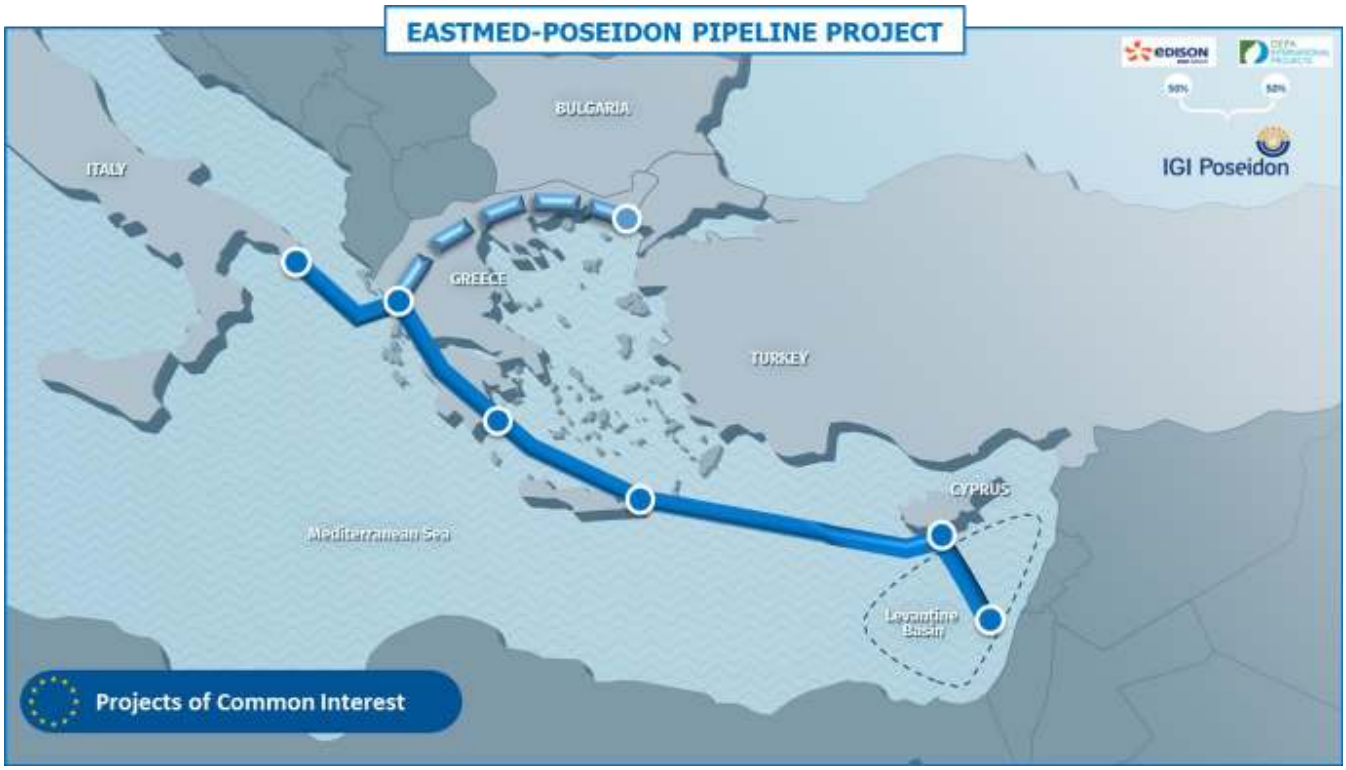
PROJECT:

EastMed Pipeline Project



Document Title:	EastMed Greek Section – Environmental and Social Impact Assessment
Document Subtitle	Chapter 7- Project's Alternatives
Project Document No:	PERM-GREE-ESIA-007_0_ESIAch07

Document details	
Document title	EastMed Greek Section – Environmental and Social Impact Assessment
Document subtitle	Chapter 7 - Project's Alternatives
Company	IGI Poseidon
Author	ASPROFOS Engineering
Project	EastMed Pipeline Project
Project Document No.	PERM-GREE-ESIA-007_0_ESIAch07
Date	03/06/2022
Version	00

Document history					
Revision	Author	Reviewed by	Approved by	Date	Status
00	ASPROFOS	ERM	IGI POSEIDON	03/06/2022	For submission to Authorities

Table of Contents

List of Tables

List of Figures

Abbreviations

See Document Map.

7 PROJECT'S ALTERNATIVES

7.1 Introduction

Scope of this Chapter is to present the assessment of the various alternatives that assessed for the EastMed Pipeline Project within Greek jurisdiction.

Initially it provides an overview of the design alternatives for the project's footprint, the methodology and the feasible main alternatives investigated in the scope of the ESIA phase; and finally, the zero alternative.

It is noted that all alternatives assessed are viable and feasible and have been taken into consideration during the design of the project. It is clarified that fieldworks have been performed only for the qualified as baseline solution; the viability and feasibility of all alternatives have been assessed with site visits.

Annex 7A presents in detail each alternative as well as the corresponding alternative evaluation matrices.

7.2 Project Conceptual Design

The identification of the conceptual design of the project, meaning basic geomorphological, technical, environmental and economic considerations, started back in 2012. During that time and up until 2018, the feasibility study of the project was elaborated which investigated various conceptual corridors and potential critical aspects of the EastMed Project.

Among others, the following were taken into consideration for the selection of the project conceptual corridor:

- Gas reserves to be connected to the pipeline. The project corridor should facilitate the transportation of natural gas[1] from countries which are interested in transferring gas from their reserves to the European Market through the specific project;
- Technical-economic considerations, e.g. most cost-effective solution, taking into consideration short and medium term funding options, market values, construction costs, operational costs

[1] At present also the transportation of hydrogen is possible.

(CAPEX/OPEX ratio), safety restrictions, technical constraints, environmental/social considerations, and regulatory compliance; and

- Compliance with European and national policies. This entails the European South Gas Corridor and Energy Policy. EU energy transition policy focuses on decarbonisation and democratization of energy, security of energy supply and competitiveness in the natural gas (NG) sector, and energy diplomacy.

On this basis, various alternative scenarios were investigated. In the early phases of the project development, different project conceptual corridors (footprint) from Crete were extensively assessed (South-east/ East coastline of Peloponnese, Central Greece, i.e. in Thessaly, Northern Greece, near Komotini). Similarly, multiple alternatives for the landing on the coastline of Peloponnese were investigated since this was identified as the optimum conceptual corridor. The connection with the Peloponnese is considered the best solution because it allows for the following:

- NG supplying network to an area currently remote from existing NG infrastructure (while central and northern Greece already hosts gas pipelines with some branches allowing for possible connection of various areas to NG);
- an interconnection with the Greek National gas transmission system, close to the Megalopoli Power Plant; and
- NG and opportunities for clean energy sources in major population centres of this region (for example Patras and Sparta).

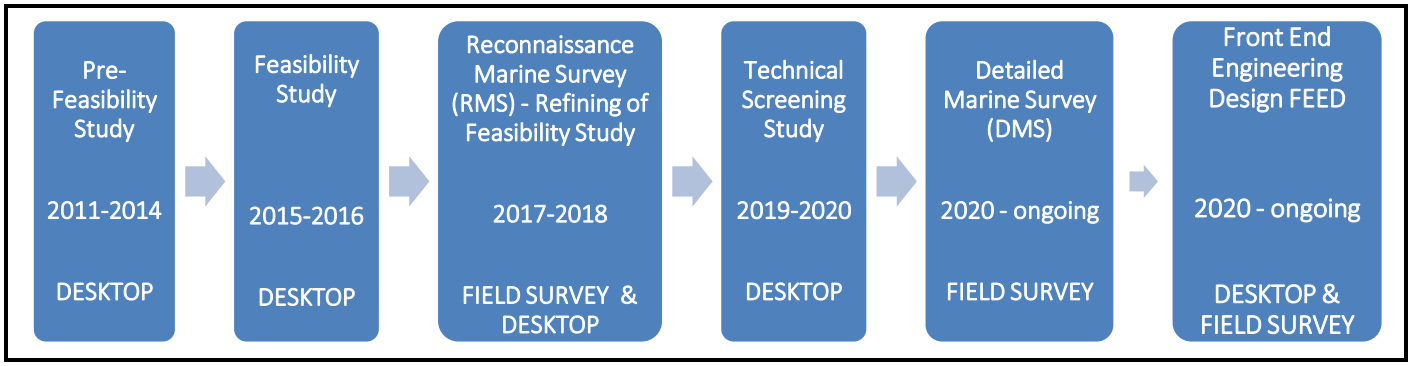
The Project definition was developed during different phases, including the following steps (Figure 7-1):

- Pre-Feasibility Study (2011-2014);
- Feasibility Study (2015-2018); definition of conceptual design (i.e. the basic geomorphological, environmental, economic and political considerations);
- Reconnaissance Marine Survey - RMS (2017-2018);
- Refining of Feasibility Study (advanced feasibility), following RMS results (2018)
- Technical Screening Study – for route optimization (2019-2020);
- Detailed Marine Survey - DMS (2020 - ongoing); and
- Front End Engineering Design (2020 - ongoing).

An early investigation of the most appropriate landfall areas and coast sections was performed in Crete and Peloponnese, and the relevant data were further refined (see details in relevant paragraphs of Section 7.5, below). During landfall investigations, the aim was to identify and refine the route

alignment within the conceptual corridor so as to avoid areas with environmental sensitivities, areas with extended cultivations (e.g. greenhouses), tourist areas and areas with difficult morphology.

As indicated above, the evaluation of the landfalls took into consideration the connection to the corresponding onshore route. That is, from the landfall site the pipeline needs to connect with the onshore route, and thus avoidance of environmentally sensitive onshore areas, archaeological sites, settlements, etc. was also considered.



Source: ERM, 2021

Figure 7-1 EastMed Pipeline Project: Route Refinement Process Flow Chart.

Some key considerations for identifying the conceptual corridor at the coast and the connection with the onshore routes included the following:

- Crete. The eastern and southern coasts of Crete have a particular morphology with either long canyons oriented North-South or settlements, several of them with relevant tourism interests. Moreover, a dense network of Natura areas is found in rather pristine areas. As a consequence, the wider area of Atherinolakkos, already hosting the "Atherinolakkos Power Plant" of Public Power Cooperation was defined as the most suitable area for the location of the landfall alternatives;
- East Peloponnese. In East Peloponnese the vast majority of the coastal zones are characterised by steep slopes and complex morphology, towered inland by hilly and semi-mountainous ranges. Even where the coastal zone could be easily accessed from the sea, the technical works required for accessing and constructing the onshore section on the hilly and semi-mountainous ranges would require significant interventions, meaning both increase in environmental impacts and costs. The few areas where geomorphological restrictions are absent (e.g. Astros, Leonidio) are areas well known for their domestic tourism development, so they were considered less suitable than other areas in the region.

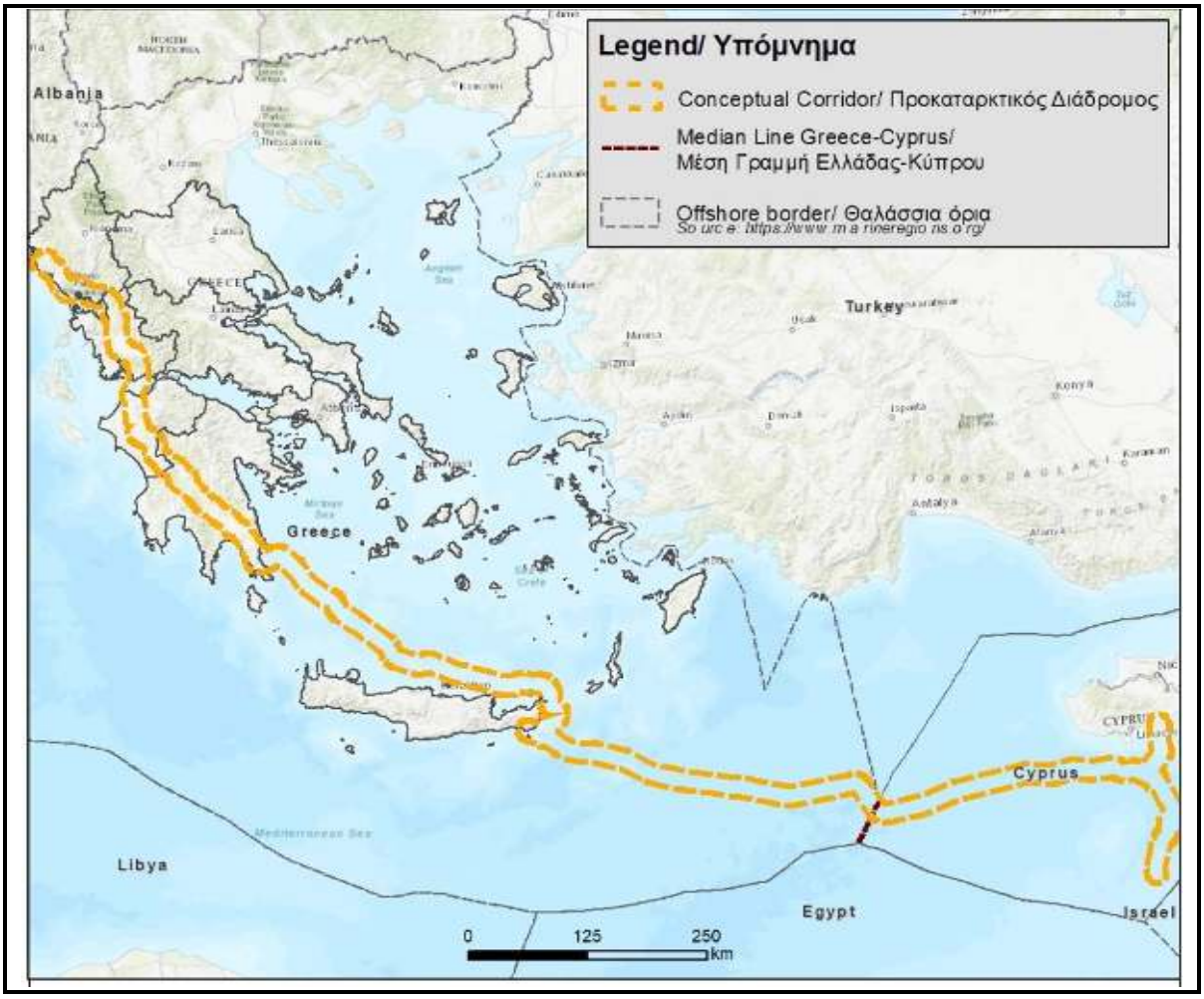
The south-east coast of Peloponnese presents the above constraints to a lesser extent, hence was the preferred option for the landing alternatives in Peloponnese; and

- North-West Peloponnese. In Northern Western Peloponnese coastline, there is a touristic development and settlements hosting family summer houses and traditional holiday venues. The North West coastline of Peloponnese is very popular for domestic tourism given the proximity to the biggest population centre of Greece, its capital, Athens. Apart from local residents or families with origins in the specific area who visit their ancestral homes and places throughout the year, many Athenians choose NW Peloponnese (especially the coastline) for short term vacations (during weekends and bank holidays) or even summer holiday.

Upon selection of a preferred conceptual corridor (undertaken for both offshore and onshore pipeline alignments), a process of route refinement commenced in order to optimize the route, especially for those sections which present greater technical/geohazards, environmental, socioeconomic and cultural heritage challenges.

Details on the assessed alternatives as well as other project development phases are presented in sections 7.3.1 and 7.5.

Section 15.1.3 - Alternatives Map also supports the alternatives assessment.



Source: ERM, 2021

Figure 7-2 EastMed Pipeline Project: Conceptual Corridor Design.

7.3 Methodology

7.3.1 Overview

As part of the assessment, the Zero Alternative has been evaluated and presented in section 7.4. In addition, a number of alternatives for the project footprint have been investigated which include pipeline route alignments and the location of main facilities (i.e. compressor and metering stations).

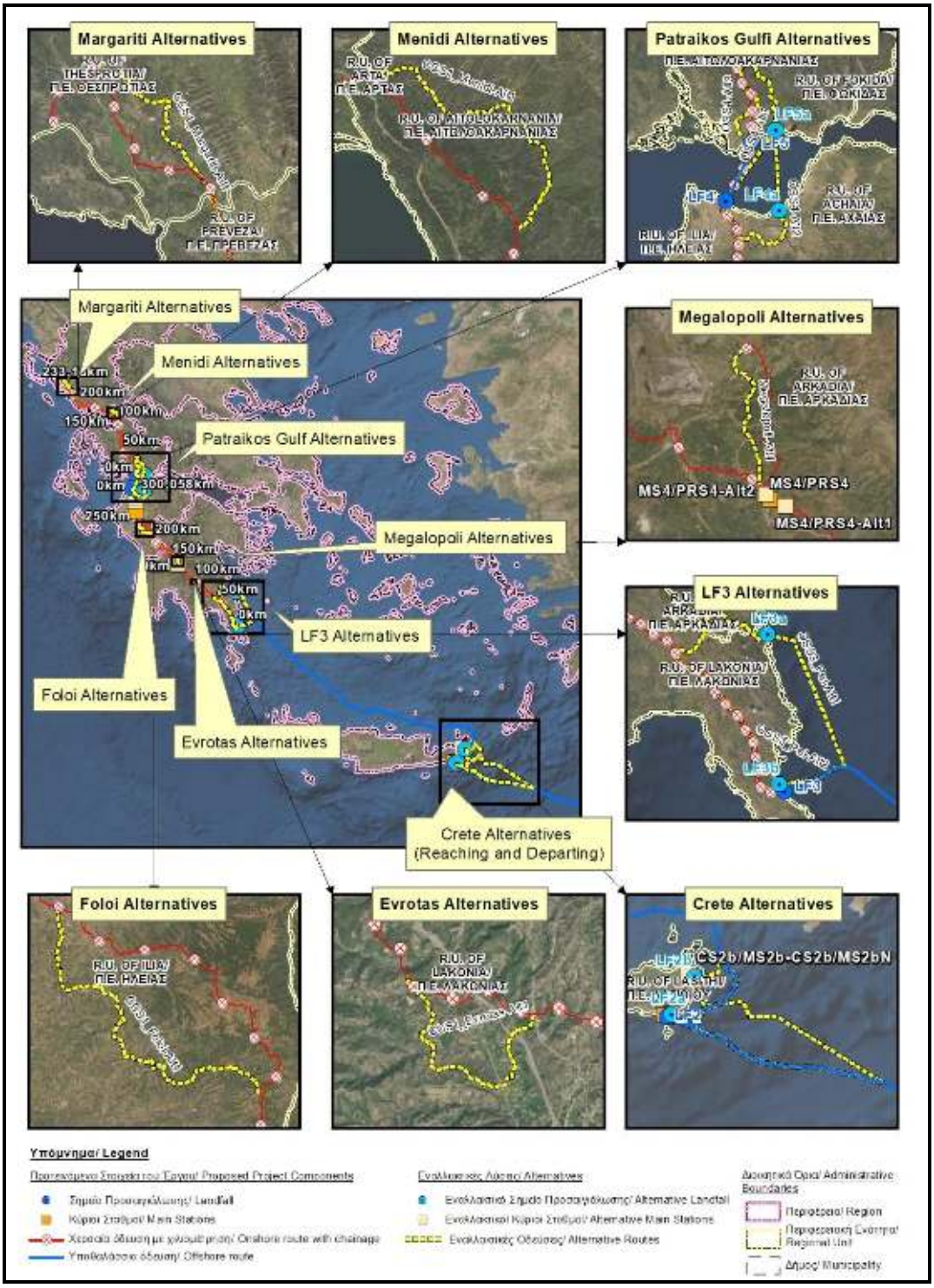
It should be noted that the pipeline routes (onshore and offshore) are part of the overall project, and therefore the offshore pipeline cannot be evaluated as an isolated element because the selection of the landfall has obvious implications for the potential impacts onshore. For instance, if a landfall site is evaluated as an isolated element, it may be considered better in terms of technical feasibility and environmental and social impacts than another landfall site alternative. However, this preferable landfall site, might induce significant impacts on the sections of the onshore and offshore approaches to the landfall point, and thus be in fact a less desirable project alternative.

In order to have a meaningful alternative assessment, the alternatives definition on the landfall and nearshore areas include the same starting point and end point. In other words, to allow for a holistic alternatives assessment and for a direct comparison between the various alternatives, common starting and ending points have been defined for all alternatives at a specific area. Obviously, this does not apply to the main facilities locations.

Lastly, the reader should note that the twin offshore pipelines, i.e. Southern Line (OSS2) and the Northern Line (OSS2N) in Greece, are very close to each other; hence, they can be assumed as one interconnector pipeline. This is why alternatives are assessed for the integrated pipeline, i.e. Pipeline System OSS2/OSS2N and Pipeline System OSS3/OSS3N.

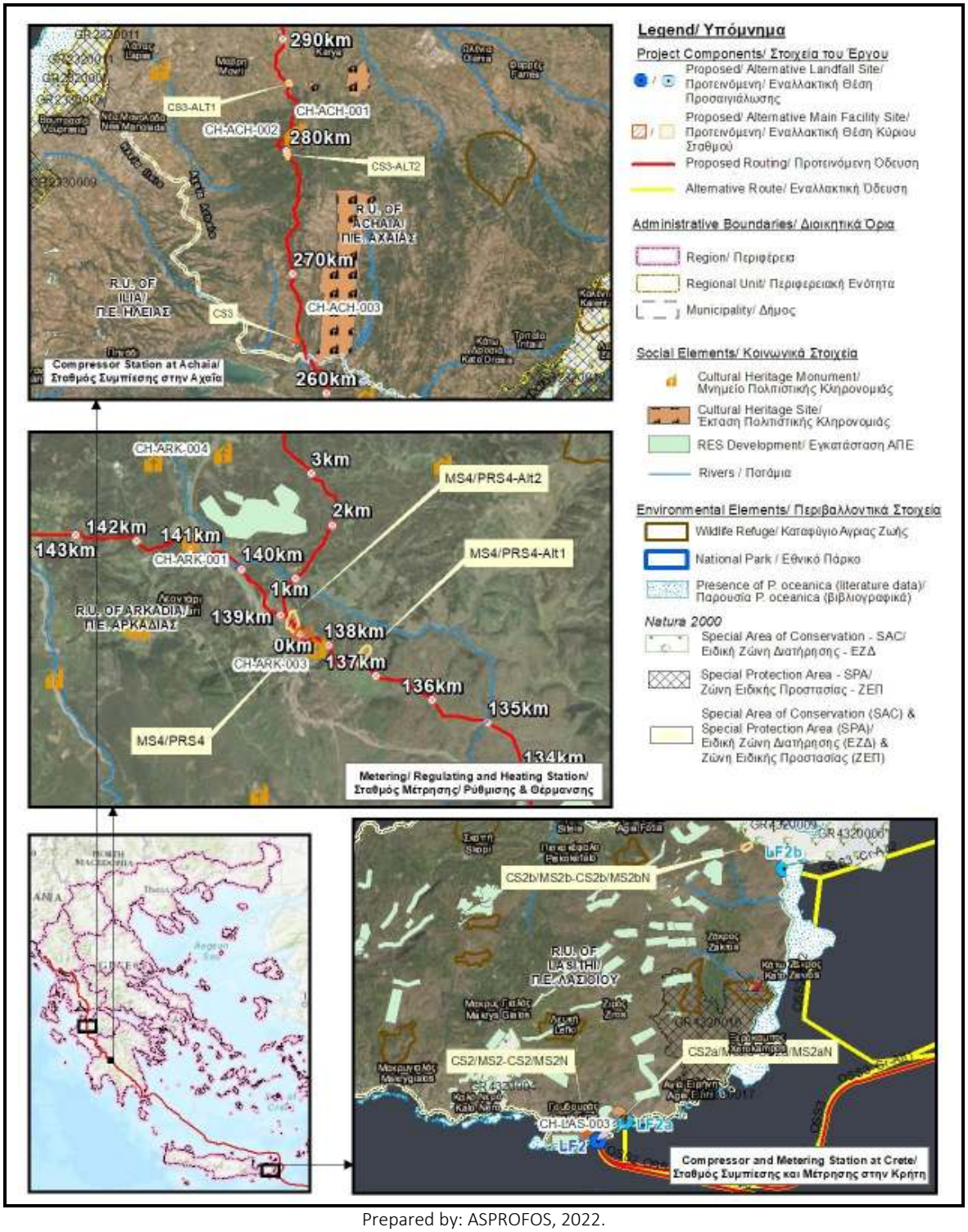
A summary of the alternatives assessment is presented in Table 7-1 and an overview in Figure 7-3. Map 15.1.3 provides the alternative routes in more detail, including environmental and social constraints.

Table 7-2 summarizes the alternatives investigated for the main project facilities (i.e. the compressor and metering stations); an overview is presented in Figure 7-4 and details are provided in Map 15.1.3.2. This map also presents the alternatives for all line valve stations (i.e. BVS, SS, LS) and the O&Ms. Alternatives of these features are not assessed given their minimum interaction with and no impact on the environment (natural and social); consequently, no real differentiation exists on the environmental performance of these features' alternatives.



Prepared by: ASPROFOS, 2022.

Figure 7-3 Overview of Feasible Pipeline Route Alternatives.



Prepared by: ASPROFOS, 2022.

Figure 7-4 Overview of Feasible Station Alternatives.

Table 7-1 Overview of Pipeline Route Alternatives.

#	Name	Project Components	ESIA Study Area Sections	Spatial Context	Characteristic Points	Alternatives Assessed
1	OSS2 Reaching Crete	• OSS2 • LF2	• South Cretan Sea • Crete	• the nearshore area at South Cretan Sea • the landfall area at SE Crete	• Starting point: close to KP 575 of OSS2/OSS2 N Line, at approx. 2100 m WD. • Ending point: Landfall site at SE coastline of Crete	• OSS2-LF2 Base-case (OSS2-BC), as resulting from the starting point and reaching base-case landfall site LF2, at SE shores of Crete, close to Atherinolakkos area (Gourouras settlement), in the Municipality of Sitia. • OSS2-LF2a Alternative (OSS2-Alt1), as resulting from the starting point and reaching alternative landfall site LF2a, at SE shores of Crete, close to the Livari area, in the Municipality of Sitia. • OSS2-LF2b Alternative (OSS2-Alt2), as resulting from the starting point and reaching alternative landfall site LF2b, at E shores of Crete, close to Skinias beach and Paleokastro settlement, in the Municipality of Sitia.
2	OSS3 Departing Crete	• OSS3 • LF2	• South Cretan Sea • Crete	• the landfall area at SE Crete • the nearshore area at South Cretan Sea	• Starting point: Landfall site at SE coastline of Crete (same as #1) • Ending point: close to KP 55, at approx. 750 m WD.	• LF2-OSS3 Base-case (OSS3_Cr-BC), as resulting from the base-case landfall site LF2 at SE shores of Crete, close to Atherinolakkos area (Gourouras settlement), in the Municipality of Sitia and reaching base-case OSS3, at the ending point. • LF2a-OSS3 Alternative (OSS3_Cr-Alt1), as resulting from the alternative landfall site LF2a, at SE shores of Crete, close to the Livari area, in the Municipality of Sitia and reaching base-case OSS3, at the ending point.

#	Name	Project Components	ESIA Study Area Sections	Spatial Context	Characteristic Points	Alternatives Assessed
						• LF2b-OSS3 Alternative (OSS3_Cr-Alt2), as resulting from the alternative landfall site LF2b, at E shores of Crete, close to Skinias beach and Paleokastro settlement, in the Municipality of Sitia and reaching base-case OSS3, at the ending point.
3	OSS3 Reaching Peloponnese	• OSS3 • LF3 • CCS1	• South East Aegean • Peloponnese	• the nearshore area at South East Aegean Sea • the landfall area at SE Peloponnese • the terrestrial area at SE Peloponnese	• Starting point: close to KP 410 of OSS3, at approx. 600 m WD. • Ending point: close to KP 65 of CCS1, close to Geraki Settlement, M. of Evrotas	• CCS1-OSS3 Base-case (OSS3_Pel-BC), as resulting from the starting point and reaching base-case landfall site LF3, at SE Peloponnese shores close to Agios Fokas settlement, in the Municipality of Monemvasia (southern limits of the Municipality) and reaching base-case CCS1, at the ending point. • CCS1-OSS3 Alt1 (OSS3_Pel-Alt1), as resulting from the starting point and reaching alternative landfall site LF3a, at the shores between Kiparisi and Kapsala, in the Municipality of Monemvasia (northern limits of the Municipality) and reaching base-case CCS1, at the ending point. • CCS1-OSS3 Alt2 (OSS3_Pel-Alt2), as resulting from the starting point and reaching alternative landfall site LF3b, at the shores of Kastela area, in Municipality of Monemvasia (southern limits of the Municipality) and reaching base-case CCS1, at the ending point.

#	Name	Project Components	ESIA Study Area Sections	Spatial Context	Characteristic Points	Alternatives Assessed
4	Evrotas	CCS1	Peloponnese	R. Evrotas crossing, in the broader area N of Sparti	• Starting point: close to KP 100 of CCS1, near the E961 Road (Tripoli – Githio), Municipality of Sparti. • Ending point: close to KP 105 of CCS1, close to Provincial Road of Sparti - Megalopoli, Municipality of Sparti	• CCS1 Base-case (CCS1_Evrotas-BC), as resulting from the starting point, crossing R. Evrotas and E71 Road (Central Peloponnese Highway) at the NE and N of Karavas Soustianon settlement, respectively, before reaching ending point. • CCS1 Alt1 (CCS1_Evrotas-Alt1), as resulting from the starting point, crossing R. Evrotas and E71 Road (Central Peloponnese Highway) east of Karavas Logastras settlement, before reaching ending point.
5	Megalopoli	Megalopoli	Peloponnese	Entire Megalopoli branch.	• Starting point: close to KP 140 of CCS1, near Soulari Settlement, Municipality of Megalopoli. • Ending point: close to KP 10 of Megalopoli branch, close to Perivolia settlement, Municipality of Megalopoli	• Megalopoli Base-case (Megalopoli-BC), as resulting from the starting point, crossing R. Alfios close to Provincial Road of Sparti – Megalopoli, SE of Gefyra settlement, before reaching ending point. • Megalopoli Alt1 (Megalopoli-Alt1), as resulting from the starting point, crossing R. Alfios close to E71 Road (Central Peloponnese Highway), SE of Gefyra settlement, before reaching ending point.
6	Foloi Plateau	CCS1	Peloponnese	Crossing of Foloi plateau	• Starting point: close to KP 213 of CCS1, near	• CCS1 Base-case (CCS1_Foloi-BC), as resulting from the starting point, passing north of Lalas settlement,

#	Name	Project Components	ESIA Study Area Sections	Spatial Context	Characteristic Points	Alternatives Assessed
				area in the Municipality of Ancient Olympia (Vasilaki settlement) and Municipality of Pirgos (Mouzaki settlement)	Vasilaki Settlement, Municipality of Ancient Olympia. • Ending point: close to KP 246 of CCS1, near Mouzaki settlement, Municipality of Pirgos	Municipality of Ancient Olympia and Goumero settlement, Municipality of Pirgos, before reaching ending point. • CCS1 Alt1 (CCS1_Foloi-Alt1), as resulting from the starting point, passing south of Lalas settlement, Municipality of Ancient Olympia and Goumero settlement, Municipality of Pirgos, before reaching ending point.
7	Patraikos Crossing	• CCS1 • LF4 • OSS4 • LF5 • CCS2	• Peloponnese • Patraikos Gulf • Western Continental Greece	• Plain of Achaia, in NW Peloponnese • landfall area at NW Peloponnese • Patraikos Gulf • landfall area at SW Etoloakarnania • Plain of Evinochori and Mt Arakynthos area at SW Etoloakarnania	• Starting point: close to KP 286 of CCS1, W of Petrochori settlement, Municipality of Dytiki Achaia. • Ending point: close to KP 29 of CCS2, NW of Grammatiko Settlement, M. of Agrinio	• OSS4 Base-case (OSS4-BC), as resulting from the starting point, reaching base-case landfall site LF4 close to Lakopetra settlement (Kalamaki beach), in the Municipality of Dytiki Achaia, crosses Patraikos Gulf, reaching base-case landfall site LF5 south of Evinochori settlement in the Municipality of Nafpaktia, crossing R. Evinos north of Evinochori settlement, starts climbing Mt Arakinthos in Municipality of I.P. of Messolonghi, before reaching ending point. • OSS4 Alternative 1 (OSS4-Alt1), as resulting from the starting point, reaching base-case landfall site LF4 close to Lakopetra settlement (Kalamaki beach), in the Municipality of Dytiki Achaia, crosses Patraikos Gulf, reaching alternative landfall site LF5a east of Kato Vasiliki settlement, Municipality of Nafpaktia, crossing R. Evinos

#	Name	Project Components	ESIA Study Area Sections	Spatial Context	Characteristic Points	Alternatives Assessed
						north of Trikorfo settlement, starts climbing Mt Arakinthos in Municipality of Agrinio, before reaching ending point. • OSS4 Alternative 2 (OSS4-Alt2), as resulting from the starting point, reaching alternative landfall sites LF4a, at Tsoukaleika, Municipality of Patra, R.U. of Achaia, crosses Patraikos Gulf, reaching alternative landfall site LF5a east of Kato Vasiliki settlement, Municipality of Nafpaktia, crossing R. Evinos north of Trikorfo settlement, starts climbing Mt Arakinthos in Municipality of Agrinio, before reaching ending point. • OSS4 Alternative 3 (OSS4-Alt3), as resulting from the starting point, reaching base-case landfall site LF4 close to Lakopetra settlement (Kalamaki beach), in the Municipality of Dytiki Achaia, crosses Patraikos Gulf, reaching base-case landfall site LF5 south of Evinochori settlement in the Municipality of Nafpaktia, crossing R. Evinos west of Evinochori settlement, starts climbing Mt Arakinthos in Municipality of I.P. of Messolonghi, before reaching ending point.
8	Menidi	CCS2	Western Continental Greece	Crossing of Mt Makrinoros in the area of Wildlife Refuge of "Iera Moni	• Starting point: close to KP 112 of CCS2, SE of Agia Triada settlement, Municipality of Amfilochia.	• CCS2 Menidi (CCS2_Menidi-BC), as resulting from the starting point, running parallel to the coastline of Amvrakikos Gulf west of Retha Monastery, on the west ridges of Mt Makrinoros, at the westernmost boundaries

#	Name	Project Components	ESIA Study Area Sections	Spatial Context	Characteristic Points	Alternatives Assessed
				Retha and Iera Moni Loggos" (Monastery of Retha and Monastery of Loggos)	• Ending point: close to KP 126 of CCS2, close to Marlesi settlement, Municipality of Amfilochia	of the Wildlife Refuge of "Iera Moni Retha and Iera Moni Loggos", before reaching ending point. • CCS2 Alt1 (CCS1_Menidi-Alt1), as resulting from the starting point, passing east of Retha Monasteri, on the central ridges of Mt Makrinoros, at the easternmost boundaries of the Wildlife Refuge of "Iera Moni Retha and Iera Moni Loggos", before reaching ending point.
9	Margariti	• CCS2	• Western Continental Greece	• Crossing of the broader area of Margariti marshlands and valley formed between the mountain ranges of Parga and of Paramythia	• Starting point: close to KP 198 of CCS2, W of Kastri settlement, Municipality of Parga. • Ending point: close to KP 225 of CCS2, NW of Karteri settlement, Municipality of Igoumenitsa	• CCS2 Margariti (CCS2_Margariti-BC), as resulting from the starting point, passing west of Kipseli settlement, Municipality of Parga, and running parallel to the marshlands of Kalodiki, Margariti and Karteri, before reaching ending point. • CCS2 Alt1 (CCS1_Margariti-Alt1), as resulting from the starting point, passing east of Kipseli settlement, Municipality of Parga, and southwest of Paramythia settlement, Municipality of Souli, south of Lake Prondani, before reaching ending point.

Prepared by: ASPROFOS, 2022.

Table 7-2 Overview of Main Facilities Alternatives.

#	Project Components	ESIA Study Area Sections	Spatial Context	Alternatives Assessed
1	Facilities at Crete (CS2/MS2-CS2/MS2 N)	Crete	SE Crete	• CS2/MS2-CS2/MS2N Base-case (CS2/MS2-CS2/MS2N BC) in the area of Atherinolakkos • CS2/MS2-CS2/MS2N Alternative 1 (CS2a the/MS2a-CS2a/MS2aN) in the Livari area • CS2/MS2-CS2/MS2N Alternative 2 (CS2b/MS2b-CS2b/MS2bN) in the Skinia area
2	Compressor Station at Achaia (CS3)	Peloponnese	Municipality of Dytiki Achaia (NW Peloponnese)	• CS3 Base-case (CS3 BC), in the area of Kato Velitses, Municipality of Dytiki Achaia • CS3 Alternative 2 (CS3-ALT1), in the area of Lampreika, Municipality of Dytiki Achaia • CS3 Alternative 3 (CS3-ALT2), in the area of Vithoulka, Municipality of West Achaia
3	Metering, Regulating and Heating Station (MS4/PRS4 & Heating)	Peloponnese	Megalopoli area	• MS4/PRS4 & Heating Station Base-case (MS4/PRS4 & Heating BC), in the area of Soulari settlement (900 m to the North), Municipality of Megalopoli • MS4/PRS4 & Heating Station Alternative 1 (MS4/PRS4 & Heating Alt 1), in the area of Soulari settlement (300 m to the North), Municipality of Megalopoli • MS4/PRS4 & Heating Station Alternative 2 (MS4/PRS4 & Heating Alt 2), in the area of Soulari settlement (1100 m to the North), Municipality of Megalopoli

Prepared by: ASPROFOS, 2022.

7.3.2 Project Footprint Alternatives Evaluation Criteria

The evaluation of alternatives is based on a range of different criteria, which include environmental characteristics, socioeconomic characteristics as well as the possible presence of cultural heritage constraints, i.e. ESIA criteria. However, the selection also needs to take into consideration technical and geotechnical criteria related to the constructability and/or viability (in terms of technical-economic parameters), i.e. FEED criteria.

The criteria used for the pipeline route alternatives assessment are presented in Table 7-3, whilst the main facilities assessment criteria are presented in Table 7-4. In total, 80 criteria have been used for the pipeline route alternatives assessment and 31 for the assessment of the main stations facilities. These criteria are grouped in various categories, depending on the project component and the possible interactions with design and ESIA related parameters.

Given the large number of criteria applicable and in order to facilitate the presentation of data, each section presents only the relevant set of criteria (i.e. those that show differences between alternatives and thus can be used as the basis for the selection). The complete alternatives assessment matrix is also presented at the end of each relevant section for validation and a more detailed evaluation, if and as required.

The selection of the best alternative is a multi-criteria and multi-disciplinary exercise. Given the different objectives of each discipline (i.e. FEED and ESIA), the ranking of the alternative according to one set of criteria may differ from the ranking according to another set of criteria. The selection therefore is based on the weighted average of potential advantages and disadvantages and therefore, the expert opinion is also relevant in order to weight the relevance of the several criteria involved in each alternative.

It is noted that it is not within the scope of an ESIA to document all FEED criteria used for the design of the project. However, a high level qualitative assessment of the main technical parameters and challenges is provided, where necessary.

Table 7-3 ESIA Related Criteria for Evaluation of Pipeline Route Alternatives.

Code	Criteria	Definition	Units	Relation to impacts evaluation
L1	Length total (km)	Total path length within the study area	km	Duration of impacts on all parameters.
L2	Length onshore (km)	Total path length within the study area	km	Duration of impacts on all parameters.
L3	Length offshore (km)	Total path length within the study area	km	Duration of impacts on all parameters.
ES	Environmental Sensitivities			
ES1	Broad-leaved forest (Code CLC:311)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Permanent loss of forests due to safety restrictions during operation.
ES2	Coniferous forest (Code CLC:312)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Permanent loss of forests due to safety restrictions during operation.
ES3	Mixed forest (Code CLC:313)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Permanent loss of forests due to safety restrictions during operation.
ES4	Natural grasslands (Code CLC:321)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Temporary loss of grasslands due to safety restrictions during construction.
ES5	Sclerophyllous vegetation (Code CLC:323)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Permanent loss of bushlands due to safety restrictions during operation.
ES6	Transitional woodland/shrub (Code CLC:324)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Permanent loss of trees and shrubs due to safety restrictions during operation.
ES7	Beaches, dunes, sands (Code CLC: 331)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Temporary loss of beaches, dunes, sands due to safety restrictions during construction.

Code	Criteria	Definition	Units	Relation to impacts evaluation
ES8	Bare rock (Code CLC: 332)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Increased nuisance during construction due to noise (use of explosives, and/ or increase construction rate).
ES9	Sparsely vegetated areas (Code CLC: 333)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km^2 (%)	Temporary loss of sparsely vegetated areas due to safety restrictions during construction.
ES10	Inland marshes (Code CLC: 411)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km^2 (%)	Temporary loss of inland marshes due to safety restrictions during construction. Risk of impacts on water balance of the area.
ES11	Shallow water habitats	Various benthic communities, coralligenous formations and other habitats, growing in dim light conditions as well as a broad range of sciaphilic and perennial organisms.	Qualitative assessment	Temporary or permanent impacts on sensitive formations.
ES12	Deep sea habitats	Various benthic communities, coralligenous formations and other habitats, growing in deep sea (depths below where solar luminance plays a direct environmental role).	Qualitative assessment	Temporary or permanent impacts on sensitive formations.
ES13	Marine caves	Hollows formed by natural processes along the coast or the seabed.	Qualitative assessment	Temporary or permanent impacts on sensitive formations.
ES14	Endangered Species	Information on endangered species of biodiversity, according to IUCN and/ or national Red List datasets.	Qualitative assessment (conservation status: NATIONAL/ IUCN)	Temporary or permanent impacts on priority species.

Code	Criteria	Definition	Units	Relation to impacts evaluation
ES15	Other elements of Natural interest	Information on features of biodiversity interest, such as local corridor passages, nesting/feeding grounds, etc.	Qualitative assessment	Temporary or permanent impacts on sensitive formations.
ES16	Naturalness	Overall assessment of ecological status of the engaged area. The 'naturalness' criterion is defined as the degree to which an area is pristine and characterized by native species (i.e. absence of perturbation by human activities and absence of introduced or cultured species).	Qualitative assessment	Temporary impacts and potential permanent (fragmentation) to a pristine (or not) natural environment.
ES17	Vulnerability to natural disasters and Industrial accidents	Distance from restricted/ safety areas.	Qualitative assessment	Assessment of presence of infrastructures that may be sensitive such as other O&G infrastructures, etc., in the vicinity of the alternative.
OC	**Oceanographic Characteristics**			
OC1	Route length within Euphotic Zone (isobath of 40 m)	Total path length within the most sensitive marine zone	km	Duration and intensity of impacts on marine resources. Shallow waters are more sensitive and important due to their support to fish-populations and their role as biodiversity hotspots, in general.
OC2	Route length within Epipelagic Zone (isobath of 200 m)	Total path length within the Epipelagic Zone	km	Duration and intensity of impacts on marine resources.
OC3	Route length, up to the isobath of 600 m	Total path length within intermediate depths waters	km	Duration and intensity of impacts on marine resources.

Code	Criteria	Definition	Units	Relation to impacts evaluation
OC4	Route length, in depths greater than 600 m	Total path length within deep waters	km	Duration and intensity of impacts on marine resources.
P	**Protected Areas**			
P1	Natura 2000| Intersection (m)	Total area to be cleared along the working strip within areas of conservation interest in accordance with Directive 92/43/EEC	Total number & total km	Impact on environmentally sensitive areas of International protection.
P2	Natura 2000| Proximity (m)	Total area in proximity to the working strip within areas of conservation interest in accordance with Directive 92/43/EEC	Total number & minimum distance in km (per feature)	Impact on environmentally sensitive areas of International protection.
P3	Wild Life Refuge | Intersection (m)	Total area to be cleared along the working strip within areas included in the national system of protected areas of L. 3937/2011 (A' 60) (excluding Natura sites)	Total number & total km	Impact on environmentally sensitive areas of national protection (excluding Natura sites).
P4	Wild Life Refuge | Proximity (m)	Total area in proximity to the working strip within areas included in the national system of protected areas of L. 3937/2011 (A' 60) (excluding Natura sites)	Total number & minimum distance in km (per feature)	Impact on environmentally sensitive areas of national protection (excluding Natura sites).

Code	Criteria	Definition	Units	Relation to impacts evaluation
P5	National Park | Intersection (m)	Total area to be cleared along the working strip within areas included in the national system of protected areas of L. 3937/2011 (A' 60) (excluding Natura sites)	Total number & total km	Impact on environmentally sensitive areas of national protection (excluding Natura sites).
P6	National Park | Proximity (m)	Total area to be cleared along the working strip within areas included in the national system of protected areas of L. 3937/2011 (A' 60) (excluding Natura sites)	Total number & minimum distance in km (per feature)	Impact on environmentally sensitive areas of national protection (excluding Natura sites).
P7	Landscape of Outstanding Natural Beauty | Intersection (m)	Total area to be cleared along the working strip within areas included in the national system of protected areas of L. 3937/2011 (A' 60) (excluding Natura sites)	Total number & total km	Impact on environmentally sensitive areas of national protection (excluding Natura sites).
P8	Landscape of Outstanding Natural Beauty | Proximity (m)	Total area to be cleared along the working strip within areas included in the national system of protected areas of L. 3937/2011 (A' 60) (excluding Natura sites)	Total number & minimum distance in km (per feature)	Impact on environmentally sensitive areas of national protection (excluding Natura sites).
P9	Rivers Crossed	Number of important intersecting water bodies	Total number	Any intersection can increase the environmental impact on water status.
P10	*Posidonia oceanica* seagrass (priority habitat 1120*- *Posidonia* Beds, according to	Total area of marine meadows of the angiosperm species *Posidonia oceanica* crossed by the pipeline.	total km	Important nursery grounds for a large number of fish and invertebrate species. Over 400 plant species and several thousand animals inhabit them. This very

Code	Criteria	Definition	Units	Relation to impacts evaluation
	Habitats Directive 92/43/EEC | Intersection (m)			productive habitat type also provides a number of ecosystem services such as food provision, coastal protection, carbon sequestration, water purification, etc.
P11	*Posidonia oceanica* seagrass (priority habitat 1120*- *Posidonia* Beds, according to Habitats Directive 92/43/EEC | Proximity (m)	Total area of marine meadows of the angiosperm species *Posidonia oceanica* in proximity to the pipeline.	minimum distance (km)	Important nursery grounds for a large number of fish and invertebrate species. Over 400 plant species and several thousand animals inhabit them. This very productive habitat type also provides a number of ecosystem services such as food provision, coastal protection, carbon sequestration, water purification, etc.
P12	ACCOBAMS sites | Intersection (m)	Total area to be cleared along the working strip within areas of conservation interest in accordance with ACCOBAMS	Total number & total km	Impact on environmentally sensitive areas of International protection.
P13	ACCOBAMS sites | Proximity (m)	Total area to be cleared along the working strip within areas of conservation interest in accordance with ACCOBAMS	Total number & minimum distance in km (per feature)	Impact on environmentally sensitive areas of International protection.
P14	Other Priority Habitats | Intersection (m)	Total area to be cleared along the project footprint within areas of conservation interest in accordance with Directive 92/43/EEC and/ or other international conventions (e.g. IUCN)	Total number & total km	Impact on environmentally sensitive areas of International protection.

Code	Criteria	Definition	Units	Relation to impacts evaluation
P15	Other Priority Habitats | Proximity (m)	Total area in proximity to the project footprint within areas of conservation interest in accordance with Directive 92/43/EEC and/ or other international conventions (e.g. IUCN)	Total number & minimum distance in km (per feature)	Impact on environmentally sensitive areas of International protection.
S	**Social Sensitivities**			
S1	Land Cover Classification	% of existing land cover (as interpreted by satellite imagery or other recent available data, e.g. CORINE LAND COVER) classified in the highest level (e.g. Artificial Surfaces, Agricultural Areas, Forests and Semi-natural Areas, Wetlands, Water Bodies)	Area (and %) per land cover class (and type)	Existing land uses are used as index of potential impacts to livelihoods, depending on the context of the broader area.
S1.1	Discontinuous urban fabric (Code CLC: 112)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value and nuisance on spatial development during operation.
S1.2	Industrial or commercial units (Code CLC: 121)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value and nuisance on spatial development during construction and operation.
S1.3	Road and rail networks and associated land (Code CLC: 122)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to nuisance of typical activities during construction.
S1.4	Mineral extraction sites (Code CLC: 131)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to economic development during operation.
S1.5	Non-irrigated arable land (Code CLC: 211)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.

Code	Criteria	Definition	Units	Relation to impacts evaluation
S1.6	Permanently irrigated land (Code CLC: 212)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.
S1.7	Vineyards (Code CLC: 221)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.
S1.8	Fruit tree and berry plantations (Code CLC: 222)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.
S1.9	Olive groves (Code CLC: 223)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.
S1.10	Complex cultivation patterns (Code CLC: 242)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.
S1.11	Land principally occupied by agriculture, with significant areas of natural vegetation (Code CLC: 243)	Total area to be cleared along the working/ pipeline protection strip, according to CORINE LAND COVER	km (%)	Impacts to land value, livelihoods and typical activities during construction and operation.
S2	Land Uses	Composition of existing land uses based on CORINE and Satellite Imagery Interpretation	Qualitative assessment	Existing land uses are used as index of potential impacts to livelihoods, depending on the context of the broader area.
S3	Land uses of Landfall Site	Composition of existing land uses based on CORINE and Satellite Imagery Interpretation	Qualitative assessment	Existing land uses are used as index of potential impacts to livelihoods, depending on the context of the broader area.

Code	Criteria	Definition	Units	Relation to impacts evaluation
S4	Spatial planning and development provisions	Official provisions regarding spatial planning and development, e.g. Local Town Plans, Regional Development Frameworks, etc.	Qualitative assessment	Compliance of the facility's establishment in the specific site and correlation to statutory provisions of the area.
S5	Military Restrictions	Minimum distance from designated military areas	km	Possible impact on national defence restrictions and/ or safety (integrity) of the project during military exercises.
S6	UXO	Number of areas in the AoI with potentially (or verified) Unexploded Ordinance.	Number	Possible impact on national defence restrictions and/ or safety (integrity) of the project during construction and operation.
S7	Population density	Existing population near the landfall site	Qualitative assessment	Crossing highly populated areas would increase socioeconomic impacts during project construction.
S8	Settlements' engagement and proximity	Total number and distance of affected settlements. As affected settlements, it is intended the ones within the study area or in direct connection to it (geomorphological, transportation, economic, social)	Number and distance (m) per feature	Main receptors for any form of socio-economic impact, and mainly potential impact on livelihood characteristics.
S9	Islets density	Number of islets within study area (1 km on each side of the pipeline axis). Islets as defined through existing naval maps and other remote sensing methods.	Number	Impact on migratory avifauna species, marine mammals (mainly seals), and biodiversity in general. Islets are considered biodiversity hotspots. Islets are more likely to host marine caves.
S10	Marine Traffic	Number of marine traffic routes crossed by the route	Number	Possible disturbance of normal marine traffic.
S11	Anchorage	Minimum distance from designated anchorage areas	km	Possible disturbance of normal marine traffic.

Code	Criteria	Definition	Units	Relation to impacts evaluation
S12	Fishing grounds	Total length through fishing grounds and reserves	km	Number of fishing grounds and reserves is related to fishermen's livelihoods potential disturbance.
S13	Aquaculture density	Number of aquaculture farms within study area (1 km on each side of the pipeline axis).	Number	Density of aquaculture farms is related to aqua farmers' livelihoods potential disturbance.
S14	Crossing of existing infrastructure	Number of crossing with underwater infrastructure lines.	Qualitative assessment based on the number and type of crossings (and/ or distance per feature).	Possible interaction of normal infrastructure operation (end-user everyday life and livelihood and market) due to impact on infrastructure during construction or operation phase.
CH	**Cultural heritage criteria**			
CH1	Declared archaeological sites	Number of declared cultural heritage resources (archaeological sites) within the study area	Number	Protection of cultural heritage.
CH2	Identified cultural heritage resources	Number of known (not declared) cultural heritage resources (archaeological sites) within the study area	Number	Protection of cultural heritage.
CH3	Areas of High Archaeological Potential (AHAP)	Number of areas identified as of High Archaeological Potential (either through consultation or desktop study) within the study area	Number	Protection of cultural heritage.
CH4	Religious resources	Churches, monasteries, cemeteries, and other places of worship, within the study area	Number and	Impacts on cultural customs, beliefs, and sensitivities.

Code	Criteria	Definition	Units	Relation to impacts evaluation
			minimum distance in km (per feature)	
CH5	Intangible cultural heritage	Intangible cultural resources including oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.	Qualitative assessment	Impacts on cultural customs, beliefs, and sensitivities.
D	**Economic Development**			
D1	Planned projects (RES, Ports, etc.)	Engagement with planned projects, mainly RES (offshore and onshore), power lines and transportation facilities.	Number and minimum distance in km (per feature)	Possible impact on future investments and regulations.
D1.1	Photovoltaic	Engagement with existing projects.	Number and minimum distance in km (per feature)	Possible impact on livelihoods and/ or investments.

Code	Criteria	Definition	Units	Relation to impacts evaluation
D1.2	Wind farm	Engagement with existing projects.	Number and minimum distance in km (per feature)	Possible impact on livelihoods and/ or investments.
D1.3	Biomass	Engagement with existing projects.	Number and minimum distance in km (per feature)	Possible impact on livelihoods and/ or investments.
D2	Hydrocarbons exploration blocks	Total length through designated H/C exploration blocks	km	Possible interferences during construction phase.
D3	Tourism development	Qualitative assessment of disturbance to existing or planned (regardless of regulatory framework) touristic development land uses/ enterprises	Qualitative assessment	Distance from existing or planned tourism development land uses/ enterprises is related to operators' livelihoods potential disturbance.
D4	Industrial Areas (official or unofficial)	Engagement with existing projects.	Number and minimum distance in km (per feature)	Possible impact on livelihoods and/ or investments.

Code	Criteria	Definition	Units	Relation to impacts evaluation
D5	Spatial development plans	Compatibility assessment to spatial provisions	Qualitative assessment	Possible impact on livelihoods and/ or investments.
A	**Administrative Jurisdiction**			
A1	Region	Total number of Local Government Organizations included in the route	Number	Number of authorities involved in the licensing process.
A2	Regional Unit	Total number of Local Government Organizations included in the route	Number	Number of authorities involved in the licensing process.
A3	Municipality	Total number of Local Government Organizations included in the route	Number	Number of authorities involved in the licensing process.

Prepared by: ASPROFOS, 2022.

Table 7-4 ESIA Related Criteria for Evaluation of Main Facilities Alternatives.

Code	Criteria	Definition	Units	Relation to impact evaluation
A1	**Area**	**Total area occupied by the station**	**m^2**	**Size of impacts on all parameters**
P	**Engagement with Protected areas**			
P1	Natura 2000 sites	Overview of nearest areas of conservation interest in accordance with Directive 92/43 / EEC.	Distance (m) from Facility's centroid to the boundary of the closest resource.	Impact on environmentally sensitive areas of European statutory protection.
P2	National Parks	Overview of nearest areas included in the national system of protected areas of L. 3937/2011 (A' 60)	Distance (m) from Facility's centroid to the boundary of the closest resource.	Impact on environmentally sensitive areas of national statutory protection.

Code	Criteria	Definition	Units	Relation to impact evaluation
P3	Wildlife Refuge Areas	Overview of nearest areas included in the national system of protected areas of L. 3937/2011 (A' 60)	Distance (m) from Facility's centroid to the boundary of the closest resource.	Impact on environmentally sensitive areas of national statutory protection.
P4	Landscapes of Outstanding Natural Beauty	Overview of nearest areas of special protection status	Distance (m) from Facility's centroid to the boundary of the closest resource.	Impact on environmentally sensitive areas.
P5	Aesthetic Forests	Overview of nearest areas included in the national system of protected areas of L. 3937/2011 (A' 60)	Distance from Facility's centroid to the boundary of the closest resource.	Impact on environmentally sensitive areas of national statutory protection.
P6	Watercourses	Overview of water systems engaged with the plot.	Absolut Value (total km) for Number and length of engaged watercourses	Impact on water quality of the broader area due to potential pollution.
P7	Forests	Forests included in the plot area (forests as defined by national legislation. If official data is unavailable CORINE data shall be used.	Area (m^2) (and %) per forest type (if available)	Permanent loss of forests due to safety restrictions during operation.
ES	**Environmental Sensitivities**			
ES1	Land Cover	% of existing land cover (as interpreted by satellite imagery or other recent available data, e.g. CORINE LAND COVER)	Area (m^2) (and %) per land cover type	Existing land cover is used as an index of potential impacts to natural vegetation and ecosystems, in total, depending on the context of the broader area.
ES2	Air Quality	Existing air quality based on available data.	Qualitative assessment	Identification of air quality of the broader area is related to the overall human intervention in the area and the potential cumulative impacts from the air emissions of project's facility.

Code	Criteria	Definition	Units	Relation to impact evaluation
ES3	Noise Background	Existing noise levels based on available data.	Qualitative assessment	Identification of noise levels of the broader area is related to the overall human intervention in the area and the potential cumulative impacts from the air emissions of project's facility.
ES4	Landscape	Assessment of aesthetic value and visibility of the facility's site.	Qualitative assessment	Deterioration of broader area's aesthetic value. Impact assessment on visual amenity of the site's area.
ES5	Morphology	Assessment of morphological features within the plot site and the surrounding area.	Qualitative assessment	Assessment of necessary earthworks, visibility and air/ noise emissions impacts to sensitive receptors.
ES6	Vulnerability to Climate Change - Flooding Risk	Correlation to areas identified as of high flooding risk and coastal modifications.	Area (m^2) (and %) within flood plains. Qualitative assessment.	Assessment of location's vulnerability to climate change. Flooding events may increase if the current models for climate change impacts are accurate. Rise of sea-level close to the coastline.
ES7	Anthropogenic Pressures	General Environmental Baseline Conditions (air quality, natural environment, existing pollution sources and status, etc.)	Qualitative assessment	Indication for the overall quality of the natural environment and as such impacts on the ecosystems integrity.
S	Social Sensitivities			
S1	Land Uses	Composition of existing land uses based on CORINE and Satellite Imagery Interpretation	Qualitative assessment	Existing land uses are used as index of potential impacts to livelihoods,

Code	Criteria	Definition	Units	Relation to impact evaluation
				depending on the context of the broader area.
S2	Spatial planning and development provisions	Official provisions regarding spatial planning and development, e.g. Local Town Plans, Regional Development Frameworks, etc.	Qualitative assessment	Compliance of the facility's establishment in the specific site and correlation to statutory provisions of the area.
S3	Distance to residential areas	Existing population centres near the site.	Distance (m) from centroid of Facility to closest residential building	Main receptors for any form of socio-economic impact, and mainly potential impact on livelihood characteristics.
S4	Distance to industrial activity	Existing industrial activities near the site.	Distance (m) from centroid of Facility to closest residential building	Infrastructure bundling opportunities and potential constraints imposition need to be assessed, either positively or negatively, in relation to the facility's implementation.
S5	Concession Areas (turf, lignite, H/C, etc.)	Existing spatial/ economic restrictions of facility's site, including blocks for H/C exploration.	Qualitative assessment	Possible impacts on economic development.
S6	Touristic Development	Qualitative assessment of disturbance to existing or planned (regardless of regulatory framework) touristic development land uses/ enterprises	Qualitative assessment	Distance from existing or planned touristic development land uses/ enterprises is related to operators' livelihoods potential disturbance.
S7	Accessibility/ expected traffic nuisance	Existing road network condition and capacity.	Qualitative assessment	Identification of new access roads, level of upgrading works of existing roads, assessment of traffic nuisance to local commuters.

Code	Criteria	Definition	Units	Relation to impact evaluation
S8	Planned projects	Engagement with planned projects, mainly RES, electricity and hydrocarbons	Qualitative assessment	Infrastructure bundling opportunities and potential constraints imposition need to be assessed, either positively or negatively, in relation to the facility's implementation.
S18	Military Restrictions	Minimum distance from designated military areas	km	Possible impact on national defence restrictions and/ or safety (integrity) of the project during military exercises.
S19	UXO	Number of areas in the AoI with potentially (or verified) Unexploded Ordinance.	Number	Possible impact on national defence restrictions and/ or safety (integrity) of the project during construction and operation.
S20	Population density	Existing population near the landfall site	Qualitative assessment	Crossing highly populated areas would increase socioeconomic impacts during project construction.
S21	Settlements engaged	Total number of affected settlements. As affected settlements, it is intended the ones within the study area or in direct connection to it (geomorphological, transportation, economic, social)	Number	Main receptors for any form of socio-economic impact, and mainly potential impact on livelihood characteristics.
S9	Expected Social Acceptance	Reasonable arguments against or in favour of the specific option based on all available data, including press releases, other social criteria consideration, experts' opinion, consultation and disclosure results.	Qualitative assessment	Acquisition of social licensing; establishment of good communication lines and relationship between project and local communities.
CH	**Cultural Heritage**			

Code	Criteria	Definition	Units	Relation to impact evaluation
CH1	Archaeological sites	Number of areas in the AoI of identified archaeological interest whether they are declared or not	Number	Protection of cultural heritage and permitting implications.
CH2	Areas of High Archaeological Potential (AHAP)	Number of areas in the AoI where literature review or consultation indicate high potential to locate unidentified cultural heritage resources.	Number	Protection of cultural heritage and permitting implications.
CH3	Engagement with Intangible cultural heritage resources.	Overview of intangible cultural heritage assets in the AoI	Qualitative assessment	Protection of cultural heritage and permitting implications.
CH4	Engagement with Religious Sites (churches, cemeteries)	Overview of religious sites included that could be affected by the project or affect their availability to all users.	Distance from Facility's centroid to the boundary of the closest resource.	Impact on religious duties and customs of people within the AoI.

Prepared by: ASPROFOS, 2022.

7.4 Zero Alternative

A zero solution is equivalent to the "do nothing" scenario. The selection of this solution leads to the maintenance of the current situation in terms of energy supply of the country and the EU.

The zero solution, i.e. the solution of non-implementation of the project, would result in the loss of all positive effects that the investigated project could induce in Greece and Europe in general (in terms of replacement of other more polluting fossil fuels, with the less polluting ones, transferred via EastMed Pipeline). This is especially so, given the fact that potential negative impacts of the project can be largely managed through sound design and management/monitoring practices. The following are a number of adverse effects under the zero alternative:

- No enhancement of competition in the energy market, through loss of access provision to additional new sources of supply currently not reaching any part of the European Union Member States or new points of entry for natural gas in Cyprus, Greece and Italy;
- No enhancement of EU security of supply by facilitating diversification of energy sources and routes by providing solutions to supply disruption and emergency scenarios;
- No broadening of the Southern Gas Corridor, no developing of natural gas resources within the EU or close border sources;
- No ensurance of supply of natural gas (and/ or hydrogen) to areas of Greece that do not have access to the National Network, such as Crete, part of Peloponnese and Western Greece; no ending to their energy isolation with respect to the European System, through a direct interconnection;
- Lack of support of the transitory phase, from coal (or oil) to renewable sources using sources, as natural gas, that are less polluting but still capable of guaranteeing the power supply demand covering energy production peaks;
- No promotion of environmental sustainability according to the decarbonisation goals to be achieved as defined in the framework of the Paris Agreement, therefore no facilitating of the replacement of fossil fuel with natural gas reducing greenhouse gas emissions in the aforementioned areas; and
- No provision of a new energy corridor to sustain and encourage the South-East Europe and east Mediterranean region's transition towards a sustainable and efficient energy transmission network, supporting the development of hydrogen production plants as well.

Based on the above, the zero alternative is not considered an advantageous one and thus is not contemplated further.

7.5 Alternatives Assessment For Pipeline Route

7.5.1 Introduction

This section presents the alternatives for the pipeline routes of the EastMed Pipeline Project. The footprint presented is slightly different from the one presented in the Scoping report (July 2021). The main difference is the refinement of the CCS2 section in Western Continental Greece.

As summarized in Table 7-1, route alternatives were assessed in nine (9) different areas of the entire project footprint, both onshore and offshore. More specifically:

1. Three (3) different alternatives were investigated reaching SE Crete, including OSS2/OSS2 N and LF2 project components (referred to as “OSS2 Reaching Crete” alternatives). Details are provided in section 7.5.2;
2. Three (3) different alternatives were investigated starting from SE Crete, including OSS3/OSS3 N and LF2 project components (referred to as “OSS3 Departing Crete” alternatives). Details are provided in section 7.5.3;
3. Three (3) different alternatives were investigated reaching SE Peloponnese, including OSS3/OSS3 N, LF3 and CCS1 project components (referred to as “OSS3 Reaching Peloponnese” alternatives). Details are provided in section 7.5.4;
4. Two (2) different alternatives were investigated in the area of R. Evrotas, including CCS1 project component (referred to as “Evrotas” alternatives). Details are provided in section 7.5.5;
5. Two (2) different alternatives were investigated in the area of Megalopoli, including Megalopoli Branch project component (referred to as “Megalopoli” alternatives). Details are provided in section 7.5.6;
6. Two (2) different alternatives were investigated in the area of Foloi Plateau, including CCS1 project component (referred to as “Foloi Plateau” alternatives). Details are provided in section 7.5.7;
7. Four (4) different alternatives were investigated for Patraikos Gulf crossing, including CCS1, LF4, OSS4, LF5 and CCS2 project components (referred to as “Patraikos Crossing” alternatives). Details are provided in section 7.5.8;
8. Two (2) different alternatives were investigated in the area of Menidi, as part of CCS2 project component (referred to as “Menidi” alternatives). Details are provided in section 7.5.9; and
9. Two (2) different alternatives were investigated in the area of Margariti, as part of CCS2 project component (referred to as “Margariti” alternatives). Details are provided in section 7.5.10.

Alternatives are presented in Map 15.1.3.

7.5.2 OSS2/OSS2 N Reaching Crete Alternatives

7.5.2.1 Overview

The alternative routes of the OSS2/OSS2N pipeline include[2]:

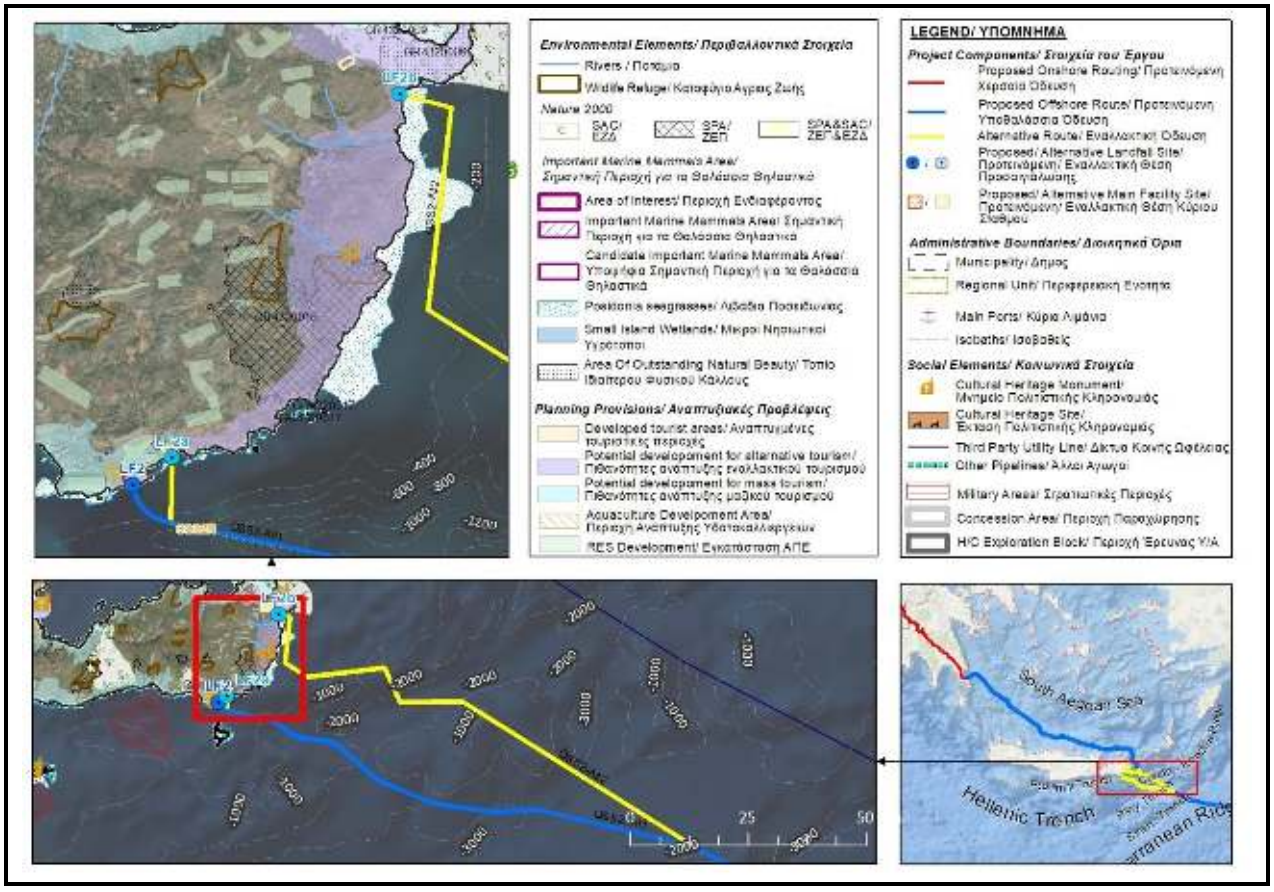
- OSS2-BC, i.e. the base-case offshore route section reaching Landfall Site LF2;
- OSS2-Alt1, i.e. the alternative offshore route section reaching Landfall Site LF2a; and
- OSS2-Alt2, i.e. the alternative offshore route section reaching Landfall Site LF2b.

In the South Cretan Sea reaching SE Crete, three (3) offshore route alternatives have been assessed connecting the starting point (between Pliny and Strabo Trenches, close to KP 575 of OSS2/OSS2 N Line, at approximately 2100 m WD), with the SE coast of Crete. Three (3) landfall sites and route alternatives are then connected (with a short onshore section) to the three (3) corresponding sites of construction of Crete Facilities (Assessment of Crete Facilities alternative sites is presented in section 7.6).

These alternatives are presented in Figure 7-5 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.

[2]These alternatives are the same as the ones assessed during the Scoping Phase; given that no improved alternative was identified, they are still considered valid.



Prepared by: ASPROFOS, 2022

Figure 7-5 Alternatives for Pipeline System OSS2/OSS2N Reaching SE Crete.

7.5.2.2 Alternatives Assessment

The main differences of these three alternatives are the following:

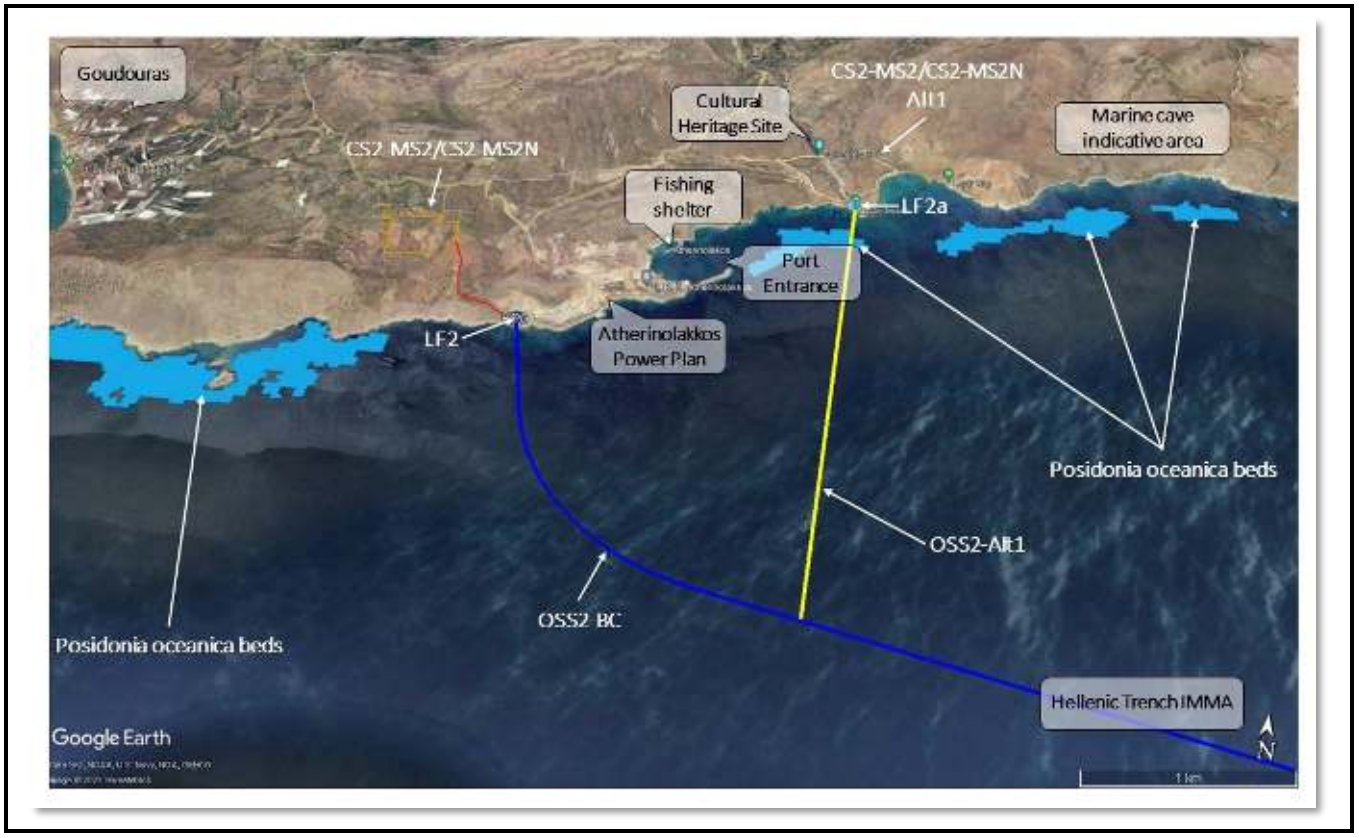
- **Natural Environment.** Regarding landfall sites, OSS2-Alt2 (LF2b) lies in a pristine area, whilst the two others in typical phrygana areas[3]. A marine cave supporting a *Monachus monachus* couple is recorded in the area E of LF2a. Proximity to Natura 2000 site is noted for OSS2-Alt2 (approximately 300 m), contrary to the other two. Offshore route OSS2-BC does not cross *Posidonia oceanica* beds unlike the other two;

[3] Phrygana areas are open dwarf shrublands dominated by low, often cushion-shaped, spiny shrubs. These shrubs are extremely high temperature- and drought-tolerant and they grow at low altitudes. This vegetation type is characteristic of Mediterranean ecosystems and is considered the result of macchie or forest degradation. Phrygana usually grow on poor and rocky limestone and siliceous substrates or at areas previously repeatedly burnt by fires.

- **Social Environment:** Regarding the landfall sites, OSS2-BC (LF2) and OSS2-Alt1 (LF2a) bundle with the existing PPC Atherinolakkos Power Plant and the nearby fishing shelter; LF2a engages with the entrance of the fishing shelter, contrary to LF2. OSS2-Alt2 (LF2b) lies in an area where no economic development is identified; however, the area is known to host some alternative tourism activity (in the broader area); and
- **Cultural Heritage:** The landfall site of OSS2-Alt1 (LF2a) is described as a "Non-declared or characterised Archaeological zone", hence the overall area has high archaeological potential.

Table 7-5 summarizes the criteria where the alternatives present differences that are considered relevant in the selection process. The detailed results of environmental criteria comparison for the landfall sites and all corresponding offshore route sections are presented in Annex 7A

OSS2-BC bundles safely with the existing industrial character of the area, avoiding significant technical challenges and areas of biodiversity interest (e.g. protected areas or biodiversity hotspots). OSS2-Alt1 is similar (identical) to OSS2-BC but it is located in front of the PPC port and most importantly interferes with an area known for its archaeological potential; as such, OSS2-BC is considered as more favourable than OSS2-Alt1 (Figure 7-12). OSS2-Alt2 lies in close proximity to biodiversity hotspots; lies within an area known to host *P. oceanica* seagrass (priority habitat). OSS2-Alt2 spans a greater length through the epipelagic zone. As such, OSS2-BC is considered more favourable than the previous alternatives.



Prepared by: ASPROFOS, 2022.

Figure 7-6 Base-Case Selection for OSS2 - Atherinolakkos Area.

Table 7-5 High Level Comparison Matrix for Alternatives OSS2/OSS2 N Reaching Crete.

General Parameter	Base-case OSS2-BC (OSS2/OSS2N->OSS2->LF2 "Atherinolakkos")	Alternative OSS2-Alt1 (OSS2/OSS2N -> OSS2a -> LF2a "Livari“)	Alternative OSS2-Alt2 (OSS2/OSS2N -> OSS2b -> LF2b "Skinias“)
Protected Areas	No interference. Site is located at great distance from any protected area (national or international) No engagement for the Route.	*M. monachus* hosting marine cave in the area of LF2a. Route crosses P. oceanica beds for approx. 105 m	Proximity to protected areas, incl. 1 Natura 2000 site, 4 Small Island Wetlands Route crosses *P. oceanica* beds for approx. 3.5 km
Biodiversity Hotspots	No interference with identified habitats of conservation interest or areas important for biodiversity (terrestrial)		The landfall area is located within completely natural vegetated areas,

General Parameter	Base-case OSS2-BC (OSS2/OSS2N->OSS2->LF2 "Atherinolakkos")	Alternative OSS2-Alt1 (OSS2/OSS2N -> OSS2a -> LF2a "Livari“)	Alternative OSS2-Alt2 (OSS2/OSS2N -> OSS2b -> LF2b "Skinias“)
	Route crosses for 62km (57 % of total length) the Hellenic Trench IMMA.		secluded from other anthropogenic pressures and even presence. Proximity to biodiversity hotspots (e.g. Natura 2000 and Landscape of Outstanding Beauty). Route crosses for 71km (62 % of total length) the Hellenic Trench IMMA
Cultural Heritage	No crossing of known cultural heritage resources	Landfall site is located within an area considered as High Archaeological Potential	No crossing of known cultural heritage resources
Infrastructure	Bundling with existing power plant. Adequate road network used for PPC power plant. Proximity to power plant port. Proximity to two RES projects (one under installation permit and another one which application is under evaluation)		Limited (if any) access to the area. Only dirt roads and tracks available. A wind farm development application is under assessment by the competent authority, whilst another one for P/V has been rejected. Otherwise, the area is completely secluded from any human presence
Technical challenges[4]	It is a flat area accessible through existing roads and power plant port. No significant geohazards are identified (no evidence of landslides, minimal liquefaction	Similar to LF2 site. However, LF2a is located in front of power plant port entrance.	Most likely new access road construction will be required. No significant geohazards (no evidence of landslides, minimal liquefaction risk); the site is located at

[4]Note that all geohazards identified along the routes are considered manageable through standard engineering techniques/processes (i.e. the route already avoids key geological hazards/constraints areas).

General Parameter	Base-case OSS2-BC (OSS2/OSS2N->OSS2->LF2 "Atherinolakkos")	Alternative OSS2-Alt1 (OSS2/OSS2N -> OSS2a -> LF2a "Livari“)	Alternative OSS2-Alt2 (OSS2/OSS2N -> OSS2b -> LF2b "Skinias“)
	risk); the site is located at adequate distance from active faults (1.5 km) and earthquake epicentres (8.5 m). No extensive earthworks are expected.		relatively smaller distance from active faults (1 km) and earthquake epicentres (5 km) than the other alternatives. Difficulties are expected during excavation works due to the hard rock formation substrate.
Development Plans	Located in an area designated for industrial use as well as for touristic use (at regional level). No marine spatial planning provisioned in the area		Located in an area designated for touristic use (at regional level) No marine spatial planning provided for in the area
Touristic Interest	Area designated for touristic use (at regional level) but no evidence of touristic activity. It is reasonable to expect limited (if any) touristic interest in the area, due to the presence of the power plant		Designated for touristic use (at regional level). No touristic development is identified in the area. The area is defined as area of "Developing tourism with potential for development of alternative forms of tourism"

Prepared by: ASPROFOS, 2022.

7.5.3 OSS3 Departing Crete Alternatives

7.5.3.1 Overview

The alternative routes of the OSS3/OSS3N pipeline departing from SE Crete towards SE Peloponnese and the continental section of the EastMed Pipeline Project include[5]:

[5]These alternatives are the same as the ones assessed during the Scoping Phase; given that no improved alternative was identified, they are still considered valid.

- OSS3_Cr-BC, i.e. the base-case offshore route section starting from Landfall Site LF2;
- OSS3_Cr-Alt1, i.e. the alternative offshore route section starting from Landfall Site LF2a; and
- OSS3_Cr-Alt2. i.e. the alternative offshore route section starting from Landfall Site LF2b.

In the South Cretan Sea departing SE of Crete, three (3) offshore route alternatives have been assessed connecting the starting point; i.e. the different landfall sites at the SE coastline of Crete[6]) with the OSS3/OSS3N line, close to KP 55, at approximately 750 m WD.

These alternatives are the same as the ones assessed during the Scoping Phase; given that no improved alternative was identified, they are still considered valid.

Alternatives for the section departing SE Crete of OSS3/OSS3N are presented in Figure 7-7 (see Section 15.1.3 - Alternatives Map).

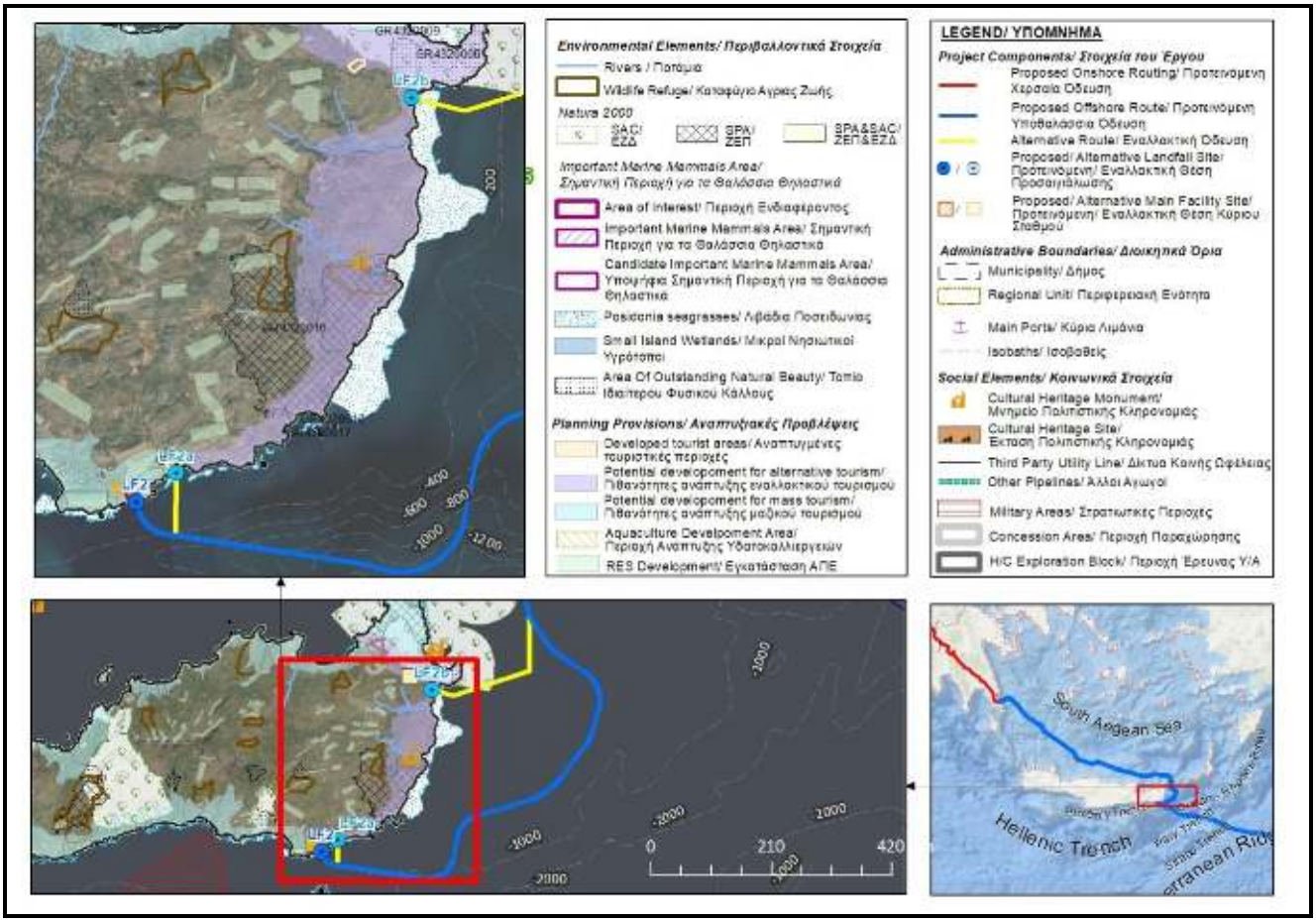
Landfalls at Crete for OSS3 (i.e. starting from Crete) are essentially the same as the landfall sites for OSS2/OSS2 N (i.e. reaching Crete). The slight shifting of the two landfalls (incoming and outgoing) is very small and therefore does not make any difference from an ESIA point of view. As such, they are considered identical.

In addition, the nearshore route section[7] starting from SE Crete is equivalent to the corresponding section reaching SE Crete (Figure 7-5). This is why the information provided for the corresponding section of OSS2/OSS2N (i.e. landfall sites and nearshore route sections) is valid for this section as well. Differences exist in the offshore route section in waters deeper than the 40 m necessary to connect the landfall area and the nearshore route section (to 40 m water depth, which was described in the previous section) to the OSS3/OSS3N pipeline system.

A detailed description of the alternatives is presented in Annex 7A.

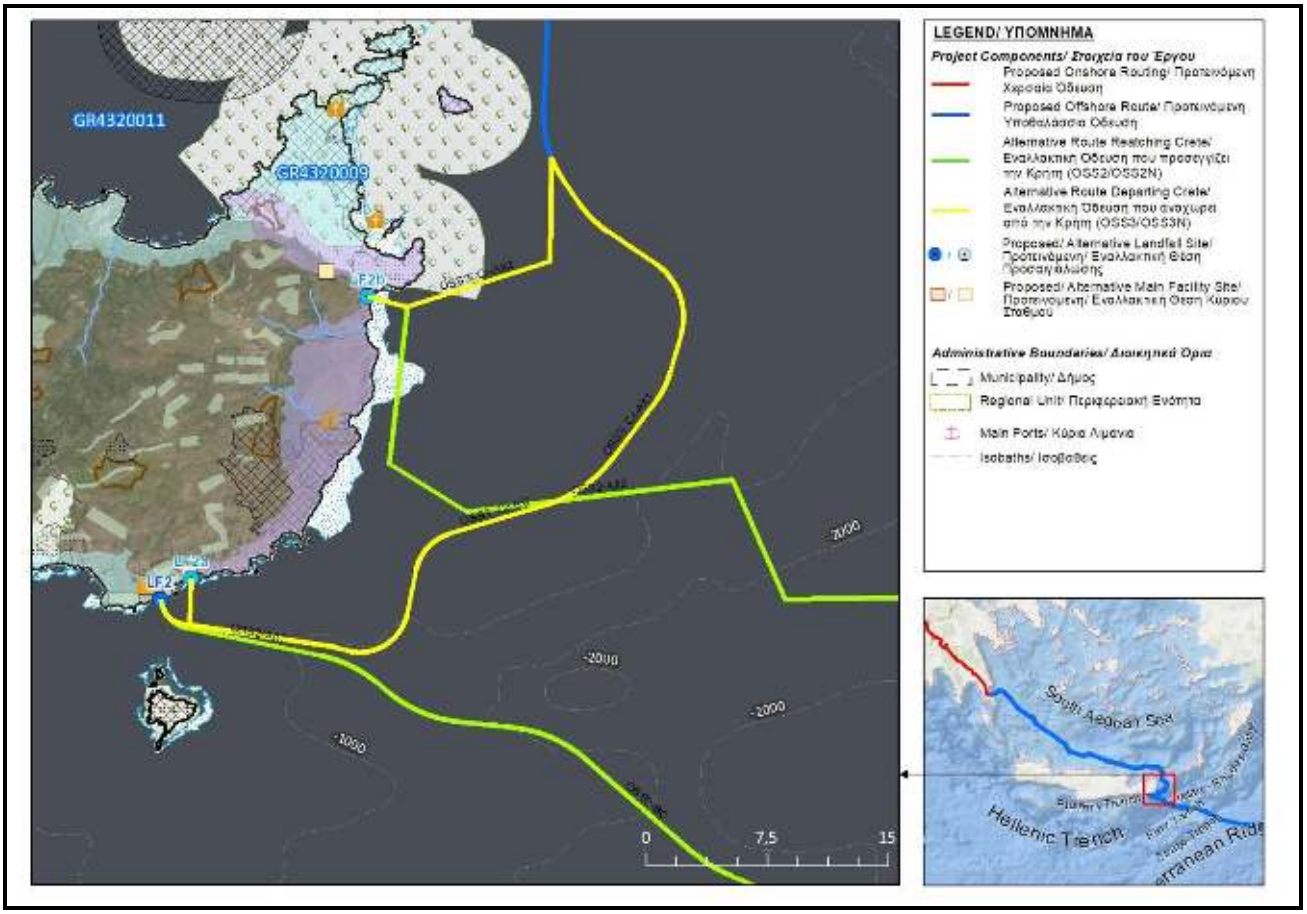
[6] It is noted that slight shifting of the two landfall sites exists, i.e. for the landfall site receiving the OSS2/OSS2N line and the landfall site dispatching OSS3/OSS3N for SE Peloponnese at SE Crete, it does not make any difference from an ESIA point of view. As such, they are considered identical.

[7] to 40 m water depth



Prepared by: ASPROFOS, 2022

Figure 7-7 Alternatives for Pipeline System OSS3/OSS3N starting from SE Crete.



Prepared by: ASPROFOS, 2022

Figure 7-8 Correlation of Alternative Landfalls for Pipeline Systems OSS2/OSS2N and OSS3/OSS3N at Crete.

7.5.3.2 Alternatives Assessment

From the presentation of the alternatives, it is evident that the differences between the OSS2/OSS2 N alternatives (described in section 7.5.2) and the OSS3_Cr alternatives are insignificant in environmental and social terms. As such, it is self-evident that the assessment will be identical; hence, the assessment is not repeated.

Table 7-5 summarises the key constraints for the alternatives assessed (reaching and/ or departing Crete). The detailed results of environmental criteria comparison for the landfall sites and the entire corresponding offshore route sections are presented in Annex 7A

It is evident that Base-case OSS3 bundles safely with the existing industrial character of the landfall area, avoiding significant technical challenges and areas of biodiversity interest (e.g. protected areas

or biodiversity hotspots). OSS3-Alt1 is similar (identical) to OSS3 but it is in front of the PPC port and most importantly is engaged with an area known for its archaeological potential. OSS3-Alt2 lies in close proximity to biodiversity hotspots; in fact, it is within area known to host *P. oceanica* seagrass (priority habitat). At greater depths, OSS3-Alt2 crosses a Natura 2000 site and poses more technical challenges than any other alternative. As such, Base-case OSS3 is better in all aspects than the other alternatives.

7.5.4 OSS3 Reaching Peloponnese Alternatives

7.5.4.1 Overview

Having selected SE Peloponnese as the most appropriate geographical region of continental Greece for landing the pipeline (see Section7.2), the most appropriate landfall and nearshore areas were investigated by defining several alternatives. Before providing the details of these it is worth noting that, among the various constraints identified along the east and northeast coastline of Peloponnese, two relevant and extended constrains were identified:

- Tourism development and settlements hosting family summer houses and traditional holiday venues. Peloponnese, especially NE and E coastline is very popular for domestic tourism (throughout the year) given the proximity to the biggest population centre of Greece (i.e. Athens). As such, many Athenians have family origins in the specific area and visit their ancestral homes and places very often throughout the year. On the other hand, many Athenians opt NE and E Peloponnese (especially the coastline) for short term vacations (during weekends and bank holidays) or even summer holiday. This tourism development is not restricted, however, to domestic tourism. Korinthos, Epidaurus, Nafplio are international tourist venues mainly for their cultural heritage and natural beauty; and
- Coastline geomorphology. The east coast of Peloponnese is characterised by steep slopes and complex morphology. Most of the coastline consists of cliffs and rocky shores, towered inland by hilly and semi-mountainous ranges. Therefore, even if the coastal zone/landfall site could be somehow easily approached from the sea, the technical challenges to construction at the landfall could be remarkable. These challenges not only involve aspects of pipeline integrity but also considerable potential requirements in terms of accessibility and logistics (e.g. would require significant interventions such as opening access roads for heavy machinery, levelling terrain for camps and pipe yards, etc.), increasing construction timings, challenging reinstatement works, etc. thus resulting in increased environmental and social impacts/challenges.

The above constraints show that the few areas where geomorphological restrictions are limited (e.g. Astros, Leonidio, Monemvasia area) coincide with areas that are well known for their domestic tourist development. As such, it is expected that areas with fewer technical constraints would potentially lead to more relevant stakeholder concerns, as identified in the very first stages of the project design.

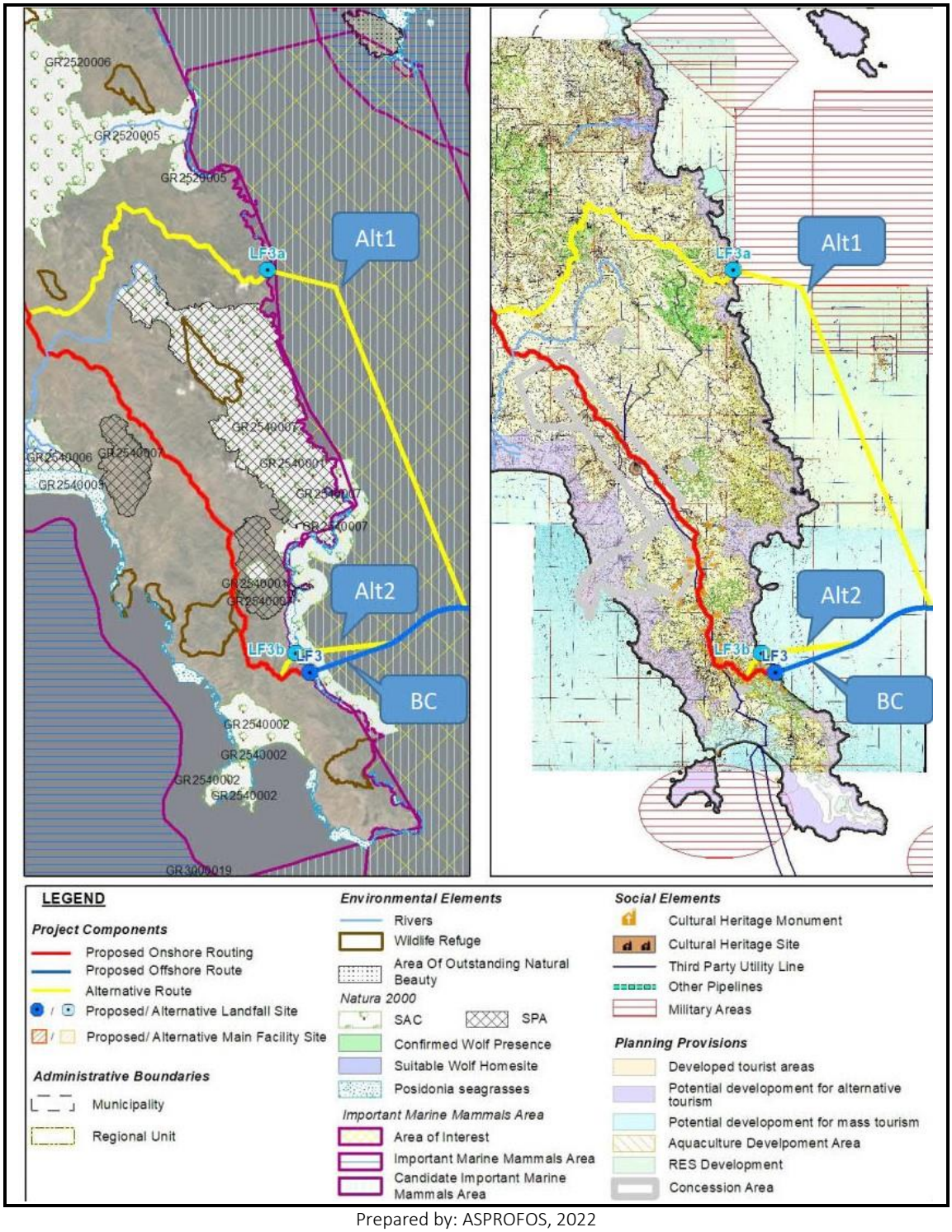
For the landfall site at SE Peloponnese, three (3) alternative landfall sites connected through corresponding offshore route sections were assessed. The different landfall sites correspond to different onshore sections (mainly two corridors), connecting the landfall site to the proposed onshore pipeline route (CCS1 in Peloponnese). As such, the following alternatives have been assessed, starting from close to KP 410 of OSS3, at approximately 600 m WD (starting point), and close to KP 65 of CCS1, close to Geraki Settlement, M. of Evrotas (ending point). The alternative routes of the OSS3/OSS3N pipeline, reaching SE Peloponnese and the continental section of the EastMed Pipeline Project include[8]:

- Base-case offshore route section OSS3_Pel-BC reaching Landfall Site LF3;
- Alternative offshore route section OSS3_Pel-Alt1) starting from Landfall Site LF3a; and
- Alternative offshore route section (OSS3_Pel-Alt2) starting from Landfall Site LF3b.

Alternatives for the section reaching SE Peloponnese of Pipeline System OSS3/OSS3N are illustrated in Figure 7-9 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.

[8]These alternatives are the same as the ones assessed during the Scoping Phase; given that no improved alternative was identified, they are still considered valid.



Prepared by: ASPROFOS, 2022

Figure 7-9 Alternatives for Pipeline System OSS3/OSS3N Reaching SE Peloponnese.

7.5.4.2 Alternatives Assessment

OSS3 reaching SE Peloponnese alternatives assessment critical points can be summarised as follows:

- Natural Environment. CCS1 segment of the OSS3_Pel-Alt1 (CCS1-Alt1) alternative passes for most of its length through pristine forested areas of Mt Parnonas, similar to the land cover of the corresponding landfall site (LF3a). Although the other two landfall sites lie within pristine natural areas, these are phrygana associations, very typical for Greece, and especially the area. The onshore segment of OSS3_Pel-BC (CCS1-BC) passes mainly through intensively agricultural areas (Plains of Molai and Vrontamas-Geraki);
- Military areas. Offshore segment of OSS3_Pel-Alt1 (OSS3-Alt1) engages with a submarine exercise area which might cause permits' duration to prolong ;
- Landscape. LF3 and LF3b lie approximately 10 km and 8 km, respectively from Monemvasia UNESCO site. Although from a great distance, project construction might be visible, with a view similar to the current one (low sparse natural phrygana vegetation and rural road network). LF3a, on the other hand, might not lie in view of Monemvasia, but it is surrounded by densely vegetated natural areas; any break in the continuity of the landscape will be clearly visible;
- Protected species and habitats:

  Posidonia oceanica is present in all nearshore areas of the landfall sites. In the southern landfall sites (LF3 and LF3b) *Posidonia oceanica* beds are directly engaged with the project (620 m and 760 m, respectively), whilst in LF3a, they are present approximately 100 m to the north,

  C. caretta. LF3b, and to a smaller extent, LF3 lie in close proximity to species nesting sites, Natura 2000 sites. The southern alternatives cross two protected areas; OSS3_Pel-BC for approximately 4 km and OSS3_Pel-Alt2 for approximately 4.5 km;

- Geohazards issues. The selection of the proposed route needs to take into consideration geohazards and accessibility. In many cases, the impact from the geotechnical works for slope stabilization or the need for new access road construction is more significant than temporary impact on protected areas or biodiversity hotspots. As a consequence, geotechnical issues, such as slope stability and access should also be taken into consideration, as studied by the technical team. Such geotechnical issues pose more challenges on construction safety issues; moreover, they pose significant operational hazards in terms of project vulnerability to mass earth movements that could be triggered and impact the Project. OSS3_Pel-Alt1 involves major technical challenges because the area is dominated by steep slopes (in some cases more than 45%) especially at the first part (Landfall LF3a) and in other parts there are areas prone to landslides. Because of these challenges this solution is deemed not preferable due to increased technical and safety challenges; and

- **Social Environment:** Regarding the landfall sites, both landfall sites support limited development. However, Kyparissi (LF3a) is a bit more developed in terms of tourism activity.

Table 7-6 and Figure 7-10 summarize the criteria where the alternatives present differences that are considered relevant in the selection process. A detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A .

Based on the above, OSS3_Pel-BC is the preferable solution.

Table 7-6 High Level Comparison Matrix for OSS3 Alternatives Reaching Peloponnese.

General Parameter	Base-case OSS3_Pel-BC (OSS3-BC -> LF3 -> CCS1-BC)	Base-case OSS3_Pel-Alt2 (OSS3-Alt2 -> LF3b -> CCS1-BC)	Alternative OSS3_Pel-Alt1 (OSS3-Alt1 -> LF3a -> CCS1-Alt1)
Protected Areas	• Offshore Route crosses SAC GR2540001 for approx. 2 km (2 km OSS3-BC, 2.5 OSS3-Alt2); Posidonia oceanica for approx. 680 m (620 m OSS3-BC and 750 m OSS3-Alt2.		• None of the project components is directly engaged with any protected area. However, the natural environment, both onshore and offshore, is of pristine quality. P. oceanica beds are located 100 m N of LF3a.
	• Landfall site is located within Natura 2000 site (SAC) GR2540001; C. caretta nests have been recorded in the beaches of LF3b and LF3 (according to ARCHELON data).		
	• Onshore Route crosses SPA GR2540007 for approx. 2 km and WR Pratagos – Aetofolia for 1 km		
Biodiversity Hotspots	• Offshore Route crosses AoI and cIMMA		
	• The landfall site area is characterised by absence of anthropogenic pressures or developments, in a pristine phryganic area.		• The landfall site area is characterised by absence of anthropogenic pressures or developments, in a pristine forested area (bushlands).
	• Onshore route passes through pristine phryganic areas very typical for Greece, and especially the area, close to the landfall site, but towards the mainland through intensively agricultural areas (Plains of Molai and Vrontamas-Geraki).		• Onshore route passes through pristine forests of Mt. Parnonas, almost reaching down to the landfall site.
	• No engagement with known cultural heritage resources exists.		

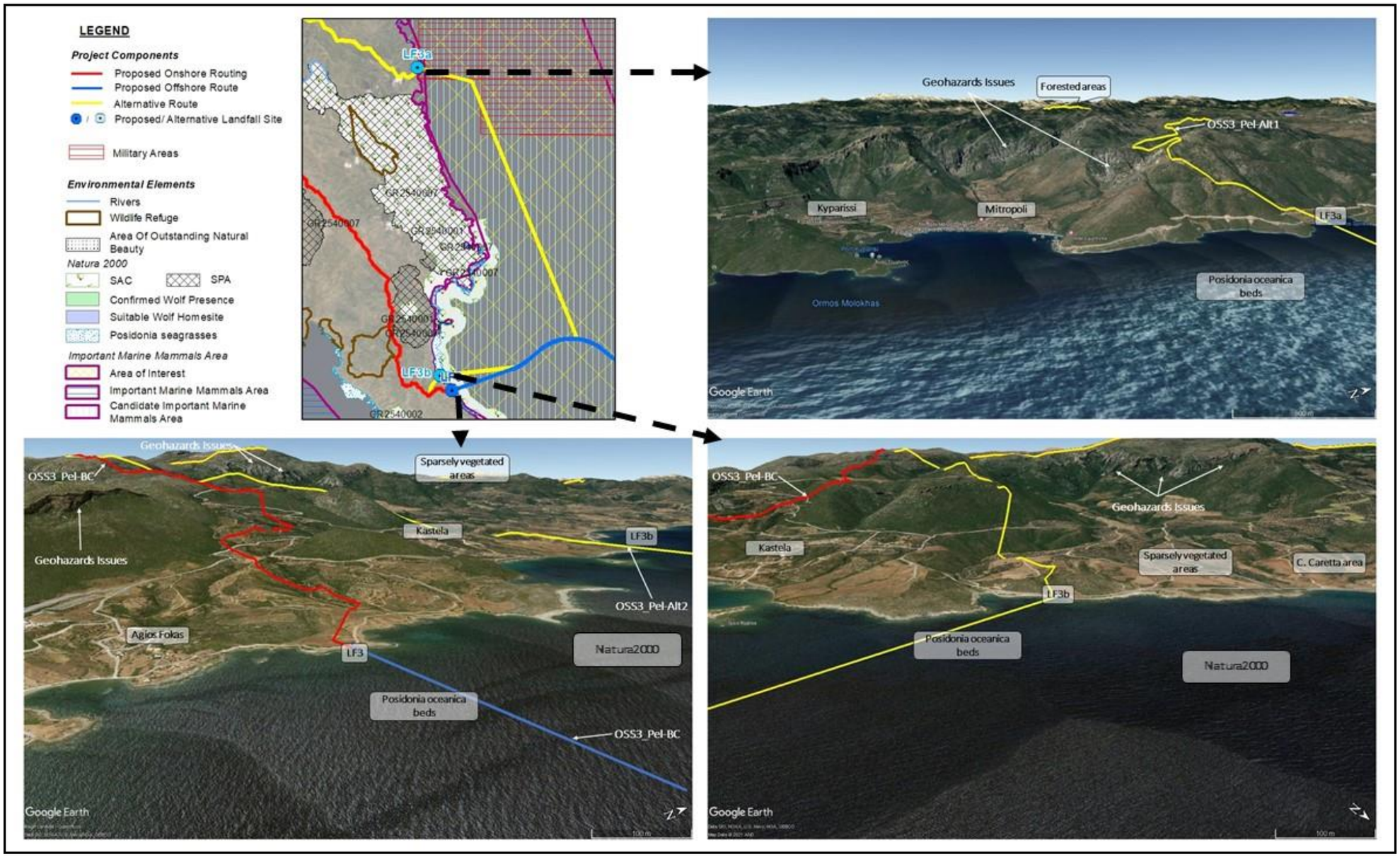
General Parameter	Base-case OSS3_Pel-BC (OSS3-BC -> LF3 -> CCS1-BC)	Base-case OSS3_Pel-Alt2 (OSS3-Alt2 -> LF3b -> CCS1-BC)	Alternative OSS3_Pel-Alt1 (OSS3-Alt1 -> LF3a -> CCS1-Alt1)
Cultural Heritage	• Landfall site is located 250 m south of a declared ancient quarry.	• No engagement with significant known cultural heritage areas is identified	
	• Onshore route lays within 200 m from declared cultural heritage resources.		• No cultural heritage resource is identified within 200 m from the onshore route.
Infrastructure	Area is quite secluded. Accessibility through existing dirt roads is feasible, but most likely some road upgrading will be performed. The small fishing shelter of Agios Fokas is not expected to provide significant facilities to the project but it is noted (at ~750 m to the south)	Similar to LF3. The small fishing shelter of Kastela is not expected to provide significant facilities to the project but it is noted (at ~900 m to the south)	• Area is quite secluded. Accessibility through existing dirt roads is feasible. The fishing shelter of Mitropoli is not expected to provide significant facilities to the project but it is noted (at ~3,000 m to the south). • The alternative crosses an area designated as a submarine exercise area by the national defence
Technical Challenges[9]	• Offshore, beach and seabed intervention works are estimated as small to moderate. The nearshore section seabed is rocky, overlain with sediments of increasing thickness, but no significant constraints are identified. Areas of potential geohazards lie on the route at greater depths (greater than 40 m WD)		
	• Landfall site is a flat area accessible through existing dirt roads. No significant geohazards are anticipated.		• Similar to other alternatives but some excavation works are necessary.
	• Onshore route phases typical geohazards on the rocky slopes.		• Major technical challenges due to steep slopes (in some cases more than 45%) especially at the first part (close to landfall)

[9]Note that all geohazards identified along the routes are considered as manageable through standard engineering techniques/processes (i.e. the route already avoids key geological hazards/constraints areas).

General Parameter	Base-case OSS3_Pel-BC (OSS3-BC -> LF3 -> CCS1-BC)	Base-case OSS3_Pel-Alt2 (OSS3-Alt2 -> LF3b -> CCS1-BC)	Alternative OSS3_Pel-Alt1 (OSS3-Alt1 -> LF3a -> CCS1-Alt1)
			and areas prone to landslides.
Development Plans	• Based on national spatial planning, the area is designated Low Industrial Priority but High Wind Power Potential. • Numerous wind farm applications exist in the area but at significant distance (~1.2 km)	• Similar to LF3 site. • Difference lies in the greater distance of the closest wind farm application compared to LF3 (1.5 km). • No marine spatial planning provided in the area	• Similar to LF3 site. • Difference lies in the greater distance of the closest wind farm application compared to LF3 (2 km). • No marine spatial planning provided in the area
Land uses/ Economic development	• Marine traffic density in the area is low. The closest fishing shelter is located in Agios Fokas (south at 700 m and > 2 km, for BC and Alt 1, respectively). No aquaculture activity is identified		• Marine traffic density in the area is low. The closest fishing shelter is located in Mitropoli, Agia Kiriaki beach (approx. 4 km distance). No aquaculture activity is identified
	• Onshore, alternative engages areas of limited economic development, restricted to agricultural activities - most of them are tree crops. Many small roads, mainly agricultural ones connecting fields and rural settlements, are crossed. The entire project footprint is engaged with a mosaic of agricultural area and rural settlements; only agricultural development is identified.		• Onshore, alternative engages areas of almost no economic development; any development is restricted to agricultural activities - most of them are tree crops. Few (considering the length of the alternative) small roads, mainly agricultural ones connecting fields and rural settlements, are crossed. 3 major roads are crossed. The entire project footprint is engaged with a mosaic of agricultural area and

General Parameter	Base-case OSS3_Pel-BC (OSS3-BC -> LF3 -> CCS1-BC)	Base-case OSS3_Pel-Alt2 (OSS3-Alt2 -> LF3b -> CCS1-BC)	Alternative OSS3_Pel-Alt1 (OSS3-Alt1 -> LF3a -> CCS1-Alt1)
			rural settlements; only agricultural development is identified.
Population centres	• No significant population centres are identified in the study area. 9 settlements have been identified within the study area (Agios Fokas 350 m, Lira 300 m, Velies 750 m, Apidea 850 m, Gouves 1000 m, Kastella 300 m, Ellinko 350 m, Agios Nikolas 470 m, Sykea 650 m, Metamorfosi 920 m)	• No significant population centres are identified in the study area. 8 settlements have been identified within the study area (Kastella 300 m, Lira 300 m, Velies 750 m, Apidea 850 m, Gouves 1000 m, Elliniko 350 m, Agios Nikolas 470 m, Sykea 650 m, Metamorfosi 920 m)	• No significant population centres are identified in the study area. In general, the area is quite secluded. 4 settlements have been identified within the study area (Vlisidia 900 m, Ochtos 600 m, Peleta 880 m, Chouni 400 m).
Touristic Interest (incl. Landscape)	Nearby villages have little touristic development. Proximity to Kastella Beach but no significant touristic development is identified in the area. Monemvasia Landscape of Outstanding Natural Beauty is an international venue (UNESCO site) but is located in a significant distance to the north (~10 km for LF3 and 8 km for LF3bnorth). Area is characterised as area of "Developing tourism with potential for development of alternative forms of tourism" based on national spatial planning		There is evidence of touristic development at 4,500 m to the south (Beach of Mitropoli). However, no significant touristic development is identified in the area of interest, although the landfall site is characterised as an area of "Developing tourism with potential for development of alternative forms of tourism" based on national spatial planning
Military Areas	No engagement		Offshore route crosses a submarine exercise area for approximately 16 km

Prepared by: ASPROFOS, 2022.



Prepared by: ASPROFOS, 2022.

Figure 7-10 Criticalities for OSS3 reaching Peloponnese alternatives assessment.

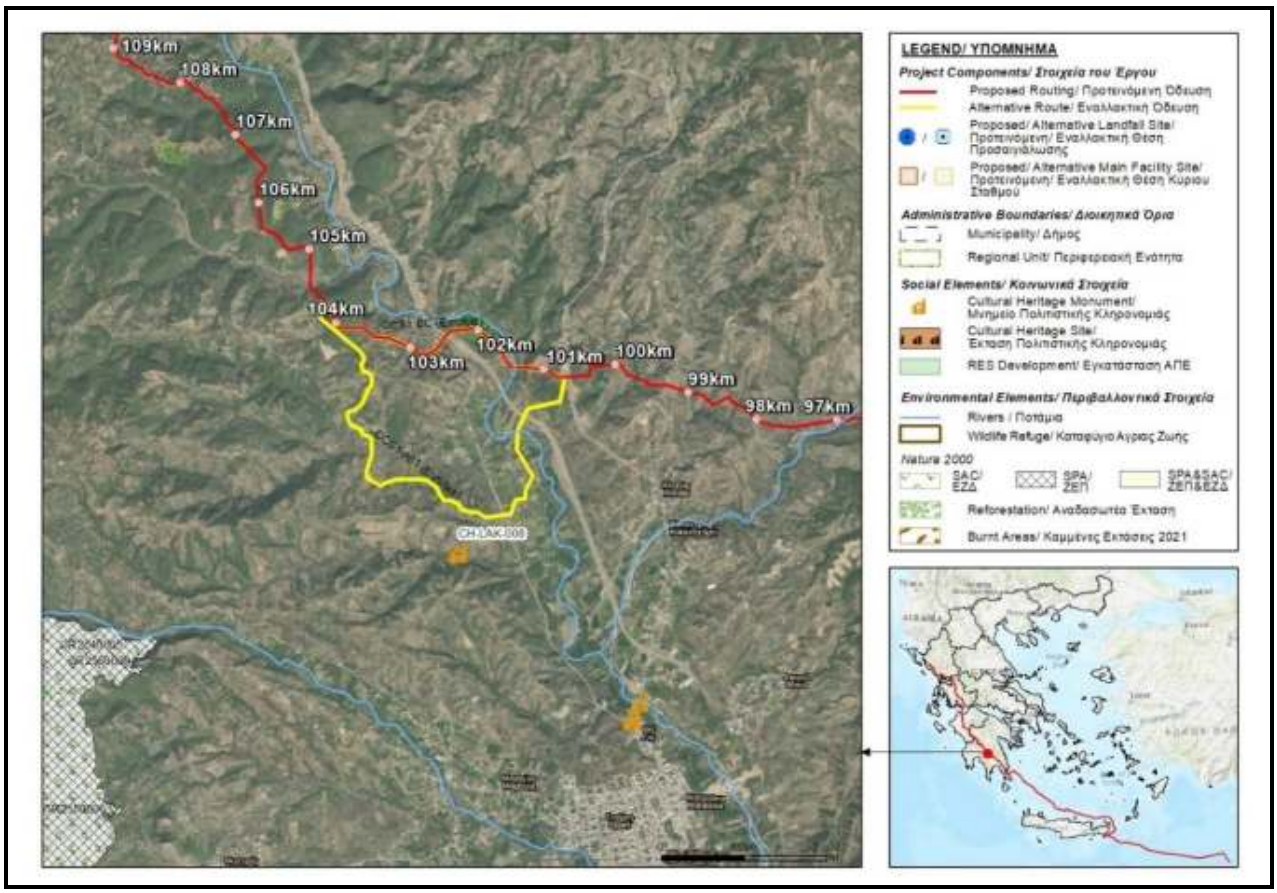
7.5.5 Evrotas Alternatives

7.5.5.1 Overview

North of Sparti, at the northern limits of the Sparti plain near the Kladas settlement, the pipeline crosses R. Evrotas. For the section of CCS1, two (2) feasible alternatives are identified.[10] The starting point of this set of alternatives lies NW of Kladas settlement, Municipality of Sparti (close to KP 100 of CCS1 base-case at the crossing of E961 Tripoli – Sparti road). The ending point lies close to KP105 of CCS1 base-case and the Provincial Road of Sparti - Megalopoli, Municipality of Sparti. Investigated alternatives in this area, are presented in Figure 7-11 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.

[10]These alternatives include the route that was presented in the Scoping Report as base-case and a new route that resulted from optimization of the latter route, based on a request by the Municipality of Sparti (14542/23-12-2020 from Technical Department of Municipality of Sparti).



Prepared by: ASPROFOS, 2022.

Figure 7-11 Alternative Routes at Evrotas Area for CCS1 – Peloponnese Pipeline Section.

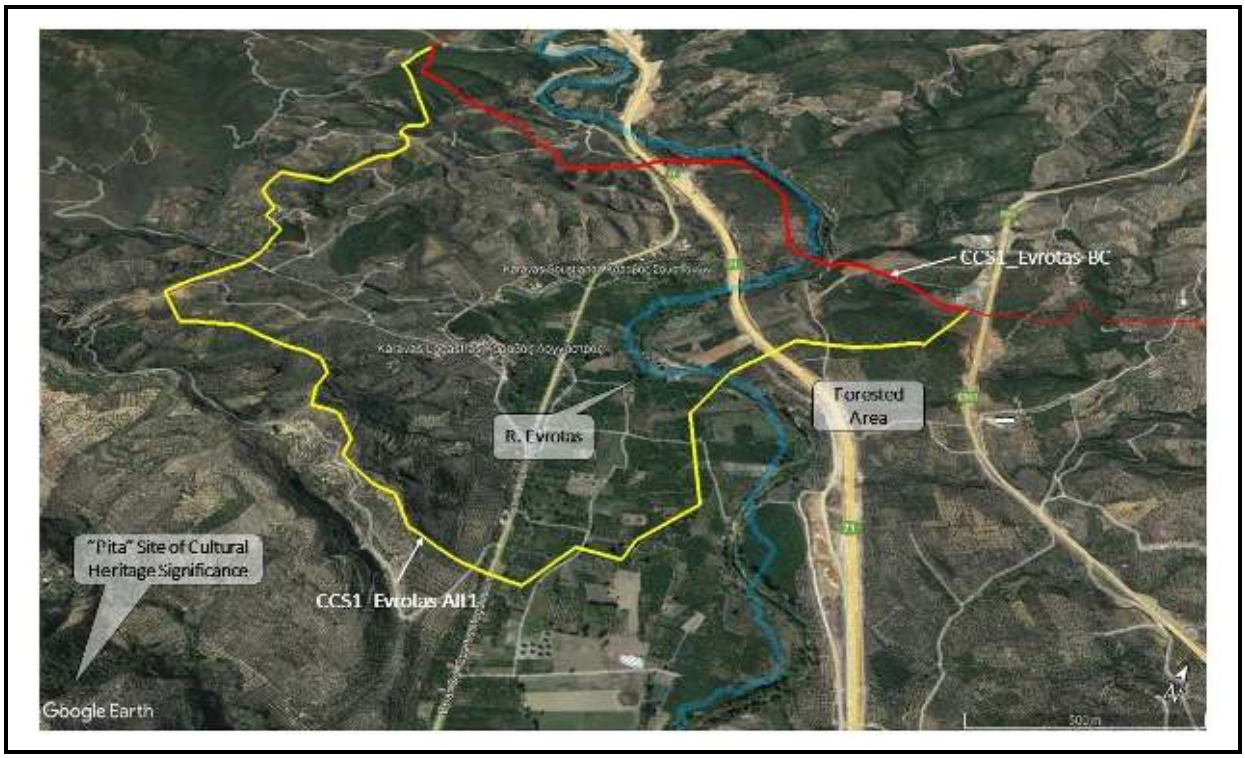
7.5.5.2 Alternatives Assessment

The main differences of these two alternatives are the following:

- **Length**. CCS1_Evrotas-Alt1 is significantly longer than CCS1_Evrotas-BC, and passes for greater length through areas of designated Spatial Planning;
- **Forest areas**. CCS1_Evrotas-Alt1 crosses broad-leaved forest areas, whilst CCS1_Evrotas-BC does not; and
- **Cultural heritage**. An area of high archaeological potential was identified at the "Pita" site approximately 500 m SW of CCS1_Evrotas-Alt1, whilst no cultural heritage engagement was identified for CCS1_Evrotas-BC.

Table 7-7 summarizes the criteria where the alternatives present differences that play significant role and are important in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A

Based on the above, CCS1_Evrotas-BC is the preferable solution. Figure 7-12 supports the main arguments of this selection.



Prepared by: ASPROFOS, 2022.

Figure 7-12 Base-case Selection for Evrotas Area.

Table 7-7 High Level Comparison Matrix for Evrotas Alternatives.

General Parameter	CCS1_Evrotas-BC	CCS1_Evrotas-Alt1
Protected Areas	No protected areas are crossed.	
Biodiversity Hotspots	Almost half of the route passes through shrublands. Presence of A71 highway has increased human presence and nuisance. Most prominent features in the area are	Most of the route passes through area dominated by tree crops (olive groves) with patches of natural areas (shrublands) and few broad leaved forests. Presence of A71

General Parameter	CCS1_Evrotas-BC	CCS1_Evrotas-Alt1
	R. Evrotas and a mosaic of shrublands and tree-crops (olive groves). The general character of the area is natural (not pristine but, mainly unaffected).	highway has increased human presence and nuisance. Although tree-crops are present, the general character of the area is natural (not pristine but, mainly unaffected).
Land Uses	33% of the route crosses through agricultural areas whilst 64% from natural or semi-natural ones (3% from other types).	82% of the route crosses through agricultural areas whilst 17% from natural or semi-natural ones (1% from other types).
Economic Development	Basecase engages areas of limited economic development, restricted to agricultural activities - most of them are tree crops. Few small roads, mainly agricultural ones connecting fields, are crossed. Two major roads are crossed.	Alternative engages areas of limited economic development, restricted to agricultural activities - almost all of them are tree crops. Some small roads, mainly agricultural ones connecting fields, are crossed. Two major roads are crossed.
Development plans	0.270 km passes through the Evrota Protection Area ("PEP3") and 1.5 km passes through Area of Agricultural Landscape and Activities Protection ("PEPD2") of the Mistra SXOOAP.	0.960 km passes through the Evrota Protection Area ("PEP3") and 4.7 km passes through Area of Agricultural Landscape and Activities Protection ("PEPD2") of the Mistra SXOOAP.
Population centres	No significant population centres are identified in the study area.1 settlement has been identified within the study area (Karavas Soustianon at 220 m).	No significant population centres are identified in the study area. 2 settlements have been identified within the study area (Karavas Logastras at 616 m, Karavas Soustianon at 78 m).
Cultural heritage	No relevant data identified.	1 identified cultural heritage resources ("Pita" site) is located at approximately 500 m to the south.

Prepared by: ASPROFOS, 2022.

7.5.6 Megalopoli Alternatives

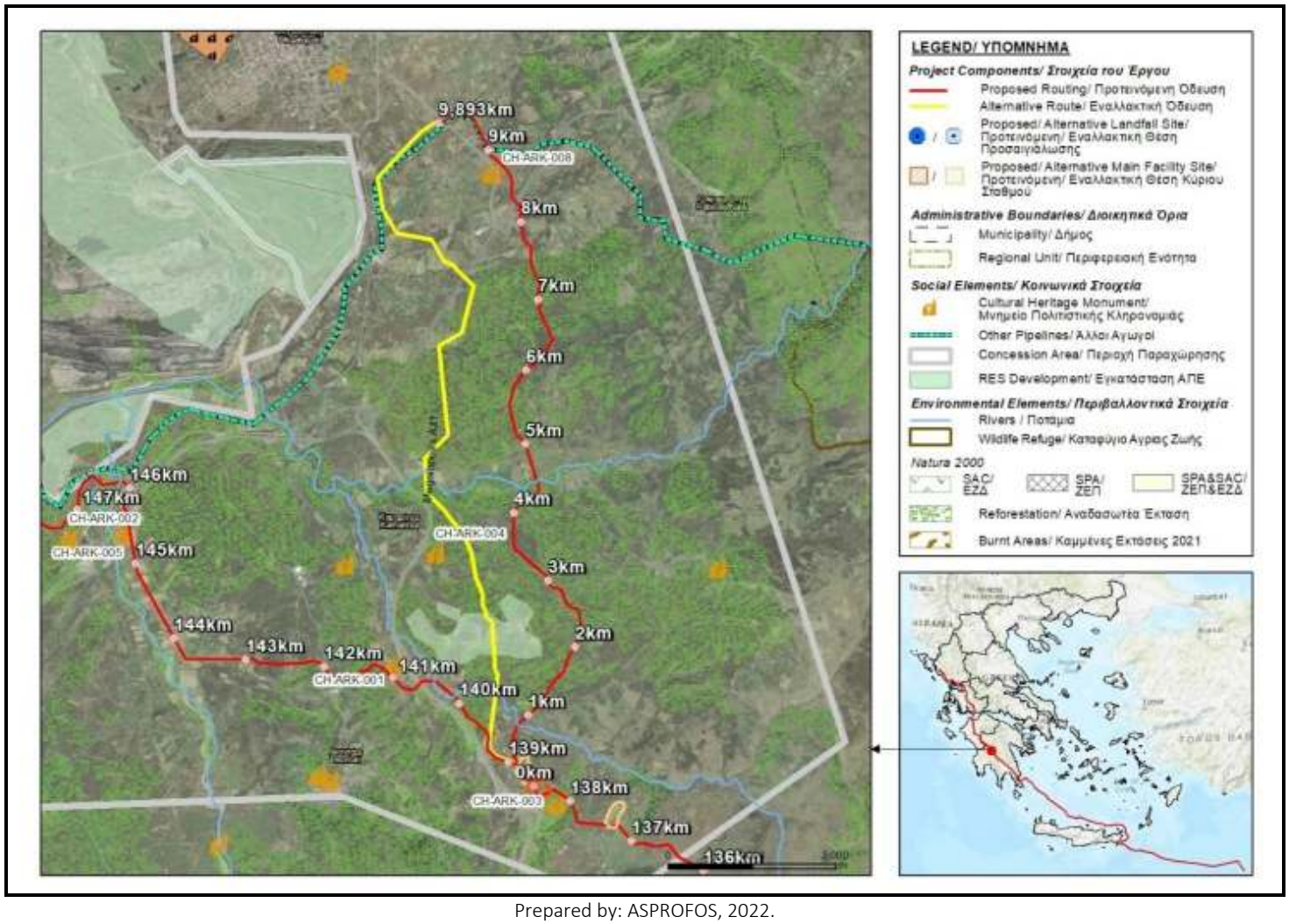
7.5.6.1 Overview

Megalopoli branch starts close to KP 140 of CCS1 base-case, near the Soulari Settlement, Municipality of Megalopoli, and has a length of approximately 10 km, ending close to the Perivolia settlement, Municipality of Megalopoli. Two (2) feasible alternatives are identified for the Megalopoli branch.[11]

[11]These alternatives include the route that was presented in the Scoping Report as base-case and a new route that resulted from optimization of the latter route.

Investigated alternatives in this area, are presented in Figure 7-13 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.



Prepared by: ASPROFOS, 2022.

Figure 7-13 Alternative Routes for Megalopoli Branch.

7.5.6.2 Alternatives Assessment

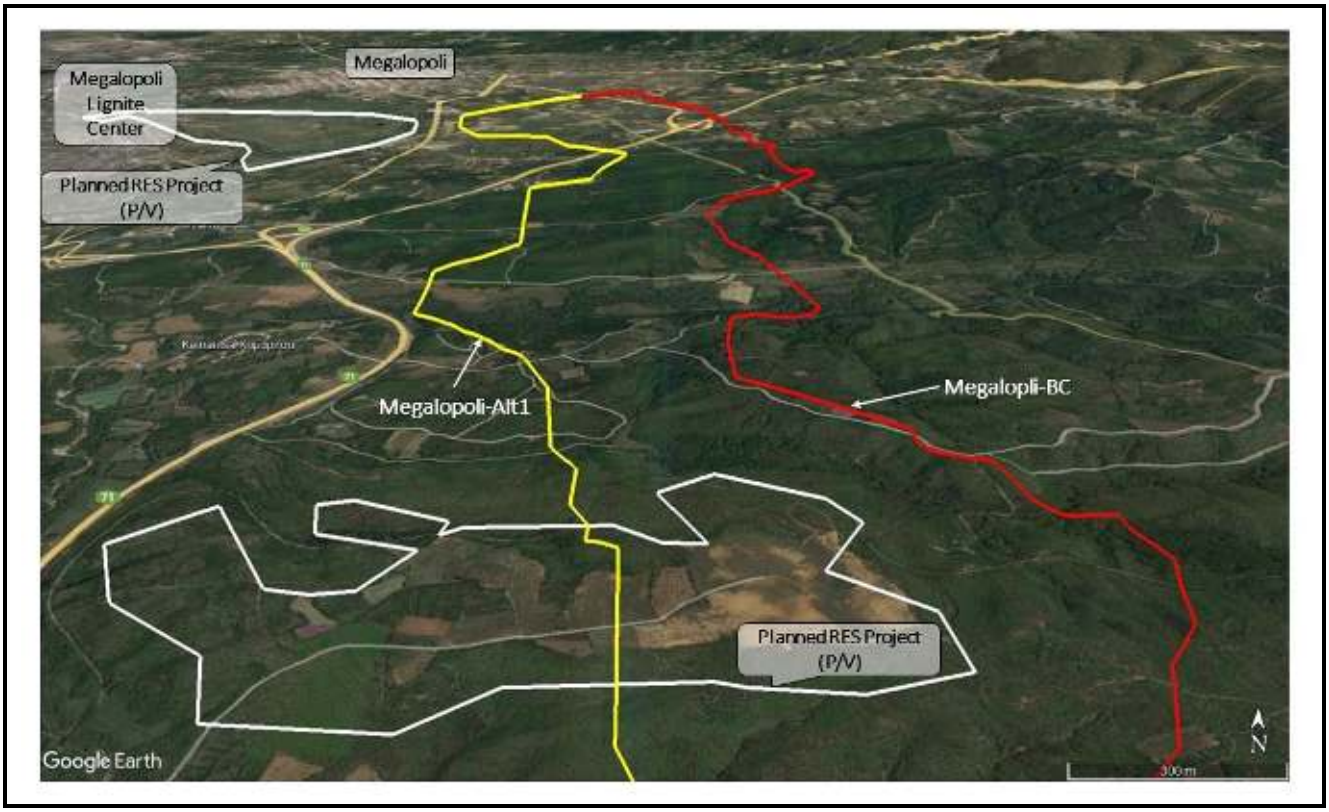
The main difference of these two alternatives is the following:

- **Planned developments**. Megalopoli-Alt1 is closer to the lignite quarry fields than Megalopoli-BC and engages with a RES project. It should be also considered that there was a route modification

request from the Municipality of Megalopoli[12] (i.e. Megalopoli-Alt1) in order to avoid engagement with a planned industrial park.

Table 7-8 summarizes the criteria where the alternatives present differences that play significant role and are important in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A

Based on the above, Megalopoli-BC is the preferable solution. Figure 7-12 supports the main arguments of this selection.



Prepared by: ASPROFOS, 2022.

Figure 7-14 Base-case Selection for Evrotas Area.

[12] See official correspondence from Municipality of Megalopoli 1309/2021/12-02-2021 & 1310/22-04-2021, in Appendix 8J.3.

Table 7-8 High Level Comparison Matrix for Megalopoli Alternatives.

General Parameter	Megalopoli-BC	Megalopoli-Alt1
Protected Areas	No Intersection with Natura2000 Areas	
Biodiversity hotspots	Almost half of the route passes through natural areas, whilst the rest mainly through land principally occupied by agriculture, with significant areas of natural vegetation. Proximity to Megalopoli Power Plant and more importantly lignite quarry fields is characterizing the broader area, north of R. Alfios; south the area is more natural. Most prominent features in the area are R. Alfios, PPC's facilities, and a mosaic of natural and agricultural areas. The general character of the area is that of degraded natural environment.	
Land Uses	45% of the route crosses through agricultural areas whilst 35% from natural or semi-natural ones (20% from other types).	56% of the route crosses through agricultural areas whilst 44% from natural or semi-natural ones.
Economic Development	Basecase engages areas of limited economic development, restricted to agricultural activities - most of them are annual crops. Crossing of A7 and Sparti-Megalopoli regional road is noted. Numerous small roads, mainly agricultural ones connecting small rural settlements or simply fields, are crossed. Proximity to Megalopoli Power Plant and more importantly lignite quarry fields is characterizing the broader area.	Alternative engages areas of limited economic development, restricted to agricultural activities - most of them are annual crops. Crossing of A7 and proximity to A71 highways is noted. Numerous small roads, mainly agricultural ones connecting small rural settlements or simply fields, are crossed. Proximity to Megalopoli Power Plant and more importantly lignite quarry fields is characterizing the broader area.
Population Centers	Megalopoli population center is noted. In total, 3 settlements have been identified within the study area (Perivolia at 225 m, Megalopoli at 710 m, Kato Makrisi at 530 m)	Megalopoli population center is noted. In total, 4 settlements have been identified within the study area (Megalopoli at 445 m, Perivolia at 300 m, Vrisoules at 445 m, Kamaritsa at 300 m).
Cultural Heritage	2 identified cultural heritage resources have been identified: 345 m to the S (Agios Konstantinos, Soulari site) and 150 to the W (Perivolia-Moreas site)	3 identified cultural heritage resources have been identified: 345 m to the S (Agios Konstantinos, Soulari site), 350 m to the W (Kamaritsa (Moreas)) and 920 m to the E (Perivolia-Moreas site
Development plans	Proximity to 1 RES project; Megalopoli's Power Plant and Lignite Center of PPC in the broader area. Recent developments include break of lignite production activities and replacement of lignite by natural gas as fuel for the Power Plant.	Engagement with 1 and proximity to 2 RES projects; Megalopoli's Power Plant and Lignite Center of PPC in the broader area. Recent developments include break of lignite production activities and replacement of lignite by natural gas as fuel for the Power Plant.

Prepared by: ASPROFOS, 2022.

7.5.7 Foloi Plateau Alternatives

7.5.7.1 Overview

For this section of CCS1, two (2) feasible alternatives are identified.[13]

In the Municipality of Ancient Olympia, at the broader area of Lalas settlement, between the region of UNESCO site of Ancient Olympia to the west and Foloi Plateau Natura 2000 site to the east, CCS1 base-case crosses the protected area at its westernmost boundaries, NE of Lalas settlement, whilst alternative from the SW side of the settlement (avoiding the protected area, but decreasing the distance to Ancient Olympia site). The starting point of this set of alternatives lies NE of Vasilaki settlement, Municipality of Ancient Olympia (close to KP 213 of CCS1 base-case). The ending point lies close to Mouzaki settlement, Municipality of Pirgos (close to KP 246 of CCS1 base-case).

An important factor of the broader area are the wildfires that broke out in the summer of 2021; even more so considering that some areas had suffered from similar wildfires in the recent past (2007).

CCS1_Foloi-BC passes through Foloi municipality unit, crosses the Natura 2000 area "OROPEDIO FOLOIS" and ends at Oleni municipality unit. The route passes at the southern side of the forest where there are areas with one-year cultivations, avoiding forest trees as much as possible.

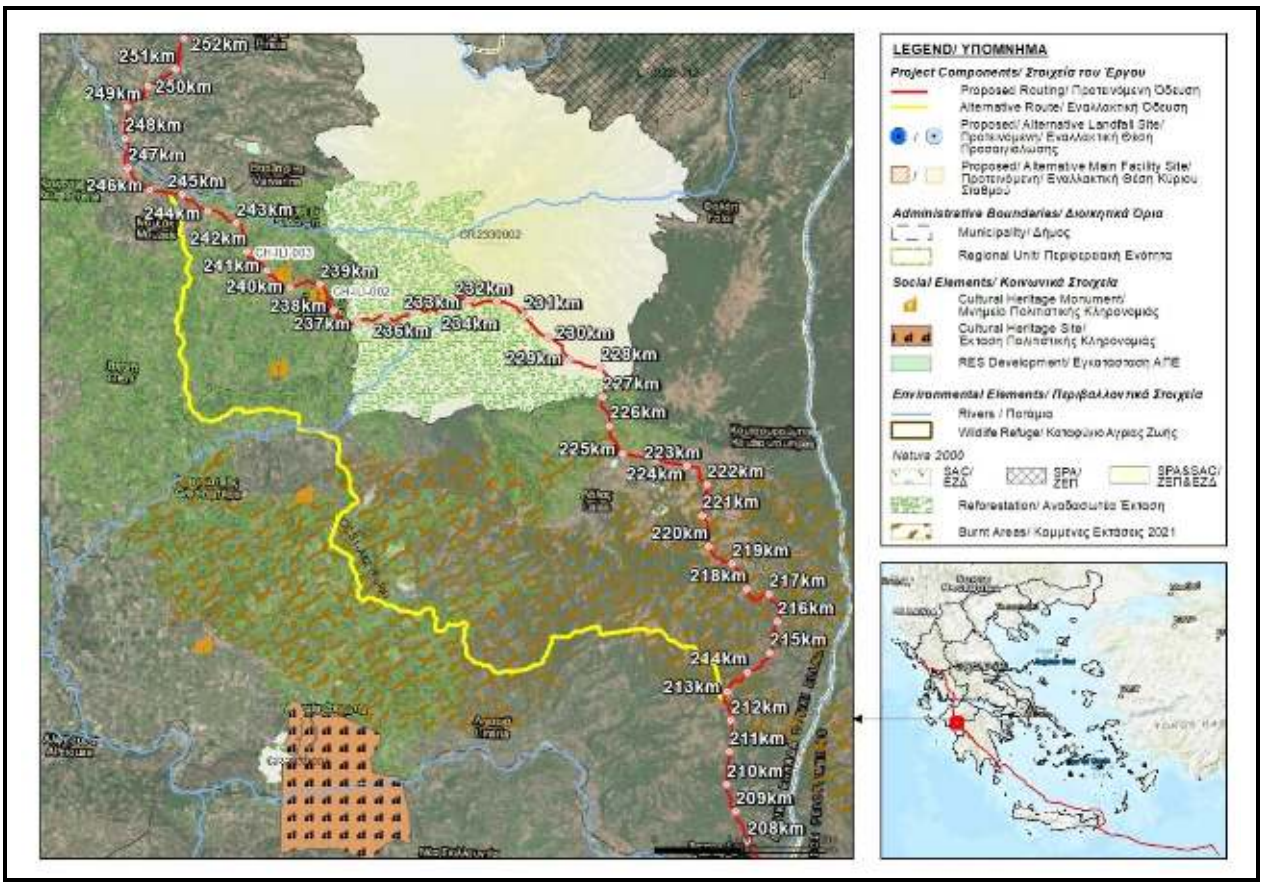
The effort was made to avoid continuous streams with steep slopes due to erosion.

CCS1_Foloi-Alt1 alternative crosses mainly the municipality unit of Ancient Olympia, south of Natura 2000 area "OROPEDIO FOLOIS" and meets CCS1 at the Oleni municipality unit. After approximately 35 km, the two alternatives converge to a corridor near Akropotamia settlement of Ilida municipality. It is noted that the CCS1_Foloi-Alt1 alternative presents great construction difficulties due to the presence of landslides and erosion.

The investigated sections are presented in Figure 7-15 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.

[13]These alternatives are the same as the ones assessed during the Scoping Phase; given that no improved alternative was identified, they are still considered valid.



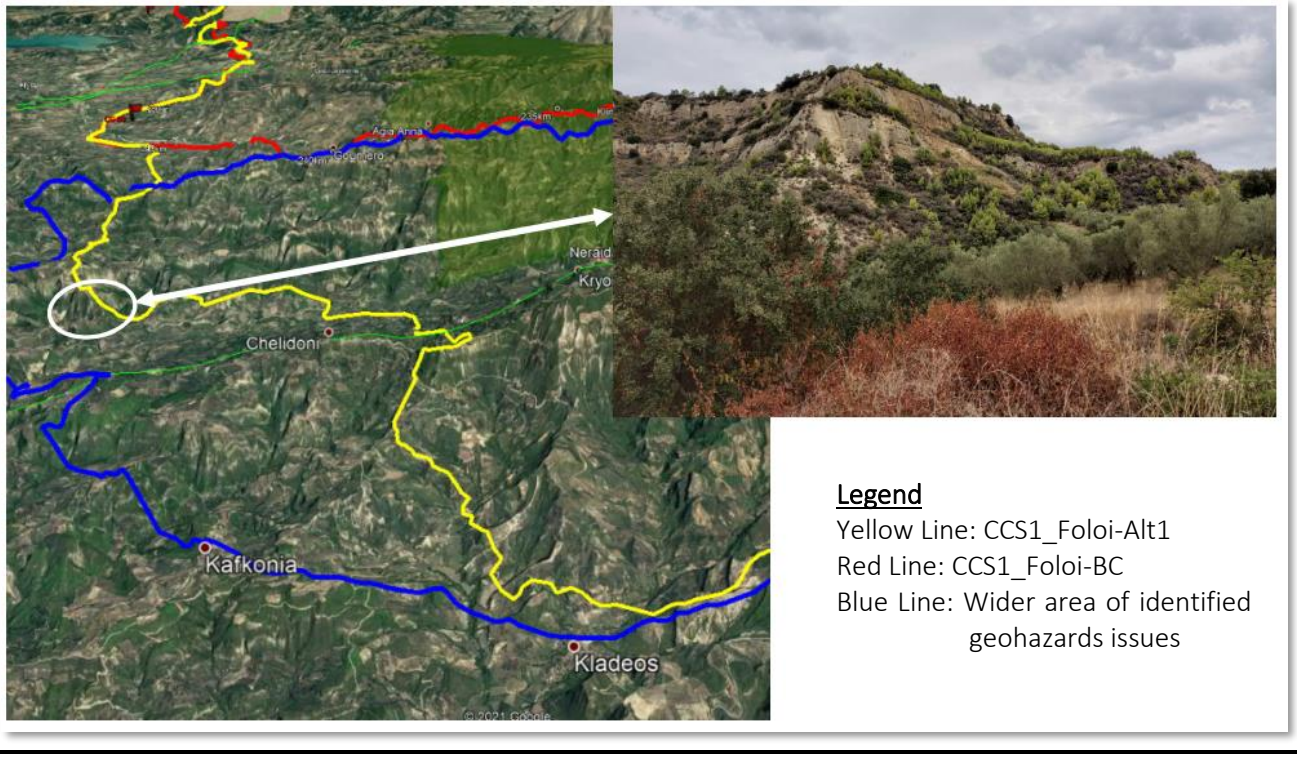
Prepared by: ASPROFOS, 2022.

Figure 7-15 Alternative Routes at Foloi Plateau for CCS1 – Peloponnese Pipeline Section.

7.5.7.2 Alternatives Assessment

CCS1_Foloi-BC and CCS1_Foloi-Alt1 alternatives assessment critical points can be summarized as follows:

- **Geotechnical issues**. The selection of the proposed route needs to take into consideration additional constraints, e.g. geohazards and accessibility. In many cases, the impact from the geotechnical works for slope stabilization or the need for new access road construction is more significant than temporary impact on protected areas or biodiversity hotspots. As a consequence, geotechnical issues, such as slope stability and access[14] should also be taken into consideration. Such geotechnical issues pose more challenges in regard to construction; moreover, they pose significant operational hazards in terms of project vulnerability to mass earth movements that could be triggered and impact the Project. CCS1_Foloi-Alt1 faces much more significant geotechnical issues and challenges than the CCS1_Foloi-BC;

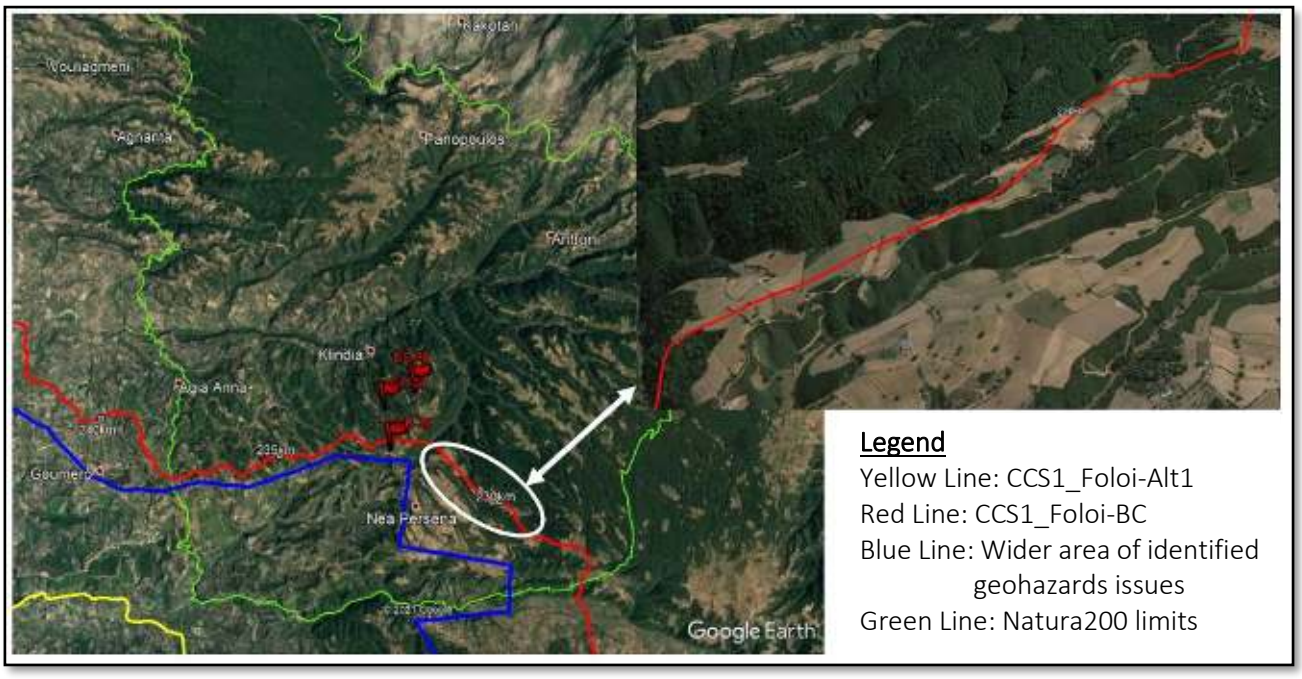


Prepared by: C&M, 2021, 2021. Base map from Google Earth. Picture from C&M, 2021.

Figure 7-16 Geotechnical Issues along CCS1_Foloi-Alt1.

[14] Geotechnical and accessibility issues are investigated within the context of the ongoing FEED of the project.

- Archaeological engagement. The broader area is very important regarding cultural heritage and should be considered an area of high archaeological potential. The area lies between the Foloi Forest (the Forest of Centaurs, a forest full of myths and traditions) and the Ancient Olympia UNESCO site (where the Olympic Games were held) and numerous related sites in the surrounding area. One of these surrounding sites is the Goumero Gorge, characterised as a monument of natural beauty by the Ministry of Culture. The gorge's path includes various cultural heritage sensitivities; the most relevant to the project's alternatives assessment are among the oldest olive trees in Greece, with branches from which the winners of the Olympic Games were crowned. Both alternatives are crossing such areas of high archaeological potential: CCS1_Foloi-BC crosses the Foloi Forest whilst CCS1_Foloi_Alt1 the Goumero Gorge. Nevertheless, potential impact on the ancient olive trees can be considered a more likely negative impact (i.e. for CCS1_Foloi_Alt1) than chance finding in the Foloi forest (i.e. for CCS1_Foloi-BC); and
- Naturalness of the broader area. Regarding CCS1_Foloi-BC, most of the route passes through agricultural areas, whilst the rest mainly through land principally occupied by agriculture with significant areas of natural vegetation. The most prominent feature in the area is the Foloi Plateau and Forest; the oak forest of Foloi is the only native broad-leafed oak forest in the Balkans, with old clusters of oaks. The base case does not affect the main core of the forest, passing mainly through cultivated areas. Regarding CCS1_Foloi-Alt1, most of the route passes through agricultural areas, whilst the rest mainly through land principally occupied by agriculture, with significant areas of natural vegetation. Most prominent features in the area is R. Lestenitsas and Goumero Gorge. Goumero Gorge is a monument of natural beauty (Ministry of Culture) where some of the oldest olive trees in Greece can be found, with branches from which they crowned the Olympians. The gorge is surrounded by lush vegetation and springs with cool water. As previously mentioned, CCS1_Foloi-BC passes at the southern side of the forest where there are areas with one-year cultivations, avoiding as much as possible forest trees; CCS1_Foloi-Alt1 passes through an area characterised by the Ministry of Culture as of significant natural beauty.



Prepared by: C&M, 2021. Base map from Google Earth.

Figure 7-17 Affected Natural Areas along CCS1_Foloi-BC.

Table 7-9 summarises the criteria to which the alternatives present differences that play a significant role and are important in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex

It should be highlighted that, in order to verify that the CCS1_Foloi-BC is indeed more sustainable and preferable than the CCS1_Foloi-Alt1, during the ongoing FEED of the project, the area was investigated in great detail regarding geotechnical considerations, and the geotechnical issues were documented; most significant ones are presented in this document (see alsoAnnex 7A).

Based on the above, CCS1_Foloi-BC is the preferable solution.

Table 7-9 High Level Comparison Matrix for Foloi Plateau Alternatives.

Code	CCS1_Foloi-BC	CCS1_Foloi-Alt1
Protected areas and species	GR2330002 (SPA & SAC) Foloi Plateau is crossed for approx. 10, at the outskirts of the protected area, with limited engagement to protected features	No Intersection with Natura 2000 Areas 13 avifauna species of conservation interest have been identified within the study area

Code	CCS1_Foloi-BC	CCS1_Foloi-Alt1
	9 avifauna species of conservation interest have been identified within the study area Route crosses Mt Foloi IBA for approx. 12 km.	
Biodiversity hotspots	Most of the route passes through agricultural areas, whilst the rest mainly through land principally occupied by agriculture, with significant areas of natural vegetation. Crossing of Foloi Plateau and corresponding protected area. Most prominent features in the area is Foloi Plateau and Forest; the oak forest of Foloi is the only native broad-leaved oak forest in the Balkans, with old clusters of oaks. Intense morphology of rippled cultivated areas is dominant. The general character of the area is that of natural environment with significant agricultural activity.	Most of the route passes through agricultural areas, whilst the rest mainly through land principally occupied by agriculture, with significant areas of natural vegetation. Most prominent features in the area is R. Lestenitsas and Goumero Gorge. Goumero Gorge is a monument of natural beauty (Ministry of Culture) where some of the oldest olive trees in Greece can be found, with branches from which they crowned the Olympians. The gorge is surrounded by lush vegetation and springs with cool water. Intense morphology of rippled cultivated areas is dominant. The general character of the area is that of natural environment with significant agricultural activity.
Land Uses	70% of the route crosses through agricultural areas whilst 18% from natural or semi-natural ones (12% from other types).	76% of the route crosses through agricultural areas whilst 24% from natural or semi-natural ones.
Economic Developme nt	Basecase engages areas of limited economic development, restricted to agricultural activities - few of them are tree crops. Numerous small roads, mainly agricultural ones connecting small rural settlements or simply fields, are crossed.	Alternative engages areas of limited economic development, restricted to agricultural activities - quite a few of them are tree crops. Numerous small roads, mainly agricultural ones connecting small rural settlements or simply fields, are crossed.
Cultural Heritage	The entire Foloi Plateau area is an Area of High Archaeological Potential. Foloi forest is also known as the Forest of Centaurs, a forest full of myths and traditions, in which had the kingdom of Centaur Folos (son of Silinos and the nymph Melia), the good Centaur who hosted the mythical hero Hercules when he chased the Erymanthios boar.	Proximity to Ancient Olympia UNESCO site is noted. Engagement with Goumero Gorge. Goumero Gorge is characterized as monument of natural beauty by Ministry of Culture. The gorge's path includes the cave of Askiti, the Holy Monastery of Askiti and an ancient cobblestone path. On the path you will find the oldest olive trees in Greece, with branches from which they crowned the Olympians.

Code	CCS1_Foloi-BC	CCS1_Foloi-Alt1
Development plans	The broader area is considered significant alternative (mainly eco) tourism venue. Numerous paths and areas of natural beauty are located and in the broader area. Some such areas are crossed by the alternative, whilst paths may also be crossed. No significant tourism establishments are identified.	The broader area is considered significant tourism venue due to proximity to Ancient Olympia; alternative tourism is also very important in the area. Numerous paths and areas of natural beauty are located and in the broader area. Some such paths and areas are crossed by the alternative. No significant tourism establishments are identified; monasteries (visited for religious tourism) are noted (in the broader area).
Technical Challenges	Avoids most of the problematic areas, crosses areas presenting gentle to moderate slopes whilst crossing of steep ravines is significantly reduced	Significant geotechnical issues regarding landslides and steep slopes. Almost the entire alternative passes through areas of erosion phenomena, as well as narrow passages, with numerous steep ravines. In order for the pipeline to be installed in this area, special construction techniques should be applied of significant cost and time impacts. Especially in the area north of Kladas settlement, the geological formation that extends from west to east presents very steep slopes, limited space for the pipeline installation and significant geohazards. The geological formations comprise alternations of marls, conglomerates and sandstones. Their thickness is a few metres and their dip is very low. Different weathering and erosion degree caused by rock mass heterogeneity (lithology and mechanical properties) can trigger rock falls.

Prepared by: ASPROFOS, 2022.

7.5.8 Patraikos Crossing Alternatives

7.5.8.1 Overview

For Patraikos Gulf crossing, two alternative landfall sites (LF4/LF4a and LF5/LF5a) connected through three alternative offshore route sections were assessed. The different landfall sites correspond to different onshore sections, connecting the landfall site to the proposed onshore pipeline route

(either CCS1, in Peloponnese, or CCS2, in Continental Greece). As such, the following alternatives have been assessed, starting from close to KP 286 of CCS1, W of Petrochori settlement, Municipality of Dytiki Achaia (Peloponnese section) (starting point) and ending close to KP 29 of CCS2, NW of Grammatiko Settlement, M. of Agrinio (Western Continental section) (ending point):

- OSS4 Base-case (OSS4-BC), connecting LF4 landfall site, at Kalamaki Beach, Municipality. of W. Achaia, R.U. of Achaia, and LF5 landfall site, south of Evinochori, Municipality of Nafpaktia, R.U. of Etoloakarnania, crossing R. Evinos north of Evinochori settlement;
- OSS4 Alternative 1 (OSS4-Alt1), connecting LF4 landfall site, at Kalamaki Beach, Municipalities of West Achaia, R.U. of Achaia, and LF5a landfall site, at Kato Vasiliki, Municipalities of Nafpaktia, R.U. of Etoloakarnania;
- OSS4 Alternative 2 (OSS4-Alt2), connecting LF4a landfall site, at Tsoukaleika, Municipality of Patra, R.U. of Achaia, and LF5a landfall site, at Kato Vasiliki, Municipalities of Nafpaktia, R.U. of Etoloakarnania; and
- OSS4 Alternative 3 (OSS4-Alt3), connecting LF4 landfall site, at Kalamaki Beach, Municipality. of W. Achaia, R.U. of Achaia, and LF5 landfall site, west of Evinochori, Municipality of Nafpaktia, R.U. of Etoloakarnania[15]; this is similar to OSS4-BC, with few modifications only in the onshore section upstream LF5 (i.e. CCS2)

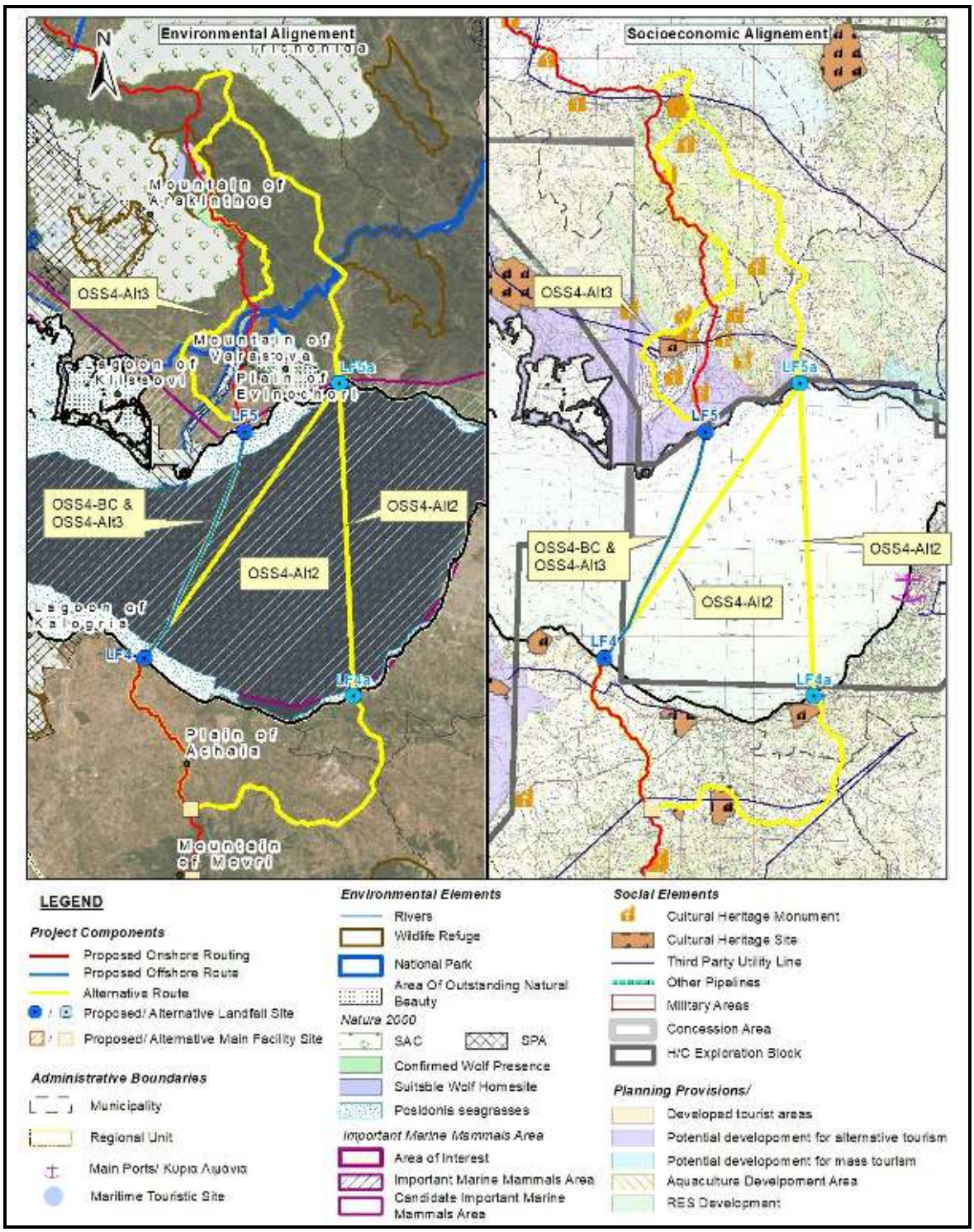
Alternatives for Patraikos Gulf crossing are illustrated in Figure 7-5 (see Section 15.1.3 - Alternatives Map).

Assessment of the specific alternatives include three different elements: the onshore route, the offshore route and the landfall site. All these elements have been considered in a unified manner through a common study area of 1 km buffer (1 km on each side of the route axis). However, here below, the various sections have been presented separately allowing a more systematic approach. It is evident that the alternatives have identical sections. Nevertheless, it has been opted to present each alternative as a whole, as an integrated solution. This allows for alternatives to be assessed as a whole, and not just a section of the entire alternative to be compared to a corresponding part of a different alternative. Extensive fragmentation/ segmentation of an assessed project (in this case of the alternative routes assessment) could mislead to wrong results. For example, one segment of an alternative might be better than the corresponding section of another one, but the other segments not; however, one cannot simply choose one segment of this alternative and two other from a different one. On the other hand, taking small bits of information might obscure the broader picture.

[15]OSS4-Alt1 and OSS4-Alt2 are the same as the ones assessed during the Scoping Phase; they are still valid, due to the environmental considerations along the base-case. OSS4-Alt3 was presented in the Scoping Phase as the base-case; however, recent design developments resulted in optimization of the latter to OSS4-BC, current's phase base-case.

For example, a landfall site of a given alternative might be preferable (from environmental point of view) but the corresponding onshore section, might pose significant geotechnical issues and thus resulting in more severe impacts; as such, the entire alternative is not preferable, even though one of its elements is preferable from ESIA point of view.

A detailed description of the alternatives is presented in Annex 7A.



Prepared by: ASPROFOS, 2022.

Figure 7-18 Alternatives Considered for Patraikos Gulf Crossing.

7.5.8.2 Alternatives Assessment

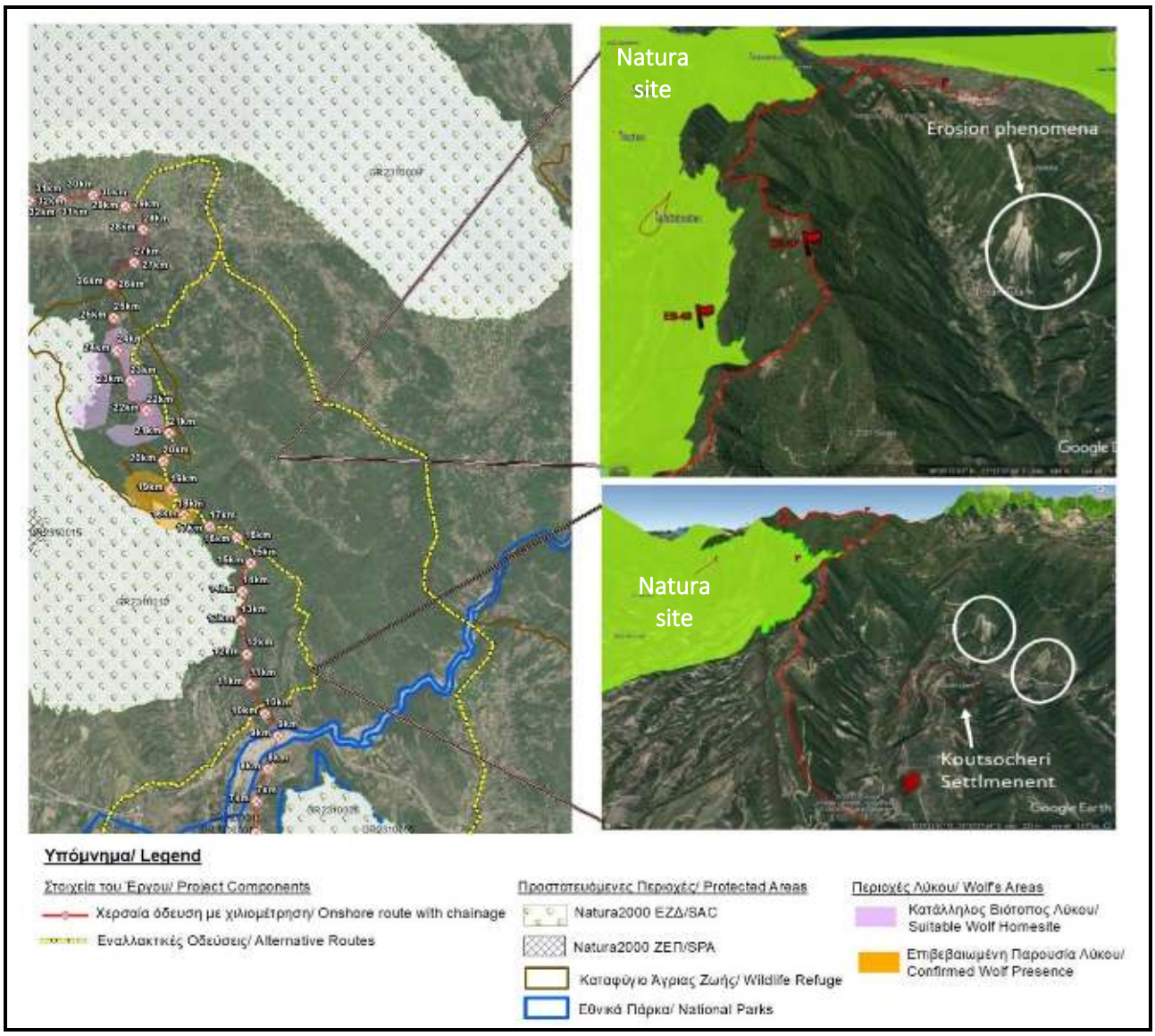
Patraikos Gulf crossing alternatives assessment critical points can be summarized as follows:

- Natural Environment. CCS1 segment of all alternatives passes through the Plain of Achaia, of rather limited ecological value. Regarding CCS2 segment, Mt Arakynthos supports an unfragmented forest; OSS4-Alt1 & OSS4-Alt2 length in the specific area is 6 km less;
- Protected species & habitats.

  Posidonia oceanica is present in all nearshore areas of the landfall sites and cannot be completely avoided; however, alternative landfalls (LF4a & LF5a) support seabeds to a smaller extent,

  Wolf's presence was confirmed at Mt Arakynthos; in fact, OSS4-BC and OSS4-Alt3 (to a smaller extent) cross through these areas.

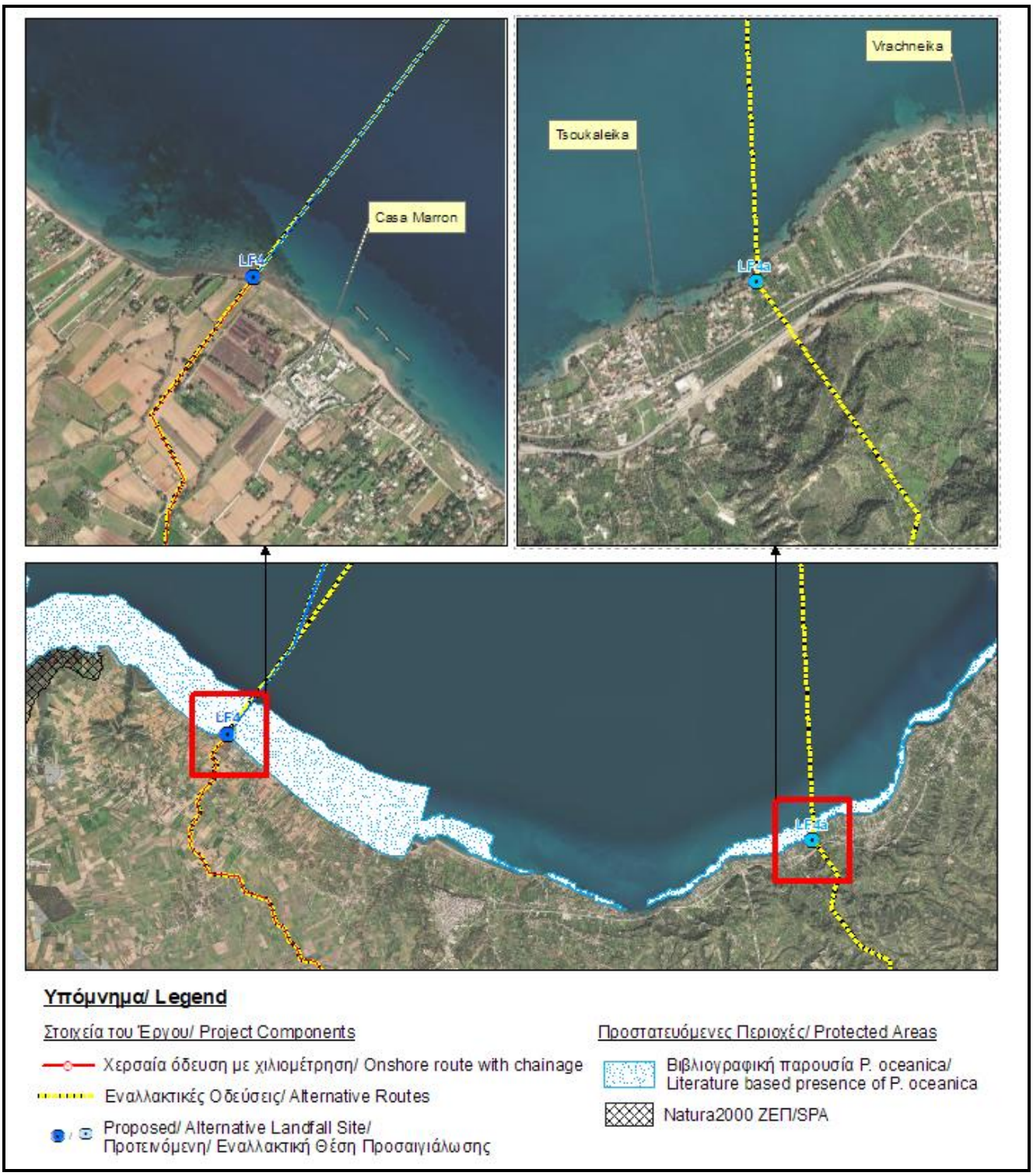
  The selection of the proposed route needs to take into consideration geohazards and accessibility. In many cases, the impact from the geotechnical works for slopes stabilization or the need for new access roads construction is more significant than temporary impact on protected areas or biodiversity hotspots. The present assessment focuses on currently known environmental constraints, however geotechnical issues, such as slopes stability and access were also taken into consideration, as studied by the technical team. Such geotechnical issues pose more challenges on construction safety issues; moreover, they pose significant operational hazards, in terms of project `vulnerability to mass earth movements that could be triggered and impact the Project. Avoidance of the specific area sensitive for the wolf, would require construction in a much more challenging (from geotechnical point of view) substrate and morphology. Figure 7-19 is relevant.



Prepared by: ASPROFOS, 2022.

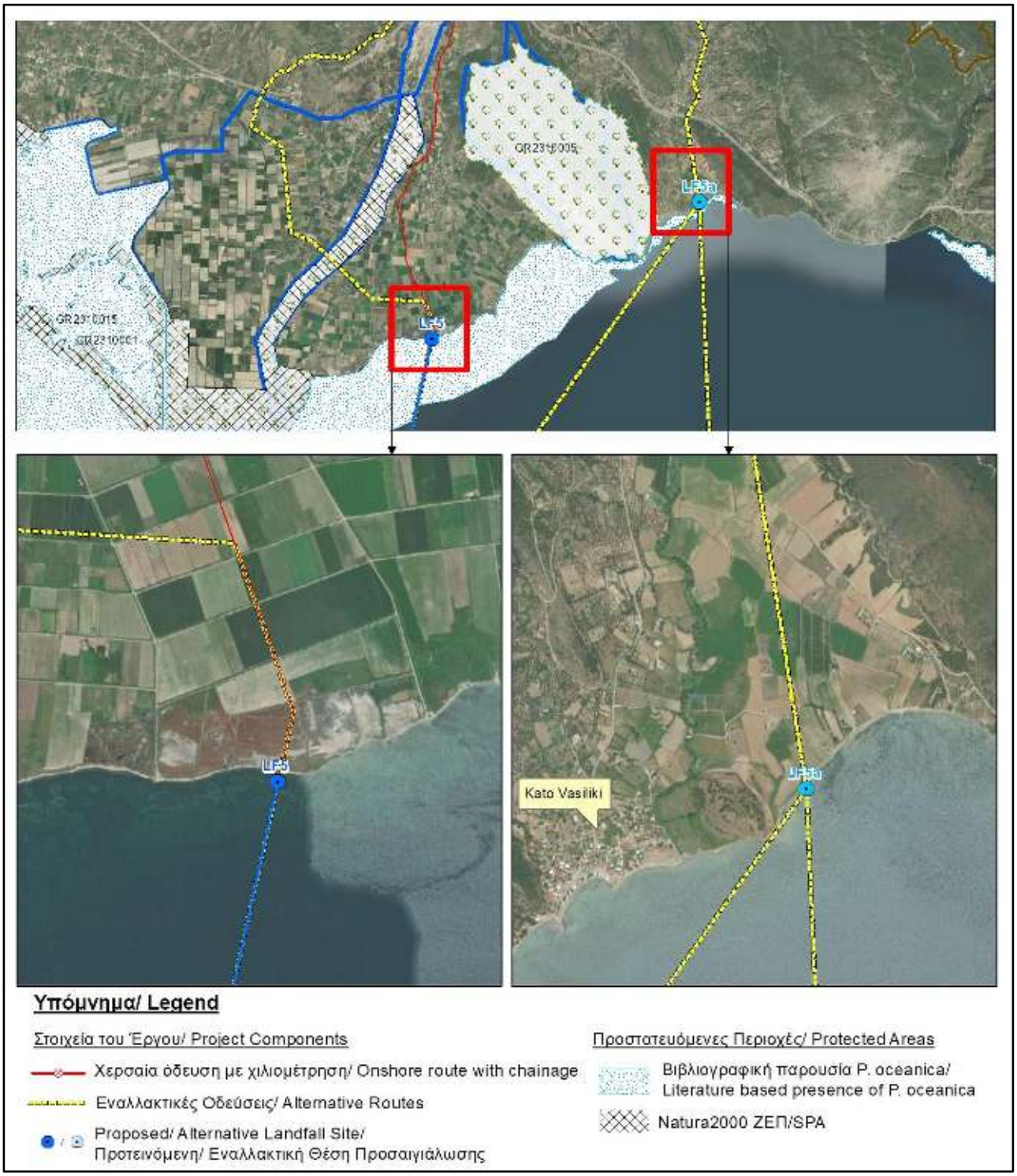
Figure 7-19 Wolf Presence in Arakynthos Area.

- **Social Environment:** Regarding the landfall sites, both landfall sites at NW Peloponnese support significant touristic activity. However, LF4a is in a much more densely populated area than LF4 and could pose greater social impacts; similar for LF5a.



Prepared by: ASPROFOS, 2022.

Figure 7-20 Tourist Development at NW Peloponnese.



Prepared by: ASPROFOS, 2022.

Figure 7-21 Tourist Development at SW Aetoloakarnania.

- Cultural heritage engagement. Out of all the alternatives only OSS4-Alt2 is engaged with declared archaeological sites (two are crossed). The other ones keep safe distances from cultural heritage resources.

Table 7-10 summarizes the criteria to which the alternatives present differences that play significant role, or are important, in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A.

It should be highlighted, in order to identify the possibility of avoidance of the wolf's sensitive areas, during the ongoing FEED of the project, the area was investigated in great detail regarding geotechnical considerations, and the geotechnical issues were documented; most significant ones are presented in this document (see also Annex 7A). Based on information acquired by the ongoing FEED, the following need to be noted:

- During the feasibility study of the project on 2015-2016, the wider area of the north Peloponnese was evaluated and the LF4a location was rejected due to the proximity to the Vrachneika and Tsoukaleika settlements which present high touristic development. Moreover, the crossings of the New and Old National road as well as the Railway line were evaluated as very challenging due to the terrain morphology of the area which present steep slopes and ground instabilities.
- Landfall LF5a at K. Vasiliki area is located too close to the declared archaeological area of Ag. Triada (ΦΕΚ: 527/B/1967-08-24 - ΦΕΚ: 618/B/1965-09-17 - ΦΕΚ: 25/B/1993-01-27). This area is more developed by a tourism point of view than the proposed LF5 location. In addition, the route after the LF5a would have more social impacts since there are a lot scattered settlements in the area and permanent cultivations. The only available area for the crossing of Ionia highway is at the limits of the settlement Chania Gavrolimnis at an area where a lot of scattered building are located. Moreover, the crossing of R. Evinos close to Paradisi settlement was considered very difficult from a technical point of view, since the active river bed is continuously modified (especially during winter period) presenting meanders due to the erodible geological formations and the water amount and velocity.

Based on the above, OSS4-BC is the preferable solution.

Table 7-10 High Level Comparison Matrix for Patraikos Crossing Alternatives.

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
Protected Areas and Species	• CCS1 section does not interfere with any protected area.			
	• LF4 and LF4a are located within P. oceanica seabed.			
	• Regarding offshore section, the entire routes crosses Patraikos Gulf. Patraikos Gulf is a very sensitive area for marine biodiversity; it hosts significant anthropogenic pressures (mainly due to maritime traffic and aquaculture activities).			
	• LF5 is located within P. oceanica seabed		• LF5a is located close to P. oceanica seabed.	
	• 30 avifauna and 5 mammal species of conservation interest have been reported in the study area (3 terrestrial).		• 30 avifauna and 4 mammal species of conservation interest have been reported in the study area (3 terrestrial).	
	• CCS2 section crosses the National Park of Messolonghi Aetoliko Lagoons (~0.5 km, in total), as well as the WR of Arakynthos (~ 5.5 km). • Canis lupus is highlighted given the fact that the route passes through areas of confirmed wolf presence (1800 m) and suitable home site (3400 m), at Mr. Arakynthos	• CCS2 section crosses the National Park of Messolonghi Aetoliko Lagoons (5 km, in total), incl. GR2310001 (~ 422 m) GR2310015 (~422 m), as well as the WR of Arakynthos (~4.2 km). • *Canis* lupus is highlighted given the fact that the route passes through areas of confirmed wolf presence (1800 m) and suitable home	• CCS2 section crosses the National Park of Messolonghi Aetoliko Lagoons (~0.3 km, in total), as well as the WR of Arakynthos (~ 5.5 km).	

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
		site (960 m), at Mr. Arakynthos		
Biodiversity Hotspots	• CCS1 section passes through the plain of Achaia (intense agricultural activity).			
	• LF4 is located in the NW part of Peloponnese, at the coastline of Achaia Plain. The entire north coastline of Peloponnese is hosting a lot of touristic developments and summer houses. • The coast on LF4 characterized by a soft strand (less than 100 m) aggravating in front of a rocky coast.			• LF4a is located within natural areas with scattered houses (numerous summer houses) and significant touristic facilities between Tsoukaleika and Vrachneika settlements. • The coast on LF5 characterized by extensive beaches.
	• Patraikos Gulf is a very sensitive area for marine biodiversity; Patraikos Gulf hosts significant anthropogenic pressures (mainly due to maritime traffic and aquaculture activities).			
	• LF5 is characterized by intensively cultivated fields of Evinochori Plain. • The coast on LF5 characterized by extensive beaches.		• LF5a is characterized by cultivated fields E of Mt Varasova, next to Kato Vasiliki settlement. • The coast on LF5 characterized by extensive beaches.	
	• Almost half of the CCS2 section passes through plain of Evinochori, in the estuary of R. Evinos; the rest of the CCS2 section passes through completely unfragmented forested areas of Mt Arakynthos (~ 10 km).		• Most of the CCS2 section passes through agricultural lands; the rest of the CCS2 section passes through the eastern foothills of Mt Arakynthos (~ 4 km), a mixed of natural and agricultural areas, S of Trichonida Lake.	

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
Land Uses	• 58% of the onshore route crosses through agricultural areas whilst 42% from natural or semi-natural ones.	• 65% of the onshore route crosses through agricultural areas whilst 35% from natural or semi-natural ones.	• 78% of the onshore route crosses through agricultural areas whilst 21% from natural or semi-natural ones and 1% from discontinuous urban fabric.	• 79% of the onshore route crosses through agricultural areas whilst 20% from natural or semi-natural ones and 1% from discontinuous urban fabric.
	• CCS1 segment of this alternative passes through intensively cultivated fields of Achaia Plain			• CCS1 segment of this alternative passes through intensively cultivated fields of Achaia Plain and also very close to the Patra Industrial Area.
	• CCS2 segment of this alternative passes through intensively cultivated fields of Evinochori Plain		• CCS2 is characterized by cultivated fields E of Mt Varasova	
Population Centres	• Numerous small, rural settlements hosting small touristic facilities are located, especially along CCS1 section			• Characteristic discontinuous urban fabric, of scattered rural settlements, summer houses and touristic facilities, especially along CCS1 section.
	• Numerous small, rural settlements hosting small touristic facilities are located, at the end of CCS2 section			

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
	• 6 settlements in the Peloponnese section (Lampreika 650 m, Niforeika 1000 m, Limnohori 550 m, Karamesineika 700 m, Gomosto 1000 m, Kalamaki 500 m)			• 10 settlements in the Peloponnese section (Petrochori 260 m, Fostaina 550 m, Vrachneika 750 m, Zambeteika 550 m, Logothetis 400 m, Ano Achaia 270 m, Spaliareika 730 m, Avgereika 550 m, Chaikali 280 m, Tsoukaleika 450 m)
	• 5 settlements in the Western Continental Greece section (Paliostani 250 m, Perithorio 430 m, Evinochori 1000 m, Kokori 1000 m, Grammatiko 420 m).	• 9 in the Western Continental Greece section (Nea Kalidona 300 m, Evinochori 1000 m, Kokori 1000 m, Agios Andreas 670 m, Agios Georgios 350 m, Koutsocheri 500 m, Gavalou 780 m, Trichoni 300 m, Gramatiko 540 m)	• 10 in the Western Continental Greece section (Trikorfo 930 m, Agios Andreas 670 m, Kato Vasiliki 550 m, Gavrolimni 250 m, Markinou 330 m, Mesarista 50 m, Ano Metapa 50 m, Gavalou 780 m, Trichoni 300 m, Gramatiko 540 m)	• 10 in the Western Continental Greece section (Trikorfo 930 m, Agios Andreas 670 m, Kato Vasiliki 550 m, Gavrolimni 250 m, Markinou 330 m, Mesarista 50 m, Ano Metapa 50 m, Gavalou 780 m, Trichoni 300 m, Gramatiko 540 m)

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
Development Plans	• LF4 area hosts some significant tourism facilities whilst numerous smaller ones are expected.			• LF4a is located within an area of numerous summer houses and significant touristic facilities.
	• LF5 is designated for "Potential for alternative tourism"; however, the broader area is not presenting any relevant facilities.		• LF5a is designated for "Potential for alternative tourism"; however, the broader area is not presenting any relevant facilities.	
Economic Development (Touristic Activity)	• The entire north coastline of Peloponnese is hosting a lot of touristic developments and summer houses. LF4 is located in the area of Kalamaki beach where scattered residents are evident. The most prominent development is the Lakopetra Grecotel establishment at a distance of ~250 m (Casa Maron).			• The entire north coastline of Peloponnese is hosting a lot of touristic developments and summer houses. LF4a is located within natural areas with scattered houses (numerous summer houses) and significant touristic facilities between Tsoukaleika and Vrachneika settlements.
	• The entire offshore route passes through fishing grounds, given that Patraikos Gulf Sea is an area of high fishing effort. No engagement with aquaculture development or underwater infrastructure is identified. • Very high marine traffic density.			
	• LF5 & LF5a are not engaged with any touristic or otherwise evident development; even though it is designated as area of potential for development of alternative forms of tourism.			

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
	• Proximity to 2 RES projects.	• Proximity to 3 RES projects.	• Proximity to 1 RES project.	• Proximity to 3 RES projects. • Industrial area of Patra lies at approx. 900 m NW in Peloponnese
Cultural Heritage	• Regarding cultural heritage, no engagement with known declared archaeological sites exist;			• In Peloponnese the Declared archaeological sites of "Skagia", "Achlada"& "Galaria" (HGG 796/B/30-8-1996) and "Kalamaki" (HGG 793/B/14-9-1995) are crossed for ~325 m and 615 m, respectively.
	• Proximity to 2 declared archaeological sites is noted (at 600 m and 300 m respectively).	• Proximity to 2 Declared archaeological sites (at 100 m and 315 m respectively).	• Proximity to 1 Declared archaeological site (at 400 m)	• Proximity to 2 Declared archaeological sites (at 150 m and 400 m respectively).
	• 2 known cultural heritage resources (undeclared ones) are located at adequate distance (380 m and 300 m, respectively).	• 3 known cultural heritage resources (undeclared ones) are located at adequate distance (240 m, 700 m, and 650 m respectively)	-	-
	• It is expected that the neighbouring populated areas host numerous small churches.			

General Parameter	Base-case OSS4-BC (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-BC)	Alternative OSS4-Alt3 (CCS1-BC -> LF4 -> OSS4-BC -> LF5 -> CCS2-Alt3)	Alternative OSS4-Alt1 (CCS1-BC -> LF4 -> OSS4-Alt1 -> LF5a -> CCS2-Alt1)	Alternative OSS4-Alt2 (CCS1-Alt2 -> LF4a -> OSS4-Alt2 -> LF5a -> CCS2-Alt1)
Technical Challenges	• Beach and seabed intervention works are estimated as low. Sandy bottom terrain can be expected in the nearshore area; no significant constraints are identified that may impede open cut shore crossing construction method. Areas of potential geohazards lie on the route in the intermediate waters. Patraikos gulf hosts indications for gas pockets			
Military Areas	• Offshore route engages with Military area for approx. 6.5 km		• Offshore route engages with Military area for approx. 3.5 km	• Offshore route engages with Military area for approx. 6.5 km

Prepared by: ASPROFOS, 2022

7.5.9 Menidi Alternatives

7.5.9.1 Overview

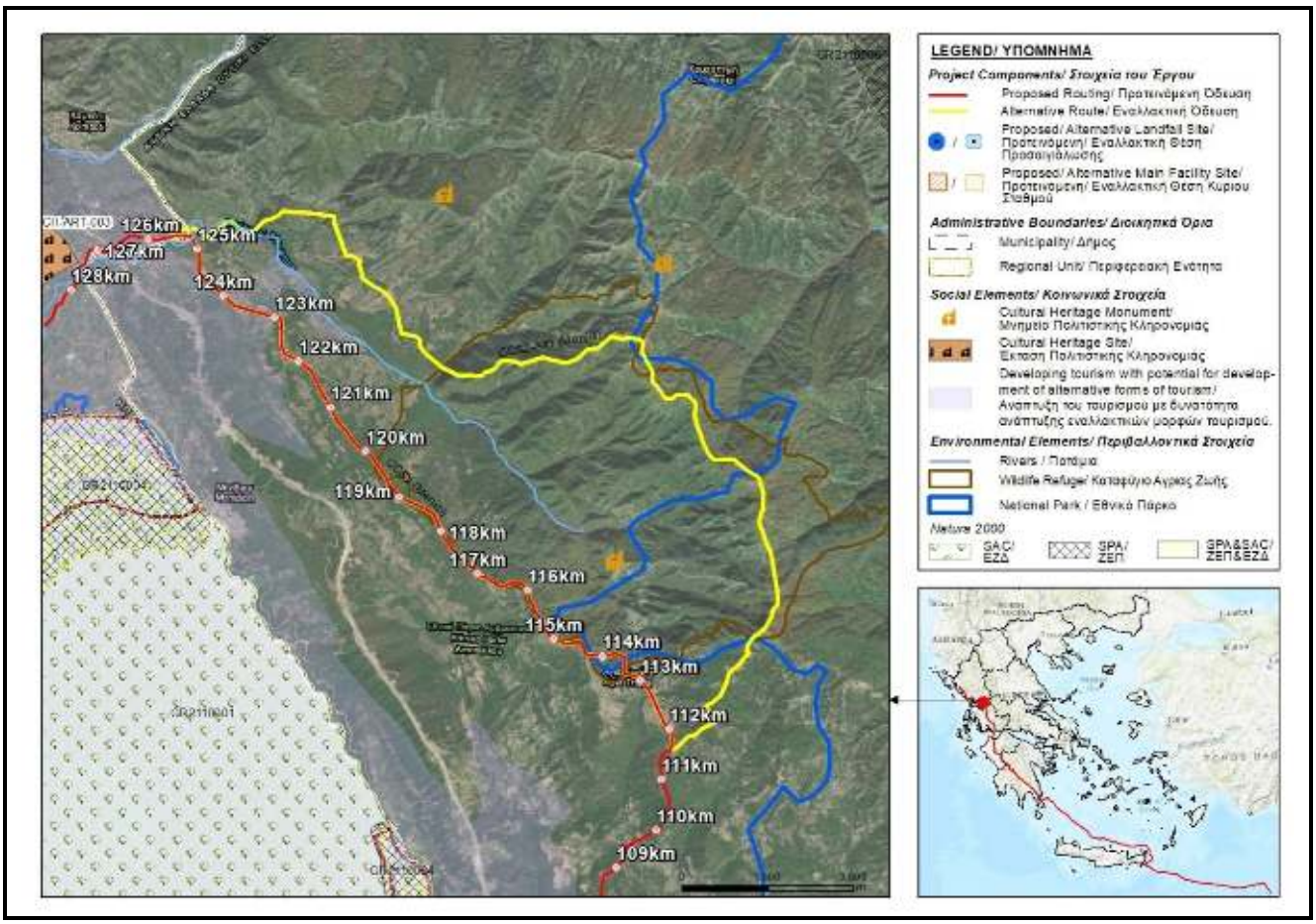
Uphill of the area of Menidi settlement, Mt. Makrinoros hosts the Wildlife Refuge of Monastery of Retha and Monastery of Loggos. For the section of CCS2, two (2) feasible alternatives are identified.[16]

In the southern limits of the Wildlife Refuge area of Monastery of Retha and Monastery of Loggos, at the western ridges of Mt Makrinoros, CCS2 base-case crosses the protected area at its westernmost boundaries, west of Monastery of Retha. Alternative CCS2-Alt1 (Menidi) crosses the same Wildlife Refuge Area from the other side of the monastery (and the easternmost boundaries of the protected area). The starting point of this set of alternatives lies SE of Agia Triada settlement, Municipality of Amfilochia (close to KP 112 of CCS2 base-case). The ending point lies close to Marlesi settlement, Municipality of Amfilochia (close to KP 126 of CCS2 base-case).

Investigated alternatives in this area, are presented in Figure 7-22 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.

[16]These alternatives include the route that was presented in the Scoping Report as base-case and a new route that resulted from optimization of the latter route.



Prepared by: ASPROFOS, 2022.

Figure 7-22 Alternative Routes at Menidi Area for CCS2 – West Greece Pipeline Section.

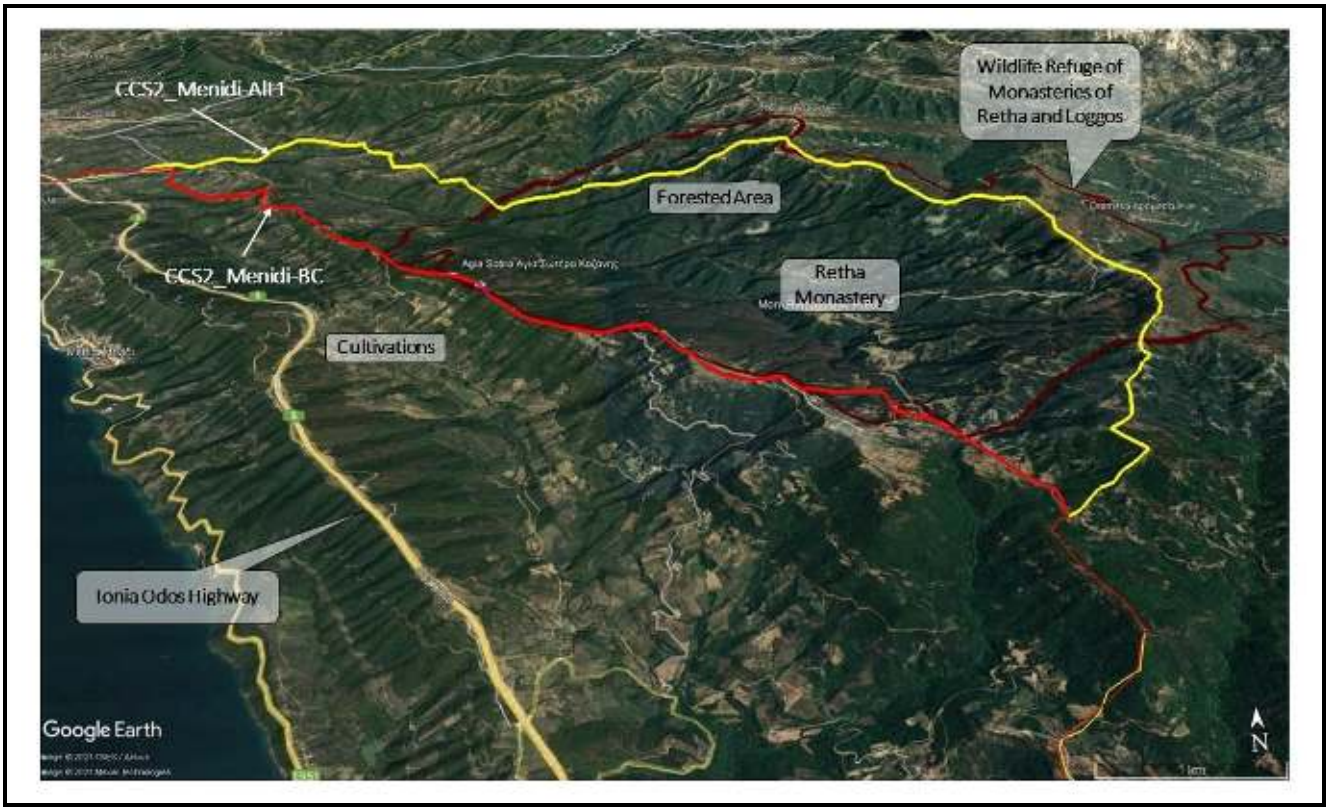
7.5.9.2 Alternatives Assessment

The main differences between these two alternatives are the following:

- Wildlife refuge area of Retha and Loggos Monasteries. CCS2_Menidi-Alt1 crosses the protected area for approximately 6.5 km more than CCS2_Menidi-BC; even more significant is the fact that the alternative passes through largely unfragmented natural areas in the central ridges of Mt. Makrinoros hosting the protected area;
- Forest areas. Based on CLC 2018 data, CCS2_Menidi-Alt1 crosses forest area for approximately 10 km (48.5%), whilst CCS2_Menidi-BC for approximately 5.5 km (38.5%). In general, the naturalness of CCS2_Menidi-Alt1 is very high in comparison to CCS2_Menidi-BC.

Table 7-11 summarizes the criteria where the alternatives present differences that play a significant role and are important in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A

Based on the above, CCS2_Menidi-BC is the preferable solution. Figure 7-23 supports the main arguments of this selection.



Prepared by: ASPROFOS, 2022.

Figure 7-23 Base-case Selection for Menidi Area.

Table 7-11 High Level Comparison Matrix of Alternatives in the Area of Menidi (WR of Monasteries Retha and Loggos).

General Parameter	CCS2_Menidi-BC	CCS2_Menidi-Alt1
Protected Areas	Wildlife Refuge Area of Retha & Logos Monasteries is crossed for 3.8 km, as well as Zone C of National Park of Amvrakikos for 13.5 km	Wildlife Refuge Area of Retha & Logos Monasteries is crossed for 10 km, as well as Zone C of National Park of Amvrakikos for 16.5 km
Biodiversity Hotspots	Most of the route passes through lowland natural forest areas at the western foothills	Almost the entire route passes through the central forested ridges of Mt Makrinoros,

General Parameter	CCS2_Menidi-BC	CCS2_Menidi-Alt1
	of Mt Makrinoros, whilst the rest through agricultural fields. Proximity to Amvrakikos Gulf and corresponding protected areas is noted. The route is parallel to the westernmost limit of Wildlife Refuge. Ionia Odos highway is also almost parallel to the alternative. Most prominent features in the area is Amvrakikos Gulf, Ionia Odos, WR of Retha and Loggos Monasteries, and Mt Makrinoros. The general character of the area is that of natural environment with limited, traditional agricultural activity. Alternative crosses forests for ~5.5 km, in total.	through the Wildlife Refuge of Retha and Loggos Monasteries, whilst only a small part through agricultural fields. Most prominent features in the area is R. Mantani and Mt Makrinoros which host the WR. The general character of the area is that of natural environment with very limited, traditional agricultural activity. Alternative crosses forests for ~ 10 km, in total.
Social Sensitivities	38% of the route crosses through agricultural areas whilst 62% from natural or semi-natural ones.	36% of the route crosses through agricultural areas whilst 64% from natural or semi-natural ones.
Economic Development	Basecase engages areas of limited economic development, close to road networks and few settlements.	Alternative engages remote areas, of no economic development; almost no proximity to road network; limited proximity to only one settlement.

Prepared by: ASPROFOS, 2022.

7.5.10 Margariti Alternatives

7.5.10.1 Overview

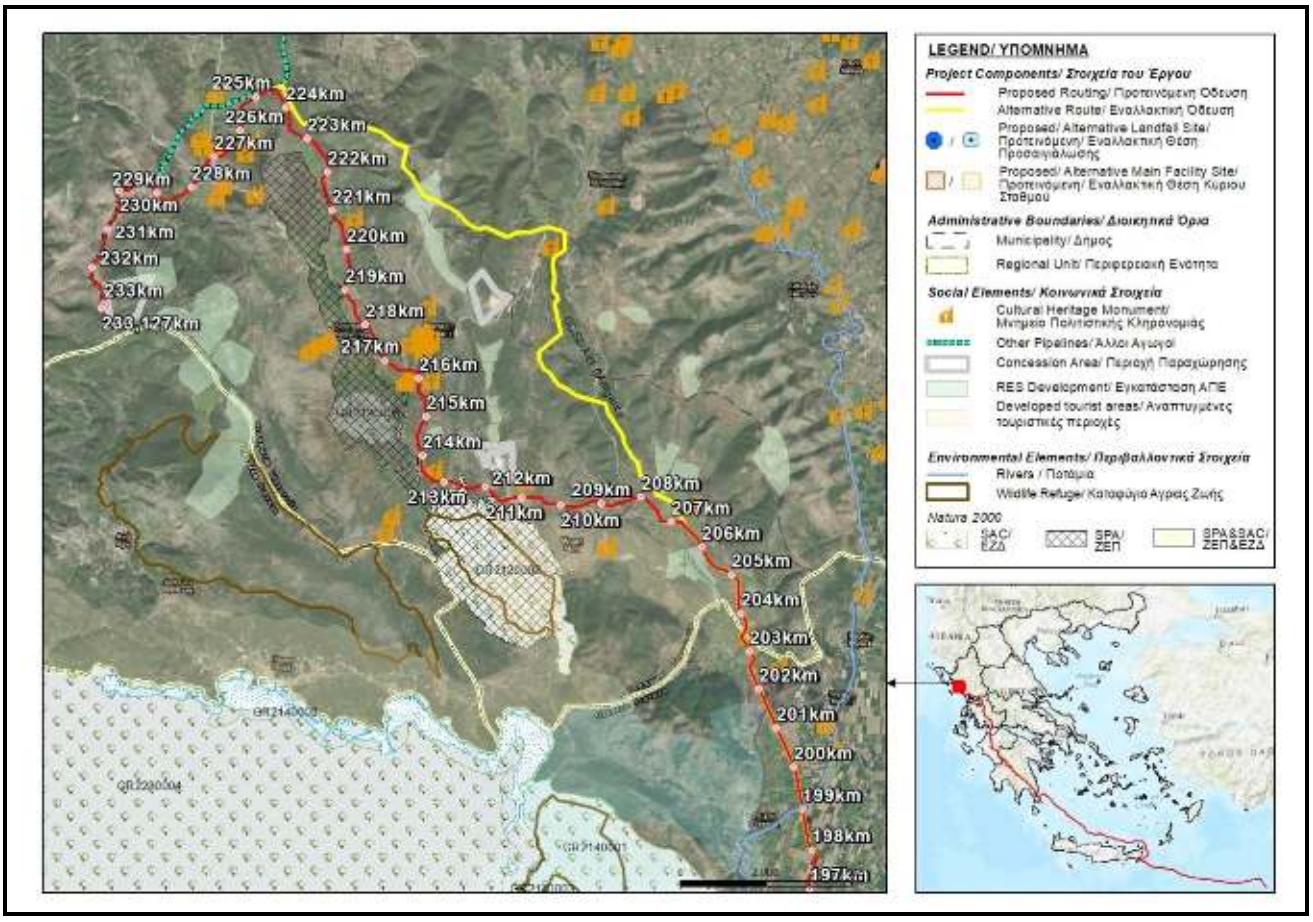
In the broader area of Margariti, two (2) feasible alternatives are identified crossing the broader area of Margariti marshlands and the valley formed between the mountain ranges of Parga and Paramythia.[17]

The starting point of these alternatives lies close to KP 198 of CCS2 base-case W of Kastri settlement, Municipality of Parga. The ending point is close to KP 225 of CCS2 NW of Karteri settlement, Municipality of Igoumenitsa. CCS2 Margariti base-case passes west of Kipseli settlement, whilst CCS2 Alt1 (CCS1_Margariti-Alt1) passes east.

[17]These alternatives include the route that was presented in the Scoping Report as base-case and a new route that resulted from optimization of the latter route.

Investigated alternatives in this area, are presented in Figure 7-24 (see Section 15.1.3 - Alternatives Map).

A detailed description of the alternatives is presented in Annex 7A.



Prepared by: ASPROFOS, 2022.

Figure 7-24 Alternative Routes at Margariti Area for CCS2 – West Greece Pipeline Section.

7.5.10.2 Alternatives Assessment

The main differences between these two alternatives are the following:

- **Natural areas**. Although, CCS2_Margariti-BC crosses a protected Natura 2000 marshlands site, it passes through agricultural areas, on the edges of the protected features, parallel for some extent to Provincial Road Preveza-Igoumenitsa. On the other hand, CCS2_Margariti-Alt1 does not cross any protected feature but passes through more natural areas, namely it passes for approximately

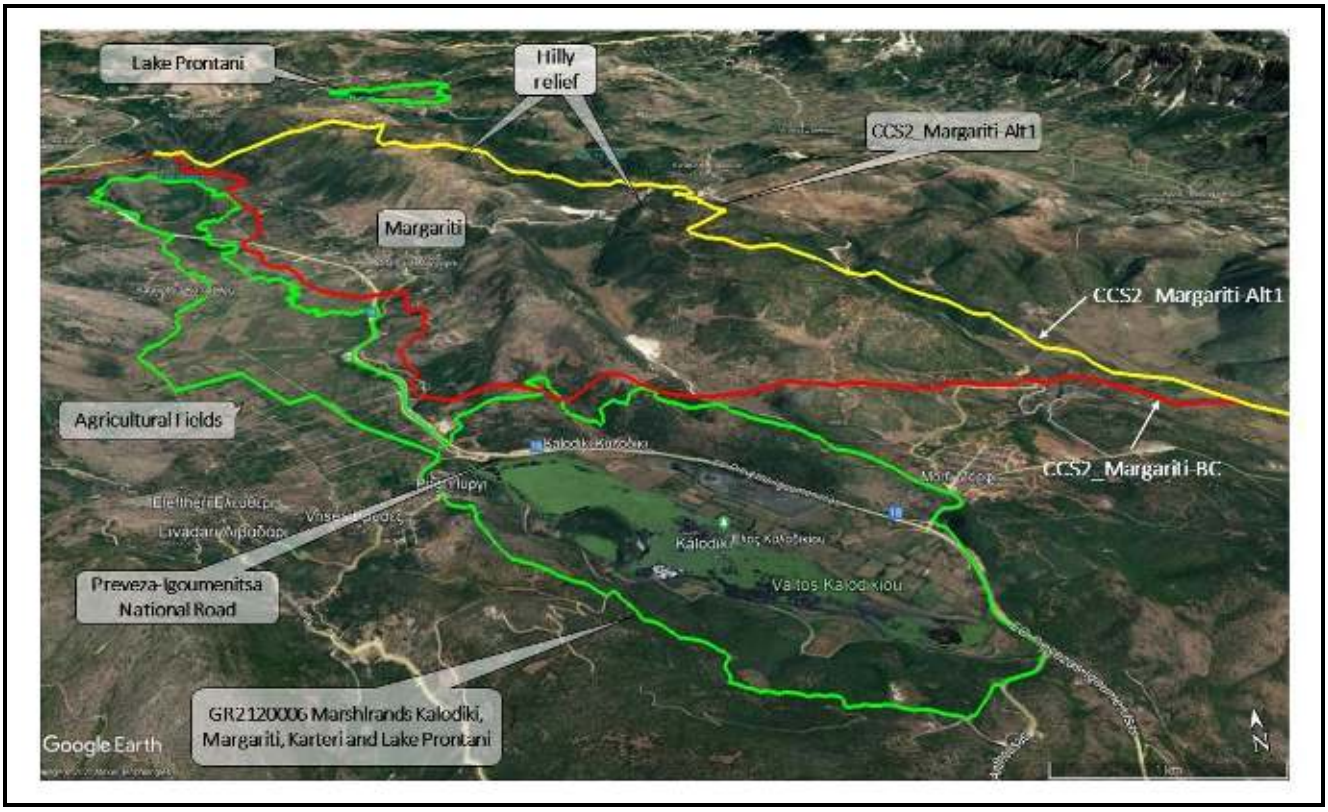
9 km more through Sclerophyllous vegetation, than CCS2_Margariti-BC. Additionally, it involves more construction works on hilly areas (Mt Paramythia);

- Spatial planning. Both routes are engaged with spatial planning provisions, including Areas of Special Protection ("PEP"), Areas of Special Uses or Areas of Building Control - Check ("PEPD"), (CCS2_Margariti-BC for 31 km and CCS2_Margariti-Alt1 for 22 km, in total). CCS2_Margariti-BC passes for 0.985 km through areas designated as "Developed Tourism" according to the national plan for tourism; however, no major tourism activity is recorded;
- Engaged settlements. Within the study area for CCS2_Margariti-BC and CCS2_Margariti-Alt1 lie 10 and 5 settlements, respectively;
- Cultural heritage. Both alternatives cross the R. Acherontas cultural heritage site. In total, within the study area for CCS2_Margariti-BC and CCS2_Margariti-Alt1 lie 19 and 6 sites of cultural heritage interest (incl. declared or not and religious sites), respectively. However, none of the 19 resources of CCS2_Margariti-BC is located within 200 m from the pipeline axis (a distance considered as adequate to minimize impacts to cultural heritage resources), whilst 1 resource of CCS2_Margariti-Alt1 lies approximately 150 m from the pipeline axis; and
- Planned developments. The main difference between the two alternatives is that CCS2_Margariti-Alt1 crosses a planned REP project (P/V) for approximately 800 m.

Table 7-12 summarizes the criteria where the alternatives present differences that play a significant role and are important in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A.

Based on the above, CCS2_Margariti-BC is the preferable solution. Figure 7-25 supports the main arguments of this selection, illustrating the intense relief in some areas of the alternative and the engagement of agricultural areas along the basecase.

It should be highlighted, that upon selection of CCS2_Margariti-BC, during the ongoing FEEED of the project, the area was investigated in great detail regarding geotechnical considerations in order to identify potential areas of further optimization. Most significant of the geotechnical issues documented are presented in this document (see also Annex 7A)



Prepared by: ASPROFOS, 2022.

Figure 7-25 Base-case Selection for Margariti Area.

Table 7-12 High Level Comparison Matrix of Alternatives in the Area of Margariti.

General Parameter	CCS2_Margariti-BC	CCS2_Margariti -Alt1
Biodiversity hotspots	Most of the route passes through wet meadows in the broader area of Margariti marshlands, whilst the rest through forest areas. Proximity to 3 marshlands and the corresponding protected area is noted. The route runs parallel to some extent to a Provincial Road (Preveza-Igoumenitsa). Most prominent features in the area is the Marshlands of Margariti, Karteri and Kalodiki. The general character of the area is that of traditional agricultural activity with significant presence of purely natural locations. The basecase crosses bushlands for 4.25 km	Almost half of the route passes through agricultural areas in the broader area of Mt Paramythia, whilst the rest through forest areas. Most prominent feature in the area is Mt Paramythia and downhill of the route, the plain of Marshlands of Margariti, Karteri and Kalodiki. The general character of the area is that of traditional agricultural activity with significant presence of purely natural locations. The alternative crosses bushlands for 13.5 km

General Parameter	CCS2_Margariti-BC	CCS2_Margariti -Alt1
Protected Areas	Overlapping GR2120002 (SAC) & GR2120006 (SPA) are crossed for 100 m.	No Intersection with Natura Areas
Land Uses	64% of the route crosses through agricultural areas whilst 27% from natural or semi-natural ones (9% through other land uses).	41.5% of the route crosses through agricultural areas whilst 58.5% from natural or semi-natural ones.
Development plans	Route passes through the following designated land uses of all engaged Municipalities: Area of Special Protection ("PEP") for 7,77 km (25.49%), through Areas of Special Uses for 0.39 km (1.27%) and for 22.32 km (73.24%) through Areas of Building Control - Check ("PEPD"), in total. 0.985 km through areas designated as of "Developed Tourism" according to national plan for tourism.	Route passes through the following designated land uses of all engaged Municipalities: Area of Special Protection ("PEP") for 3.77 km (16.64%) and for 18.88 km (83.36%) through Areas of Building Control - Check ("PEPD"), in total.
Population Centres	10 settlements are identified within the study area (Themelo 1000 m, Tzara 150 m, Spatharei 66 m, Morfi 780 m, Kalodiki 480m, Katavothra 650 m, Milokokkia 911 m, Koroni 590 m, Margariti 570 m, Palaiokastro 325 m)	5 settlements are identified within the study area (Themelo 1000 m, Tzara 150 m, Spatharei 530 m, Koroni 590 m, Karvounari 580 m)
Cultural heritage criteria	11 declared archaeological sites are located within the study area. 1 is crossed (R. Acheron) 5 identified cultural heritage resources and 3 religious sites	3 declared archaeological sites are located within the study area. 1 is crossed (R. Acheron) 2 identified cultural heritage resources and 1 religious site
Economic Development	10 RES project are located within the study area (1 at 30 m, 1 at 210 m, 1 at 280 m, 2 at 290 m, 3 at 320 m, 2 at 600 m)	1 RES project is crossed for 793 m whilst 9 more are located within the study area (1 at 30 m, 1 at 40 m, 1 at 290 m, 2 at 370 m, 2 at 440 m, 2 at 820 m, 1 at 851 m)

Prepared by: ASPROFOS, 2022.

7.6 Alternatives Assessment For Main Facilities

This section presents the alternatives for the main facilities of the EastMed Pipeline Project. As summarized in Table 7-2, the alternative site locations evaluated combine a total of (9) different sites as follows[18]:

- For the Compressor and Metering Stations at Crete (CS2/MS2-CS2/MS2N), three alternative locations were investigated (see section 7.6.1);
- For the Compressor Station at Peloponnese (CS3), three alternative locations were investigated (see section 7.6.2); and
- For the Metering, Pressuring and Heating Station (MS4/PRS4) at Peloponnese, three alternative locations were investigated (see section 7.6.3).

7.6.1 CS2/MS2-CS2/MS2N Alternatives

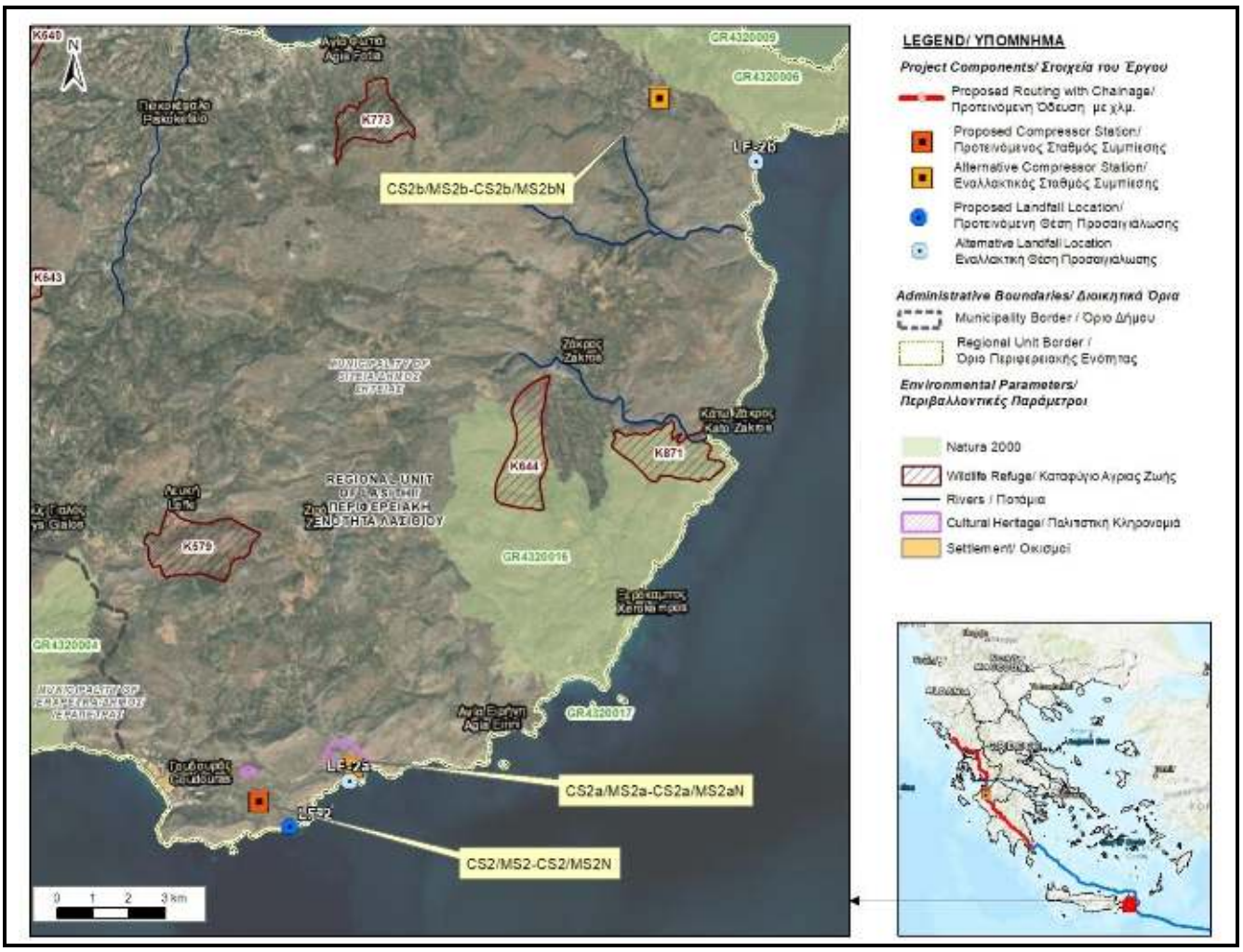
In Crete, three alternative locations for the compressor station were investigated, corresponding to three alternative landfall locations:

- Base-case solution of station CS2/MS2-CS2/MS2N in the area of Atherinolakkos;
- Alternative solution of station CS2a/MS2a-CS2a/MS2aN in the area of Livari; and
- Alternative solution of station CS2b/MS2b-CSb/MS2bN in the Skinia area.

The investigated solutions are presented in the figure below.

A detailed description of the alternatives is presented in Annex 7A.

[18]The alternatives presented in the Scoping Phase are still applicable and viable, since no new design data have been acquired. The alternatives are presented anew, enriched with some environmental and socioeconomic information.



Prepared by: ASPROFOS, 2022.

Figure 7-26 Alternative locations for CS2/MS2-CS2/MS2N station investigated in Crete.

From the point of view of environmental, social, economic and cultural heritage characteristics as well as based on the information available at this stage of the study, CS2a/MS2a-CS2a/MS2aN and CS2b/MS2b-CS2b/MS2bN alternatives include significant limitations which are:

- Cultural Heritage. The CS2a/MS2a-CS2a/MS2aN solution is placed in declared archaeological zone and installation of any facility might face permitting problems. It is also engaged with a gorge and a stream discharging to the sea; and
- Natural Environment. The CS2b/MS2b-CS2b/MS2bN solution is located within a pristine natural environment area. Apart from that, it is very close to a Natura 2000 site and within a UNSESCO Geopark of Sitia.

Therefore, **the CS2/MS2-CS2/MS2N base-case solution among the alternatives is the preferred solution** and is the proposed solution for the installation of a compressor and metering station in Crete.

Table 7-13 summarizes the criteria to which the alternatives present differences that play significant role, are important, in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A

Table 7-13 High Level Comparison Matrix of Alternatives for CS2/MS2-CS2/MS2N.

General Parameter	CS2/MS2-CS2/MS2N (Base Case)	CS2a/MS2a-CS2a/MS2aN	CS2b/MS2b-CS2b/MS2bN
Protected areas	No engagement.	No engagement.	Alternative is located within the Sitia Natural Geological Park, which is a world-class park and is under UNESCO protection.
Biodiversity Hotspots	The broader area is characterized by gentle slopes and is covered by pastures, barren areas and plots of arable land, mainly with permanent crops such as olive groves. Specifically, the plot occupies almost entirely Olive groves (95%)	The broader area is characterized by sparse phrygana vegetation with small parts of crops, mainly olive groves, as well as pastures. Specifically, the plot occupies phrygana vegetation for about 80% The plot lays in front of the gorge formed by “Kato Steno” stream discharging to the sea.	The broader area is characterized by Sclerophyllous vegetation and a complex surface water system (of small streams). Specifically, the plot occupies agricultural lands (mainly olive groves) for about 80%
Air Quality	Atherinolakkos Power Plant is located ~550 m to the E.	Atherinolakkos Power Plant is located ~1300 m to the W.	No pressures.
Noise Background	Atherinolakkos Power Plant is located ~550 m to the E, but the background noise is very low.	Atherinolakkos Power Plant is located ~1300 m to the W, but the background noise is very low.	No noise sources identified.
Landscape	A flat area of Olive groves between hilly ranges to the NW and SE Cretan Sea. Surrounding natural areas are covered by phrygana vegetation. Despite the nearby presence of Atherinolakkos Power Plant,	Phrygana vegetation with few Olive groves in the entrance of a gorge. The area is secluded by Atherinolakkos Power Plant and Fishing shelter, by the surrounding hills. High aesthetic value but not	Area located in a hilly mosaic of maquis vegetation and olive groves. Vantage view of the seascape to the E. Low absorption capacity.

General Parameter	CS2/MS2-CS2/MS2N (Base Case)	CS2a/MS2a-CS2a/MS2aN	CS2b/MS2b-CS2b/MS2bN
	the aesthetic value of the landscape is not decreased. Moderate absorption capacity.	visible by any sensitive receptor. Moderate absorption capacity.	
Morphology	Area located on a gentle slope plateau of olive groves. Small to moderate earthworks for levelling.	Area located on slopes of the "Kato Steno" stream delta. Moderate to high earthworks for levelling.	Area located on a gentle slope plateau of olive groves. Small to moderate earthworks for levelling.
Land Uses	95% on agricultural area (Olive groves) and 5% on natural-semi natural areas (phrygana vegetation)	20% on agricultural area (Olive groves) and 80% on natural-semi natural areas (phrygana vegetation)	83% on agricultural area (mainly Olive groves) and 17% on natural-semi natural areas (sclerophyllous vegetation)
Spatial planning and development provisions	According to Lefki SXOOAP, the facility is located on Zone of Agricultural Land. Atherinolakkos Power Plant is designated as Heavy Industry Zone.	According to Lefki SXOOAP, the facility is located on Grazing lands and few small sections on Zone of Agricultural Land.	According to Itanos SXOOAP, the facility is located on area Outside Spatial Planning, where no heavy industry is allowed.
Economic development	Presence of Atherinolakkos Power Plant is the only significant economic activity		No engagement.
Cultural Heritage	3 sites are located within the study area (Kastri of Goudoura at 690 m and Dasonari of Lefki at 590 m, to the North; "Favolies and Livari of Agia Triada" at 1900 m to the Southeast)	Facility is located within "Favolies and Livari of Agia Triada" archaeological site	No data available.

Prepared by: ASPROFOS, 2022.

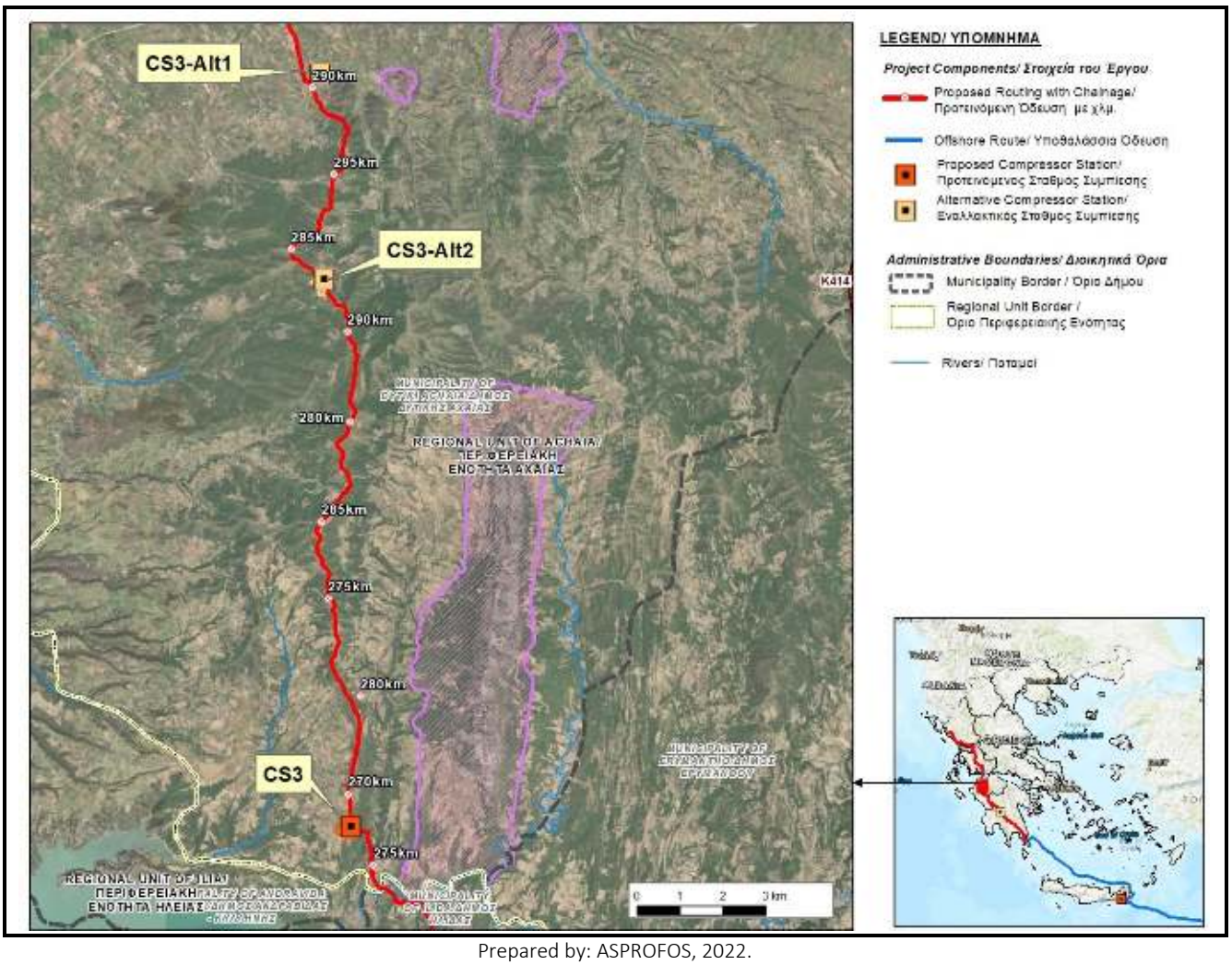
7.6.2 CS3 Alternatives

In Peloponnese, three alternatives for the installation of a CS3 compressor station were considered:

- Base case CS3 (CS3-BC) compressor station in the area of Kato Velitses, M. of W. Achaia;
- Alternative CS3-Alt1 compressor station in the area of Lampreika, M. of W. Achaia; and
- Alternative CS3-Alt2 compressor station in the area of Vithoulka, M. of W. Achaia

Investigated alternatives are illustrated in the figure below.

A detailed description of the alternatives is presented in Annex 7A.



Prepared by: ASPROFOS, 2022.

Figure 7-27 Alternative locations for CS3 station considered for Western Greece.

Based on the available information, there are no significant environmental, socio-economic and cultural heritage restrictions on all alternative sites considered for the installation of a compressor station in Western Greece.

From a natural environment point of view, Base-case CS3 is preferable than the others. CS3-Alt2 is in a more remote and isolated location (in a less anthropogenic environment) compared to CS3 (Base-case) and CS3-Alt1 solutions. CS3-Alt1 is less appropriate (based on available data) due mainly to the proximity to residential area while it's included in an area characterized as high productivity agricultural land; furthermore, the area presents flooding risk.

Therefore, the location of the **CS3 compression station is the preferred solution** and is the basic choice for the installation of a compression station in Continental Greece.

Table 7-14 summarizes the criteria to which the alternatives present differences that play significant role, or are important, in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A.

Table 7-14 High Level Comparison Matrix of Alternatives for CS3.

Criteria	Base Case	Alternative CS3-Alt1	Alternative CS3-Alt2
Protected Areas	Closest protected area (GR2330002 SAC&SPA) is located at approx. 12 km	Closest protected area (GR2320011 SPA) is located at approx. 11 km	Closest protected area (GR2330022 SPA) is located at approx. 13 km
Biodiversity Hotspots	Plot is located in an area surrounded by a mosaic of agricultural and semi-natural (and natural) areas; close to the artificial lake of Pinios, in an otherwise seemingly completely undisturbed environment. According to Official Forest Maps, 53,373 m² (48%) are protected by forest legislation. Based on satellite images, forest or forested areas cover 0%.	Plot is located in an area surrounded by agricultural activity, close to population centers. According to Official Forest Maps, 60,177 m², 75.5% are protected by forest legislation. Based on satellite images, forest or forested areas cover 7%	Plot is located in an area surrounded by natural vegetation, mainly forests and forested areas (bushlands), in a seemingly completely undisturbed environment. According to Official Forest Maps, 26,879.45 m², approx. 26.21% are protected by forest legislation. Based on satellite images, forest or forested areas cover: 20%
Noise Background	No noise sources identified.	No significant noise sources identified. Nevertheless, site is located in a more anthropogenic environment than any other option.	No noise sources identified.
Landscape	Area located on agricultural area surrounded by a mosaic of agricultural and natural areas. Most cultivations are tree-crops giving out a sense of semi-natural area. Moderate absorption capacity, in	Area located on the foot of a mountainous forest. The remaining area is completely covered by agricultural crops and settlements. Many cultivations are tree-crops. High absorption capacity, in	Area located on a plateau at 550 m altitude, surrounded by mountainous forest. Minimum absorption capacity, in comparison to other options.

Criteria	Base Case	Alternative CS3-Alt1	Alternative CS3-Alt2
	comparison to other options.	comparison to other options.	
Morphology	Area located on a plane surface of agricultural land use. Small earthworks for leveling.	Area located on a plane surface of agricultural land use. Small earthworks for leveling.	Area located on a plane surface of agricultural land use and/ or grasslands. Small to moderate earthworks for leveling.
Vulnerability to Climate Change - Flooding Risk	No flood risk identified.	~50% is located within EL02RAK0008 flooding area	No flood risk identified.
Land Uses	100% on agricultural area.	93% on agricultural area and 7% on natural-semi natural areas (sclerophyllous vegetation)	81% on agricultural areas and 19% on natural-semi natural areas (4% on forests)
Spatial planning and development provisions	No spatial provision	Area included in "Indicative broader zone of high priority agricultural land".	No spatial provision
Population centers	No population centers in the broader area. 3 settlements are identified in the broader area (Kato Velitses at 1,600 m, Kalivakia at 2000 m and Portes at 2600 m))	No population centers in the broader area. 4 settlements are identified in the broader area (Lampreika at 550 m, Petrochori at 650 m, Pournari at 1200 m and Mirto at 1,200 m)	No population centers in the broader area. 4 settlements are identified in the broader area (Pournari at 2800 m, Krinos at 3,200 m, Petras at 4,000 m and Vithoulkas at 2,600 m)
Cultural Heritage	Basecase is located 1500 m from the closest Declared A.S. Proximity to declared A.S. "Santameri - Mount Skolis" gives ground to increased chance finding of cultural heritage resource.	Alternative is located 1100 m from the closest Declared A.S. Alternative is surrounded by numerous settlements with churches and cemeteries.	No engagement identified

Prepared by: ASPROFOS, 2022.

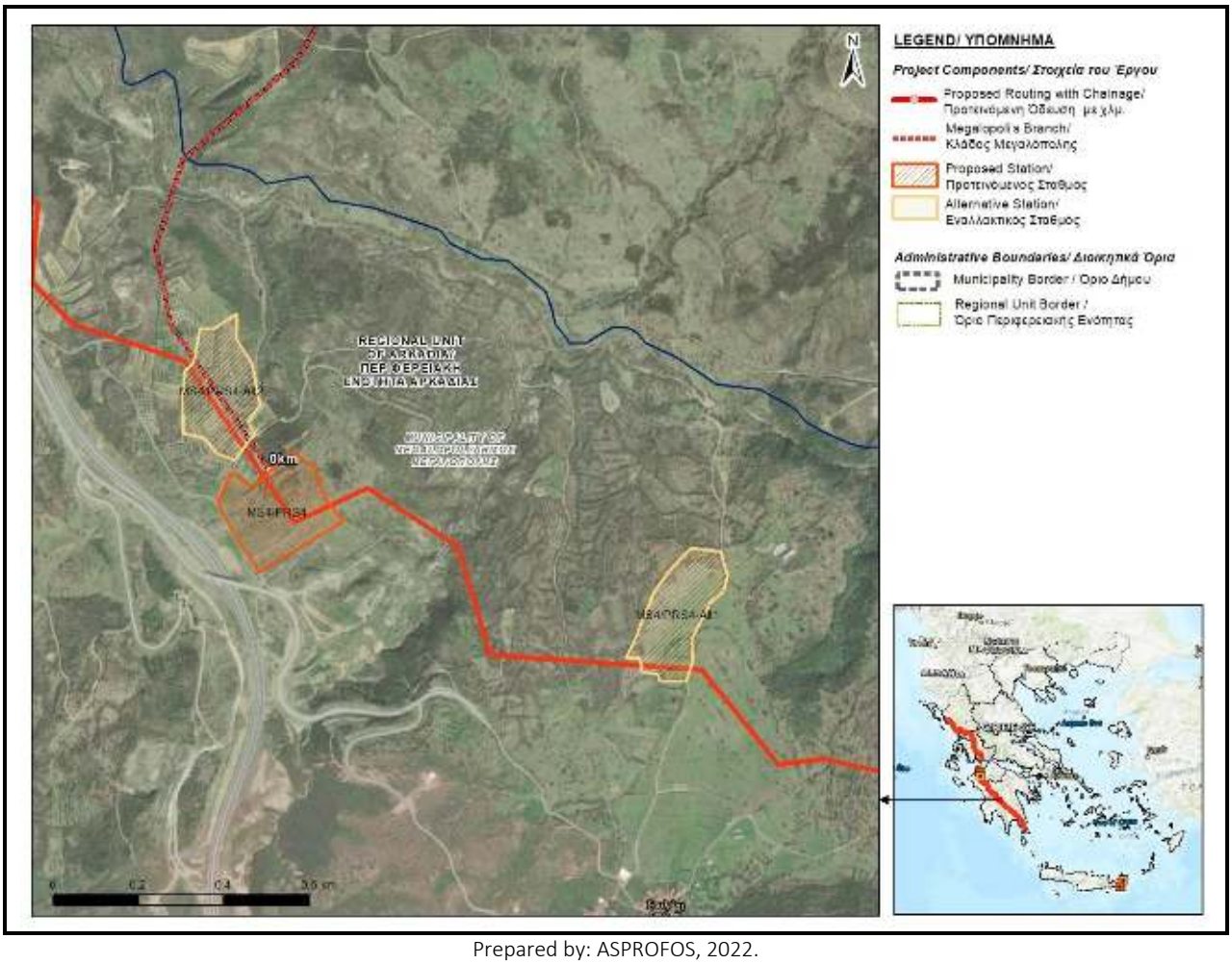
7.6.3 MS4/PRS4 and Heating Station Alternatives

In Soulari area, M. of Megalopoli, three alternatives for the installation of a Metering Station (MS4), Pressure Regulating Station (PRS4) and Heating station were considered:

- Base case MS4/PRS4 & Heating station (BC);
- Alternative 1 (MS4/PRS4 ALT1); and
- Alternative 2 (MS4/PRS4 ALT2).

It is reminded that the Metering Station (MS4), Pressure Regulating Station (PRS4) and the Heating Station shall be all placed in the same plot.

Investigated alternatives are illustrated in the figure below.



Prepared by: ASPROFOS, 2022.

Figure 7-28 Alternative locations for MS4/PRS4 & Heating station considered.

Based on the available information available at this stage of the study, there are no significant environmental, socio-economic and cultural heritage restrictions on base case and alternative sites considered for the installation of a station in the area.

In conclusion, MS4/PRS4 & Heating BC is slightly preferable to MS4/PRS4 and Heating Alt2. For almost all aspects, the two alternatives are identical (due to the close proximity to each other). Proximity to more settlements for MS4/PRS4 & Heating Alt2 is another reason to give advantage to the base-case. Apart from that, MS4/PRS4 & Heating BC and MS4/PRS4 & Heating Alt2 are similar. MS4/PRS4 & Heating Alt1 is not recommended (based on available data) due mainly of social concerns, i.e. close proximity to settlement and also close proximity to 2 worshiping places. It is noted that all options are sited within concession area of PPC and in the broader area (<6km) from the active coal mine of PPC.

Therefore, MS4/PRS4 & Heating BC is the recommended solution and is the basic choice for the installation of a specific station in Peloponnese.

Table 7-15 summarizes the criteria to which the alternatives present differences that play significant role, or are important, in the selection process. Detailed matrix with the complete environmental and social criteria for these alternatives is presented in Annex 7A.

Table 7-15 High Level Comparison Matrix of Alternatives for MS4/PRS4 and Heating Station

General Parameter	Base Case	Alternative 1	Alternative 2
Development plans	No spatial provision. Recent developments include break of Megalopoli lignite production activities and replacement of lignite by natural gas as fuel for the Power Plant.		
Population centres	Megalopoli is a significant population centre of the broader area. 3 settlements are identified in the broader area (Soulari at 900 m, Leontari at 1,650 m and Voutsaras at 2,700 m))	Megalopoli is a significant population centre of the broader area. 2 settlements are identified in the broader area (Soulari at 300 m and Voutsaras at 1900 m)	Megalopoli is a significant population centre of the broader area. 3 settlements are identified in the broader area (Soulari at 1,100 m, Leontari at 1,450 m and Voutsaras at 2,900 m)
Economic development	Within concession area of PPC. ~5,5 km from existing coal mining area of PPC.	Within concession area of PPC. ~6 km from existing coal mining area of PPC.	Within concession area of PPC. ~5 km from existing coal mining area of PPC.
Cultural Heritage	Basecase is located 550 m from Agios Konstantinos Church and 1,200 m from Profitis Ilias Church.	Alternative is located 700 m from Agios Konstantinos Church and 370 m from Profitis Ilias Church.	Alternative is located 550 m from Agios Konstantinos Church and 1,350 m from Profitis Ilias Church.

Prepared by: ASPROFOS, 2022.

ANNEX 7 – SUPPORTING MATERIALS FOR CHAPTER 7

ANNEX 7A – ALTERNATIVES ASSESSMENT MATRIX