East Europe;
- The North-South Corridor in Western Europe to remove internal bottlenecks and increase short-term deliverability, thus making full use of possible alternative external supplies, including from Africa, and optimising the existing infrastructure, notably existing LNG plants and storage facilities.

Figure 1-2   Strategic Project

In relation to the gas sector, the “Southern Gas Corridor” was identified as playing a major role in Europe’s energy security in ensuring the diversification of gas supplies to European markets. The Shah Deniz II field has represented the main supply source to which the European Union has looked upon in order to open the new corridor, as the first gas to become available to Europe by 2020 from a new supplier to the EU (Azerbaijan).

On 28th June 2013, the selection of the TAP Project by the Shah Deniz Consortium in order to transport gas from the Shah Deniz II field in Azerbaijan to Europe has represented the achievement of European Union energy policy goal to open the Southern Gas Corridor and it has defined an import route for Azeri gas into Europe, confirming at the same time the strategic role of Azerbaijan in the future of European energy supplies. The selection of TAP has consequently been endorsed by the European Union itself.

Implementation of EU priority project

The European Union endorsement for the development of the Southern Gas Corridor has been further strengthened in 2013 by the adoption of a Union-wide list of so-called projects of common interest (PCI) as required by the Energy Infrastructure Package regulation. The regulation aims at identifying the main infrastructure projects that will contribute to the achievement of energy policy goals in the European Union. In relation to the gas sector, these objectives relate to the improvement of security of supply, competition, market integration, and sustainability.

TAP has been included among the highest ranked projects that serve to meet the objectives of European energy policy of security of supply, competition, market integration and sustainability. As a result, TAP has been selected as a PCI by member states and included in the list of PCIs for the Southern Gas Corridor as part of a complex value chain including other projects upstream of TAP, also indicated as PCIs and needed for the realization of the Southern Gas Corridor.

The list represents a political endorsement of these projects at the highest level by national governments (including endorsement of projects located outside of the EU territory but necessary for the completion of the Southern Gas Corridor). In the context of the selection of PCIs, TAP has been strongly supported by the Italian and Greek governments. The ability of TAP to bring further integration between European markets and Balkan and South-Eastern European markets has also been discussed and recognized in the course of the evaluation of PCI projects, along with its benefits in terms of further competition and diversification of supply for the countries in these areas as well as for the rest of Europe.

---

3 The list currently awaits approval by the European Parliament and Council.
1.2.1.2 No project alternative – consequences for Europe

In the light of the developments described above, the “No Project” alternative would imply:

- EU energy policy goal of realizing the Southern Gas Corridor is not met
- EU energy policy goals of increasing security of supply, competition, market integration and sustainability are not met
- The political support provided by the Italian government and formal and informal commitments of supporting TAP as a PCI are not met in reality by the implementation of the project
- The possibility of increasing market integration between European and Balkan and South-Eastern European markets is lost
- Damage to EU-Azeri relations as the realization of the Southern Gas Corridor (of which Azerbaijan is considered playing a primary role) and several other pipelines upstream of TAP is compromised

1.2.1.3 Italian benefits

The implementation of the TAP Project presents several direct and indirect benefits for Italy that will influence its gas market, economy and the overall GDP of the country.

Increase in competition

The development of TAP will directly contribute to the increase in competition in the Italian gas market. The entry of new shippers in the Italian gas market will allow reducing the position of incumbent players and potentially reducing gas prices in Italy.

Increase in diversification of supplies

The completion of the TAP project will also allow an increase in diversification of supply sources for Italy. Italy currently relies on gas supplies from pipeline imports via four main connections with Austria (via the TAG pipeline), Switzerland and northern Europe (via Transitgas pipeline), with Libya (via Greenstream pipeline) and with Algeria (via Transmed and TTPC). In addition, LNG imports provide additional sources of gas. TAP will provide an additional line for pipeline import.

---

1 The Italian Energy Regulatory Authority (Autorità per l'Energia Elettrica e il Gas) as well as the Greek and Albanian regulatory authorities have recognized these additional benefits in granting the exemption from European third party access and unbundling rules to TAP. See document available at: [http://www.autorita.energia.it/allegati/docs/13/249-13all.pdf](http://www.autorita.energia.it/allegati/docs/13/249-13all.pdf)
Increase in security of supply

The creation of an additional import line will also directly contribute to security of supply in Italy and provide a new source of gas that can be called upon in case existing supply sources become unavailable (as it occurred for instance during the Russia-Ukraine gas crisis in 2006 and 2009 or at the occasion of recent political disorders in North Africa). The additional gas imports brought by TAP to Italy could also be used to satisfy peaks of demand in Europe such as those occurred in many countries at the beginning of 2012 due to severe weather conditions. Provided all the necessary interconnections be in place, TAP's physical reverse flow capabilities can potentially be deployed in these circumstances to deliver gas in areas in South-Eastern Europe that have been among the ones hit hardest by the supply crisis in the last few years due to their dependency on one supply source.

Increase in liquidity of the Italian market

The realization of TAP will also facilitate the increase in liquidity on the Italian gas market and further contribute to the development of a liquid hub in Italy. The development of liquid hubs and further integration between markets represents one of the fundamentals of European and Italian energy policies. The realization of TAP will also directly impact the Italian electricity market that depends to a large extent on natural gas for energy production.

Increase in market integration

The implementation of TAP will provide a first direct link between Italy and Greece and further link the Italian market with Balkan and South Eastern Europe markets once further interconnections are realized. In the future these interconnections will provide further market integration between Italy and these areas, and therefore additional benefits in terms of security of supply and competition. The implementation of TAP will also trigger the need to implement further network investments in Italy in order to further transport the gas from the TAP delivery point in Italy to consumers, therefore fostering infrastructure and economic development in Italy.

Finally, it needs to be considered that an Intergovernmental Agreement (IGA) between Albania, Italy and Greece on the construction and operation of the TAP Project was signed in Athens on February 13th 2013. At the Italian National Level the TAP Project is included in and supported by the National Energy Strategy (Interministerial Decree, 8th March 2013).

1.2.1.4 No project alternative – consequences for Italy

In the light of the considerations above, the “No Project” alternative would imply:

- Lost opportunity for Italy to increase competition, diversification of supply, security of supply, liquidity in the Italian market and market integration, and the economic benefits deriving from these.

---

1 IGA is pending ratification in Italy
The inability of Italy to meet its international commitments taken both at the European level (in the framework of the PCI process, as well as wider European energy policy), and at the level of bilateral relations with Greece and Albania (in the framework of the IGA).

1.2.1.5 Conclusions

The “No Project” alternative would prevent the realization of several benefits of the TAP project for Italy and Europe as a whole. The consequences of the “No Project” alternative would span from the political to the economic level and damage Italy in terms of its geopolitical and economic interests recognized in several occasions at both the European and national level.

At the European level, the “No Project” alternative would mean missing crucial goals of European energy policy as well as indirectly preventing that Europe as a whole receives the benefits of increased diversification, competition, security of supply and market integration.

At the national level, the “No Project” alternative would mean that no benefits deriving from increased competition, diversification, and security of supply, liquidity and integration would materialize in Italy. It would further mean no economic opportunities for Italy through direct, indirect and induced employment generated from the construction and operation of the project. In the context of Italian international relations, the “No Project” alternative would also mean that Italy would fail in meeting its international commitments towards European and non-European partners.

1.3 Report Structure

This document is composed of the following Sections:

- Section 1 Introduction;
- Section 2 Summary of the Alternative Selection Process;
- Section 3 Alternative Assessment in the Industrial Area of Brindisi;
- Section 4 Phase 1: Macro - Corridors Selection;
- Section 5 Phase 2: Landfall and Off-Shore Route Selection;
- Section 6 Phase 3: PRT Location and On-shore route selection
- Section 7 Conclusions: Selected ESIA Base Case Alternative
### Abbreviations and Definitions

**Alt. 1**
- Alternative 1

**CTR**
- Carta Tematica Regionale (Thematic Regional Map)

**CoNISMA**
- Consorzio Nazionale Interuniversitario per le Scienze Marine (National Consortium for Marine Sciences)

**CEOM;**
- Centro Oceanografico Mediterraneo (Mediterranean Oceanologic Centre)

**DM**
- Decreto Ministeriale (Ministerial Decree)

**DLgs**
- Decreto Legislativo (Legislative Decree)

**EBRD**
- European Bank for Reconstruction and Development

**EIA**
- Environmental Impact Assessment

**ERM**
- Environmental Resources Management

**ESIA**
- Environmental and Social Impact Assessment

**EU**
- European Union

**GIS**
- Geographic Information System

**Kp**
- Pipeline Kilometre Chainage

**LU**
- Land Use

**NTA**
- Norme Tecniche di Attuazione (Technical Implementation Rules)

**PAI**
- Piano stralcio per Assetto Idrogeologico (Hydrogeological Planning)

**PG3**
- Zone with Very High landslide hazard

**PRG**
- Municipal Planning Tool

**PR**
- Performance Requirement

**PRT**
- Pipeline Receiving Terminal

**PUTT/p**
- Piano Urbanistico Territoriale Tematico per il Paesaggio (Thematic Territorial Urban Planning)

**SCI**
- Site of Community Importance

**SIN**
- Sito di Interesse Nazionale (Sites considered to be of National Interest)

**SRG**
- Snam Rete Gas

**SRT**
- Snam Rete Gas Tie-In

**TAP**
- Trans Adriatic Pipeline

**TAP AG**
- Project Proponent

**ZPS**
- Zona di Protezione Speciale (Special Protection Zone)
1.5 Glossary of Terms

- Alternative 0: Onshore, Offshore pipeline route and PRT presented in the ESIA Study submitted in March 2012;

- “No Project” Alternative: no development of pipeline along the Southern Gas Corridor and therefore no gas would be supplied from Azerbaijan through Greece, Albania and then Italy to the European Union gas network;

- Base Case Route: Onshore, Offshore pipeline route and PRT described in the present ESIA Study;

- GIS (Geographical Information System): GIS is any system that captures, stores, analyses, manages, and presents data that are linked to location;

- GIS Natura: This Project is a geographic information system, updated up to 2006, that integrates into a single system the checklist of fauna, flora and fungi, flora and fauna distribution database, data on marine biotic communities, the distribution patterns of Italian vertebrates (REN), the distribution of priority habitats of the Habitats Directive, the vegetation cover (Corine Land Cover level IV), the phytoclimatic, ecopedological and landscape maps, the boundaries of parks and other protected areas.

- Landscape constraint: it consists of restrictions on the use of private property arising from the recognition of the inherent characteristics of the property (scenic beauty) that require protection. Areas subjected to landscape constraints are defined in planning instruments (PUTT/p, PRG);

- Monumental Olive Tree: olive tree older than a hundred years protected by the Regional Law N° 14/2007 – “Apulia landscape and monumental olive trees safeguard”, due to its importance for agriculture production, its ecological and hydrogeological protection and its historic and cultural heritage relevance in regional landscape characteristics;

- Posidonia oceanica Meadows: Posidonia oceanica seagrass meadows are considered one of the most important ecosystems in the Mediterranean and are listed as a “priority” habitat type under Annex I of the Habitats Directive (Council Directive 92/43/EEC - Code: 1120; see Section 1.2).

- PG3: in the Territorial Hydrogeological Planning (Piano stralcio per Assetto Idrogeologico) the Apulia Basin Authority defines the hydrogeological risk with regard to flooding and slope instability and it identifies 3 classes of landslide hazard; PG3 identifies zones with Very High landslide hazard.

- PRG (Piano Regolatore Generale): the Municipality Urban Planning is the instrument that regulates urban development and activities in the municipality;
• PUG (Piano Urbanistico Generale): the General Urban Plan is the new urban planning document defined by the Regional Law N° 20 -27/07/01, that will replace the PRG;

• PUTT/p (Piano Urbanistico Territoriale Tematico per il paesaggio): the Apulia Region Thematic Territorial Urban Planning establishes constraints on land use in order to safeguard the historic, cultural heritage and landscape characteristics of the territory;

• SCI (Site of Community Importance): A SCI is defined by the European Commission Habitats Directive (92/43/EEC) as a site which, in the bio geographical region or regions to which it belongs, contributes significantly to the maintenance of or restoration to a favourable conservation status of a natural habitat type or of a species and may also contribute significantly to the preservation maintenance of biological diversity within the biogeographic region or regions concerned;

• SIN (Sito di Interesse Nazionale): Contaminated site of national relevance, in which soil, sediments and groundwater are considered potentially contaminated as the default assumption from industrial activities. Any construction activity within the SIN requires a preliminary characterisation of the environmental aspects (such as soil and groundwater) agreed with Regulatory Authorities (who validate data gathered during the site characterization activities) and, if the contamination is confirmed, remediation is to be performed according to a remedial plan again agreed with Regulatory Authorities. Following completion of clean-up, the Authorities will issue a clean-up certificate for the piece of land of interest. The characterisation and the remediation activities within the SIN are led by the Ministry of Environment, together with the local agencies (ARPA, Municipality and Province);

• ZPS (Zone di Protezione Speciale): Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.
2 SUMMARY OF THE ALTERNATIVE ASSESSMENT PROCESS

This Section presents an overview of the Alternative Assessment process. The Section describes the Study Area considered for the analysis, the Regulation & Standards considered and finally the approach and methodology undertaken. It should be noted that the analysis presented in this document has been revised from that included in the ESIA submitted in March 2012, with the aim to follow-up the Alternative Assessment process undertaken since the early stages of the project and to consider the requests and comments of the several Stakeholders together with Project Design amendments made subsequent to the original ESIA submission.

2.1 Definition of the Study Area

On an EU level energy supplies are currently divided between three strategic suppliers and “corridors”: the Northern Corridor from Norway, the Eastern Corridor from Russia, and the Mediterranean Corridor from Africa together with imports through LNG. It is one of the main objectives of EU energy policy to achieve diversification of gas supplies, and therefore enhance security of supply in Europe. As described above the development of the Southern Gas Corridor helps to achieve this aim.

The TAP Project is a strategic asset in the Southern Gas Corridor as it aims at importing natural gas from the Caspian Sea.

The selection process for the Adriatic crossing from Albania to Italy and the subsequent onshore connection to the SRG gas transport network took place in a specific study area, located between Brindisi and Lecce. The choice of this area of the Region of Apulia is naturally defined by the technical development of the pipeline route along the Southern Corridor starting in Greece, passing through Albania and crossing the Adriatic Sea with a landfall in Italy (see Figure 2-1). In fact, the need to reduce pipeline length crossing in the Adriatic Sea from Albania identifies the landing on the Southern coast of Apulia Region (see Figure 2-1) as being the only realistic option from a technical and commercial perspective.
2.2 Regulations and Guidelines

2.2.1 Alternatives Assessment Process within the Overall ESIA Process

As briefly introduced in Section 1, the assessment of alternatives is a crucial component within the Environmental and Social Impact Assessment (ESIA) process. Particularly, as a process:

- it interacts with Project design and decision-making activities, informing and challenging them;
- it is a vehicle for including an evaluation of options and alternatives (balanced with environmental, social, safety, economic and technical considerations); and
- it is a process that is parallel and integral with public consultation. Public consultation shapes the scope of an ESIA, and the ESIA process is used as a vehicle for stakeholders to influence Project design, planning and decisions to the extent practicable.
At the same time as a deliverable:

- it is a documentation of pre-Project conditions, a description of the intended activity, an identification of negative and positive impacts and the means by which these are avoided, minimised and reduced to an acceptable level or, in the case of positive impacts, enhanced.

Italian legislation in force related to the environmental impact assessment (EIA) (Legislative Decree\(^1\) 152/06 and subsequent amendments that implement European Directive\(^2\) 85/337/CEE, as modified by Directives 97/11/CE and 2003/35/CE) establishes that both the Scoping Report and the Environmental Impact Assessment (EIA) Report should include a description of the Project alternatives investigated and the decision-making process which led to the selection of the best option.

Moreover it should be noted that the Ministry of Cultural Heritage, in its Scoping Advice included a prescription that requires a detailed Alternative Assessment of the alternatives considered by TAP AG.

2.2.2 EBRD Performance Requirements (PR)

As part of the European Bank for Reconstruction and Development (EBRD) Performance Requirement (PR) 1 - defined as Environmental and Social Appraisal and Management - this assessment aimed to assess environmentally, socially, technically and financially feasible alternatives in order to avoid or minimise potential impacts. To the extent feasible for such an alternatives assessment, other EBRD PR's were also taken into account. EBRD PR5 (Land Acquisition, Involuntary Resettlement and Economic Displacement) was considered in order to analyse land use, land acquisition and potential resettlement issues. The framework of EBRD PR 6 (Biodiversity, Conservation and Sustainable Natural Resource Management) was applied with special care to biodiversity-related constraints regarding pipeline route. A stakeholder identification and engagement was performed pursuant to EBRD PR 10 (Information Disclosure and Stakeholder Engagement) that included key stakeholders from the principal governmental and non-governmental organisations, commercial players, individuals, private and public sector companies, and the general public, both individual and corporate. EBRD PR 4 (Community Health, Safety and Security) was also considered in order to avoid or minimise risks to community safety and security. PR 8 (Cultural Heritage) was applied to ensure protection of cultural heritage from adverse impacts of Project activities.

\(^1\) Decreto Legislativo
\(^2\) Direttive
2.2.3 Technical Regulations and Guidelines

The technical objectives of the pipeline route selection are pipeline constructability and safety. The following main codes and regulations are referenced by the pipeline design.

Table 2-1 Regulatory / Code Reference

<table>
<thead>
<tr>
<th>Reference</th>
<th>Legal Status</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNV-OS-F101</td>
<td>Int. design code for offshore pipelines</td>
<td>Offshore</td>
</tr>
<tr>
<td>Decreto Ministeriale</td>
<td>DM 17/04/08, Gazzetta Ufficiale 107</td>
<td>National Regulation onshore gas pipelines Onshore Italy</td>
</tr>
<tr>
<td>EN 1594</td>
<td>EU design code for onshore gas pipelines</td>
<td>Onshore EU</td>
</tr>
</tbody>
</table>

2.3 Approach & Methodology

The Alternative Assessment has been based on detailed analysis of the broader area territory (i.e. the Study Area defined in Figure 2-2), aimed at identifying the most suitable “Base Case” solution. This analysis followed a logical process: first Macro-Corridors were identified. Within the identified Macro-Corridors a key indicators analysis was undertaken in order to select the most-suitable Macro-Corridor. Then, within the selected Macro-Corridor, specific Micro-Corridors and route alternatives were determined by analysing a series of key-indicators as well as cultural heritage, social and environmental constraints. A combination of such indicators allowed the identification of the preferred landfall, the final route selection and PRT siting (defined as the Base Case Alternative).

The phases that led to the Alternative Selection are described below and illustrated in Figure 2-2.

Phase 1 is the Macro - Corridor Selection. As subsequently described the selection process consists in a weighted land use analysis complemented by an expert based evaluation of a series of environmental, cultural heritage and social constraints/key-indicators. The results of the analysis and the quantification of each constraint provide weighting – maps summarizing the different indices in order to allow the identification of the best Macro - Corridor.

Phase 2 is the Landfall and Offshore Route Selection. It consists of the landfall location identification, within the Macro-Corridor identified in Phase 1 (Macro - Corridor Selection), considering mainly a series of environmental, social, cultural heritage and technical constraints that could affect the pipeline feasibility. The selected landfall location is the input element for Phase 3.

Phase 3 consists of the PRT & Onshore Route Selection. The main elements for the PRT location selection were that it should be located outside the Landscape Constraint (Coastal and Territorial area of Melendugno and Vernole) and where no local constraints (such as monumental olive trees, archaeological findings, and other local environmental and social constraints) are

---

1 Ministerial Decree, abbreviated DM
present. The onshore Route Selection is based on an iterative re-routing process aimed at optimizing the route in terms of minimization of adverse environmental, social and cultural heritage impacts.

A comprehensive stakeholder engagement was performed during the Alternative Assessment that provided input and feedback to the overall alternative selection process.

**Figure 2-2  Alternative Selection Process Flow Chart**

Source: ERM (2013)

As mentioned in Section 1 of this document, in the first phase of the Alternative Assessment process, TAP AG focused in particular on landfall alternatives in the industrial area of Brindisi (ref. to previous Alternative 3), for which a specific study was conducted. This study ruled out the feasibility of a landfall in that area. A summary of the reasons of this exclusion is reported in the following Section.
3 ALTERNATIVE ASSESSMENT IN THE INDUSTRIAL AREA OF BRINDISI

In 2010 TAP AG, given the complexity and characteristics of the Brindisi industrial area, commissioned Saipem to conduct a study on the possibility of a landfall in that area.

The risks and the technical complexities led TAP AG to the conclusion that landing is not feasible in this area.

The Figure below shows the alternatives analysed.

**Figure 3-1** Alternatives in the Industrial Area of Brindisi
For the alternatives shown in the *Figure* above, technical problems related to the need to use unconventional construction methods (with related construction risks) have been identified in addition to compliance with safety measures related to the presence of the industrial area of Brindisi and safety-related issues due to heavy maritime traffic. From an environmental standpoint, there are problems related to the crossing of protected areas (at a regional, national and European level) and natural habitats.

The critical issues related to each of the alternatives analysed are indicated in the following box.

For more detailed information, see Appendix 1 of this Annex.

**Box 3-1** Critical issues related to each of the alternatives analysed in the industrial area of Brindisi

**Area I – Alternatives 3A, 3G-S**
- Posidonia Oceanica.
- Proximity to the Natura 2000 areas (impact during construction)
- Contaminated area (Site of National Interest)
- Impact on maritime traffic
- Interference with the petrochemical plant– onshore route
- Natural Park – onshore route
- Uncertain availability of the artificial island (ex British Gas)
- Technical feasibility of the microtunnel (unconventional offshore construction methods)

**Area II – Alternatives 3B, 3E-S, 3H-S**
- Posidonia Oceanica
- Vicinity to the Natura 2000 park (impact during construction)
- Contaminated Area (Site of National Interest)
- Impact on maritime traffic
- Interferences with the petrochemical plant – the petrochemical torches are close to the landfall
- Technical feasibility of the microtunnel (unconventional offshore construction methods)

**Area III – Alternatives 3D, 3F-S**
- Posidonia Oceanica
- Proximity to the Natura 2000 areas (impact during construction)
- Contaminated area (Site of National Interest)
- Saline di Punta della Contessa Regional Natural Park– onshore route and landfall
- Technical feasibility of changes of direction at 90° (unconventional offshore construction methods)
Project Title: Trans Adriatic Pipeline – TAP
Document Title: ESIA Italy - Annex 2 Alternative Assessment
4 PHASE 1: MACRO – CORRIDOR SELECTION

4.1 Description of the overall Macro-Corridor investigation process

The overall process of the Macro-Corridor selection is summarised in the three main steps listed below and is illustrated in Figure 4-1:

- Step 1: Land Use (LU) analysis and identification of alternative Macro – Corridors;
- Step 2: Identification of cultural heritage and environmental constraints which the preliminary best Macro - Corridor selection would be based on; and
- Step 3: Expert – based analysis and weighing of each constraint; generation of Weight – Maps summarizing the different indices in order to confirm the identification of the final best Macro – Corridor or part of it among the selected ones (step 2).

The three steps are described in the following paragraphs of this Section that include the maps illustrating the results of the assessment activities. The Macro-Corridors are indicated on the maps through arrows with the following colour coding:

- Grey arrow: Macro-Corridor suitable;
- Red- grey arrow: Macro-Corridor suitable but with critical aspects;
- Red arrow: Macro-Corridor unsuitable.

The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation. Once a Macro-Corridor is labelled as red (i.e. unsuitable) it is considered discarded as an alternative.

The conclusions of the Macro-Corridor investigation are described in Section 4.5.
4.2 Step 1: Land use analysis and identification of Macro – Corridors

4.2.1 Methodology

The LU data were downloaded directly from the Web GIS of Apulia Region and they represent the latest version available (update of 2006). The LU map was derived by coupling the Thematic Regional Map (CTR) layers with a detailed photointerpretation based on Very High Resolution satellite imagery at a scale of 1:5000.

The analysis was carried out on two selected LU groups: Residential and Commercial/Industrial. The first class included land uses ranging from dense continuous urban areas, to small settlements and isolated houses. The percentage of residential LU was calculated for each cell of a 1km² grid covering the entire study area, and then the result was visualized through an index ranging from 0 to 1, in order to have an overview of the location of main urban concentrations and to map less concentrated areas whereas pipeline routing would be theoretically easier.

The same analysis was carried out for the Commercial/Industrial LU; which consisted of Industrial, Commercial, Technological infrastructures and Services such as Airports and Hospitals.

The two maps were then overlaid to produce a Built-up Land Use Map that was used to define the Macro-Corridors. The presence of sensitive LU classes (i.e. Industrial/Commercial and Residential) was considered a major constraint in the best Macro - Corridor selection. Therefore the Macro–Corridors were drawn on the Built-Up Land Use map, with the aim to avoid areas of dense urban or commercial/industrial development.
4.2.2 Results

The Land Use analysis produced three main maps:

- Commercial/Industrial Land Use – Figure 4-2;
- Residential Land Use – Figure 4-3;
- Overall Land Use map – Figure 4-4.

The colour coding on the maps represents an index (ranging from 0 to 1) of the density of Commercial/Industrial, Residential areas and Built-up areas, with 0 being the least dense and 1 the most dense.

**Figure 4-2 Commercial, Industrial & Services Land Use Map.**

Source: ERM (2013)
Based on these, four Macro–Corridors have been identified which avoid areas of dense urban or commercial/industrial development.

*Figure 4-4* (the Built-Up Land Use map) shows the locations of the four Macro–Corridors (A, B, C, D) identified through the land use analysis. While the Macro-Corridors B, C, and D are wide land strips free from main concentrations of residential or commercial/industrial development, corridor A is a narrow land strip located in between settlements. The high density of settlements would represent here a limitation for the pipeline route development.

The colour of arrows marks the level of suitability of the related Macro–Corridor: Grey indicates the suitability of the Macro-Corridor, Red-Grey indicates that the Macro–Corridor is suitable with limitations, Red is unsuitable.
Figure 4-4  Built-up Land Use Map. Arrows: grey suitable, red unsuitable

Source: ERM (2013)
Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation

The following table reports the results related to Land Use analysis.

<table>
<thead>
<tr>
<th>Key - Indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Safety and Social</td>
<td>Figure 4-2</td>
<td>Unsuitable (presence of continuous urban fabric)</td>
<td>Suitable</td>
<td>Suitable</td>
<td>Suitable</td>
</tr>
</tbody>
</table>
4.3 Step 2: Constraints mapping

4.3.1 Methodology

Having defined Macro–Corridors, the next step was the identification of the social and environmental constraints within the corridors themselves in order to discard unsuitable ones.

The following elements were considered as constraints:

- **Protected Areas:** The territory of Apulia Region is largely occupied by areas with high importance in terms of environment and biodiversity. All different forms of Protected Areas were identified and mapped: National and Regional protected areas, Important Bird Areas, NATURA 2000 framework areas (SCI – Site of Community Interest and ZPS Zone of Special Protection), RAMSAR wetlands. As required by Directive 92/43/EEC (Natura 2000), in case any project crosses Natura 2000 Protected Areas with significant impacts, its authorization is granted only if there are no other possible alternatives and proposing mitigation and compensation measures.

- **Hydrogeological Constraints:** The hydrogeological setting of the landfall is a major limitation in pipeline route planning. Therefore the PAI (Hydrogeological Plan), which contains hydrogeological risk identification and defines requirements for risk minimisation, was analysed in detail. Flood and Landslide Hazard, cliffs at degradation risk were mapped for the entire study area;

- **PUTT/p Constraints:** cultural heritage, environmental constraints at regional level were extracted from the PUTT/p. Wetlands, Maquis and Forests were mapped together with the River Network. Caves, Important Archaeological and Architectonic sites together with landscape (Law 1497/39) and Natural/Cultural heritage (Galasso Law) constraints were considered as high risk elements;

- **Marine biodiversity:** Regarding the offshore area, marine biodiversity is a major issue for the alternative assessment. In particular the presence of *Posidonia oceanica* was identified as a critical element, as the species and its habitat are protected by the Natura 2000 Directive; therefore this was mapped as a main constraint. Data about the distribution of *P. oceanica* were derived from the study carried out in 2005 by the Ministry of Environment, in collaboration with the Interuniversity National Consortium for Marine Sciences (CoNISMA) and the Mediterranean Oceanologic Centre (CEOM); and

- **Contaminated Sites:** the harbour and the industrial area of the city of Brindisi are defined as Contaminated Site of National Strategic Importance (SIN). This was taken into account in the Alternative Assessment as a constraint.
4.3.2 Results – Protected Areas

*Figure 4-5* shows the protected areas within the study area. The map demonstrates that the almost entire coast in the study area is occupied by at least one of the nature protection constraints, except for the city of Brindisi and corridor D.

A continuous strip of Site of Community Importance (SCI) entirely covers the offshore area of corridors A and C and of part of corridor B.

In particular Macro-Corridor C crosses an area where the extent of the Protected Areas reaches the maximum extent in the study area.

The SCIs located North of Brindisi are: “Posidonieto San Vito”, “Litorale Brindisino”, “Torre Guaceto e Macchia S. Giovanni”.

Between Brindisi and the Macro–Corridor D the following SCIs are mapped: “Stagni e Saline di Punta della Contessa”, “Bosco di Tramazzone”, “Rauccio”, “Aquatina di Frigole”, “Torre Veneri”, “Le Cesine”.

Protected areas South from Macro–Corridor D are: “Palude dei Tamari”, “Torre dell’Orso” and “Alimini”.

The Special Protection Zone (ZPS) “Punta della Contessa” is located offshore the Brindisi coast facing the onshore Regional Protected Area (RPA) with the same name.

Inland, the National Protected Area “Torre Guaceto” is located North of Brindisi and the RPA “Bosco e Paludi del Rauccio” between Brindisi and Macro–Corridor D.

Based on the above, Macro-Corridor D is concluded to be the most suitable based on the protected areas constraints.
Figure 4-5  Map of Protected Areas (Cumulative Analysis)

The following table reports the results related to protected Areas analysis.

Table 4-2  Protected Areas - Analysis results

<table>
<thead>
<tr>
<th>Key - Indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected Areas</td>
<td>Environmental</td>
<td>Figure 4-5</td>
<td>Unsuitable</td>
<td>Suitable</td>
<td>Unsuitable</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

In addition, the presence of *Posidona oceanica*, priority habitat under Directive 92/43/EEC (Natura 2000), was specifically analysed.
Based on data from a study carried out in 2005 by the Ministry of Environment, together with the Interuniversity National Consortium for Marine Sciences (CoNISMA) and the Mediterranean Oceanologic Centre (CEOM); the presence of the Posidonia oceanica represents the major constraint in the offshore portion of the study area.

As shown in Figure 4-6, Macro–Corridors A, B, and C would cross areas where Posidonia oceanica has been largely mapped. In particular Macro-Corridor C crosses an area where the extent of Posidonia oceanica reaches the maximum extent in the study area. Macro–Corridor D is the only one which avoids areas of Posidonia oceanica.

**Figure 4-6** Map of Posidonia oceanica. Arrows: grey suitable, red unsuitable (Cumulative Analysis)

Source: ERM (2013)

Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation
The following table reports the results related to Posidonia oceanica.

### Table 4-3  Posidonia oceanica - Analysis results

<table>
<thead>
<tr>
<th>Key - Indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posidonia oceanica</td>
<td>Environmental</td>
<td>Figure 4-6</td>
<td>Unsuitable</td>
<td>Suitable (with limitations)</td>
<td>Unsuitable</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

#### 4.3.3 Results – Hydrogeological Risk

A major factor in the analysis of constraints was the classification of the area as High Landslide Hazard (PG3) according to the PAI. In fact Art. 13 of the NTA of the PAI only allows “carrying out interventions required for the maintenance of public works or of public interest” in those areas. Meetings with the Basin Authority confirmed the prohibition of any new constructions (even with employment of micro-tunnelling technique) in areas classified as PG3.

The hydrogeological hazard map in Figure 4-7 shows areas subject to PG3 constraint with zoom boxes in correspondence to the Macro-Corridors.

Within Macro-Corridor B the coastal area appears rather uniformly classified as high risk, hence, regarding hydrogeological risk, this Macro-Corridor must be considered unsuitable.

Macro-Corridor C, in its coastal area presents zones classified as high risk. Moreover, in more inland areas there are numerous erosive river channels and flood plains. For these reasons the Macro-Corridors C is considered suitable, but only for limited areas.

Macro-corridors A and D show a more fragmented risk classification and offer wider sections of coast that could accommodate the landfall. Macro-Corridor A does not have major issues with PG3 but there are wide areas occupied by cliffs prone to erosion processes, which are considered areas under protection. Therefore, Macro-corridor A is considered unsuitable and Macro-corridor D is considered suitable.
**Figure 4-7** Hydrogeological Hazard Map. Arrows: grey suitable, red unsuitable (Cumulative Analysis)

Source: ERM (2013)

Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation

The following table reports the results related to Hydrogeological Risk.

<table>
<thead>
<tr>
<th>Key - Indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrological Hazard</td>
<td>Environmental</td>
<td>Figure 4-7</td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Suitable</td>
<td>Suitable(with limitations)</td>
</tr>
</tbody>
</table>
4.3.4 Results – PUTT/p constraints

*Figure 4-8* and *Figure 4-9* show two maps derived from the PUTT/p of the Apulia region identifying elements that are considered a constraint in the route planning.


Macro-Corridor C does not include major constraints from the PUTT/p except for a coastal area constraint determined by D.Lgs. 42/2004, Art. 142, par 1, letter c), L.1497/39 and D.M. 01/08/1985.

Macro-Corridor D includes an area interested by the Hydrogeological constraint, the coastal area of Melendugno and Vernole (constrained by D.Lgs 42/2004, Art. 142, par 1, letter c), L.1497/39 and D.M. 01/08/1985) and the coastal area of Salento constrained by D.Lgs 42/2004, Art. 136, par 1, letter c) and L.1497/39.
Figure 4-8  Maps of selected items from Thematic Territorial Urban Plan (PUTT/p) (Cumulative Analysis)

Source: ERM (2013)
Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation
Figure 4-9  Maps of selected items from Thematic Territorial Urban Plan (PUTT/p) (Cumulative Analysis)

The following table reports the results related to PUTT/p constraints.

<table>
<thead>
<tr>
<th>Key - Indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUTT/p constraints</td>
<td>Environmental and Cultural heritage</td>
<td>Figure 4-8 Figure 4-9</td>
<td>Suitable (with limitations)</td>
<td>Suitable (with limitations)</td>
<td>Suitable (with limitations)</td>
<td>Suitable (with limitations)</td>
</tr>
</tbody>
</table>

Source: ERM (2013)
Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation.
4.3.5 Conclusions of the constraint analysis

Table 4-6 Summary of the analysis results

<table>
<thead>
<tr>
<th>Key - indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use</td>
<td>Safety and social</td>
<td>Figure 4-2</td>
<td>Unsuitable (presence of continuous urban fabric)</td>
<td>Suitable</td>
<td>Suitable</td>
<td>Suitable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 4-3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 4-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protected Areas</td>
<td>Environmental</td>
<td>Figure 4-5</td>
<td>Unsuitable</td>
<td>Suitable (with limitations)</td>
<td>Unsuitable</td>
<td>Suitable</td>
</tr>
<tr>
<td>Posidonia</td>
<td>Oceania</td>
<td>Figure 4-6</td>
<td>Unsuitable</td>
<td>Suitable (with limitations)</td>
<td>Unsuitable</td>
<td>Suitable</td>
</tr>
<tr>
<td>Hydrological</td>
<td>Hazard</td>
<td>Figure 4-7</td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Suitable (with limitations)</td>
<td>Suitable</td>
</tr>
<tr>
<td>PUTT/p Constraints</td>
<td>Cultural and environmental heritage</td>
<td>Figure 4-8</td>
<td>Suitable (with limitations)</td>
<td>Suitable (with limitations)</td>
<td>Suitable (with limitations)</td>
<td>Suitable (with limitations)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 4-9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Analysis</td>
<td>All</td>
<td></td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

4.4 Step 3: Expert – Based Analysis

4.4.1 Methodology

Inside the territory considered for the realization of the Project, 22 constraints and their relative distinct geographic information layers were identified and represented. Based on a specific weight assignment criteria (described below), a weight was assigned to each constraint that ranges from 0.25 to 1: in general, however, the weight 0.25 is the minimal impact and 1 is the maximum impact (“No-Go”).

Table 4-7 shows the list of constraints and corresponding weights.

Table 4-7 List of the constraints and corresponding weights in the alternative assessment

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Type</th>
<th>Origin</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Land use (+ safety zone 100 m)</td>
<td>Social</td>
<td>Region</td>
<td>1 (No-Go)</td>
</tr>
<tr>
<td>Industrial Land use (+ safety zone 100 m)</td>
<td>Social</td>
<td>Region</td>
<td>1 (No-Go)</td>
</tr>
<tr>
<td>Services (+ safety zone 100 m)</td>
<td>Social</td>
<td>Region</td>
<td>1 (No-Go)</td>
</tr>
<tr>
<td>High Landslide hazard (PG3)</td>
<td>Environment</td>
<td>PAI</td>
<td>1 (No-Go)</td>
</tr>
<tr>
<td>SCI (Site of Community Importance)</td>
<td>Biodiversity</td>
<td>Natura2000</td>
<td>0.75</td>
</tr>
<tr>
<td>ZPS (Special Protection Zones)</td>
<td>Biodiversity</td>
<td>Natura2000</td>
<td>0.75</td>
</tr>
<tr>
<td>RAMSAR</td>
<td>Biodiversity</td>
<td>Natura2000</td>
<td>0.75</td>
</tr>
<tr>
<td>National protected areas</td>
<td>Biodiversity</td>
<td>Env. Ministry</td>
<td>0.75</td>
</tr>
<tr>
<td>Regional protected areas</td>
<td>Biodiversity</td>
<td>Region</td>
<td>0.75</td>
</tr>
<tr>
<td>Posidonia Oceania</td>
<td>Biodiversity</td>
<td>Env. Ministry</td>
<td>0.75</td>
</tr>
<tr>
<td>Caves (+ safety zone 100 m)</td>
<td>Environment</td>
<td>PUTT/p</td>
<td>0.75</td>
</tr>
<tr>
<td>Forest</td>
<td>Biodiversity</td>
<td>PUTT/p</td>
<td>0.50</td>
</tr>
<tr>
<td>Maquis</td>
<td>Biodiversity</td>
<td>PUTT/p</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Numerical weights were assigned in order to categorise the technical, social, environmental and cultural heritage constraints listed above in order to analytically describe their spatial combination.

As a first step, constraints were identified for the areas where it is not possible to implement the Project, regardless of the building techniques and potentially implementable mitigation measures and / or compensation, which were assigned a weight of 1 ("No-Go "). They are the following:

- technical constraints related to land use (presence of residential and industrial settlements and service facilities such as airports, railway lines etc.), characterised by the building requirement to comply with the safety distance of 100 m from any building. In addition to being insurmountable, constraints related to land use have a high extension and distribution. Therefore, they were used as indicators for the preliminary identification of macro-corridors, i.e. macro-areas where the analysis of the other constraints listed in the previous table are focused.

- areas with a very high geomorphological risk (PG3), as classified by the PAI, for which, in accordance with the prescription contained in Art. 13 of the NTA, new interventions are prohibited, including the pipeline.

The assignment of weights continued by identifying the constraints that, although they do not explicitly block the implementation of the Project through a specific provision, are assigned to areas of significant environmental interest for which it is necessary to ensure their protection and conservation and, therefore, with the construction of the Project, would be subject to considerable impacts. These constraints are as follows:

- Protected areas subject to EU constraints (Natura 2000 Directive), national and regional regulations: these are terrestrial or aquatic areas that stand out thanks to their geographical, abiotic and biotic features, either entirely natural or semi-natural in a satisfactory state of conservation, which must be protected.

- Areas of great natural interest such as Posidonia oceanica: this consists of a protected species of aquatic flora of great environmental value, the presence of which generally implies the identification of protected areas within the Natura 2000 network (SCI and ZPS).
Caves: defined in PUTT/P as geomorphological emergencies due to their recognised scientific and landscape value, the protection of which is mandatory, ensuring a safety zone of 100 m.

In light of the above characteristics, it was considered necessary to assign a weight of 0.75 to these areas since the construction of works within their confines is highly restricted by the need to maintain the state of conservation of habitats, flora, wildlife (for protected areas and Posidonia oceanica) and to protect the caves.

The third class of weights, corresponding to the numerical value of 0.50, includes the following constraints:

- Forests, Maquis and Wetlands, included in the PUTT/p, which regulates the protection and preservation of existing vegetation and prohibits it from being cut and/or damaged.
- Ex Law 1497/39 and the Galasso Decree: constraints are applied to these areas due to their natural beauty and unique characteristics. Landscape authorisations must be obtained before construction work can be performed here.
- Archaeological Constraint, included in the PUTT/p: these sites of historic and artistic interest are protected to prevent any uses or interventions that would reduce or destroy their potential public value, as they represent a significant trace of history, art or culture.
- Areas with High Flood Hazards, as defined by the PAI: any intervention in these areas is subject to the ruling of the Basin Authority based on a hydrological compatibility study (Art. 7 NTA).

Each of the aforementioned constraints, characterised by the protection and conservation requirement, has the ability to strongly influence the design of the intervention, through the implementation of specific construction methods (e.g. microtunnel, micro re-routing etc.) and mitigation measures, which have earned them a numerical weight of 0.50.

The class of constraints with a weight of 0.25 includes the following:

- Hydrogeological constraint, included in the PUUT/p.
- River Network and relative buffer zone (150 m), defined by the PUTT/p.
- Archaeological Signs and relative buffer zone (100 m), restricted by the PUTT/p.
- Sites of National Importance.

The construction activities in areas where these constraints are in force require the obtaining of permits and a considerable economic commitment. However, they are still much inferior to the constraints previously described due to less stringent requirements or limited spatial extension (e.g. archaeological signs vs. archaeological restrictions).
4.4.2 Results

Figure 4-10, Figure 4-11 and Figure 4-12 represent the outcomes of the combination of the single constraints according to the assigned weights as described in Section 4.4.1. The Maximum Weighting Value Map aims at enhancing the level of constraint at each location by showing the highest score reached by the single constraint. The corridor D has no constraints offshore and inland, the yellow colour represents a medium level of constraint. While for the other Macro – Corridors, the colour mostly encountered is orange, representing a medium-to-high constraint level.

The Map of the Sum of Weighting Levels on the other hand shows the interaction between constraints with different origin and level of importance. The higher level of constraint imposed on the offshore zone, makes the corridors A, B, and C less suitable than D.

The last map showing the arithmetic Sum of every Single Weighting considers each constraint as being added to any other constraint in the area regardless its origin and significance. The goal of the map is to locate “hot spots” in order that they can be avoided. Such areas, defined by the dark blue colour, are clearly visible in the map. One of the widest zones lays between the macro-corridors B and C.
Figure 4-10  Maximum Weighting Value map (1km² gridded mesh)

Source: ERM (2013)

Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation
Figure 4-11  Sum of Weighting Levels map

Source: ERM (2013)
Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation
Figure 4-12  Weight map resulting from the sum of each single layer

Source: ERM (2013)
Note: The colour of the corridors changes progressively through the text from grey to red, cumulating the elements of limitations and constraints considered at each step of the evaluation

Table 4-8  Summary of Weighted Maps Analysis

<table>
<thead>
<tr>
<th>Key - Indicator</th>
<th>Component</th>
<th>Reference</th>
<th>Corridor A</th>
<th>Corridor B</th>
<th>Corridor C</th>
<th>Corridor D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted maps</td>
<td>all</td>
<td>Figure 4-10</td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Suitable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 4-11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 4-12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.5 Conclusions of the Macro–Corridor Investigation

The above described Macro-Corridor investigation leads to progressively discarding Macro-Corridors A, B and C.

Macro-Corridor D includes a suitable area for the pipeline construction where:

- no constraints deriving from the presence of natural Protected Areas, Hydrological Hazard (PG3 classification) nor *Posidonia oceanica*,

- PUTT/p constraints in this area are compatible with the construction and operation aspects planned for the TAP Project.
5 PHASE 2: LANDFALL AND OFFSHORE ROUTE SELECTION

The landfall location was selected within Macro–Corridor D based on the analysis of specific environmental, social, cultural heritage and technical constraints that affect the pipeline feasibility. These constraints are reported in Table 5-1.

An offshore survey was performed by TAP with video technology within Macro-Corridor D, whose results contributed to the definition of the off-shore Base Case Route (see results of the survey in Box 5-1).

Box 5-1 Survey on Posidonia oceanica within Macro-Corridor D

- Posidonia oceanica was found at two depths within the survey area: between 4 and 14 m depth and around 19 m depth.
- Posidonia oceanica did not appear to form continuous mattes within these zones, rather it appeared in discrete clumps varying in size from <1 m across to approximately 8 m, including sand or rock outcrops;
- At the 19 m depth zone, only quite small and isolated clumps of Posidonia oceanica were observed;
- At shallower depth, the percentage of the Posidonia oceanica seabed clumps cover varied markedly over short distances.

Table 5-1 Environmental, Social, Cultural heritage and Technical constraints considered for the landfall selection

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Component</th>
<th>Coverage</th>
<th>Law/Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG3</td>
<td>Environmental</td>
<td>Nearshore</td>
<td>PAI</td>
</tr>
<tr>
<td>Presence of Posidonia oceanica</td>
<td>Environmental</td>
<td>Nearshore</td>
<td>From survey</td>
</tr>
<tr>
<td>Touristic facilities on the shore</td>
<td>Social</td>
<td>Nearshore</td>
<td>From survey</td>
</tr>
<tr>
<td>Tunnel Length</td>
<td>Technical</td>
<td>Nearshore</td>
<td>-</td>
</tr>
<tr>
<td>Safety Distance</td>
<td>Technical</td>
<td>Near/Onshore</td>
<td>-</td>
</tr>
<tr>
<td>Mediterranean Maquis</td>
<td>Environmental</td>
<td>Onshore</td>
<td>PUTT/p</td>
</tr>
<tr>
<td>Woodland</td>
<td>Environmental</td>
<td>Onshore</td>
<td>PUTT/p</td>
</tr>
<tr>
<td>Wetland</td>
<td>Environmental</td>
<td>Onshore</td>
<td>PUTT/p and PRG of Melendugno</td>
</tr>
<tr>
<td>Archaeology</td>
<td>Cultural heritage</td>
<td>Onshore</td>
<td>PUTT/p and PRG of Melendugno</td>
</tr>
<tr>
<td>Local constraints</td>
<td>Env/Soc/Cult</td>
<td>Onshore</td>
<td>PRG of Melendugno</td>
</tr>
</tbody>
</table>
The discontinuous presence of the PG3 constraint along the coastline in the area of the Macro - Corridor D, as shown in Figure 5-1, automatically defines the area suitable for the landfall (indicated as “NO PG3 Costal area” in the Figure).

**Figure 5-1  PG3 Constraint within Corridor D**

![Figure 5-1 PG3 Constraint within Corridor D](image)

Source: ERM 2013

Within this area (i.e. the area shown in Figure 5-1), considering the safety distance requirement of 20 m from the existing isolated buildings and facilities two possible options for landfall location have been identified (Figure 5-2): the North Micro - Corridor and the South Micro - Corridor.
In both Micro - Corridors, the nearshore section would be built in microtunnel, entering onshore and exiting offshore. Considering that, elements evaluated for the selection of the landfall location are the following:

- Presence of *Posidonia oceanica* (based on TAP offshore survey outcomes): as it should be avoided, the microtunnel exit point (offshore) will depend on *Posidonia oceanica* location;

- Length of the microtunnel and offshore impact: 1,500 metres is to be considered as a reasonable length for the microtunnel. Increasing the length of the microtunnel increases the complexity of the construction.

Other constraints considered for the microtunnel entry point are (see *Table 5-1*): the presence of touristic facilities on the shore, environmental constraints such as Mediterranean Maquis, Woodland and Wetland and related protection zone and local constraints, including the PRG of Melendugno. *Figure 5-3* shows the constraints considered in the landfall Micro - Corridors.
Within the Micro – Corridors, four alternative landfall locations have been evaluated (Figure 5-4) and a ranking has been made to select a solution which would ensure less interactions with the environmental, cultural heritage and social constraints reported in Table 5-1.
The ranking comparison between the landfall alternatives, based on the above reported analysis, are shown in Table 5-2 and Table 5-3.

Table 5-2  Ranking comparison between the landfall alternatives and colour coding explanation

<table>
<thead>
<tr>
<th>Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Alternative which has a reduction of the interactions with the considered constraints</td>
</tr>
<tr>
<td>Yellow</td>
<td>There are no substantial and relevant differences between the analysed alternatives</td>
</tr>
<tr>
<td>Orange</td>
<td>Alternative which is limited by the considered constraints</td>
</tr>
</tbody>
</table>

Source: ENT 2013
Table 5-3  Ranking comparison between the landfall alternatives

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Alternative F</th>
<th>Alternative G</th>
<th>Alternative H</th>
<th>Alternative I</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG3</td>
<td>No PG3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of Posidonia oceanica</td>
<td></td>
<td>Posidonia oceanica can be avoided with a microtunnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touristic facilities on the shore</td>
<td></td>
<td>No interaction with the touristic facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microtunnel Length and offshore impact for areas not crossed with the microtunnel</td>
<td>&lt; 1,500 m and minor impact on offshore route not crossed with the microtunnel</td>
<td>&gt; 1,500 m and major impact on offshore route not crossed with the microtunnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Distance</td>
<td></td>
<td>Safety Distance Respected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mediterranean Maquis</td>
<td></td>
<td>No interaction thanks to microtunnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodland</td>
<td>No interaction tanks to microtunnel</td>
<td>Microtunnel entry point in &quot;Woodland&quot; area (PUTT/p)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetland</td>
<td>No interaction</td>
<td>Potential interaction</td>
<td>No interaction</td>
<td></td>
</tr>
<tr>
<td>Archaeology</td>
<td></td>
<td>No interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal Local constraints</td>
<td>Microtunnel entry point in an agricultural area)</td>
<td>Microtunnel entry point in &quot;Woodland&quot; area (PRG of Melendugno and PUTT/p)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 5-3, the preferred landfall and microtunnel route is the Landfall Alternative F. This landfall alternative is characterized by:

- an overall tunnel length which ensures:
  - avoidance of any interaction with the Mediterranean Maquis and Woodland onshore and Posidonia oceanica offshore;
  - avoidance of any interaction with tourist facilities;
- compliance with safety distance from buildings.
6 PHASE 3: PRT LOCATION AND ONSHORE ROUTE SELECTION

Once the landfall location was defined as outcome of the alternative assessment process, the PRT and onshore pipeline route selection was carried out in parallel with slightly different criteria for the PRT and the pipeline route. The assessment of the PRT and route is described separately in the two following paragraphs.

6.1 PRT LOCATION SELECTION

The PRT location was selected on the basis of the environmental, social and cultural heritage criteria reported in the table below.

Table 6-1 Environmental and Local constrains considered during PRT selection

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Component</th>
<th>Law/Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Constraint (Coastal and Territorial area of Melendugno and Vernole)</td>
<td>Environmental</td>
<td>Decree 42/2004 (Art.136, paragraph 1, letter c)</td>
</tr>
<tr>
<td>Monumental Olive Trees</td>
<td>Environmental</td>
<td>Regional Laws n. 14/2007 and 12/2013</td>
</tr>
<tr>
<td>Archaeological findings</td>
<td>Cultural heritage</td>
<td>PRG of Melendugno/PUG of Vernole and PUTT/p</td>
</tr>
<tr>
<td>Other local constraints</td>
<td>Env/Soc/Cult HERIT</td>
<td>PRG of Melendugno/PUG of Vernole</td>
</tr>
<tr>
<td>Distance from urban area</td>
<td>Social</td>
<td>-</td>
</tr>
<tr>
<td>Commercial/industrial area</td>
<td>Social</td>
<td>PRG of Melendugno/PUG of Vernole</td>
</tr>
</tbody>
</table>

The key driver of the analysis was the presence of a Landscape Constraint area along the entire coastal area in Macro-Corridor D stretching approximately 8km inland. Therefore, considering this constraint (Figure 6-1), TAP has investigated possible alternatives related to location of the PRT outside of this area.
The following PRT alternatives were considered as they ensured no interaction with the constraints reported in Table 6-1:

- The area “PRT-Option A”, located further inland and outside the landscape constraint. This area is designated for commercial and light industrial use and lies within the municipality of Vernole.

- The area “PRT-Option B”, also located outside the landscape constraint within the municipality of Melendugno. No olive trees are present in this second area.

The potential PRT sites are shown on Figure 6-2.
The comparison of the PRT alternative locations are shown in Figure 6-2. Both PRT locations are unconstrained, according to the analysis of criteria identified in Table 5-3. The PRT Option B location is on an agricultural area, at present uncultivated, not considered a material constraint. PRT selection will therefore be based both on PRT location and route options (refer to Section 6.3)

6.2 Onshore Route Selection: Onshore Base Case Route

The environmental, social and cultural heritage elements considered for the identification of the on-shore route were derived from Planning Instruments, considered by Italian Legislation and from common best practice in Impact Assessment. These elements are described in the following table.
The pipeline route starts from the landfall and reaches, according to the outcome of the previous Section 6.1, two possible PRT alternatives.

Considering pipeline routing from the coastal area to the PRT locations, the first potential constraint was a wetland area and the related protection zone and a Special Agricultural Zone (landscape constraint). As per Figure 6-3, in order to minimize the impact, the preferred onshore Base Case Route (green line) would run parallel to the existing roads and along the southern border of the wetland protection zone.
Once the eastern section of the Base Case Route was defined, two alternative routes were identified to connect to the PRT options (Figure 6-4):

- Northern Alternative connecting with PRT-Option A (red line);
- Southern Alternative to connect with PRT-Option B (green line);

Neither of the investigated routes to the new proposed PRTs show technical constraints.
The constraint analysis was then carried out on the two above described route alternatives.

The Northern Route would potentially interfere with archaeological constraints. In fact the pipeline route would pass very close to an area characterized by a large number of Pagghiare and by the project of the Archaeological Park of Acquarica (as defined in the PUG of Vernole), which includes two archaeological sites (see Figure 6-5).
Other constraints along the Northern Route, derived from the PUG of Vernole were the following:

- expansion area for new developments of the built up area north of Vernole Municipality;
- cemetery and the related safety zone;
- sport facilities area;
- new road planned, that might have interfered with the road construction
- Geomorphological Scarp: according to the NTA of Vernole PUG, vegetation cut and morphological changes are forbidden in this area, thus making it incompatible with the foreseen construction activities for the pipeline.

Taking into account the above there is no possibility for re-routing in the area to avoid possible cultural heritage impacts.

Source: ERM (2013)
Therefore the Northern Route was considered not suitable and was discarded as a route alternative.

The proposed Southern Route showed less significant constraints than the Northern one and is therefore considered more suitable for the pipeline routing (see Figure 6-6). In fact it mainly crosses agricultural land and avoids natural and cultural heritage protected areas, while respecting the required distance from urban areas.

**Figure 6-6  Southern Route**

![Southern Route Diagram](Source: ERM (2013))
6.3 Comparison of PRT and Route Options

The comparison between PRT (Option A and option B) and Route (Northern and Southern Route) is summarized in the following Table 5-3 and Table 6-3.

Table 6-3 Environmental Social and Cultural heritage constraints considered during Onshore Route Selection

<table>
<thead>
<tr>
<th>Constraint</th>
<th>North Route – PRT Option A</th>
<th>South Route – PRT Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland</td>
<td>No interaction</td>
<td></td>
</tr>
<tr>
<td>Agricultural Area</td>
<td>Mainly along existing roads</td>
<td></td>
</tr>
<tr>
<td>Archaeological findings</td>
<td>Close to an area characterized by a large numbers of Pagghiare and the future Archaeological Park of Acquarica (as defined in the PUG of Vernole, which includes two archaeological sites.)</td>
<td>No interaction</td>
</tr>
<tr>
<td>Distance from urban area</td>
<td>Respected</td>
<td></td>
</tr>
<tr>
<td>Other local constraints</td>
<td>Interaction with local constraints reported in the PUG of Vernole and listed above, which limit the construction activities</td>
<td>Interaction with local constraints which are compatible with the construction activities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRT Option A</th>
<th>PRT Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Constraint (Coastal and Territorial area of Melendugno and Vernole)</td>
<td>Outside</td>
</tr>
<tr>
<td>Monumental Olive Tree</td>
<td>No Olive Trees and in particular Monumental ones</td>
</tr>
<tr>
<td>Archaeological findings</td>
<td>No archaeological findings</td>
</tr>
<tr>
<td>Other local constraints</td>
<td>No constraints in the considered area</td>
</tr>
<tr>
<td>Distance from urban area</td>
<td>Respected</td>
</tr>
<tr>
<td>Land use</td>
<td>Commercial/ light industrial Area</td>
</tr>
</tbody>
</table>

From the Table above, the South Route section is more suitable and consequently together with the PRT Option B, has been selected as the Base Case Route Alternative.
7 CONCLUSIONS: SELECTED ESIA BASE CASE ALTERNATIVE

The Base Case Alternative has been identified through a comprehensive Alternative Assessment carried out on a large portion of the Apulia Region coastal area in order to ensure the minimization of environmental, social, and cultural heritage impacts.

The assessment involved:

- Collection of social, cultural heritage and environmental data and analysis of the collected data using key – indicators.
- Identification of constraints deriving from Urban and Territorial Planning Instruments and environmental, cultural heritage protection tools.
- Engagement of national, regional and local authorities, non-governmental organisations and local communities.

As a result of the Alternative Assessment process, the selected Base Case Alternative ensures the least interaction with environmental, social and cultural heritage constraints in the considered study area and a related minimisation of impacts on the environmental, social and cultural heritage components.

The Base Case Alternative consists of:

- Base Case Landfall and Offshore Route located North of San Foca in the Municipality of Melendugno, Lecce Province. The landfall project foresees the use of micro-tunnelling technique (both offshore and onshore) and is characterized by:
  - a tunnel length sufficient to avoid any interaction with the Posidonia oceanica offshore and the Mediterranean Maquis/Woodland, tourist facilities and PRG constraints onshore;
  - compliance with safety distance requirements for existing buildings and complexes;
  - a distance of 1.3 km from San Foca Harbour.

- The Onshore Base Case Route minimising the impact on the environment by avoiding natural habitats, running along existing roads and tracks for more than half of its total length. The remaining section of the onshore route does not show interference with any of the identified constraints.

- The Base Case PRT, which is located within the Municipality of Melendugno outside the landscape protection area (Coastal and Territorial area of Melendugno, acknowledged by the Decree 42/2004, Art.136, Paragraph 1, letter c and Law 1497/39). No significant interactions with environmental, social and cultural heritage constraints have been identified. The location shows no interference with the envisaged development of an Archaeological Park of Acquarica.
Figure 7-1  Southern Route

Source: ERM (2013)
Appendix 1

Alternative Assessment Development Process
TABLE OF CONTENTS

1 Introduction 3
2 Feasibility Study (2003-2005) 5
3 Conceptual Engineering Phase (2006-2007) 6
4 Basic Engineering Phase (2008-2011) 7
  4.1 Route Re-Assessment for Alternative 3 (2010) 8
5 Conclusions of the Basic Engineering Phase Final Assessment (2008-2011) 11
6 Route Refinement for Alternative 0 and first ESIA submission (2012) 13
7 Review of the Alternative Assessment Process 14

LIST OF FIGURES

Figure 1-1 Project Area across the Adriatic Sea with Route Alternatives Analysed 4
Figure 4-1 Alternative 3: Overall Map of the Study Area 9
Figure 5-1 Protected Areas from Brindisi to San Foca (Natura 2000) 12

LIST OF BOXES

Box 4-1 New Brindisi Urban Plan 8
1 Introduction

This Appendix to Annex 2 Alternative Assessment describes the analysis of route alternatives conducted up to the point of the original ESIA submission in March 2012. Further landfall/route/PRT refinements conducted subsequent to March 2012 are described in Annex 2 Alternative Assessment, which provides the final Base Case Alternative.

The selection process for the Adriatic Sea crossing from Albania to Italy and the subsequent onshore connection to the Snam rete Gas (SRG) gas distribution network underwent three main Project phases. The three phases and their chronology were as follows:

- An initial Feasibility Study conducted between 2003 and 2005;
- A Conceptual Engineering Phase conducted between 2006 and 2007;
- A Basic Engineering Phase conducted between 2008 and 2011.

A description of each stage of the route assessment/refinement process is described below and in total five main route alternatives were identified and carried forward for consideration and comparison (see Figure 1-1):

- Alternative 0 Landfall north of San Foca;
- Alternative 1 Landfall north of the village of Lindinuso;
- Alternative 2 Landfall north of the Cerano Power Plant;
- Alternative 3 Landfall at the Petrochemical Plant; and
- Alternative 4 Landfall north of Casale Airport (Brindisi).

A summary of the assessment process conducted on the different alternatives considered and the key conclusions in terms of their feasibility is provided in subsequent sections of this report.
Figure 1-1 Project Area across the Adriatic Sea with Route Alternatives Analysed
2 Feasibility Study (2003-2005)

The objective of the Feasibility Study was to identify the most suitable corridor from south-eastern Europe to Italy. Initial investigations identified an onshore corridor from northern Greece across southern Albania to the harbour at Vlore. At the Italian end of the pipeline the ultimate point to be reached was the tie-in to the Snam Rete Gas (SRG) Network near Brindisi. At that time it was considered that the shortest offshore crossing would be between Vlore, Albania and the Italian coastline within a corridor bounded by Brindisi to the north and Otranto to the south.

Within this corridor possible landfalls were considered at Brindisi and further south at San Foca and Otranto. At that time both southerly options (San Foca and Otranto) were not considered further due to the longer onshore connection required in Apulia and were temporarily discarded.

The following “Conceptual Engineering Phase” was therefore focused on the Brindisi Alternatives.
3 Conceptual Engineering Phase (2006-2007)

During the Conceptual Engineering Phase, the Albanian landfall was moved north from Vlore to Fier. The preferred landfall in Italy was considered to be in the region of Brindisi, with an onshore pipeline to the tie-in near Brindisi. The offshore Posidonia oceanica sea grass belt was initially considered the main constraint for the Brindisi option which extends along the Italian coastline in shallow water and is classified as a "Natura 2000" and priority habitat area. To prevent / minimise interference with the protected area, four different shore approaches were identified between the village of Lindinuso and the northern boundary of the city of Brindisi.

These were as follows:

- Alternative 1 Landfall north of the village of Lindinuso;
- Alternative 2 Landfall north of the Cerano Power Plant;
- Alternative 3 Landfall at the Petrochemical Plant; and
- Alternative 4 Landfall north of Casale Airport (Brindisi).

During that time, the focus was on Alternative 1. A preliminary environmental study was performed, and an offshore survey was initiated along Alternative 1 to gather data on seabed bathymetry, sea bed conditions and structure as well as environmental data.

---

1 Council Directive 92/43/EEC (and subsequent amendments) on the conservation of natural habitats and wild fauna and flora was implemented in Italy with the Decree of the President of the Republic N° 357/97. The Directive established that “A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000.”
4 Basic Engineering Phase (2008-2011)

In the subsequent Basic Engineering Phase the four alternatives identified above were considered in greater detail from technical (including safety issues), environmental and socio-economic perspectives. As a result of these assessments Alternatives 2 (north of the Cerano Power Plant) and Alternative 3 (in proximity of the petrochemical plant) were put on hold for further investigation for the following reasons:

- The assessment of Alternative 2 concluded that a routing to the north of the power plant would cross an onshore protected area (Natura 2000) and Salina di Punta della Contessa Regional Nature Park that also serves as a military area. A routing south of the power plant would impact an onshore protected area and Bosco di Cerano Regional Nature Reserve and interfere with the main power transmission corridor. For these considerable crossings of protected areas Alternative 2 was judged impracticable and then discarded.

- The assessment of Alternative 3 concluded that the crossing of the petrochemical plant appears as a constraint from a safety perspective. Moreover, in the south, an onshore protected area (Natura 2000) and Salina di Punta della Contessa Regional Nature Park would have to be crossed and as per Alternative 2, this route was judged impracticable.

In view of the above, Alternatives 2 and 3 were not considered further at that time.

Alternative 1 was scrutinised further as a technically adequate route whilst Alternative 4 was also carried forward as this was the only route avoiding offshore Natura 2000 sites. Site visits in 2008 and 2009 confirmed two feasible options for Alternative 4, from which the western Alternative 4 was found most suitable, in order to reduce impacts on ship traffic during offshore construction. Moreover, based on the October 2009 field survey findings, logistic sites required for the construction phase of Alternative 4 were also identified and preliminarily assessed from a technical, environmental, socio-economic and cultural heritage perspective.

In late 2009, local and regional stakeholders of Apulia were consulted in order to introduce Alternatives 1 and 4 as the pipeline route options, subject to final evaluation, as well as to verify the routes’ feasibility and approvability from a safety, environmental, socioeconomic and cultural heritage point of view. The key outcome of these consultations was that the stakeholders considered that Alternative 1 was impracticable due to crossing a Natura 2000 protected area (*Posidonia oceanica*) and Alternative 4 was impracticable as it interferes with future land-use plans of the Municipality of Brindisi (it should be highlighted that, as described in Annex 2, in a later stage of the project, this alternative was found impracticable also because of interference with a PG3 area, with a high hydrogeological risk). Since the formal approval process for the new land-use plan of Brindisi has been delayed up until today an update of the current situation is summarised in the following Box 4-1.
Brindisi Municipality is currently carrying out the authorization procedure for the implementation of a new urban plan. At the moment the new urban plan is going through a SEA (Strategic Environmental Assessment) procedure according to the National and Regional guidelines. According to the procedure, preliminary guidelines have been set-up for the new planning tool, including the definition of strategic objectives.

According to the plan, the Alternative 4 landfall area is foreseen as a “renaturalization” area of the coast line. Along the onshore pipeline route, projects for the improvement of the existing ecological network are included. Further restrictions in the landfall area are due to the city airport presence.

Therefore, the constraints previously identified in 2009-2010 for Alternative 4 are still in place, even if the new urban planning tool is not yet formally effective (i.e. the authorization procedure is still ongoing in terms of the SEA procedure step).

### 4.1 Route Re-Assessment for Alternative 3 (2010)

As a result of the consultation activities, in particular with the Municipality of Brindisi, TAP AG in 2010 decided to undertake a route re-assessment for Alternative 3. With regard to the Alternative 3 nearshore corridor (landing points in the proximity of the Petrochemical Plant of Brindisi), seven nearshore/landfall route options were identified (see Figure 2-3):

- **3A**: route approaching the coast following a corridor between the southern Brindisi Harbour shipping lane and the Posidonia oceanica meadow. Landing point is located in the artificial island realized for the planned construction of a LNG plant at that time planned by British Gas;
- **3B**: almost same nearshore section of the 3A but with landing point inside the fence of Petrochemical Plant;
- **3D**: almost same nearshore section of the 3A but with landing point in the greenfield south of the industrial area;
- **3E-S**: route crossing two Brindisi Harbour shipping lanes and landing in the Petrochemical Plant close by the flare stack;
- **3F-S**: route crossing two Brindisi Harbour shipping lanes and landing outside the Petrochemical Plant in an area inside a Regional Park, clear from civil and industrial settlements;
- **3G-S**: route crossing one Brindisi Harbour shipping lane twice and landing in the island of the future LNG by means of a microtunnel 1,950 m long;
- **3H-S**: route crossing two Brindisi Harbour shipping lanes and then the Posidonia oceanica meadow site by means of a long microtunnel (3,300 m) landing in an unused portion of industrial area.
Figure 4-1: Alternative 3: Overall Map of the Study Area
The re-assessment showed that nearshore, landfall and onshore areas of the Alternative 3 corridor are characterized by critical issues in terms of environmental impact and crossing of congested locations, which will require complex and, in some case, unconventional construction methods (potentially affected by technical risks). In this context the technical feasibility assessment of the analysed routes is affected by a high level of uncertainties which may be summarized as follows:

- **Nearshore**: Construction works along technically pursuable routes, having a potential direct and/or indirect impact on the environmentally protected areas (*Posidonia oceanica* formations/Natura 2000 area), are subjected to stringent limitations prescribed by Authority requirements which, at the current design step, may substantially change the envisaged technical solutions;

- **Nearshore/Landfall**: The extensive trenching works required potentially implies management of contaminated marine sediment and its replacement with “imported” non-contaminated soil;

- **Landfall**: The opportunity of a suitable landing point in an unused area south of the Brindisi industrial district is largely conflicting with the necessity to preserve the above mentioned environmentally protected areas in the nearshore at a distance of 1-2 km from the coast;

- **Onshore**: This section includes crossings of areas already allocated to different uses (future LNG Plant), narrow passages in very congested/populated areas and the Petrochemical Plant site. All these issues involve an increase in risk ("Seveso 3" requirements see *Seveso II Directive 96/82/EC*) and the possibility of not obtaining the authorization from the Authorities.
5 Conclusions of the Basic Engineering Phase Final Assessment (2008-2011)

Taking all of the above into account, the conclusions reached with respect to the feasibility of each of the landfall alternatives were as follows:

- **Alternative 1** was found impracticable due to crossing a Natura 2000 protected area (*Posidonia oceanica*);

- **Alternative 2** was found impracticable due to the crossing of a Natura 2000 protected area (*Posidonia oceanica*) and high, rugged cliffs at the landfall.

- **Alternative 3** was found impracticable from a constructability and safety point of view since it would pass through an area with extensive industry infrastructure and buildings associated with the existing industrial complex of Brindisi (the Polimeri Europa and Basell chemical plants). This alternative might also interfere with a protected area (*Posidonia oceanica* formations/Natura 2000 area) that is very close to the route and passes through areas of heavy soil contamination. These negative outcomes arise from a detailed evaluation undertaken on at least seven different route refinement options for Alternative 3 (see Section 4.1), as above summarized.

- **Alternative 4** interferes with future land-use plans of the Municipality of Brindisi and is therefore no longer a viable alternative. There are also numerous clusters of houses in close proximity to the route, which could be incompatible with the realization of the TAP Project.

As none of the four options was found to be feasible from a technical or environmental perspective it was concluded that the option of a landfall further south within the corridor between Brindisi and Otranto needed to be re-assessed. However, south of Brindisi the offshore Natura 2000 sites extend continuously as far south along the coast to a location 2 km north of San Foca (See Figure 5-1).
Out of this process a new route option was identified and termed Alternative 0. In comparison with the other alternatives, Alternative 0 represents the optimal solution in terms of technical viability, safety and environmental, socioeconomic, land-use and cultural heritage impacts for the following reasons (see Section 5):

- it does not interfere with offshore and onshore protected areas;
- the onshore route lies within agriculture areas and not urbanized areas; and
- the route does not cross any protected (Natura 2000) areas.

For the above reasons Alternative 0 was considered the best option at this point and was chosen as the Project “base case” route.
6 Route Refinement for Alternative 0 and first ESIA submission (2012)

The "Alternative 0" pipeline route was then further refined including the following aspects:

- A few very slight adjustments were introduced based on updated cadastral maps, in order to guarantee safe distance from buildings (see safety zones) and to reduce as much as possible the number of land parcels affected by service easement;
- The PRT location was assessed and optimised;
- A minor rerouting was applied after the new location for the PRT site was identified and considering local stakeholder engagement results.
- A landfall microtunnel extension was introduced to avoid any impacts on coastal cliffs and on nearshore sea grass resources or conflicts with possible future tourism development.

Based on the results of this re-routing and after completing the Scoping procedure, TAP AG applied for the Italian EIA Procedure, submitting an ESIA evaluating the social and environmental impacts of Alternative 0 on 15th March 2012.
7 Review of the Alternative Assessment Process

The main issues resulting from ESIA consultations about Alternative 0 were the following:

- The landfall of Alternative 0 was located within a zone identified as being of high hydrogeomorphological risk due to the potential instability of the sea cliffs. Despite the fact that the proposed microtunnel would be a proper technical solution in order to avoid negative effects on the stability of the sea cliffs, the Basin Authority has expressed non-compliance of the Project with the regional planning legislation on hydro-geological risks.

- The proposed PRT location was found to fall within the landscape protection area (Coastal and Territorial area of Melendugno, acknowledged by the Decree 42/2004, Art.136, Paragraph 1, letter c and Law 1497/39). Given this location, the Ministry of Cultural Heritage recommended TAP to locate the PRT outside this constrained area, even if a good landscape mitigation design could reduce the PRT landscape impact.

This led to a halt in the permitting procedure and the Ministry of Environment granted TAP three successive suspensions of the authorization process (up to September 2013). Further landfall/route/PRT refinements conducted subsequent to March 2012 are described in Annex 2 Alternative Assessment, which provides the final Base Case Alternative.