Trans Adriatic Pipeline

ESIA Amendment Greece

Section 5 - Environmental Cultural Heritage and Socioeconomic Baseline

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5 Environmental Cultural Heritage and Socioeconomic Baseline

5.1 Introduction

This section describes the environmental, socioeconomic and cultural heritage resources along the proposed reroutings. The description is structured as per the following main headings:

- Physical Environment - including geology and soils, land, hydrology, surface and ground water resources, air, noise etc.
- Biological Environment – including aquatic and terrestrial habitats, flora and fauna, biodiversity and protected areas.
- Socioeconomic Environment - including land use, demography, employment, education, infrastructure, public services and public health etc.
- Cultural Heritage - including designated and potential archaeological sites, monuments and intangible cultural heritage.

Maps supporting this section, presenting the baseline information along the proposed reroutings, are included in *Annex 5* of the ESIA Amendment. The maps depict data for the following baseline topics:

- *Annex 5.1 - Habitats and Protected Areas*
- *Annex 5.2 - Landscape*
- *Annex 5.3 - Land Use and Socioeconomic Environment*
- *Annex 5.4 - Cultural Heritage*
- *Annex 5.5 - Administrative Structures*
- *Annex 5.6 - Geology*

The information presented in this section is based on desktop work and literature search as well as field surveys where necessary. Field survey reports, describing the methodologies used and details on the survey findings, referenced throughout this section, are presented in *Annex 6*. The Annex contains the following reports:

- *Annex 6.1 - Flora and Vegetation Baseline Study*
- *Annex 6.2 - European Souslik Baseline Study*
- *Annex 6.3 - Avifauna Baseline Study*
- *Annex 6.4 - Hydrobiology (freshwater fish fauna) Baseline Study*
- *Annex 6.5 – Landscape Baseline Study*

Due to the macroscopic nature of the physical environment and the relatively small distance between the ESIA basecase and the new basecase, some of the aspects of physical environment present no notable difference between the two routes. In such cases, and in order to avoid repetition, reference is made to the relevant ESIA sections.

The following chapters present in detail the most important reroutings along the TAP route, where field surveys took place and the environmental and socioeconomic impacts where reassessed based on the newly collected data.

The rest of the proposed reroutings are presented jointly, since their impacts are considered as either minor or equivalent to the ones already assessed in the ESIA. Each one was examined individually and assessed with the data collected during the main phase of the ESIA.

5.2 Amfitriti rerouting

5.2.1 Physical Environment

5.2.1.1 Geology, Seismicity and Geomorphology

The geological structure of the area consists mostly from volcanic formations such as tuffs, tuffites, andesites, dacitoid andesites, molassic formations and Alpine formations. Molassic formations that prevail are the ones of Eocene and Oligocene consisting of marls alternating with or passing to sandy marls, sandstones and conglomerates. At the upper sections occur tuffs to tuffites with limestone schill banks.

Both the ESIA baseline route and the Amfitriti rerouting are crossing the same geological formations:

- Eocene deposits: Sandstones, clays marls, and intercalations of limestones

- Holocene deposits: Various sediments, mainly alluvial river deposits and large alluvial fans

With regard to seismicity, the Amfitriti rerouting is not affected by any active faulting system in its immediate vicinity or associated with significant instrumental seismicity. Reference is made to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.2.1.2 Subsurface and Soils

The dominant soil type in Amfitriti rerouting is Calcaro-vertic Cambisol. Due to intensive cultivation and application of fertilizers, the area is susceptible to soil contamination by nitrates.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.2.1.3 Groundwater and Surface Waters

The Amfitriti rerouting similarly to the ESIA basecase, crosses the Mixed (Porous/fractured) groundwater body of Alexandroupoli (GR1200130) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60/EC). On the basis of the depth of groundwater table, permeability of the aquifer material and permeability of aquifer overlying strata, the vulnerability of the groundwater is considered high.

No major surface water bodies are found along the Amfitriti rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.2.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Amfitriti rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.2.1.5 Acoustic Environment

Information on the acoustic environment for the Amfitriti rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054_00).

5.2.1.6 Landscape and Visual Amenity

The Southern Evros plain belongs to plain agricultural areas with regard to landscape character types, i.e. is characterized by open views of fields spreading in the entire area and interrupted by small villages that are embedded smoothly in the landscape. As presented in detail in section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054), such a landscape is typically characterized by low sensitivity to the proposed changes and low magnitude of change.

5.2.2 Biological Environment

5.2.2.1 Flora and Habitats

The Project area around Amfitriti rerouting comprises agricultural land cultivated with annual crops, mainly wheat, with few patches of pseudomaquis vegetation. With regards to flora taxa of conservation interest, reference is made to section 6.3.2.1.2. of the ESIA (GPL00-ASP-642-Y-TAE-0054) which provides information for wider area of Southern Evros Section.

No sensitive or specially designated habitats were identified along the Amfitriti rerouting.

5.2.2.2 Fauna

The broader area of Southern Evros, hosts jackals (*Canis aureus*)) as described in the ESIA, as well as remarkable populations of bird species of conservation concern locally (e.g. Loutros forest area). The baseline conditions regarding large mammals in the area remain the same as described in detail in the ESIA study.

5.2.2.3 Aquatic Ecology

Amfitriti rerouting similarly to the ESIA Basecase crosses Apokrimno (Erene) stream at IP 109-5.

During the ESIA, the “Apokrimno” stream crossing was characterised by mid-lowland fish fauna of a relatively small catchment at low elevation (28m) with the presence of marshy-fringe habitats (reedbed with *Phragmites* and *Typha*). In general, it is expected to be a relatively ichthyofauna-

rich site. Alien species presence was relatively low, only *Lepomis gibossus* and *Carassius gibelio* are present, and in very low densities and the "Apokrimno" site was assessed as "moderate".

Reference is made to section 6.3.3.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where aspects of aquatic ecology and ichtyofauna in rivers and streams crossed by the pipeline are discussed in detail for the Southern Evros plain where the Amfitriti rerouting is located.

5.2.2.4 Protected areas/Sites of Conservation Interest

There are no protected areas or sites of conservation interest in the vicinity of Amfitriti rerouting.

5.2.3 Socioeconomic Environment

5.2.3.1 Demographics and Settlements

Both Amfitriti rerouting and the ESIA basecase are located within the Region of East Macedonia and Thrace and the Municipality of Alexandroupoli...

A detail and thorough analysis of socioeconomic aspects per municipality, including the Municipality of Alexandroupoli, is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure and use, municipalities' infrastructure, public services and health facilities, education and skills are cited. The main settlements in the area of Amfitriti rerouting are Palagia and Amfitriti settlement of Alexandroupoli Municipality.

5.2.3.2 Economy, Employment and Income

The Municipality of Alexandroupoli exhibits mixed economic activities. Approximately 27% work in agriculture with lower proportions working in the public sector, construction, trade and as employees in various small businesses. However, along the pipeline corridor, agricultural activity is the main economic activity, providing the main source of employment.

Main cultivation is wheat and cotton and main animal husbandry is sheep and goats. There are no permanent crops cultivated in the area. Many households may sustain complementary economic activities, but the main source of income comes from agricultural activities with pensions providing also a complementary income. Households exhibit generally low income levels (under 700 Euro/month).

Unemployment rate is at 9% of the economical active population, with 54% of the unemployed recorded among the young population.

5.2.3.3 Land Tenure and Use

Land ownership in the Municipality of Alexandroupoli is at 40%. Main land uses in the Project area are as follows:

- Non-irrigated, arable land (mainly annual cultivations - wheat and clover)
- Forested area used for timber
- Bee-keeping

5.2.4 Cultural Heritage

A total of 8 cultural heritage sites, consisting of 3 archaeological sites and 5 Intangible Cultural Heritage (ICH) sites were identified in the area of Amfitriti rerouting. The most notable sites from this region include:

- The underground stone-made ancient aqueduct in Amfitriti
- The chapel of Aghios Georghios in Amfitriti
- Chapels (possibly Aghios Georghios) close to abandoned Potamos settlement
- Abandoned Potamos Settlement

Table 5-1 below presents an inventory of the Cultural Heritage Sites in the area of Amfitriti rerouting.

Table 5-1 ***Cultural Heritage Sites in the area of Amfitriti rerouting***

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
109-5	CH-335-E	Amfitriti3	Ground truthed in November 2012	550	A	Part of an underground stone-made vaulted aqueduct excavated during the construction of DESFA pipeline. Possibly related to the pipeline system recorded in Loutros area.	Uncertain, possibly modern
109-5	CH-336-E	Amfitriti4	Ground truthed in November 2012	485	ICH	Road shrine dedicated to Virgin Mary (Panagia).	Modern
109-5	CH-338-E	Amfitriti6	Ground truthed in November 2012	640	ICH	Chapel of Aghios Georghios, on a mound with good view of the surroundings.Water stream near by	Uncertain
109-6	CH369 -E	Amfitriti7	Desktop	200	ICH	Unknown chapel.	Uncertain
109-9	CH-376-E	AmfitritiA	Ground truthed in Febr2013	520	A	Sporadic pottery scatter	Uncertain
109-11	AM1	AmfitritiB	Ground truthed in June 2014	50	A	Ondulating landscape,ploughed field, a couple of roof tiles. Old military camp on a rise to the SE, between base case and rerouting. Potential site.	Uncertain
109-11-1	CH-325-E	Palagia4	Oral consultation with 15th EBA	310	ICH	Chapels	Possibly modern
109-11-1	CH-330-E	Potamos2	Desktop	420	ICH	Abandoned Potamos settlement.	Possibly pre-modern

Source: EXERGIA (June 2014)

5.3 Kosmio rerouting

5.3.1 Physical Environment

5.3.1.1 Geology, Seismicity and Geomorphology

The geological structure of the area consists mostly of Post-Alpine sediments deposited in the Komotini – Xanthi basin. Pleistocene deposits outcrop at the hilly areas, and have a varying lithology, from sands to marly limestones. Pleistocene terrace deposits can also be found, uplifted and partially eroded by neotectonic faults. The Pleistocene deposits are overlain by Quaternary and Holocene alluvial and terrestrial sediments.

Both the ESIA baseline and Kosmio rerouting are crossing the same geological formations:

- Pleistocene deposits: sands, conglomerates, sandstones, clays, marls, and intercalations of limestones
- Holocene deposits: Various sediments, mainly alluvial river deposits and large alluvial fans

With regard to seismicity, the Kosmio rerouting is not affected by any active faulting system in its immediate vicinity or associated with significant instrumental seismicity. Reference is made to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed discussion of geohazards is provided.

5.3.1.2 Subsurface and Soils

Dominant soil types at Kosmio rerouting, are expected to be Calcaric Fluvisol and Eutric Campisol, soils characterized by high quality and moderate to well drainage. Due to intensive cultivation and application of fertilizers, the area is susceptible to soil contamination by nitrates and heavy metals.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.3.1.3 Groundwater and Surface Waters

The Kosmio rerouting, similarly to the ESIA basecase, crosses the Porous Groundwater Body of Xanthi – Komotini (1205) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60/EC). The capacity of

the aquifer depends on the presence and the distribution of the coarse grained material, which is located mainly near large (Kompsatos, Kosynthos) or smaller (Aspropotamos, Bosbos) streams. On the basis of the depth of groundwater table, permeability of the aquifer material and permeability of aquifer overlying strata, the vulnerability of the groundwater is considered high.

Kosmio rerouting, similarly to the ESIA Basecase, crosses the Chionorema stream (IP251-10), which is considered as a watercourse of permanent flow. The discharge of Chionorema (Asprorema / Vosvozis or Bosbos river) based on in situ measurements conducted by the Hellenic Centre for Marine Research (HCMR) in August 2012 was 0.09 m^3/s.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.3.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Kosmio rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.3.1.5 Acoustic Environment

Information on the acoustic environment for the Kosmio rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.3.1.6 Landscape and Visual Amenity

With regard to landscape character types, the Komotini - Xanthi Plain comprises of *plain agricultural areas* i.e. is characterized by open views of fields spreading in the entire area and interrupted by small villages that are embedded smoothly in the landscape and *mixed riparian forested and agricultural areas* which are connected to the river systems of Bosbos. The rivers are surrounded by mixed riparian forests (mostly galleries of poplars, willows, and some planes and deciduous shrublands) and agricultural vegetation. The water element, although limited in width, is dominant in the area and characterizes the whole scenery. It is noted that this is not the case for the whole length of the river systems of the study area, due to intensive agricultural development. As presented in detail in section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054), *plain agricultural areas* landscape is typically characterized by low sensitivity to the proposed

changes and low magnitude of change. *Mixed riparian forested and agricultural areas* landscape is typically characterized by medium sensitivity and low magnitude of change.

Regarding areas of high landscape value, Kosmio rerouting crosses the *Bosbozis (Bosbos) River*: Bosbozis (Bosbos) River is included in the Wildlife Refuge of Chatisio and discharges into Lake Ismarida which is part of the National Park of Eastern Macedonia – Thrace. The National Park of Eastern Macedonia – Thrace consists of a complex of protected areas, including 4 Natura 2000 sites, 2 Ramsar sites, and numerous wildlife refuges. Although, the site is close to the urban centre of Komotini and the discontinuous urban fabric surrounding Komotini, it presents inspiring scenery and is deemed of high natural and aesthetic value. The proposed pipeline route crosses Bosbozis River and its tributary 'Trelochimarros' at IP251-10 and IP251-11.

5.3.2 Biological Environment

5.3.2.1 Flora and Habitats

The larger parts of Kosmio rerouting comprise agricultural land (sunflower, corn, cotton and wheat) and a very small portion is covered by shrubs and grasslands. Streams that pass through the valleys of the study area are dominated by *Salix alba - Populus alba* galleries. Synanthropic vegetation encompasses species such as *Ulmus sp., Paliurus spina-christi* and *Rubus ssp*. Habitats of interest and land cover of Kosmio rerouting are presented below in *Section 5.3.2.3.*

5.3.2.2 Flora species

According to the results of the field surveys, one (1) species of conservation interest, *Dianthus tenuiflorus* (*Figure 5-1***Error! Reference source not found.**), was recorded *D. tenuiflorus* is a range-restricted Balkan endemic species flowering in June and July. It was found within the Kosmio rerouting, within the project area, between IP251-9 – IP251-10 (FH-E-080). A few individuals were observed growing at the vicinity of a dry stream in a small patch of *Paliurus spina-christii* garrigues amongst cultivated land.It grows locally in NE Greece in open pine forest, deciduous scrub and roadsides, at 50-1100 m a.s.l. (Strid & Tan, 1997; Dimopoulos *et al.*, 2013). It is also reported from neighbouring areas in Bulgaria and FYR of Macedonia (Strid & Tan, 1997).

It is unlikely that these individuals will be affected during project construction activities.

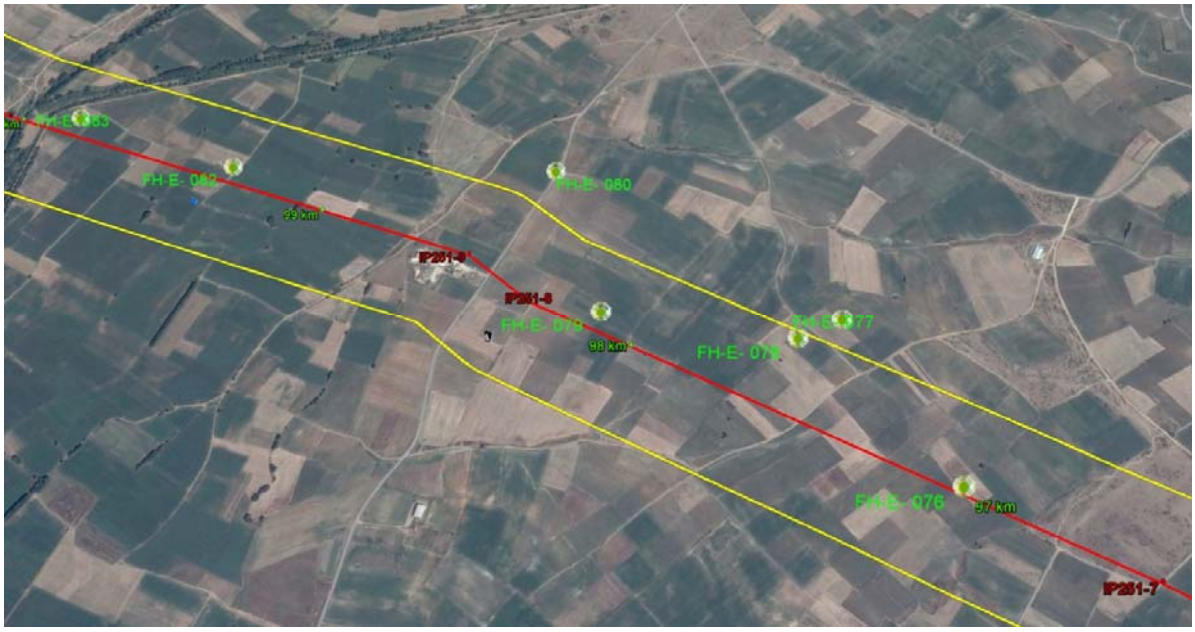
Figure 5-1 ***Location of FH-E-080 / The range-restricted Balkan endemic Dianthus tenuiflorus, in Kosmio rerouting***

Source: EXERGIA field survey (June 2014)

5.3.2.3 Habitat types

Riparian galleries: Well-developed riparian galleries belonging to the European habitat 92A0 "*Salix alba and Populus alba galleries*" were observed at the Chatisio river crossing in Kosmio (Figure 5-3). Riparian galleries belong to the most threatened habitats at a global and European level as well as in Greece. Intensive human activity, such as river impoundment, channelization and drainage exerts high pressure to riparian habitats, with the willow (*Salix*) and poplar (*Populus*) communities to be affected at most (Wenger *et al.,* 1990; Dafis *et al*., 2001; Fernandes *et al.,* 2011; Clerici *et al.,* 2013). With the exception of Chatisio site, riparian vegetation in the study area is considered to be poor, consisting mainly of reeds (*Phragmites australis*) and scattered single black poplar (*Populus nigra*). It is important to note that within the Project area, extermination of riparian vegetation in comparison to its past state, as this is depicted in satellite images, was observed in several streams crossed by the pipeline along the Kosmio rerouting as shown in *Figure 5-2*. Channels at Kosmio rerouting are dominated by reed stands or black poplar (*Populus nigra*) as well as white willow (*Salix alba*) and elm (*Ulmus spp.*) stands.

Figure 5-2 ***Degradation of riparian vegetaion in several stremas crossed by the pipeline route in Kosmio rerouting***



Source: EXERGIA field survey (June 2014)

Figure 5-3 ***European habitat 92A0 "Salix alba and Populus alba galleries", Chatisio river, Kosmio, FH-79***

Source: EXERGIA field survey (June 2014)

Scrubland communities : Semi-natural vegetation consisting of garrigues with *Paliurus spina-christii* was observed among cultivated fields at two locations in Kosmio rerouting (FH-E-054, FH-E-080, *Figure 5-4*), possibly as a result of long abandoned cultivations re-colonized by woody formations. They belong to the Greek habitat 5340 "Garrigues of Eastern Mediterranean" which

refers to shrubby, often low and poor in species formations growing usually in dry, poor soils in continental and insular Greece mostly at low elevations, occasionally up to 1200 m (Dafis *et al*., 2001). In these stands, woody species were rather few and loose while numerous common species of grass and herbs were observed to grow among them: *Avena sterilis, Salvia verbenaca, Eryngium campestre, Cardopatium corymbosum, Thymus* sp., *Cichorium intybus, Teucrium capitatum, Delphinium peregrinum, Prunella laciniata, Asphodelus ramosus* etc. The Balkan endemic *Dianthus tenuiflorus* was observed in this habitat type at FH-E-080.

Figure 5-4 Greek habitat 5340 "Garrigues of Eastern Mediterranean", Kosmio, FH-54

Source: EXERGIA field survey (June 2014)

5.3.2.4 Fauna

Avifauna

The Table below (*Table 5-2*) presents bird species of conservation interest in the area of Kosmio rerouting.

Table 5-2 ***Bird species of conservation interest present in the area of Kosmio rerouting***

Species	Common name	Records in Kosmio rerouting	Expected range/status in Kosmio rerouting project area	Reason of conservation interest {Annex I (2009/147/EC), Hellenic Red Data book}	General comments
Perdix perdix	Grey partridge	Kosmio_WP3 Kosmio_WP7	breeding	HRDB - EN	Two (2) territories within or in the immediate vicinity of the pipeline corridor
Egretta garzetta	Little egret	1 km northeast of Kosmio_Wp2	foraging	Annex I (2009/147/E)	A single individual
Ciconia ciconia	White stork	Kosmio_Wp1 Kosmio_Wp2 Kosmio_Wp8	foraging	Annex I (2009/147/EC) HRDB - VU	Breeding in nearby human settlements, outside the project area
Circaetus gallicus	Short-toed eagle	1km southeast of Kosmio_Wp3	foraging	Annex I (2009/147/EC) HRDB - NT	A single individual
Circus aeruginosus	Western marsh harrier	Kosmio_Wp1 Kosmio_Wp2 Kosmio_Wp3 Kosmio_Wp7	foraging	Annex I (2009/147/EC) HRDB – VU	Possibly breeding in suitable wetland habitat far to the south of the project area
Accipiter brevipes	Levant sparrowhawk	2km northeast of Kosmio_Wp3	foraging	Annex I (2009/147/EC)	A single individual
Buteo buteo	Common buzzard	Kosmio_Wp4 Kosmio_Wp5	foraging	Annex I (2009/147/EC)	Isolated individuals, highly unlikely to breed within the project area
Hieraaetus pennatus	Booted eagle	2km southwest of Kosmio_Wp4	foraging	Annex I (2009/147/EC) HRDB - EN	A single individual
Falco naumanni	Lesser kestrel	Kosmio_Wp2 Kosmio_Wp4 Kosmio_Wp6 Kosmio_Wp7 Kosmio_Wp8	foraging	Annex I (2009/147/EC) HRDB - VU	>25 observations, breeding population is present in nearby human settlements (e.g. village Megalo Doukato) outside the project area

Species	Common name	Records in Kosmio rerouting	Expected range/status in Kosmio rerouting project area	Reason of conservation interest {Annex I (2009/147/EC), Hellenic Red Data book}	General comments
Glareola pratincola	Common pratincole	2km south of Kosmio_Wp7	foraging	Annex I (2009/147/EC) HRDB - VU	A flock of a few individuals, possibly originating from the breeding populations along the coastal wetlands far southwest of the project area
Coracias garrulus	Roller	Kosmio_Wp4 Kosmio_Wp5	breeding	Annex I (2009/147/EC) HRDB - VU	Five (5) territories within, or in the immediate vicinity of the pipeline corridor in the vicinity of the project area
Dendrocopos syriacus	Syrian woodpecker	between Kosmio_Wp3 and Kosmio_Wp5	breeding	Annex I (2009/147/EC)	Sparse population, nesting mainly in riparian tree stands
Melanocorypha calandra	Calandra lark	Kosmio_Wp3 Kosmio_Wp6 Kosmio_Wp7	breeding	Annex I (2009/147/EC) HRDB - VU	Three (3) territories within, or in the immediate vicinity of the pipeline corridor
Calandrella brachydactyla	Greater short-toed lark	Kosmio_Wp3 Kosmio_Wp7	breeding	Annex I (2009/147/EC)	Three (3) territories within, or in the immediate vicinity of the pipeline corridor
Alauda arvensis	Eurasian skylark	Kosmio_Wp2 Kosmio_Wp4 Kosmio_Wp8	breeding	HRDB - NT	Three (3) territories within, or in the immediate vicinity of the pipeline corridor
Lanius collurio	Red-backed shrike	Kosmio_Wp7	breeding (?)	Annex I (2009/147/EC)	<5 observations, very small breeding population (if any)
Lanius minor	Woodchat shrike	Kosmio_Wp8	breeding (?)	Annex I (2009/147/EC) HRDB - NT	<5 observations, very small breeding population (if any)

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, EN: Endangered, DD: Data Deficient, NE: Not Evaluated.

Source: EXERGIA (Field Survey, June 2014)

The summer 2014 field surveys showed that it is mainly widepsread bird species that are estimated as having a high probability of occupancy at sampling stations along Kosmio rerouting area: these species are *Merops apiaster*, *Galerida cristata*, *Hirundo rustica*, *Emberiza melanocephala, Luscinia megarynchos*, *Passer domesticus* and *Hippolais pallida*. In addition, field data showed that a few rare taxa of conservation interest (all in Annex I (2009/147/EC and /or the Greek Red Data Book) have a small yet remarkable breeding population within or in the vicinity of the rerouting area or even on the ROW: these species are *Coracias garrulous, Perdix perdix, Alauda arvensis, Melanocorypha calandra* and *Calandrella brachydactylla*. For details on the ESIA Amendement avifauna field surveys, see Anne 6.3.

The great majority of bird species with conservation interest are non-passerines. Yet, only a limited number of these species are expected to be affected by the TAP pipeline, since most of them do not breed in the areas examined, but simply forage in various numbers or are vagrants. The White Stork (*Ciconia ciconia*) observed in Kosmio rerouting area can be regarded as a representative example of this situation: White Storks foraging in the fields are known to breed within nearby human settlements; subsequently their breeding is unlikely to be affected by the Project.

Similarly, the Syrian Woodpecker (*Dendrocopos syriacus*), a protected species also observed in Kosmio, is breeding in trees which could lie in close proximity to the pipeline route. Assuming that trees are not going to be felled at any significant extent during the construction, this is also a species of little concern as regards to project construction.

On the other hand, priority has to be given to ground-nesting species which are more likely to be affected by project activities, such as the remaining three passerines of conservation concern (*Alauda arvensis, Melanocorypha calandra, Calandrella brachydactylla*). The endangered in Greece *Perdix perdix* also nests at the ground as well as the Annex I / Vulnerable in Greece *Coracias garrulous*, all of them recorded breeding along the Kosmio reroutings.

5.3.2.5 Aquatic Ecology

Kosmio rerouting similarly to ESIA Basecase, crosses Bosbos river where the rather tolerant *Squalius Orpheus* species was recorded during the ESIA preparation when the stream was assessed of poor condition.

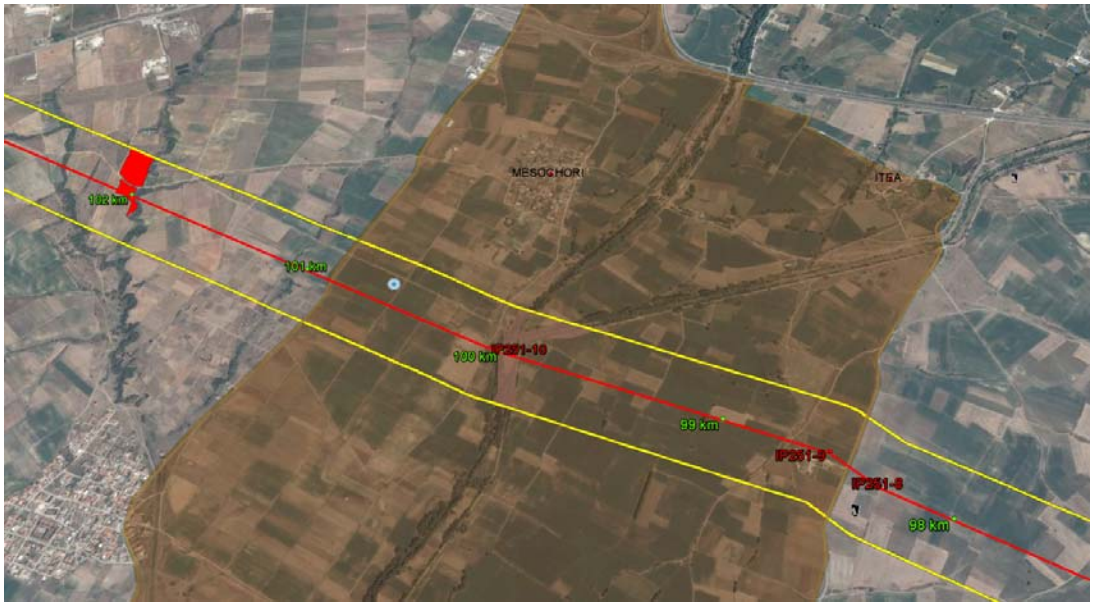
Reference is made to section 6.3.3.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where aspects of aquatic ecology and ichtyofauna in rivers and streams crossed by the pipeline are discussed in detail for the Komotini-Xanthi plain where Kosmio rerouting is located.

5.3.2.6 Protected areas/Sites of Conservation Interest

Kosmio rerouting, similarly to ESIA base case, crosses Wildlife Refuge of Chatisio (GG 601/B/30-04-1976) which is a site protected within the auspices of the Ministry of Agriculture (Forestry Agency). The Chatisio Wildlife Refuge covers a total area of 1,350 ha. The route crosses the Wildilife refuge at approximately IP251-8 of Kosmio rerouting.

The Figure below presents the crossing by the Kosmio rerouting.

Figure 5-5 ***Crossing of Chatisio Wildlife Refuge by Kosmio Rerouting***



Source: EXERGIA field survey (June 2014)

5.3.3 Socioeconomic Environment

5.3.3.1 Demographics and Settlements

Both Kosmio rerouting and the ESIA basecase are located within the Region of East Macedonia and Thrace and the Municipality of Komotini.

A detail and thorough analysis of socioeconomic aspects per municipality, including the Komotini municipality is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline

environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure and use, municipalities' infrastructure, public services and health facilities, education and skills are cited. The main settlements in the area of Kosmio rerouting are Megalo Doukato, Paradimi, Mesochori, Itea, Isalon, Messouni and Meleti settlements, all belonging to Komotini municipality.

5.3.3.2 Economy, Employment and Income

The Municipality of Komotini exhibits a mixed economy with agricultural economic activities complemented by public sector services and manufacturing in the nearby industrial area. However, the settlements and communities along Kosmio rerouting are mainly agricultural communities where farming and animal husbandry are the main economic activities providing the main source of employment. Main cultivation is wheat and cotton and main animal husbandry is sheep and goats. There are no permanent crops cultivated in the area. Unemployment rate is at almost 10% of the economical active population.

5.3.3.3 Land Tenure and Use

Land ownership in the Municipality of Komotini is recorded at 60% of the farmers. Land use in the municipality is as follows:

- Land used for cultivation of annual /seasonal crops (wheat, maize and cotton)
- Land used for animal husbandry
- Organized industrial zone close to the study area

Kosmio rerouting mainly crosses cultivated land.

5.3.4 Cultural Heritage

A total of 7 cultural heritage sites, including 3 sites of High Archaeological Potential (AHAP) were identified in the area of Kosmio rerouting. The most notable sites include:

- A tomb and dense pottery scatters in Linos dating in the Neolithic and probably in the Hellenistic period.
- Extensive pottery scatter and foundation remains in Kosmio

- AHAP site based on place name related to a medium density pottery scatter in Paradimi.

Table 5-3 below presents an inventory of the Cultural Heritage Sites in the area of Kosmio rerouting.

Table 5-3 ***Cultural Heritage Sites in the area of Kosmio rerouting***

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
251	AM2	Isalon1	Literature review	760	AHAP	Chance finding. Inscribed funerary stele	Uncertain
251-3	AM4	Kosmio2	Literature review	230	A	Pottery scatters, roof tiles, foundation remains extending approx. 22500 sq. m.	Byzantine
251-10	AM6	Paradimi2	Literature review	1080	AHAP	Chance finding (grape or oil mill)	Uncertain
251-10	AM9	ParadimiA	Ground truthed during June 2014 survey	0	A	Medium density pottery scatter, roof tiles, coarse ware (prehistoric?)	Possibly prehistoric
251-10	AM7	Paradimi3	Desktop	130	AHAP	Place name Keramidario (=area with tiles)	Uncertain
251-10	AM5	Mesochori1	Literature review	1000	A	Low rise with prehistoric pottery scatters. Evidence of dense occupation along Pos-Pos river	Prehistoric.
251-15	CH-28-E	Toumpa Linos	Ground truthed	570	A	Tomb and surface ceramic scatters in high density, of the Neolithic Period and probably of the Hellenistic too. Officially recognized archaeological site.	Neolithic and probably Hellenistic too

Source: EXERGIA (June 2014)

5.4 Nestos rerouting

5.4.1 Physical Environment

5.4.1.1 Geology, Seismicity and Geomorphology

The geological structure of the area consists mostly of Post-Alpine sediments deposited in the Komotini – Xanthi basin. Pleistocene deposits, mainly scree, cemented breccia and debris materials in the form of older talus cones and slope deposits. The Pleistocene deposits are overlain by Quaternary and Holocene alluvial and terrestrial sediments. Significant swamp and organic sediments can be found inside the alluvial formation of Chrysoupoli Plain.

Both ESIA baseline and the Nestos rerouting are crossing the same geological formations:

- Pleistocene deposits: Sands, conglomerates, sandstones, clays, marls, and intercalations of limestones
- Holocene deposits: Various sediments, mainly alluvial river deposits and alluvial fans. Clays, humic clays and silts also at modern and old swamp areas.

With regard to seismicity, the Nestos rerouting is in close vicinity of the Kavala-Xanthi fault, part of the large Thrace Composite Seismogenic Source. The segment of Kavala-Xanthi fault is situated to the west of the Nestos rerouting. Lack of small scale detailed mapping of Kavala-Xanthi fault cannot exclude the possibility of surface ruptures across the westernmost part of the proposed route. Near surface geometry and co-seismic rupture complexity could also lead to secondary tectonic activity inside the studied area, in the form of parallel or secondary smaller faults not mapped or with a lack of surface expression. The more recent earthquake that occurred on April 11, 1829 in Xanthi is attributed to Kavala-Xanthi fault, but this is lively debated. Reference is made to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.4.1.2 Subsurface and Soils

The dominant soil type in Nestos rerouting is Calcaric Cambisol and Rocks Outcrops. These are high quality soils with good drainage. On the basis of soil cohesion, the area has fairly good cohesion which reduces the likelihood of soil erosion. On the basis of soil properties and topography the likelihood of compaction is considered low.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.4.1.3 Groundwater and Surface Waters

Nestos rerouting crosses the Nestos Delta Porous Groundwater Body (1206) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60//EC). It is located at the Quaternary deposits of Nestos river. The average depth of the Nestos Delta porous groundwater body is 20 m and the area 250 km^2.

The hydrogeological formulation of Nestos river basin consists of sedimentary formulations with high permeability in percentage 5.8%, semipermeable formations in percentage 45.9%, marbles (semipermeable, fragmented formations) in percentage 20.3% and impervious formations in percentage 28%. On the basis of the depth of groundwater table, permeability of the aquifer material and permeability of aquifer overlying strata, the vulnerability of the groundwater is considered low.

No major surface water bodies are found along the Nestos rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.4.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Nestos rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.4.1.5 Acoustic Environment

Information on the acoustic environment for the Nestos rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.4.1.6 Landscape and Visual Amenity

The Komotini - Xanthi plain belongs to plain agricultural areas with regard to landscape character types, i.e. is characterized by open views of fields spreading in the entire area and interrupted by small villages that are embedded smoothly in the landscape. As presented in detail in section

6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054), such a landscape is typically characterized by low sensitivity to the proposed changes and low magnitude of change.

Nestos River, which is considered to be an area of high landscape value, is not affected by the route change in Nestos area (Nestos rerouting).

5.4.2 Biological Environment

5.4.2.1 Flora and Habitats

The broader area of Nestos plain (Komotini - Xanthi plain) consists mainly of agricultural land with cereals (wheat, barley, maize), while a very small portion is covered by shrubs and grasslands. Streams that pass through the valleys of the study area are dominated by *Salix alba - Populus alba* galleries. Synanthropic vegetation encompasses species such as *Ulmus sp., Paliurus spina-christi* and *Rubus ssp*. The rerouting area by far comprises agricultural land and irrigation channels.

European Habitat Reed thickets (72A0) (KP161-171, IP374-1 IP374-22) was recorded in the area.

Greek habitat 72A0 Reed thickets

This habitat type is widespread in Greece (Dafis *et al.,* 2001) and the most frequent riparian habitat type along the route. It is present in temporary streams, standing or slow flowing waters dominated by *Phragmites australis* and *Typha* sp. The location of 72A0 Reed thickets is presented in Annex 5.1. (GPL100-EXG-642-Y-TAE-1006).

Regarding flora species, no species of conservation interest were recorded along the Nestos rerouting during the field surveys.

5.4.2.2 Fauna

Jackal (*Canis aureus*)

The jackal is not considered a priority species for the European Union and therefore it is listed on Annex V of the EU Habitats Directive. It is also assessed as species of Least Concern by the IUCN and listed on Appendix III of CITES, showing a global increasing population trend. Nevertheless, in Greece the Red Data Book species status is “Endangered”,and thus the animal has been given special attention during the ESIA and the current environmental studies

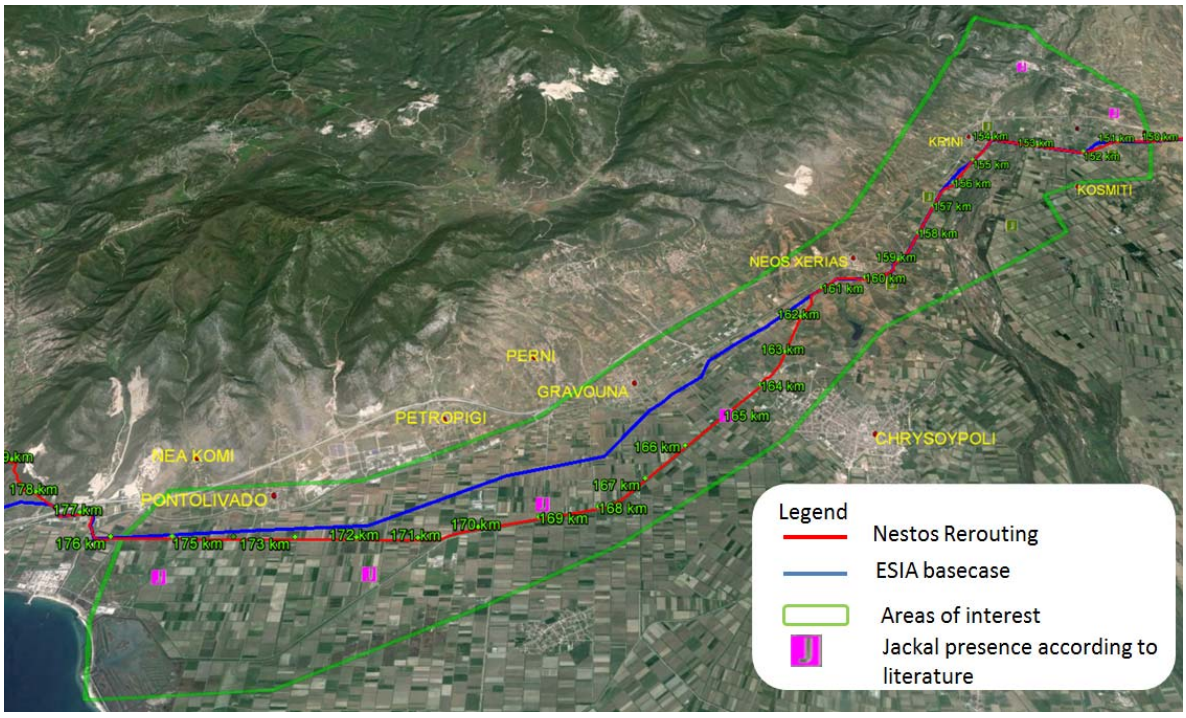
Based on the field investigations carried out along the pipeline route during the ESIA, the golden jackal occupies regions in Evros, Xanthi and Serres area.

Nestos area was then identified as one of the key areas along the ESIA basecase hosting local jackal population.

The ESIA baseline conditions regarding Jackal presence in the Nestos area have not changed with regards to Nestos rerouting and no further field surveys were required during the ESIA Amendment: reference is thus made to section 6.3.2.2.1 of the ESIA (GPL00-ASP-642-Y-TAE-0054_00) and Annex 6.5.9. (GPL00-ASP-642-Y-TAE-0061_00) of the ESIA which describe in detail the literature data and field survey data on the presence of Jackal along the ESIA pipeline route in Nestos region.

Figure 5-6 below presents the area of interest in the area of Nestos combined with the recorded jackal presence according to literature.

Figure 5-6 Areas of interest in the broader area of Nestos rerouting combined with recorded jackal presence



Source: EXERGIA field survey (June 2014)

<u>European Ground squirrel *(Spermophillus citellus)*</u>

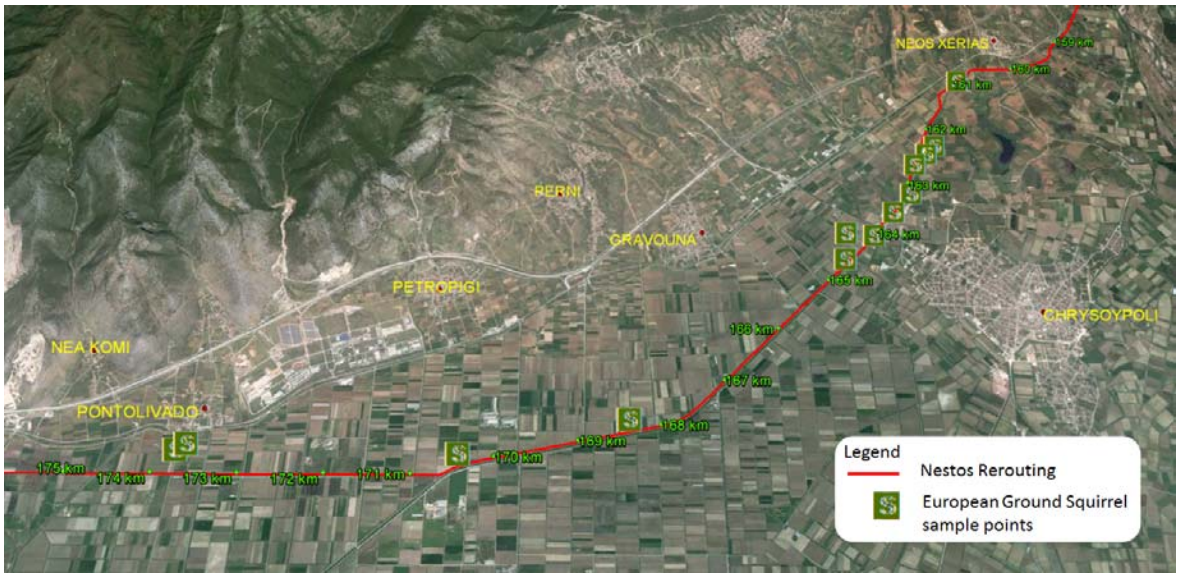
The species is listed in Appendix II of the Bern Convention, which includes strictly protected fauna species, and Annexes II and IV of the EU Habitats and Species Directive, which include species requiring designation of Special Areas of Conservation, and species in need of strict protection, respectively. In accordance with European legislation, the species is protected in Greece by Presidential Decree 67/1981. The species is assessed as Vulnerable by the IUCN and the Greek Red data Book (Youlatos, 2008).

The Greek populations of the European ground squirrel are considered to be in decline and severely fragmented (Youlatos, 2008), however systematic surveys concerning the occurrence and the ecology of the species are lacking. According to Youlatos (2008), European ground squirrel occurs only in the northern part of Greece and includes 3 clearly defined and probably isolated sub-populations, located in western Macedonia, in central Macedonia and in Thrace.

During the ESIA field surveys no colonies were observed along a 500 m corridor along the ESIA basecase route in the area of Nestos. The ESIA Amendment field surveys focused on recording the presence of *Spermophilus citellus* colonies within a 500 m corridor along the Nestos rerouting (from IP374 to IP374-24). No colonies were recorded during the field survey.

Figure 5.7 below presents field survey sampling points to assess the presence of European Ground Squirrel in Nestos rerouting. Further details of the field survey outcomes can be found in Annex 6.2 (GPL00-EXG-642-Y-TAE-1006-at10).

Figure 5-7 ***Sampling points during field survey to assess the presence of Euroepean Ground Squirrel (Spermophillus citellus) along Nestos rerouting***



Source: EXERGIA field survey (June 2014)

Avifauna

The summer 2014 field surveys showed that it is mainly widepsread bird species that are estimated as having a high probability of occupancy at sampling stations along Nestos rerouting area: these species are *Cettia cetti*, *Galerida cristata*, *Hirundo rustica*, *Motacilla flava, Luscinia megarynchos*, *Acrocephalus arundinaceus* and *Hippolais pallida*. The reports of species of conservation interest within the project area as shown in Table 5.7 refer to vagrant individuals, foragers or breeders with very small populations. For details please refer to Annex 6.3 of the ESIA Amendment

Table 5.4 below presents species of conservation interest in the area of Nestos rerouting.

Table 5-4 ***Bird species of conservation interest present in the area of Nestos Rerouting***

Species	Common name	Records in Nestos reroutings	Expected range/status in Nestos reroutings project area	Reason of conservation interest {Annex I (2009/147/EC), Hellenic Red Data book}	General comments
Tadorna tadorna	Common shelduck	1km south of Nestos_Wp3	foraging	HRDB - VU	Two individuals, feeding at a rice paddy. Suitable breeding habitat far outside the project area
Egretta garzetta	Little egret	Nestos_Wp3	foraging	Annex I (2009/147/EC)	Suitable breeding habitat far outside the project area
Ciconia ciconia	White stork	Nestos_Wp1 Nestos_Wp2 Nestos_Wp4 Nestos_Wp5	foraging	Annex I (2009/147/EC)	Breeding in nearby human settlements, outside the project area
Circus aeruginosus	Western marsh harrier	1km west of Nestos_Wp1 and 1km southeast of Nestos_Wp8	foraging	Annex I (2009/147/EC)	Suitable breeding habitat far outside the project area
Falco naumanni	Lesser kestrel	Nestos_Wp5 Nestos_Wp7	foraging	Annex I (2009/147/EC)	Breeding population is present in nearby human settlements outside the project area
Himantopus himantopus	Common stilt	1km south of Nestos_Wp3	foraging	Annex I (2009/147/EC)	Few individuals, feeding at a rice paddy. Suitable breeding habitat far outside the project area
Dendrocopos syriacus	Syrian woodpecker	Nestos_Wp5	breeding	Annex I (2009/147/EC)	<5 observations, very small breeding population

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, EN: Endangered, DD: Data Deficient, NE: Not Evaluated.

Source: EXERGIA (Field Survey, June 2014)

The great majority of the bird species of conservation concern, as seen in *Table 5.4,* are non-passerines. Most of them do not breed in the study area but simply forage in various numbers or are vagrants.

5.4.2.3 Aquatic Ecology

Table 5.5 below presents literature data on the native freshwater fish fauna of Nestos river basin and their conservation status.

Table 5-5 ***Native freshwater fish fauna of Nestos river basin and their conservation status***

Species	Conservation[1]	Nestos river		Strymon river	
		Distribution	Endemicity	Distribution	Endemicity
Acipenser sturio	CR/DD/*	X	1c	X	1c
Abramis brama	LC/LC			X	1
Alburnoides bipunctatus	LC/LC	X	1	X	1
Alburnus alburnus	LC/LC	X	1a		
Alburnus sp. Volvi	LC/LC			X	1
Alburnus thessalicus	LC/LC			X	1a
Alosa fallax	LC/DD/Yes	X	1	X	1
Anguilla anguilla	CR/NT	X	1	X	1
Aphanius fasciatus	NE/LC/Yes	X	1	X	1
Aspius aspius	DD/LC/Yes			X	1
Barbus strumicae	LC/LC/Yes	X	1	X	1
Chondrostoma vardarense	NT/LC	X	1	X	1
Cobitis punctilineata	VU/VU/Yes			X	1
Cobitis strumicae	LC/LC/Yes	X	1	X	1
Cyprinus carpio	VU/LC	X	1	X	1
Esox lucius	LC/LC	X	1	X	1
Eudontomyzon hellenicus	CR/CR/Yes			X	1
Gobio bulgaricus	LC/LC	X	1	X	1
Knipowitschia caucasica	LC/LC	X	1	X	1

[1] * Table follows Economou et al. 2007.
* Conservation status categories follow: “Red Book of Threatened Animals of Greece”/IUCN Red List / presence in Habitat Directive 92/43/EC annexes, respectively.
*Annotations: 1 = Native, confirmed presence in river basin; 1? = Presumably native, reported but unconfirmed presence; 2 = Introduced to the basin; 2? = Reported but unconfirmed introduction.
a : Doubtful taxonomic status of population; b : Doubts on native or introduced status; c : Extirpated or possibly extirpated population.
Symbols placed in parenthesis indicate occurrence only in sections of transboundary rivers outside the Greek territory.

Species	Conservation[1]	Nestos river		Strymon river	
		Distribution	Endemicity	Distribution	Endemicity
Leucaspius delineatus	LC/DD	X	1	X	1
Oxynoemacheilus bureschi	LC/LC	X	1	X	1
Perca fluviatilis	LC/LC	X	2	X	1
Petroleuciscus borysthenicus	LC/LC			X	1
Phoxinus cf. phoxinus	LC/LC	X	1a		
Phoxinus strymonicus	EN/EN			X	1
Proterorhinus semillunaris	LC/LC			X	1
Rhodeus amarus	LC/LC/Yes	X	1	X	1
Rutilus rutilus	LC/LC	X	1	X	1
Salmo cf. macedonicus	DD/DD/Yes	X	1a	X	1a
Scardinius erythrophthalmus	LC/LC	X	1	X	1
Silurus glanis	LC/LC	X	(1?)	X	1
Squalius orpheus	LC/LC	X	1	X	1
Tinca tinca	LC/DD	X	1	X	1
Vimba melanops	DD/DD	X	1	X	1

Source: EXERGIA (2014)

During the ESIA Amendment study, two (2) crossing points were sampled for freshwater fish along the rerouting within the Nestos lowland basin, in areas where dense shrubs and riparian vegetation allowed access. Both sampling sites are in artificial channels which indeed form the bulk of “stream-like” water bodies in the study area.

Table 5.6 below presents fish species sampled in Nestos lowland basin.

Table 5-6 ***Fish species sampled, in Nestos lowland basin and absolute abundances***

a/a	Species	CHRYSOUPOLI_1	CHRYSOUPOLI_2
1	*Alburnoides bipunctatus*	7	24
2	*Barbus strumicae*	2	202
3	*Cobitis strumicae*	15	35
4	*Esox lucius*	1	
5	*Gambusia holbrooki*	24	3
6	*Gobio bulgaricus*	7	1
7	*Lepomis gibbosus*	6	
8	*Leucaspius delineatus*		3
9	*Rhodeus amarus*	16	538
10	*Squalius orpheus*	8	113

Source: EXERGIA (Field Survey, June 2014)

With regards to the entire species list, three species (*Barbus strumicae, Cobitis strumicae* and *Rhodeus amarus*) are listed in Annexes of Directive 92/43, as species of Community Interest. Two species (*Gambusia holbrooki* and *Lepomis gibossus*) are alien to the basin of Nestos river. The rest of the species are native to the basin, but they are either designated as Least Concern (LC) or as Data Deficient (DD), in the respective catalogues.

5.4.2.4 Protected areas/Sites of Conservation Interest

Nestos rerouting similarly to the ESIA basecase, crosses the National Park of Eastern Macedonia Thrace for approximately 16km, through the northernmost part of the site, in the peripheral zone of the National Park and the outer limits of the overlapping protected areas (see Annex 5.1).

Reference is made to section 6.3.4.1.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.4.3 Socioeconomic Environment

5.4.3.1 Demographics and Settlements

Both Nestos rerouting and the ESIA basecase cross the Region of East Macedonia and Thrace and the Municipality of Nestos.

A detailed and thorough analysis of socioeconomic aspects per municipality, including the Nestos municipality is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure and use, municipalities' infrastructure, public services and health facilities, education and skills are cited. The main settlements in the area of Nestos rerouting are Gravouna and Chrysoupoli settlements.

5.4.3.2 Economy, Employment and Income

The Municipality of Nestos exhibits a mixed economy with agricultural sector holding a relatively small percentage of economic activity in the area while 36% of surveyed households reported trade as their primary activity and 14% employment in the public sector. Agriculture employs only 18% of the surveyed households. Cultivations are mainly annual crops (maize, wheat, animal feed).

Unemployment rate is reported at almost 7% of the economical active population.

5.4.3.3 Land Tenure and Use

Land ownership in Komotini is reported at 50% of the farming population. Land use in Nestos municipality is as follows:

- Cultivated land, mainly with annual crops (maize and animal feed) but also permanent crops (mainly olive trees and few fruit trees and vineyards)
- Some industrial activity in the wider area
- Forested land used for timber

5.4.4 Cultural Heritage

A total of 6 cultural heritage sites, consisting of 2 archaeological sites, 2 areas of Intangible Cultural Heritage (ICH) sites and 2 areas of High Archaeological Potential (AHAP) were identified along Nestos rerouting. The most notable sites from this region include:

- Remains of the ancient city Pistiros in Pondolivado area
- Remains of an ancient town in Nea Komi area
- Medium density pottery scatter in Nea Komi, possibly related to the nearby ancient town
- Profitis Elias chapel in Chryssoupoli

Table 5-7 below presents an inventory of the Cultural Heritage Sites in the area of TAP Nestos rerouting.

Table 5-7 ***Cultural Heritage Sites in the area of Nestos rerouting***

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
374-9-3	***AM89***	Chryssoupolis2	Desktop	150	ICH	Profitis Elias chapel	Uncertain,possibly contemporary
374-14	***AM13***	Chryssoupolis1	Desktop	550	ICH	Place name Pyrovoleia=pill box area	Uncertain,possibly contemporary
374-23	***CH-10a-E***	Pondolivado 2	17th EPCA	650	A	Wall, settlement and findings of the Classical and Hellenistic Period (Ancient Pistiros).	Classical,Hellenistic
374-24	***AM14***	Nea KomiA	Ground truthed during June 2014 survey	40	AHAP	Low density pottery scatter. Few pottery sherds, straple handle.	Uncertain
374-24	***CH-13a-E***	Nea Komi2	17th EPCA	360	A	Ancient town. Officially recognized archaeological area.	Roman
374-24	***CH13-E***	Nea Komi	Ground truthed	430	AHAP	Field with ceramic scatters and roof tiles in moderate density. The connection of the CH13 site to the officially recognized archaeological site of Nea Komi, fortress of the Roman Period, should be further investigated.	Roman and historic

Source: EXERGIA (2014)

5.5 Nea Karvali rerouting

5.5.1 Physical Environment

5.5.1.1 Geology, Seismicity and Geomorphology

The geological structure of the area consists mostly of Paleozoic and Mesozoic metamorphic rocks of the Rhodope Massif. Marbles, amphibolites, mica schists and gneisses along with granitic intrusions (Kavala batholiths). Pleistocene deposits in the area are mainly scree, sand and gravels, cemented breccia and debris materials in the form of older talus cones, slope deposits and river terraces. The Pleistocene deposits are overlain by Quaternary and Holocene alluvial and terrestrial sediments.

Both the ESIA baseline and the Nea Karvali rerouting are crossing the same geological formations, although the rerouting is sited on mostly bedrock material instead of the Nea Karvali alluvial plain to the south. These formations are:

- Paleozoic gneiss.
- Mesozoic marbles with schist lenses.
- Pleistocene screes and terrace deposits: breccias, conglomerates, sand and gravels
- Holocene deposits: Various sediments, mainly alluvial river deposits and alluvial fans.

With regard to seismicity, Nea Karvali rerouting is in close vicinity to the Kavala - Xanthi fault, part of the large Thrace Composite Seismogenic Source. Althought the rerouting is close to the fault trace, the foot-wall positioning excludes the possibility of direct co-seismic rupturing and also lower ground motion values than the hanging-wall. The more recent earthquake that occurred on April 11, 1829 in Xanthi is attributed to Kavala - Xanthi fault, but this is lively debated. Reference is made to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed discussion of geohazards is provided.

5.5.1.2 Subsurface and Soils

The dominant soil type in Nea Karvali is Rocks Outcrops and Calcaric Fluvisol .Regarding the geological formation of the area there is a potential for elevated concentrations of heavy metals

along this part of the route. The soil is prevailed by sand and silt/clay and characterized by well drainage and low structure.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.5.1.3 Groundwater and Surface Waters

Nea Karvali rerouting, similarly to ESIA basecase, is crossing the Lekani karstic groundwater body (1207) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60/EC). This specific groundwater body is located among Xanthi, Drama and Kavala, at the carbonate formations (karstic marbles) of Lekani mountains. It is recharged by precipitation and Nestos river. The average depth of the Lekani karstic groundwater body is 100 m and the area covers 1,209 km^2.

No major surface water bodies are found along Nea Karvali rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.5.1.4 Climate and Ambient Air Quality

Climate and air quality information for Nea Karvali rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.5.1.5 Acoustic Environment

Information on the acoustic environment for Nea Karvali rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.5.1.6 Landscape and Visual Amenity

Nea Karvali rerouting is characterized by two different types of landscape, mountainous forested areas and plain agricultural areas. The landscape of mountainous forested areas offers inspiring views to colorful and beautiful pure or mixed forests and an overview of the agricultural plains, while agricultural area is characterized by open views of fields spreading in the entire area and interrupted by small villages that are embedded smoothly in the landscape.

As presented in detail in section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054), plain agricultural areas landscape is typically characterized by low sensitivity to the proposed changes and low magnitude of change while mountainous forested areas are typically characterized by high sensitivity and medium magnitude of change.

5.5.2 Biological Environment

5.5.2.1 Flora and Habitats

The project area around Nea Karvali rerouting comprises agricultural land cultivated with annual crops with patches of pseudomaquis vegetation and stands of *Platanus ssp.* along the streams of the area. Greek habitat 62A0 “Eastern submediterranean dry grasslands” is recorded in the project area. No flora species of conservation interest were reported along Nea Karvali rerouting.

For more details, reference is made to section 6.3.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.5.2.2 Fauna

According to desktop studies and field surveys carried out during ESIA preparation, the area of Nea Karvali rerouting holds no territories or colonies of jackal, wolf and European ground squirrel species of conservation interest.

Regarding avifauna there are no reports of species of conservation area in the area of Nea Karvali rerouting. During the ESIA, species of conservation interest were observed only in the Agios Timotheos – Kioupia wildlife refuge (IP427-IP443) 6 km from Nea Karvali rerouting. Such species are the Red-backed Shrike (*Laniuscollurio*) and the European Honey Buzzard (*Pernisapivorus*).

For more details, reference is made to section 6.3.3.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.5.2.3 Aquatic Ecology

Regarding icthyofauna there are no records of species of conservation interest from Nea Karvali rerouting area. For more details, reference is made to section 6.3.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.5.2.4 Protected areas/Sites of Conservation Interest

There are no protected areas/sites of conservation Interest along Nea Karvali rerouting.

5.5.3 Socioeconomic Environment

5.5.3.1 Demographics and Settlements

Both Nea Karvali rerouting and the ESIA basecase cross the Region of East Macedonia and Thrace Region and the Municipality of Kavala.

A detail and thorough analysis of socioeconomic aspects per municipality, including the Municipality of Kavala is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure and use, municipalities' infrastructure, public services and health facilities, education and skills are cited.

The main settlement in the area of Nea Karvali rerouting is Lefki, with a population of around 50 residents.

5.5.3.2 Economy, Employment and Income

The Municipality of Kavala exhibits mixed economy where almost all sectors of economic activity are represented with the highest proportion being business / real estate and trade. Only 11% of those employed work in agriculture. Agricultural cultivations consist mainly of seasonal crops (mainly wheat), clover and sunflower (sold for biofuel production). Fruit tree cultivations account for an additional 12%.

The Municipality of Kavala exhibits a high rate of unemployment, at 19% of the active population.

5.5.3.3 Overview of Land Tenure and Use

Land ownership in the Municipality of Kavala is lower compared to other municipalities in the region, with 30% of the farmers owning the land they cultivate.

Land use in the Municipality of Kavala is as follows:

- Intensive cultivation of seasonal crops (wheat and maize) as well as permanent crops (olive trees and fruit trees)

- Forested land
- Organized industrial zone close to the study area

5.5.4 Cultural Heritage

Two sites of culture heritage interest are identified in the area of Nea Karvali:

- Akontisma, Nea Karvali - Architectural remnants of an ancient fortified town, located on a hill. Ceramic scatters in high density. Officially recognized archaeological site.
- Akontisma, Nea Karvali - Mound 1km north-east of the village ancient Akontisma. Hill between the village and the zone of the phosphate fertilizers plant.

Both sites are located at a distance of approximately 1000m from the Nea Karvali rerouting.

5.6 Drymos rerouting

5.6.1 Physical Environment

5.6.1.1 Geology, Seismicity and Geomorphology

The area of Drymos rerouting is part of the Circum Rhodope belt geotectonic unit. A variety of basement formations (ophiolites, carbonates, metamorphic rocks etc) form a NW-SE striking set of thrust stacks. Multiple Pleistocene terrace deposits can also be found, part of the Mygdonia basin sediment infill. The Pleistocene deposits are overlain by Quaternary and Holocene scree, weathering material and terrestrial sediments.

Both the ESIA baseline and Drymos rerouting are crossing the same geological formations:

- Conglomerates of Jurassic Age.
- Svoula Formation: Sandstones, limestones and shale intercalations
- Pleistocene terrace deposits: Gravels, pebbles, clays and sands
- Holocene deposits: Various sediments, mainly weathering material and slope deposits

With regard to seismicity, Drymos rerouting is not affected by any active faulting system in its immediate vicinity or associated with significant instrumental seismicity. Reference is made to

Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.6.1.2 Subsurface and Soils

The dominant soil type in Drymos is Dystric Regosol and Rhodric Luvisol, soils generally characterized by medium quality and moderately well drainage. Due to intensive cultivation and application of fertilizers, the area is susceptible to soil contamination by nitrates.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.6.1.3 Groundwater and Surface Waters

Drymos rerouting, similarly to the ESIA basecase, crosses the porous groundwater body of Mygdonia (1007) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60/EC). It is located at the eastern part of Thessaloniki Prefecture, inside the quaternary and Neocene deposits of the area. The average thickness of the Mygdonia groundwater body is 30 - 450 m and the area covers 687 km^2. The groundwater level fluctuation has a range of 0.1 - 15 m and average depth 8 m (87 m altitude). The permeability of the aquifer ranges between $2.5 * 10^{-6}$ and $2.2*10^{-3}$ m/sec. Live storage capacity is estimated to be $98.2 * 10^6$ m^3/year. On the basis of the depth of groundwater table, permeability of the aquifer material and permeability of aquifer overlying strata, the vulnerability of the groundwater is considered high.

No major surface water bodies are found along the Drymos rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.6.1.4 Climate and Ambient Air Quality

Climate and air quality information for Drymos rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.6.1.5 Acoustic Environment

Information on the acoustic environment for Drymos rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.6.1.6 Landscape and Visual Amenity

The Gallikos plain belongs to plain agricultural areas with regard to landscape character types, i.e. is characterized by open views of fields spreading in the entire area and interrupted by small villages that are embedded smoothly in the landscape. As presented in detail in section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054), such a landscape is typically characterized by low sensitivity to the proposed changes and low magnitude of change.

5.6.2 Biological Environment

5.6.2.1 Flora and Habitats

The area of the rerouting comprises agricultural land with patches of shrubland as well as parts of an industrial character. No species of conservation interest are reported in the area of the rerouting.

For more details, reference is made to section 6.3.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.6.2.2 Fauna

According to field surveys carried out during ESIA preparation as well as literature search, the area of Drymos rerouting holds no territories or colonies of jackal, or wolf.

European ground squirrel

During a dedicated field survey north of Drymos village (IP677-6), a single burrow was detected in a meadow over a hill with a quite big entrance that seemed recently abandoned. Due to the habitat suitability and also to the great resemblance of the burrow to the ones generally known as of ground squirrels, it is quite possible that *Spermophilus* occupied this area, at least one year ago. Although the adjacent fields were thoroughly searched, no other evidence of the species' presence was recorded. It should be noted that Drymos rerouting places the pipeline northwards of the ESIA basecase, thus the colony recorded in May 2013 during ESIA preparation is now avoided. The abandoned burrow detected in June 2014 is located 1km NW of the 2013 colony.

Avifauna

Regarding avifauna, the baseline conditions at Drymos rerouting are considered similar to the ESIA basecase. In fact, Drymos rerouting only moves a small part of the ESIA basecase route outside the crossing of the National Park of Koroneia-Volvi, where during the ESIA preparation, species of conservation interest were identified.

For more details on avifauna presence in the area, reference is made to section 6.3.3.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054_00).

5.6.2.3 Aquatic Ecology

There are no watercourses in the area of the rerouting.

5.6.2.4 Protected areas/Sites of Conservation Interest

Drymos rerouting reduces the length of the pipeline crossing the National Park of Koroneia-Volvi by approximately 2km as compared to the ESIA basecase.

For more details on crossing of the National Park of Koroneia-Volvi by the ESIA basecase, reference is made to section 6.3.4.1.4 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.6.3 Socioeconomic Environment

5.6.3.1 Demographics and Settlements

Both Drymos rerouting and the ESIA basecase cross the Region of Central Macedonia and the Municipality of Oreokastro.

A detail and thorough analysis of socioeconomic aspects per municipality, including Oreokastro municipality is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure and use, municipalities' infrastructure, public services and health facilities, education and skills are presented. The main settlement in the area is Drymos settlement.

5.6.3.2 Economy, Employment and Income

The Municipality of Oreokastro is located close to Thessaloniki and exhibits a mixed economy with all types of employment being represented to some proportion; farming provides 13% of employment whilst 13% of employment is provided by the public sector and 13% by trade. All of the surveyed households that are engaged in farming cultivate exclusively wheat. Animal husbandry is an important source of income. The main income for 45% of surveyed households is pension, whilst 36% are self-employed.

5.6.3.3 Land Tenure and Use

Land ownership in Oreokastro is recorded at 60%. The land is mainly used for annual crop cultivation (mainly wheat) and animal husbandry.

5.6.4 Cultural Heritage

There are no findings of cultrual heritage interest in the area of Drymos rerouting.

5.7 Pyrgoi rerouting

5.7.1 Physical Environment

5.7.1.1 Geology, Seismicity and Geomorphology

The area of Pyrgoi rerouting is part of the Pelagonian geotectonic unit. Bedrock formations in the area are mainly Triassic – Jurassic marbles. Pleistocene red deposits of Villafrancian age (breccia, sands, gravel and conglomerates) are also abundant. Small outcrops of Neogene marls and marly limestones can also be found. The Pleistocene deposits are overlain by Quaternary and Holocene scree, weathering material and alluvial sediments.

Both the ESIA baseline and Pyrgoi rerouting are crossing the same geological formations, with the exception of the Neogene marls:

- Marbles of Triassic – Jurassic age.
- Neogene marls and marly limestones.
- Pleistocene red terrestrial deposits

- Holocene deposits: Various sediments, mainly weathering material, alluvial sediments and slope deposits

With regard to seismicity, Pyrgoi rerouting is not affected by any active faulting system in its immediate vicinity or associated with significant instrumental seismicity. Reference is made to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.7.1.2 Subsurface and Soils

The dominant soil type in Pyrgoi rerouting area is Rocks Outcrops and Calcaric Leptosol.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.7.1.3 Groundwater and Surface Waters

Pyrgoi rerouting similarly to the ESIA basecase, crosses the Karstic groundwater body of NW Mountain Vermio (code 908a) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60//EC). On the basis of Karst terrain and the depth of the groundwater table (average depth at 117 m), the vulnerability of the groundwater depends on soil cover.

No major surface water bodies are found along the Pyrgoi rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.7.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Pyrgoi rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.7.1.5 Acoustic Environment

Information on the acoustic environment for the Pyrgoi rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.7.1.6 Landscape and Visual Amenity

Pyrgoi rerouting is located at the Vermio mountain slopes, which belongs to mountainous shrubland and grassland with regard to landscape character types, i.e is characterized by altitude that ranges from 300 meters to 1900 meters. Mountainous slopes covered by shrublands and grasslands are the most characteristics for this landscape type. On the Vermio Mountain slopes these areas have historically been used for summer pasture.

5.7.2 Biological Environment

5.7.2.1 Flora and Habitats

This area is characterized by grasslands and shrubland, mixed deciduous forest NW of Pyrgoi and agricultural land.

The flora taxa of conservation interest found in the Vermio Mountain slopes are presented in Section 6.3.2.1.2 of the ESIA(GPL00-ASP-642-Y-TAE-0054). In summary, the broader area hosts 31 species of conservation interest, including protected, Balkan endemic and rare species.

Table 5.8 below presents taxa of conservation interest in the Pyrgoi rerouting area according to the ESIA findings.

Table 5-8 ***Flora species of conservation interest in the area of Pyrgoi rerouting***

No.	*Latin name (Family name)*	*Common name*	*Anticipated range*	*Reason of conservation interest*
1	*Achillea holosericea* (Compositae)	-	Rare[2]	Balkan endemic
4	*Anacamptis pyramidalis(Orchidaceae)*	Pyramidal Orchid	Sporadic	Protected under PD 67/81
5	*Anthyllis vulneraria subsp. bulgarica (Leguminosae)*	Kidneyvetch	Sporadic	Balkan endemic
6	*Atropa bella-dona (Solanaceae)*	Belladona		Protected under PD 67/81
7	*Centaurea napulifera subsp. Napulifera (Compositae)*	Cornflower	Sporadic	Balkan endemic
8	*Cephalanthera longifolia (Orchidaceae)*	Sword-leaved Helleborine	Sporadic	Protected under PD 67/81
9	*Cephalanthera rubra (Orchidaceae)*	Red Helleborine	Sporadic	Protected under PD 67/81
10	*Epipactis sp. (Orchidaceae)*		Sporadic	Protected under PD 67/81
11	*Galium oreophilum (Rubiaceae)*	-		Balkan endemic
12	*Himantoglossum caprinum (Orchidaceae)*	Eastern Lizard Orchid	Sporadic	Protected under PD 67/81& Annex II EU Habitats Directive

[2]Of small population and/or of narrow biogeographical range.

No.	Latin name (Family name)	Common name	Anticipated range	Reason of conservation interest
13	*Neottia nidus-avis (Orchidaceae)*	Bird's Nest Orchid	Sporadic	Protected under PD 67/81
14	*Ophrys apifera (Orchidaceae)*	Bee Orchid	Sporadic	Protected under PD 67/81
15	*Ophrys scolopax subsp. Cornuta (Orchidaceae)*	Horned Orchid	Sporadic	Protected under PD 67/81
16	*Ophrys sphegodes subsp.epirotica (Orchidaceae)*	Early Spider Orchid	Sporadic	Balkan endemic, Protected*
17	*Orchis mascula (Orchidaceae)*	Early Purple Orchid		Protected under PD 67/81
18	*Paeonia peregrine (Paeoniaceae)*	-	Sporadic	Rare
19	*Paronychia macedonica (Caryophyllaceae)*	-		Balkan endemic
20	*Phlomis samia (Labiatae)*	-		Balkan endemic
21	*Platanthera chlorantha (Orchidaceae)*	Greater Butterfly Orchid	Sporadic	Protected under PD 67/81
22	*Platanus orientalis (Platanaceae)*	Oriental Plane	Sporadic	Protected under PD 67/81
23	*Polygala supina* subsp. *rhodopea* (Polygalaceae)	-		Balkan endemic
24	*Scabiosa tenuis* (Dipsacaceae)	-		Balkan endemic
25	*Scutellaria rupestris* subsp. *adenotricha* (Labiatae)	-	Rare	Balkan endemic, Protected*
26	*Silene atropurpurea* (Caryophyllaceae)	-		Balkan endemic
27	*Stachys iva* (Labiatae)	-		Balkan endemic
28	*Stachys plumose* (Labiatae)	-		Balkan endemic
29	*Veronica chamaedrys* subsp. *Chamaedryoides* (Scrophulariaceae)	Speedwell		Greek endemic
30	*Platanthera* sp. (Orchidaceae)			Protected under PD 67/81
31	*Orchidaceae* unidentified			Protected under PD 67/81

Source: EXERGIA (2014)

The abundance of taxa of conservation interest in the different vegetation types is presented in section 6.3.2.1.2. of the ESIA (GPL00-ASP-642-Y-TAE-0054) .

5.7.2.2 Fauna

The broader area of Pyrgoi rerouting, Vermio mountain slopes, hosts wolves and bears. The baseline conditions regarding large mammals in the area remain the same as described in detail

in the ESIA study. Regarding avifauna the most important species observed in this section of the pipeline route was the Short-toed Eagle (*Circaetus gallicus*). However, no evidence of nesting sites was observed along the pipeline route.

For more details on the fauna baseline for the area, reference is made to Section 6.3.2.1.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.7.2.3 Aquatic Ecology

There are no major watercourses in the rerouting area.

5.7.2.4 Protected areas/Sites of Conservation Interest

There are no protection areas in the area of Pyrgoi rerouting.

5.7.3 Socioeconomic Environment

5.7.3.1 Demographics and Settlements

Both Pyrgoi rerouting and the ESIA basecase are located in the Region of West Macedonia and the Municipality of Eordea. A detail and thorough analysis of socioeconomic aspects per municipality, including the Eordea municipality is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure and use, municipalities' infrastructure, public services and health facilities, education and skills are cited. Pyrgoi settlement is the only settlement located close to the rerouting area.

5.7.3.2 Economy, Employment and Income

In the Municipality of Eordea, according to household survey carried out during ESIA preparation, 25% of the population works in construction, 18% in the energy sector and 21% in the public sector. In settlements more distant to the PPC power plants, like Pyrgoi, local economy has retained a more agricultural character, with the main economic activity being apple cultivation.

5.7.3.3 Land Tenure and Use

Land ownership in the Municipality of Eordea is relatively smaller compared to other municipalities in the region. Land use is as follows:

- Agricultural area, mainly annual crops, corn and cereals, with the exception of apple trees in the east
- Lignite mining and power generation at Ptolemaida Basin

5.7.4 Cultural Heritage

A total of 15 cultural heritage sites, consisting of 8 archaeological sites, 2 monuments and 5 Intangible Cultural Heritage (ICH) sites, were identified in the area of Pyrgoi rerouting.

The most notable sites from this region include:

- Kastro bridge, a listed stone made bridge that lies on an important ancient track
- Sandrinos bridge, listed stone made bridge
- The remains of a stone paved road
- Neolithic period archaeological sites
- Hellenistic period archaeological site
- Roman and Byzantine period archaeological site

Table 5-9 presents an inventory of the Cultural Heritage Sites in the area of Pyrgoi rerouting.

Table 5-9 ***Cultural Heritage Sites in the Area of Pyrgoi Rerouting***

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
1136-3	CH-19		Ground truthed during October 2011 CH Survey	400	A	Poorly preserved remains of stone house measuring no less than 0.01 ha. The structure is believed to be of historic date or recent antiquity. No associated ceramics were found nearby, making dating difficult.	Uncertain ,historic
1136-3	CH-83	Pyrgoi 3	Ground truthed during November 2010 and February 2011 CH Survey	330	M	Kastro Bridge. Stone bridge. Listed monument with a surrounding protection zone of 200 m. The area lies on an important ancient track leading from Eordaia to the Upper Macedonia. Stone-paved pathways reported in the area are possibly part of this track. . Close to the village, in fortified area settlement dating from the Hellenistic to Byzantine periods.	Uncertain,possibly Post-Byzantine
1136-3	CH-20		Ground truthed during October 2011 CH Survey	770	A	Well preserved field house made of dry stone.	Uncertain,
1136-3	AM62	Pyrgoi8	Ground truthed during November 2010 and February 2011 CH Survey	250	ICH	Stone made walls	Uncertain
1136-5	AM52	PyrgoiB	Ground truthed in June 2014	0	ICH	On a hill slope, linear stone made features. Possibly drywall or field boundary? Or old military structures?	Uncertain
1137	CH-84	Pyrgoi2	Ground truthed during November 2010 and February 2011 CH Survey	565	M	Sandrinos. Stone made bridge in Pyrgoi.	Uncertain,
1137	AM53	PyrgoiC	Ground truthed in June 2014	20	ICH	Mountain top, great view of the surroundings. Circular stone structure on the top.	Uncertain
1137	AM51	Pyrgi A	Ground truthed in June 2014	230	A	Roof tiles, pottery fragments, possibly of prehistoric and byzantine date visible in a hill slope section close to ESIA basecase.	Possibly prehistoric, byzantine

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
1139	CH-346	Kominia Chorafia	Site list from LPD at the Greek Ministry of Culture	710	A	Neolithic period archaeological site	Neolithic
1137	CH-345	Kominia Lofos	Site list from LPD at the Greek Ministry of Culture	550	A	Neolithic period archaeological site	Neolithic
1139	AM101	Pyrgoi17	Desktop study	710	ICH	Unknown church	Uncertain, possibly contemporary
1139	AM63	Pyrgoi9	Literature review	430	A	Remains of a stone paved road reported in the area	Uncertain
1139	AM50	Pyrgoi16	Desktop study	460	ICH	Place name Kaliva (=hut), church in maps	Uncertain
1142-1	CH-348	Omali Lofos	Site list from LPD at the Greek Ministry of Culture	280	A	Hellenistic period archaeological site	Hellenistic
1143-1	CH-347	Omali Mikros	Site list from LPD at the Greek Ministry of Culture/ Ground Truthed during June2014 CH Survey	40	A	Roman and Byzantine period archaeological site	Roman

Source: EXERGIA (2014)

5.8 Foufas - Eordea rerouting

5.8.1 Physical Environment

5.8.1.1 Geology, Seismicity and Geomorphology

The area of Foufas - Eordea rerouting is part of the Ptolemaida – Kozani Basin. The main basin formations along the route are the lignite-bearing Komnina Formation of Upper Miocene – Lower Pliocene age and Lower-Middle Pleistocene Perdika formation. Pleistocene red deposits of Villafrancian age (breccia, sands, gravel and conglomerates) are also abundant. The Pleistocene deposits are overlain by Quaternary and Holocene scree, weathering material and alluvial sediments.

Both the ESIA basecase and Foufas - Eordea rerouting are crossing the same geological formations:

- Komnina formation: Clays, silt, sands, conglomerates and thick lignite beds
- Perdika formation: Sands, clays and lignites.
- Pleistocene red terrestrial deposits and cemented breccias.
- Holocene deposits: Various sediments, mainly weathering material, alluvial sediments and slope deposits

With regard to seismicity, Foufas - Eordea rerouting is not affected by any major active faulting system in its immediate vicinity or associated with significant instrumental seismicity. Reference is made to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.8.1.2 Subsurface and Soils

The dominant soil type in the Eordea-Foufas rerouting is Vertic Calcic Luvisol. Due to shallow water table, intensive farming practices, excessive use of fertilizers (particularly nitrogen based fertilizers) the area is prone to nitrate contamination.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.8.1.3 Groundwater and Surface Waters

The Eordea-Foufas rerouting similarly to the ESIA basecase, crosses the porous Groundwater Body of Ptolemaida Basin (code 906a). The groundwater head is variable in the aquifer from around 540 to 640 masl. The average depth to groundwater is 19 mbgl and the average annual groundwater fluctuation is 3 m. On the basis of the depth of groundwater table, permeability of the aquifer material and permeability of aquifer overlying strata, the vulnerability of the groundwater is considered low.

No major surface water bodies are found along the Eordea - Foufas rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.8.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Foufas - Eordea rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.8.1.5 Acoustic Environment

Information on the acoustic environment for the Foufas Eordea rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.8.1.6 Landscape and Visual Amenity

With regards to landscape character types, the Ptolemaida basin area comprises upland agricultural areas i.e. areas characterized by a mean altitude of 800 meters and pastures, meadows and grasslands throughout this landscape type and *mountainous shrublands and grasslands* with mountainous slopes covered by shrublands and grasslands. As presented in detail in section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054), such a landscape is typically characterized by low sensitivity to the proposed changes and low magnitude of change.

5.8.2 Biological Environment

5.8.2.1 Flora and Habitats

As described in the ESIA and according to literature review, Ptolemaida Basin, where Eordea - Foufas rerouting is located, is mainly covered by agricultural and urban areas and does not host any rare or threatened species. Regarding the pipeline crossing of the Wildlife Refuge of Kouri (IP1172-1 to IP1188 + 650m), the vegetation and flora are typical of rural areas, without any conservational importance.

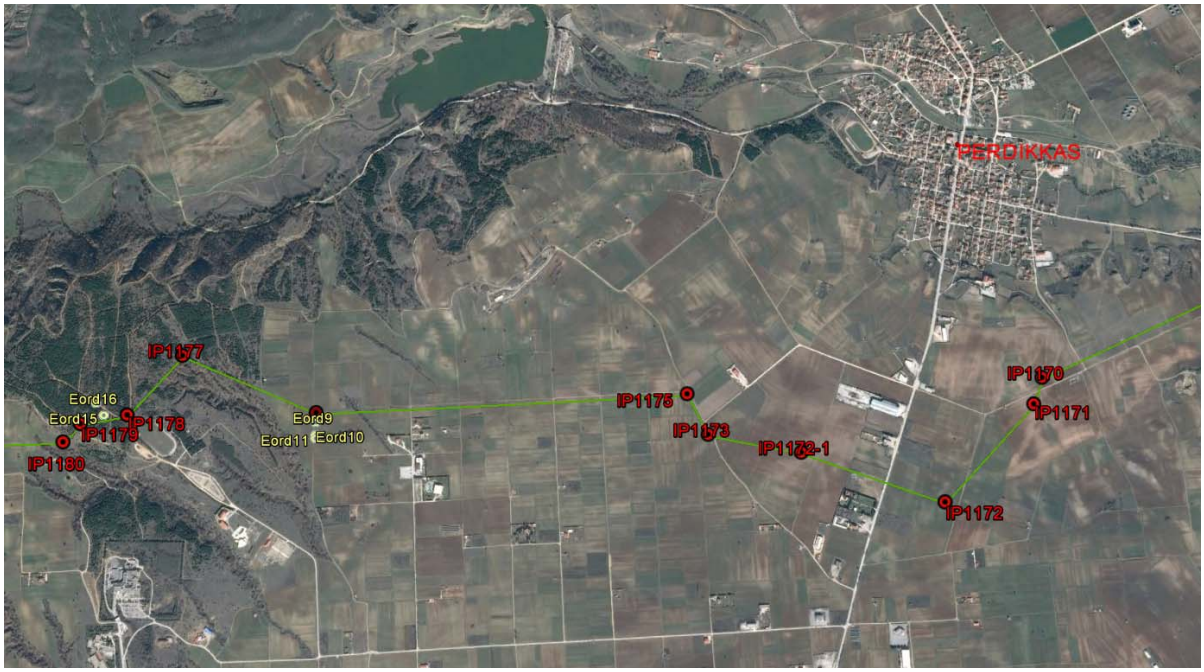
Agricultural areas in Ptolemaida Basin are dominated by cultivations of cereals (wheat, barley, maize), rice, cotton, burclover and fruit orchards (cherry, peach, apricot, pear) with small patches of grasslands, meadows and pastures.

5.8.2.2 Fauna

Spermophilus citellus

According to a dedicated field survey, two areas were identified as potentially hosting *Spermophillus citellus* colonies in the area of the Eordea - Foufas rerouting. One area is located west of Perdikkas village, between IP IP1175 and IP1176, where sampling locations showed evidence of former or current presence in the area. The other one is located west of Perdikkas, between IP1178 and IP1179, and the site presented clear evidence of Spermophilus presence. Details of the field surveys and results are presented in Annex 6.2. *Figure 5.8* below presents an overview of the potential presence of *Spermophillus citellus* in the area of Eordea – Foufas rerouting according to the field survey results.

Figure 5-8 ***Potential presence of Spermophillus citellus in Eordea-Foufas rerouting***



Source: EXERGIA (2014)

5.8.2.3 Aquatic Ecology

There are no watercourses of conservation interest in the area of Eordea Foufas rerouting.

5.8.2.4 Protected areas/Sites of Conservation Interest

Similarly to the ESIA basecase, Eordea - Foufas rerouting crosses the Wildlife refuge of Kouri-Ptolemaida which is a site protected within the auspices of the Ministry of Agriculture (Forestry Agency).

5.8.3 Socioeconomic Environment

5.8.3.1 Demographics and Settlements

Both Eordea - Foufas rerouting and the ESIA basecase are located in the Region of West Macedonia and the Municipality of Eordea. A detail and thorough analysis of socioeconomic aspects per municipality, including the Eordea municipality is presented in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054), where important aspects of the socioeconomic baseline environment such as demographics (population, age, gender, ethnicity and religion), economy, employment and income, land tenure

and use, municipalities' infrastructure, public services and health facilities, education and skills are cited.

The following settlements in the proximity of Eordea - Foufas rerouting are:

- Perdikkas
- Galateia

5.8.3.2 Economy, Employment and Income

In the Municipality of Eordea, according to household survey carried out during ESIA preparation, 25% of the population works in construction, 18% in the energy sector and 21% in the public sector. In settlements more distant to the PPC power plants, like Pyrgoi, local economy has retained a more agricultural character, with the main economic activity being apple cultivation.

5.8.3.3 Land Tenure and Use

Land ownership in the Municipality of Eordea is relatively smaller compared to other municipalities in the region. Land use is as follows:

- Agricultural area, mainly annual crops, corn and cereals, with the exception of apple trees in the east
- Lignite mining and power generation at Ptolemaida Basin

5.8.4 Cultural Heritage

A total of 15 cultural heritage sites, consisting of 10 archaeological sites, 1 monument, 2 Intangible Cultural Heritage (ICH) sites and 2 Areas of High Archaeological Potential (AHAP) were identified along Eordea –Foufas rerouting.

The most notable sites include:

- The Neolithic excavation site in Kouri area, in Ptolemais
- The extensive hellenistic – roman settlement in Perdikkas
- The remains of a fortification wall in Variko

- Byzantine aqueduct in Foufas
- Pottery scatters and structural remains in Kouri area in Perdikkas
- Pottery scatter in Potamia area, in Galateia

Table 5-10 below presents an inventory of the Cultural Heritage Sites in the area of Eordea - Foufas rerouting.

Table 5-10 ***Cultural Heritage Sites in the Area of Eordea – Foufas Rerouting***

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
1178	AM107	Ptolemaida A	Ground truthed during May 2012 Survey	10	A	Kouri area .Wooded mountain top. Archaeological indications in this area(pottery scatters, structureremains). Also pottery in the fields to the west. Information provided by the warden of antiquities/literature	EBA,Roman
1177	CH-108	Perdikkas 2	Ground truthed during November 2010 and February 2011 CH Survey	740	A	Archaeological site of Perdikkas. By the artificial lake of Perdikkas. Extensive settlement of hellenistic-roman date. Remains of a monumental construction identified.	Hellenistic-roman
1191	CH-121	Foufas 1	Ground truthed during November 2010 and February 2011 CH Survey	640	ICH	Church of the Assumption and recreational area in the churchyard, located by the road.	Possibly modern
1196	CH-125	Variko 4	Ground truthed during November 2010 and February 2011 CH Survey	250	ICH	Unknown chapel (on the road).	Uncertain
1194	CH-122	Variko5 (Drosero)	Ground truthed during November 2010 and February 2011 CH Survey	480	M	Church of Aghia Kiriaki.	Uncertain
1200	AM93	Variko6	Literature review	530	A	Remains of a fortification wall.Site controlling the Amyntaio plain, and the access to Kastoria and Cheimaditis lake.	Uncertain
1189	AM75	Galatia	Literature review	890	A	Hellenistic-roman Archaeological site	Hellenistic-roman
1183-1	AM109	Ptolemaida2	Site list from LPD at the Greek Ministry of Culture	1080	A	Neolithic excavation site (Kouri area)	Neolithic
1191	AM91	Foufas3	Site list from LPD at the Greek	370	A	Paliochori Site . Byzantine aquaeduct.	Byzantine

IP	*CH- site code*	*CH site name*	*Source*	*Distance to Centreline* (m)	*Site Type*	*Description*	*Date*
			Ministry of Culture				
1189	AM73	GalateiaA (Potamia)	Ground truthed in June2014/Site list from LPD at the Greek Ministry of Culture	250	A	Pottery scatter possibly of byzantine date in a young crops field by a water stream. Site coincides with Potamia area.	Uncertain
1192	CH-23		Ground truthed during October 2011 CH Survey	300	A	Medium density ceramic scatter/. Ashlar stone	Bronze Age
1194-4	CH-24		Ground truthed during October 2011 CH Survey	150	A	Medium density ceramic scatter of Pre-Modern style	Uncertain, but pre-modern
1172	CH-22		Ground truthed during October 2011 CH Survey	70	A	Low density ceramic scatter. Ceramic technology suggest dating to sometime during the Classical period, but cannot yet be identified to a specific culture	Classical
1177	AM66	Perdikkas6	Literature review	110	AHAP	Place name Kalives (=huts)	Uncertain
1180	AM69	Perdikkas11	Literature review	720	AHAP	Place name Megali Toumba(=big mound)	Uncertain

Source: EXERGIA (2014)

5.9 Minor Reroutings

As mentioned in Section 3 of the ESIA Amendment (GPL00-EXG-642-Y-TAE-1004), approx. 110 minor reroutings were proposed in addition to the reroutings studied above, as the engineering design is advancing and the engineering team addresses local needs and requests. These changes are relatively small and lie within the ESIA basecase route corridor that was studied in detail in the ESIA for the TAP Project. As a result, the environmental, socioeconomic and cultural heritage baseline for these minor reroutings has been described in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054).

Where necessary, the project team undertook field surveys to verify existing information, as has been the case with cultural heritage surveys in the areas of Assiros, Gefyra, Dispilio and Militsa.

5.10 Other Permanent and Temporary Installations

As mentioned in Section 3 of the ESIA Amendment (GPL00-EXG-642-Y-TAE-1004), a number of changes have taken place to the location of permanent (i.e. BVS) and temporary (pipe yards, camp sites) installations of the project, either due to changes of the route or due to the progress of the engineering design. The new locations as compared to the ESIA basecase locations are provided in Annex 4.2. In Anex 4.2 it can be seen that the new locations are within the pipeline corridor of the reroutings or the ESIA basecase, or very close to the locations studied during ESIA preparation. As a result, the environmental, socioeconomic and cultural heritage baseline for these installations has been described in ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054).

Where necessary, the project team undertook field surveys to verify existing information.

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