Trans Adriatic Pipeline

Biodiversity Offset Strategy

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1 INTRODUCTION

1.1 Overview

The Trans Adriatic Pipeline (TAP) project traverses Greece, Albania and Italy. Individual Environmental and Social Impact Assessments (ESIAs) were produced to comply with the legislative frameworks of the host countries, the European Union (EU) regulatory impact assessment and environmental framework, and the European Bank for Reconstruction and Development (EBRD) performance requirements (2008 edition). The following performance requirements and standards are now being applied to the project specifically in relation to biodiversity: EBRD Performance Requirement 6 (PR6) 2014; European Investment Bank (EIB) Environmental and Social Handbook Standard 3, 2013; and International Finance Corporation (IFC) Performance Standard 6 (PS6) 2012.

This Biodiversity Offset Strategy (Offset Strategy) has been prepared to demonstrate how any unavoidable significant residual impacts to biodiversity features (including critical habitat, natural habitat and priority biodiversity features, as defined in the relevant performance standards) from the project can be compensated through the establishment of biodiversity offsets in a manner that achieves an overall net gain or no net loss (NG/NNL) in biodiversity. Biodiversity offsets have been considered only as a last resort and all measures in accordance with the mitigation hierarchy were applied to avoid and/or minimise impacts to species and habitats of conservation importance. This strategy relates to the pipeline construction corridor (both onshore and offshore), compressor stations (Greece and Albania), pipeline receiving terminal (Italy) and new/upgraded access roads (primarily Albania).

A Biodiversity Offset Management Plan (BOMP) will be developed in the future which will provide more details on the offset design, intended conservation outcomes, specific management actions and details on the legal mechanisms of securing and establishing the prospective site(s). Further detail on supplementary actions (indirect offsets) shall also be included in the BOMP.

1.2 Scope and purpose

The scope and purpose of this Offset Strategy is to:

- identify the offset policies and framework applicable to the project
- describe TAP's overarching principles for achieving NG/NNL
- present the potential offset liabilities for any residual impacts to critical habitat, natural habitat and priority biodiversity features
- propose an accounting model for demonstrating how NG/NNL shall be achieved
- provide a desktop assessment of offset site availability, supported by an initial ground-truthing survey

- outline the process and timelines for implementing any required biodiversity offsets

This strategy covers terrestrial and freshwater biodiversity features in Greece, Albania and Italy, and marine biodiversity features in the Adriatic Sea.

Impacts and compensation relating to ecosystem services are not included as part of this strategy and are instead being addressed by way of the land easement and acquisition strategy, and livelihood restoration plans.

2 BACKGROUND

2.1 Location and extent

The TAP project is a greenfield development comprising the design, construction and operation of an 878 km-long natural gas pipeline (see inset below). The pipeline route starts near Kipoi in Greece at the Greek–Turkish border and terminates near San Foca in Italy, crossing Greece, Albania and the Adriatic Sea. The pipeline connects at its entry point to the Trans Anatolian Pipeline and downstream to the Italian SRG natural gas network. The pipeline follows a carefully selected route that is designed to minimise risk by avoiding, as far as engineering and construction constraints allow, densely populated and environmentally and culturally sensitive areas and by ensuring that it runs through the shortest and shallowest offshore route.

2.2 TAP project

The pipeline's initial design capacity is 10 billion cubic metres per annum (bcma), expandable to 20 bcma through additional compression. The pipeline will span 773 km onshore (550 km in Greece, 215 km in Albania and 8 km in Italy) and 105 km offshore.

Construction of early infrastructure works started in 2015 with the building and rehabilitation of Albanian roads and bridges required to improve safety and access to the pipe-laying sites. The launch of the main construction activities took place in 2016 and TAP is expected to be ready for operations by the beginning of 2020.

3 OFFSET FRAMEWORK

3.1 Guiding principles and requirements

The offset framework for the project is primarily derived from the performance requirements and standards of the potential project Lenders, with consideration to TAP's existing Environmental and Social Management System (ESMS) and the guidelines developed by the Business and Biodiversity Offsets Programme (BBOP).

In addition to these conditions, the European Union Birds Directive (2009/147/EC) and Habitats Directive (92/43/EEC) require the provision of compensatory measures for impacts to Natura 2000 sites.

There are no known specific regulatory policies in place from the Greek, Albanian or Italian national governments requiring the provision of biodiversity offsets. It is expected that the development and implementation of any offsets will need to be undertaken in a manner that is compatible with national conservation and planning requirements.

3.1.1 Lenders' requirements

Each of the Lenders' standards on biodiversity conservation describes the core objectives under which the standard operates, defines what biodiversity features might require compensatory measures for any significant residual impacts and identifies a range of criteria that a compensatory measure for biodiversity would have to meet. The following three sections outline the objectives and definitions of biodiversity features from each institution.

Each of the potential project Lenders require a comprehensive offset framework to provide compensatory measures for unavoidable impacts to biodiversity. Whilst each Lender's requirements are different, there are a number of common principles to them which will be used as the framework for this Offset Strategy.

3.1.1.1 EBRD Performance Requirement 6

The EBRD's PR6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources is underpinned by the following high-level objectives:

- protect and conserve biodiversity using a precautionary approach
- apply a mitigation hierarchy to adverse impacts, with the aim of achieving a net gain in biodiversity
- promote sustainable management and use of natural resources.

The assessment process requires the identification of two primary categories of biodiversity; critical habitat and priority biodiversity features. Table 3-1 summarises the criteria for what constitutes a biodiversity feature.

Table 3-1: Criteria for identification of EBRD biodiversity features

Biodiversity feature	Criteria[1]
Critical Habitat	Highly threatened or unique ecosystems
	Habitats of significant importance to important endangered or critically endangered species
	Habitats of significant importance to endemic or geographically restricted species
	Habitats supporting globally significant migratory or congregatory species
	Areas associated with key evolutionary processes
	Ecological functions that are vital to maintaining the viability of other Critical Habitat
Priority Biodiversity Features	Threatened habitats
	Vulnerable species
	Significant biodiversity features identified by a broad set of stakeholders or governments (e.g. KBAs, IBAs).
	Ecological structure and functions needed to maintain the viability of priority biodiversity features described above

Once the mitigation hierarchy has been appropriately applied, any measured residual impact to biodiversity features will require compensatory actions such as offsets, to achieve a net gain for critical habitat features and no net loss for priority biodiversity features.

3.1.1.2 EIB Standards on Biodiversity and Ecosystems

The EIB Standards on Biodiversity and Ecosystems are based on the following principles:

- the application of the mitigation hierarchy to maintain the integrity of areas of important biodiversity and natural functioning of ecosystems
- internalisation of the value of biodiversity and ecosystem values into project design and cost benefit analysis
- consistency with EU environmental law
- respect for international conventions and agreements and their provisions and standards
- use of a landscape scale analysis approach rather than impacts in isolation
- adequate engagement with local communities, especially relating to potential impacts to ecosystem services
- efficient management of biodiversity through adaptive management measures

[1] EBRD Performance Requirement 6: paragraphs 12 and 14

- monitoring to demonstrate the achievement of biodiversity gains from correct management.

This standard also aims to strengthen and support the implementation of the EU Biodiversity Strategy to 2020.

Biodiversity features and ecosystem services are identified through a process of scoping which characterises the environment by its legal conservation regime and the type of habitat. Habitats are classified as natural, semi-natural or urban and are distinguished by the level of anthropogenic disturbance (e.g. presence of invasive species, pollution, habitat fragmentation, condition of ecosystem and function over time). The value (criticality) of each feature is screened against a number of attributes and considered to be critical habitat if it still satisfies any of the criteria listed in Table 3.2.

Table 3-2: Criteria for identification of EIB biodiversity features

Biodiversity feature	Criteria[2]
Critical Natural Habitat Or Critical Semi-natural Habitat	The presence of critically endangered, endangered or vulnerable species as defined by the IUCN Red List of threatened species and in the relevant national legislation
	It is important to the survival of endemic or restricted range species, or unique assemblages of species
	It is required for the survival of migratory species or congregatory species
	It is required for the maintenance of biological diversity with significant social, economic or cultural important to local communities
	It is required for the maintenance of ecosystem functioning and the provision of key ecosystem good and services
	It is of key scientific value

Once the mitigation hierarchy has been appropriately applied, any measured significant residual impact to biodiversity features will require compensatory actions such as offsets, to achieve a net gain for those biodiversity features for which critical habitat (natural or semi-natural) was designated.

3.1.1.3 IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources

The IFC Performance Standard 6 primarily aims to achieve the following objectives:

- to protect and conserve biodiversity
- to maintain the benefits of ecosystem services

[2] EIB Standards on Biodiversity and Ecosystems

- to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities

The extent and quality of critical habitat in a project area is assessed in both natural and modified habitats. Table 3-3 lists the key criteria for critical habitat.

Table 3-3: Criteria for identification of IFC biodiversity features

Biodiversity feature	Criteria[3]
Critical Natural Habitat or Critical Modified Habitat	Habitats of significant importance to critically endangered and/or endangered species
	Habitats of significant importance to endemic and/or restricted-range species
	Habitats supporting globally significant migratory species or congregatory species
	Highly threatened and/or unique ecosystems
	Areas associated with key evolutionary processes

Guidance Note 6 (IFC, 2012) recognises that critical habitat can be categorised based on relative vulnerability (degree of threat) and irreplaceability (rarity or uniqueness). In the CHA two tiers of critical habitat are identified; Tier 1 and Tier 2. Tier 1 critical habitat is considered irreplaceable and not able to be compensated with biodiversity offsets.

Once the mitigation hierarchy has been appropriately applied, any measured significant residual impact to biodiversity features will require compensatory actions such as offsets, to achieve a net gain for those biodiversity features for which critical habitat (natural or modified) was designated.

3.1.2 EU Directives

Additional measures apply within Greece and Italy for Special Protection Areas (SPA) designated under the Birds Directive and Special Areas of Conservation (SAC), Sites of Community Importance (SCI) and Annex 1 Priority Habitats designated under the Habitats Directive, in order to maintain the ecological coherence of the Natura 2000 network.

3.1.2.1 The Birds Directive

Article 3 of the Birds Directive[4] requires the conservation of biotopes and habitats through the creation and maintenance of protected areas (SPA) as well as the re-establishment of destroyed biotopes. No specific conditions relating to the provision of offsets are noted.

[3] IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources paragraph 16

[4] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

3.1.2.2 The Habitats Directive (92/43/EEC)

Article 6 (3) of the Habitats Directive[5] requires an Appropriate Assessment of any project or plan that is likely to have a significant effect on a European site *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives".*

Article 6 (4) of the Habitats Directive states "the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected". The liability for implementing compensatory measures lies with the Member State rather than the project proponent. Competent national authorities shall approve a project once it has been demonstrated that the site's integrity will not be adversely affected (no net loss).

Offsets for unavoidable impacts to SAC and SCI need to comply with existing management plans (Article 6, 1) and the site's conservation objectives under Natura 2000. Table 3-4 lists the biodiversity features requiring compensatory measures.

Table 3-4: Criteria for identification of EU Birds or Habitats Directive biodiversity features

Biodiversity feature	Criteria
Birds Directive	Special Protection Area
Habitats Directive	Special Area of Conservation
	Sites of Community Importance
	EU Priority Habitat
	Emerald Sites (Albania only)*

*It is assumed that Emerald Sites in Albania will be integrated into the Natura 2000 network upon full accession to EU membership, so impacts to the Emerald Sites will be treated as per the other Habitats Directive biodiversity features.

3.1.2.3 EU Marine Strategy Framework Directive (2008/56/EC)

This Directive establishes a framework for Community action in marine policy. It aims to protect, preserve and where practicable restore the marine environment to maintain biodiversity and provide clean healthy, productive oceans and seas. It reflects the Community's commitment to halting biodiversity loss at national, regional and global scales, ensuring conservation and sustainable use of marine resources and the creation of a global network of marine protected areas under the auspices of the Convention on Biological Diversity and Natura 2000 obligations.

There are no specific offsetting requirements under the directive, as most marine biodiversity features are covered under Annexes 1 and 2 of the Habitats Directive.

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

3.1.2.4 EU Biodiversity Strategy to 2020

Whilst not strictly a regulatory framework for biodiversity offsets, the EU Biodiversity Strategy to 2020 sets out six clear targets to attempt to halt the loss of biodiversity and ecosystem services:

- Target 1. Protect species and habitats
- Target 2. Maintain and restore ecosystems
- Target 3. Achieve more sustainable agriculture and forestry
- Target 4. Make fishing more sustainable and seas healthier
- Target 5. Combat invasive alien species
- Target 6. Help stop the loss of global biodiversity

This offset strategy and the implementation of any biodiversity offsets will be developed in consideration to the specific actions associated with Target 2 and Target 5.

3.1.3 The Business and Biodiversity Offset Programme (BBOP)

The Business and Biodiversity Offset Programme (BBOP) is a voluntary collaboration of private companies, governments, conservation experts and finance institutions that have developed a set of principles and guidelines for the design and implementation of compensatory measures[6] to achieve measurable conservation gains (no net loss) to offset unavoidable losses to biodiversity.

The BBOP offset approach provides a comprehensive foundation for the development of TAP's offset strategy, through the following core principles:

- adherence to the mitigation hierarchy
- setting limits to what can be offset
- assessing impacts and offsets at a landscape context
- ensuring no net loss
- striving for additional conservation outcomes
- stakeholder participation
- equity
- long-term outcomes
- transparency
- science and traditional knowledge

Each principle is described with an accompanying criterion and one or more indicators which details how the principle can be adhered to. These principles appear in part across each of the prospective Lender's requirements for providing compensatory measures for significant residual impacts to biodiversity and also to guarantee a biodiversity net gain in the case of CHs affected by the project.

[6] BBOP adopts the terminology of calling an offset "compensation" as in some languages other than English, the word offset is not understood.

4 OFFSET APPROACH FOR TAP

4.1 TAP principles

TAP's principles for biodiversity offset management have been developed to align its HSE objectives with the guiding principles of the Lenders and BBOP, namely:

- ***Adhere to relevant national and international environmental laws***
- ***Fully implement the Ecological Management Plan and associated documents***
- ***Follow the mitigation hierarchy by avoiding irreplaceable features and minimising impacts elsewhere***
- ***Assess offset liability of each biodiversity feature against the most stringent requirement (worst case scenario)***
- ***Complete sufficient stakeholder engagement***
- ***Achieve net gain in biodiversity features triggering critical habitat, and no net loss in natural habitat and priority biodiversity features, through direct and indirect offsets***
- ***Adaptive management of offset programmes through ongoing monitoring***

4.2 Hierarchy for minimising impacts

The specific mitigation and rehabilitation measures implemented by TAP as part of the mitigation hierarchy are described in the Ecological Management Plan (EcMP) and associated documents, such as the Route Environmental Impact Register (REIR). The majority of the onshore pipeline working strip, with the exception of the 8 m Permanent Protection Strip (PPS), will be rehabilitated on completion of construction, with pre-construction habitats allowed to regenerate (i) naturally from the seed bank and (ii) through biorestoration in sensitive areas. Within marine habitats the construction footprint will be far larger, with an estimated Area of Impact (AOI) of >2km in all of the coastal, nearshore and offshore DMUs. For this reasons the term ROW refers to onshore habitats and AOI refers to marine habitats.

Figure 1 illustrates how the mitigation hierarchy can be applied to a generic section of the pipeline.

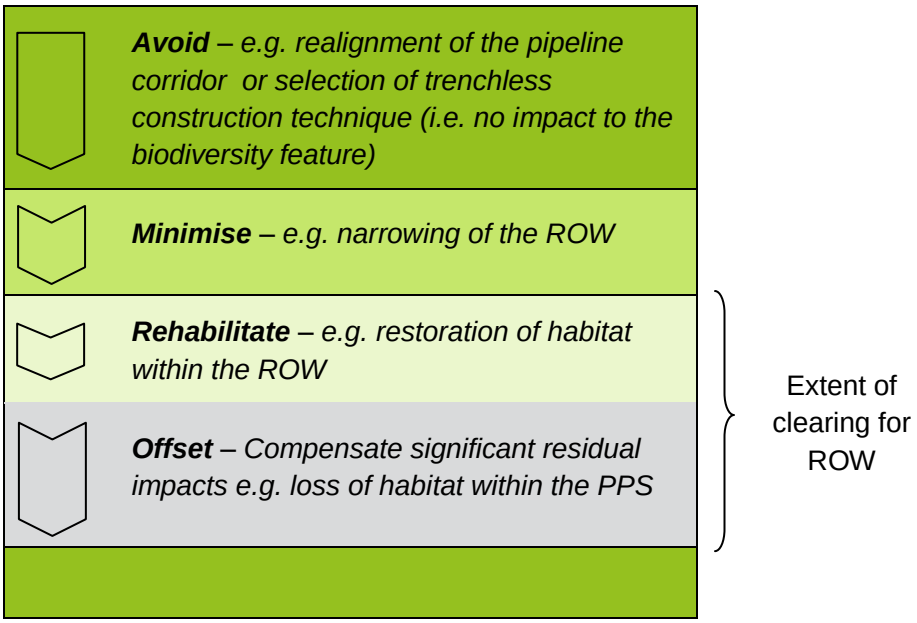


Figure 1 Mitigation hierarchy for pipeline ROW

Table 4-1 summarises the key commitments and actions being undertaken to minimise the residual impact. These are discussed in more detail in the EcMP and associated documents.

Table 4-1 Summary of mitigation hierarchy for significant residual impacts to biodiversity features

Mitigation Hierarchy Stage	Commitments/Actions
Avoid	Route realignments Changes of watercourse crossing construction technique from open cut to trenchless Restrictions on construction hours/seasons Additional onshore micro-siting during Contractor site establishment Offshore micro-siting Avoidance of sensitive areas during construction works (e.g. anchor placement).
Minimise	Narrowing of working strip (area within the ROW where vegetation is cleared) Watercourse crossing method statements Implementation of marine megafauna and turtle mitigation protocols
Restore/rehabilitate	Translocation and reseeding (incl. seed collection) Revegetation / biorestoration of ROW Retention of habitat features (coarse woody debris) for use in reinstatement

Mitigation Hierarchy Stage	Commitments/Actions
Offset	Direct offset activities (residual impacts) Indirect offsets (Additional Conservation Actions) such as contributions to research, capacity building (supplementary action) and other additional conservation actions Stakeholder engagement and increased awareness (supplementary action)

It is acknowledged that some habitats simply cannot be recreated within the ROW or AOI post-construction (i.e. those supporting deep-rooted tree species such as beech forest and complex riparian vegetation, or benthic habitats supporting cold water corals) resulting in a permanent residual impact.

Some habitats (such as coastal dune ecosystems) may be more challenging to rehabilitate and may require additional measures such as seed collection, active planting and/or translocation programmes.

Biodiversity offsets will be proposed for residual impacts to terrestrial, freshwater and marine biodiversity features triggering critical habitat that occur within the ROW and AOI respectively. Both direct and indirect measures will be considered to achieve a net gain, the approach/es taken forwards will depend upon the specific requirements and characteristics of individual biodiversity features needing to be offset.

Offset measures to achieve no net loss for biodiversity features classified as priority biodiversity features and/or natural habitats will also be proposed. Supplementary actions are only to be considered for compensation for residual impacts that are not significant or where land-based offsets are not considered viable.

4.3 Achieving No Net Loss/Net Gain

An overarching theme of simplicity shall be employed wherever possible, to ensure the primary objectives of any biodiversity offset is “on the ground” conservation gains, whilst maintaining compliance with the relevant performance standards/requirements.

The conservation goals of NG/NNL shall primarily be achieved through the establishment of offset sites near to the pipeline which are specifically managed to promote the restoration of the existing or former habitat types (restoration gains) and to protect biodiversity from future loss (averted loss) through modified land use. Offset sites shall be established preferably on State or privately owned land in consultation with key stakeholders, whereby local contractors shall be engaged to undertake specific management actions to improve the habitat quality of the site as well as prevent further degradation or complete loss.

A biodiversity accounting model (see Section 5) shall be used to quantify the ‘value’ of the residual impacts to each biodiversity feature compared to reference values for undisturbed habitat in the area. Offset site value shall also be compared to the undisturbed reference sites. It is anticipated that with ongoing management, the ‘value’ of the site shall increase to a point that it exceeds that of the impact area. At this point

NG/NNL has been achieved and where practical the offset site can be integrated into the National reserve network.

Monitoring shall be undertaken regularly to demonstrate the progress towards achieving NG/NNL. Should such monitoring suggest a site is under-performing, additional management actions may be instigated or the total extent of the site increased, which shall increase the value of the site and in doing so achieve its conservation goal.

Where the ongoing monitoring is demonstrating that achieving a conservation goal is not going to be feasible, alternative options shall be considered including set-asides or 'trading-up'. Trading-up would only be used as a last resort if external influences such as development pressure or changes to land-uses make conservation management incompatible with the surrounding landscape. In this scenario, extensive stakeholder engagement would be undertaken to identify the critical conservation priorities within the local area.

A time-span of 15 years is proposed for the monitoring and reporting of the conservation goal for each biodiversity value. If a biodiversity value has not fully achieved NG/NNL in this time, additional management or monitoring shall be considered. This is likely to apply to old-growth forest or deep water corals.

Additionally, indirect offset measures, or Additional Conservation Actions (ACAs), shall be considered where there is insufficient knowledge regarding the habitat requirements, usage or known extent of a biodiversity value as is often the case in marine environments. Examples of such measures include; data sharing with regional conservation organisations/ initiatives, partnerships with NGOs/ Civil Society Organisation (CSOs), research grants to improve scientific knowledge of regional biodiversity values, capacity building and support of protected areas.

4.4 Stakeholder engagement

Stakeholder engagement is critical to the successful implementation of any prospective offset sites or programmes. Working in partnership with Project stakeholders, TAP will identify opportunities to contribute further to conservation outcomes, and achieve the objectives of this Offset Strategy, by providing support to local initiatives for biodiversity conservation (e.g. local NGO/CSO activities, programmes for implementation of Natura 2000 requirements). The identification and implementation of measures set out in this Offset Strategy will require the active participation of Project stakeholders, including national, regional and local governments; NGOs/CSOs and conservation groups; academic institutions; Project lenders; and other potentially affected and interested parties.

The stakeholder engagement activities set out in this Offset Strategy align with the TAP Project's broader Stakeholder Engagement Plan (SEP). They reflect TAP's commitment to maintain open and transparent engagement and communication with stakeholders through timely, structured, inclusive and on-going dialogue, in alignment with international good practice.

In line with the SEP, TAP will maintain communications with identified stakeholders throughout implementation of the Offset Strategy. The Project will update the Offset Strategy stakeholder map to ensure engagement with additional stakeholder groups and individuals identified during the offset process. It will also ensure that stakeholder engagement conducted through the Offset Strategy reflects changes in the broader Project SEP due to identified opportunities to improve engagement; emerging stakeholder issues; and outcomes of engagement and grievance management monitoring processes.

A preliminary list of biodiversity stakeholders is provided below. This list will likely change as stakeholder engagement activities progress and as implementation of the Offset Strategy serves to identify specific offset opportunities.

4.4.1 Preliminary stakeholder list

The preliminary list of TAP Project biodiversity stakeholders is as follows:

National government:

- *Albania*
  - Ministry of Energy and Industry
  - Ministry of Transport and Infrastructure
  - Ministry for Urban Development and Tourism
  - Ministry of Economic Development, Trade and Entrepreneurship
  - Ministry of Agriculture, Rural Development and Water Administration
  - Ministry of Environment; Ministry of Finance and Ministry of Justice
  - National Agency for Natural Resources
- *Greece*
  - Ministry of Environment, Energy & Climate Change
  - Ministry of Education, Research and Religious Affairs
  - Ministry of Development, Competitiveness, Infrastructure, Transportation and Networks
- *Italy*
  - Ministry for the Environment, Land and Sea
  - Ministry of Economic Development
  - Ministry of Finance

Regional government

- *Greece*
  - Decentralised Administration of Macedonia and Thrace
  - Decentralised Administration of Western Macedonia and Ipeirus
  - Region of Eastern Macedonia-Thrace
  - Region of Central Macedonia
  - Region of Western Macedonia
  - Water Management Agencies (TOEV)
  - Management Body of Lakes Koronia and Volvi

  - Management Body of National Park of Eastern Macedonia-Thrace (Management Body of Nestos Delta and Lakes Vistonida-Ismarida)
  - Management Body of Axios -Loudias-Aliakmonas Delta
- *Italy*
  - Regional Executive Board (Apulia Region)
  - Regional Council (Apulia Region)

Local Authorities

- *Albania*
  - Berat, Fier and Korça counties
  - ten municipalities
  - twenty-eight Project-affected administrative units/ Local Government Units
  - head of villages in each Project-affected administrative unit
- *Greece*
  - Municipal authorities
  - local community authorities
  - Urban Planning and Technical Services Departments of each Municipality
- *Italy*
  - Municipalities of Melendugno, Vernole, Brindisi and Lecce
  - Municipality Technical Departments
  - members of Melendugno Municipality Board and Council
- Project staff
- community members
- landowners and users:
  - farmers
  - herders and semi-nomadic workers
  - fishermen
  - small businesses
  - unions
  - Unions of Agricultural Cooperatives and Registers of Farmers
- Chambers of Commerce and Business Associations
- Civil Society and NGOs (including organisations representing vulnerable groups)
- universities and research institutes
- local, national and international media
- International Organisations

The nature and intensity of stakeholder engagement will vary according to levels of stakeholder interest in the Offset Strategy and in specific offset opportunities. All stakeholders will be informed of the Offset Strategy objectives and implementation process; stakeholders will themselves determine their participation in the broader strategy or specific initiatives.

4.4.2 Stakeholder potential issues

Issues of particular stakeholder interest may include:

- land use policy: stakeholders may, through the Offset Strategy, identify opportunities to promote effective biodiversity offset through changes in land use policy
- agricultural area management: support for biodiversity-friendly agricultural practices such as set-aside and conservation, and planting of hedges, shrubs and linear forestry
- forestry management: the reforestation of degraded areas with tree species appropriate to the ecoregion and habitat type
- management of protected areas and internationally recognized areas: offset activities will seek to support and enhance the effective management of Protected Areas and internationally recognized areas (KBAs, IBAs, IPAs, EBSAs)
- maintenance of wildlife refuges / biocorridors
- maintenance of important fauna and key sites (breeding, feeding, nesting etc.)
- development of regional ecotourism opportunities
- development of conservation education and outreach capacities.

4.4.3 Engagement mechanisms

4.4.3.1 Stakeholder mapping

TAP will conduct stakeholder analyses and mapping to identify biodiversity stakeholders to determine the nature and level of their interest in the Offset Strategy, and to determine the most appropriate tools and methods of engagement and communication. Engagement will be linked to identified Offset Strategy issues (e.g. specific stakeholder concerns and/or the need to build shared understanding); to share information on identified issues; to prioritize initiatives; to identify alternatives or to build consensus around the resolution of specific issues.

4.4.3.2 Communications / information disclosure

TAP will provide accurate, consistent, timely and transparent information on its biodiversity offset activities through Project information offices, fact sheets, the TAP website and face-to-face engagement with identified stakeholders.

4.4.3.3 Stakeholder engagement / participation

The Project will promote active stakeholder engagement in the identification and management of Offset Strategy initiatives through small group meetings and technical workshops designed to promote stakeholder participation and ownership in the design, implementation and evaluation of biodiversity activities.

4.4.3.4 Record keeping

All biodiversity-related communications and engagement activities will be documented in TAP's Stakeholder and Grievance and Management Tool (SGMT). The SGMT will

maintain information on the individuals and stakeholder groups' participation in the Offset Strategy development and implementation; details of any consultations or meetings held and information provided; commitments made by TAP and the monitoring of their delivery; and a record of specific grievances lodged and the status of their resolution. The SGMT will prioritise biodiversity-related stakeholder issues and commitments through to closure.

4.4.3.5 Monitoring, evaluation and reporting

TAP will conduct regular monitoring and quality assurance in relation to all biodiversity-related stakeholder engagement. Specifically, this will means ensuring stakeholder identification and analyses includes all potentially interested / affected individuals and stakeholder groups; monitoring all stakeholder activities to ensure these are conducted as planned; assessing if the engagement is effective (i.e. if stakeholder engagement activities deliver Offset Strategy information in an accessible and culturally-appropriate manner; if activities facilitate project awareness of stakeholder issues and concerns; and if stakeholders are satisfied about it and feel it is meaningful to them); and adapting the engagement processes and procedures where necessary.

To this end, TAP will apply a rigorous monitoring and evaluation framework for biodiversity-related stakeholder engagement activities, capturing key information in the Environmental and Social Action Plan (ESAP). This will enable TAP to determine and measure:

- stakeholder participation in Offset Strategy development and implementation, including level of involvement of affected people in committees and joint activities in the Offset Strategy process
- the number of stakeholder-proposed Offset Strategy initiatives supported
- the percentage of formal engagement meetings held against the number of meetings planned
- the number of informal engagement meetings held
- the number of commitments made to biodiversity initiatives and delivered within the set timeframe
- level of stakeholder recognition / understanding of the TAP Offset Strategy process (measured through independent perception surveys)
- stakeholder satisfaction with the engagement process
- biodiversity-related grievances received and closed out

4.5 Financing mechanism

The implementation and ongoing management of offset sites will require a financial mechanism in place to provide security to both the Lenders and regulatory authorities that commits TAP to ongoing costs for:

- Potential land acquisition / land management costs (fencing, weeding, pest eradication, replanting, erosion control)
- monitoring of Site Quality for NG/NNL reporting

Additionally it should be expected that the following up-front costs will need to be taken into account:

- landholder compensation
- legal costs for security of land

TAP is committed to the implementation of the measures described in this Biodiversity Offset Strategy. TAP will put in place a mechanism to ensure that TAP has sufficient funds and management resources to complete the action required by the Biodiversity Offset Management Plan.

5 BIODIVERSITY OFFSET ACCOUNTING MODEL

In order to demonstrate the principles of NG/NNL for any significant residual impacts from TAP, it is critical to use a metric or accounting model that can quantify the 'value' for each biodiversity feature. The measurement of the metric at the impact site is used to show the offset liability for each biodiversity feature. The measurement of the metric at an offset site is used to show the underlying value of the site and any improvements in the quality of the site resulting from land management practices.

Such approaches are well established for terrestrial biodiversity features where habitat is commonly spatially explicit and have been successfully implemented in Australia[7], South Africa[8] and New Zealand[9].

By virtue of the fact that linear infrastructure projects, such as pipelines, can traverse very large distances in disparate vegetation types, it is expected that a range of offset measures will be required in order to acquit the offset liability to the varied biodiversity features being impacted.

Where there may be uncertainty as to the spatial extent of an impact, a number of alternative indirect measures will be proposed that can clearly be demonstrated to contribute to enhancing the conservation of the biodiversity feature.

5.1.1 Direct/Land based offsets

The guiding principle of the establishment of an offset site is to achieve a NG/NNL through an increase in both the quality and the extent of the available habitat for a particular biodiversity feature. This can be achieved through implementing management activities targeted at improving site condition (restoration offsets) and reducing threatening processes (averted loss/preservation offsets).

An accounting model is required to allow the transparent comparison of the value of an offset site against that of the residual impacts to a biodiversity value. In an ideal situation a detailed accounting model could be implemented that takes into account the following factors (BBOP, 2012b):

- conservation significance of the biodiversity feature
- habitat condition and extent
- landscape context
- habitat utilisation or occupancy
- time delays until conservation gains
- background risk of loss for a biodiversity feature

[7] Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy

[8] Provincial Government of Western Cape: Guideline on Biodiversity offsets

[9] Department of Conservation Biodiversity Offsetting Programme

- likelihood of success of site establishment and ongoing management
- likelihood of success of conservation gains being achieved
- protection of site against future development

TAP will implement a modified version of a '*Habitat Quality * Area*' metric that can readily be implemented using the limited available knowledge and precedents for conservation initiatives for relevant biodiversity features. In order to account for some of the contemporary innovations in offsetting (Parkes et al, 2003; BBOP, 2012a; Bull et al, 2014; World Bank Group, 2016), additional parameters are proposed to account for the scarcity of a biodiversity feature and the likelihood of success for a particular offset site.

The following elements will be considered in the calculation of an overall biodiversity feature metric for both the impact sites and proposed offset sites:

- site condition describes the structural components of the habitat type (terrestrial or marine) relative to the ecological requirements of the biodiversity feature
- site context describes the value of the site at the landscape and regional scale
- habitat utilisation describes the presence and importance within the overall distribution of the biodiversity feature
- expected improvements in site quality due to implementation of management actions
- risk of loss accounts for the likelihood of inherent decline in site quality due to external threatening processes

This approach is designed to be adaptable to the specific requirements of each biodiversity feature under investigation. Specific scoring elements would be presented in conjunction with the final NG/NNL calculations once the preferred offset sites have been identified.

A Net Gain for any biodiversity feature is achieved when:

Impact Site Quality * Residual Impacts (ha) * Conservation Significance

(Offset Liability)

is less than

Offset Site Quality * Offset Area (ha) * Likelihood of Success

(Offset Acquittal)

Key advantages of this approach include:

- the values of all parameters can be stated upfront in the Offset Strategy, allowing for a transparent and repeatable calculation
- the model applies a penalty for impacts to biodiversity features of higher conservation status through the use of a multiplier
- the model takes into account uncertainties relating to the likelihood of success and equity in time

5.1.1.1 Impact/Offset site quality

Where possible, the data collected during the ESIA, subsequent studies and the pre-clearance/ pre-construction surveys will be used to calculate the overall score for each biodiversity feature. Should the information collected be insufficient to accurately determine a score at a particular site, a precautionary approach will be employed that scores the component at its maximum score. In order to achieve an accurate comparison it is imperative that the survey data collected at both the impact and offset sites is collected to a comparable standard.

Table 5-1 illustrates the primary components that when assessed collectively can be used to derive an overall metric for a site and for comparisons in the assessment of NG/NNL, as used in the Australian EPBC Environmental Offset Policy. For each biodiversity feature, the metric components will be customised for the biodiversity feature based on its habitat requirements and scored against an established benchmark under undisturbed conditions. This benchmark information could be acquired from national environment agencies or could be acquired in future surveys.

Table 5-1: Metric scoring of impact site/offset site quality

Metric component	Component elements	Scoring range
Site Condition		**0 - 4**
Habitat structure/condition	Height, canopy cover	0 - 2
Modification	Natural or modified habitat	0 - 1
Micro-habitat features	Species specific features (logs, dens, roosts)	0 - 1
Presence of weeds or other invasive species	Pest abundance	-1 - 0
Site Context		**0 - 3**
Connectivity	Connectivity to adjacent habitat	0 - 1.5
Patch size	Viability of patch to support a population	0 - 1.5
Habitat utilisation		**0 - 3**
Presence on site	Confirmed, modelled	0 – 1.5
Frequency of occurrence	Regular, seasonal or episodic	0 – 1.5
Presence of threats		**-2 - 0**
Threatening processes on site	Hunting/fishing, development pressure	-2 - 0
Total		**10**

5.1.1.2 Residual impacts

The anticipated residual impacts for each biodiversity feature are presented in detail in Section 6 of this document.

5.1.1.3 Conservation significance

The impact metric is to be weighted with a multiplier for conservation significance, whereby the greater the IUCN conservation status of a biodiversity feature, the higher the multiplier and in effect the larger the offset liability for impacts to that value. Whilst the IUCN conservation status is primarily linked with the risk of extinction of a species, the parameter has been diversified to include migratory/congregatory and endemic/restricted-range species as these characteristics are considered in the assessment of critical habitat.

The thresholds proposed in Table 5-2 have been devised to increase the offset liability for any biodiversity feature beyond a simple 'area * condition' calculation. There are no established standards in the literature or published by BBOP on how to apply multipliers in an offset accounting model. The values used in the proposed accounting model are based on those that appear in the Australian EPBC Act Offset Calculator. Through adherence to the proposed monitoring and reporting schedule, discussed in Section 8, and the ongoing review and adaptation of the proposed offset initiative, it will be possible to ensure the offset liability is acquitted within the proposed duration of the initiatives.

Table 5-2: Conservation status multipliers

Conservation status	Conservation significance multiplier
Species	
Critically Endangered	3.0
Endangered	2.0
Vulnerable	1.25
Endemic/Restricted Range	1.5
Migratory/congregatory	1.1
Ecosystems	
EU Priority Habitat (onshore) EU Annex I habitat (Priority and non-priority offshore)	1.5
Other threatened ecosystems	1.25

5.1.1.4 Likelihood of success

The likelihood of success is an assessment of the probability of success of the offset site for achieving the required conservation gains. The lower the probability of the offset action/ site being successful, the less of the offset liability is acquitted by the site, and hence a larger or additional site, or alternative conservation measures, may be required to acquit the liability for that particular biodiversity feature.

It is estimated that the likelihood of success in offsets seldom reaches 75% (Bull et al., 2014), due to the variety of external factors that can contribute to the overall success of an offset site. The factor used for each biodiversity feature shall be determined depending on the specific goals of the offset site, the known success of similar schemes and any input from the stakeholder engagement process.

The preliminary stages of offset establishment shall include pilot studies that can provide a greater certainty of the likely success of habitat restoration in a particular area.

The following example demonstrates how a site may achieve NG/NNL using the proposed metric.

Significant residual impact of 100ha of good quality habitat for the Brown Bear (7/10), in Greece

Impact Metric =

Quality (7/10) *Area (100ha) * Conservation Significance Multiplier (Endangered = 1.5)

= 1050 units

Offset site at implementation where the likelihood of success is estimated at 60%:

Offset Metric =

Quality (5/10) *Area (225ha) * Likelihood of Success (60% or 0.6)

= 675 units

Offset site after 15 years of site improvement and/or averting loss:

Offset Metric at 15 years =

Quality (8/10) *Area (225ha) * Likelihood of Success (60% or 0.6)

= 1080 units

Offset site demonstrated to have acquitted liability after 15 years through improving quality (405 units) in conjunction with averted loss (675 units).

5.1.2 Indirect offsets

Where the application of a biodiversity accounting model is not appropriate to quantify the impacts to biodiversity features (i.e. where there is no spatially explicit loss of a habitat type), alternative approaches need to be considered. Wherever possible it is proposed that a direct offset shall be used to compensate for residual impacts.

Any indirect measures for terrestrial biodiversity features shall be developed closely with key stakeholders, focussed on improving the scientific knowledge for any biodiversity features encountered by TAP, to which there is insufficient knowledge to make as rigorous an assessment as possible. Additional conservation actions could include the development of a national database of protected species using the survey data collected during the baseline assessments, building capacity with local conservation organisations or assisting in the management/restoration of existing protected areas crossed by the pipeline.

Residual impacts on freshwater fish species cannot be ruled out at this stage, particularly where the watercourse in question is proposed to be open cut. Additional offset measures such as the installation of fish passages at upstream blockages or micro-habitat creation proximal to the impacts will be investigated.

TAP will also investigate the option of partnering with, or sponsoring, existing marine research institutions in the Adriatic whose focus includes species identified as having critical habitats overlapping with the offshore pipeline route and AOI.

This approach would enable TAP to potentially adhere to the BBOP (2009) Principles of Biodiversity Offsets in the following ways:

- **No net loss** objectives within the marine context may be specific to a defined spatial area and for example relate to maintaining species occupancy within that area. Assuming appropriate application of the mitigation hierarchy, it is anticipated that this shall be achieved.
- **Additional conservation measures** may be achieved through the facilitation of further research and/or monitoring of critically endangered, endangered and vulnerable species that would not have occurred if the offset had not been implemented.
- This could also enable the requirement for a **net gain** of biodiversity in relation to critical habitats to be achieved, through an in-kind offset that improves understanding of their population biology and develops adaptive conservation measures that promote the recovery of these populations.
- **Landscape context** supporting existing regional marine biodiversity research and monitoring will allow TAP to implement an offset that embraces the ecosystem approach.
- **Stakeholder participation** through partnerships with regional research initiatives would allow wider inputs to the selection of specific monitoring and research programmes for the biodiversity offsetting.
- **Equitability and transparency** between countries should be balanced through investment in regional programmes and data sharing commitments.
- **Long–term outcomes:** an advantage of selecting this offset measure is that the findings of monitoring and research can then be fed into regional management approaches, such as those implemented by Member States in relation to the Marine Strategy Framework Directive to meet good environmental status objectives.
- **Scientific knowledge:** the selection, design and implementation of this offsetting approach should take into account all relevant scientific and local knowledge (Dickie *et al*., 2013).

The specific measures that shall be employed by TAP as part of the mitigation hierarchy are described in the EcMP and associated documents.

6 RESIDUAL IMPACTS

Biodiversity features likely to require a biodiversity offset were assessed using available information gathered during the ESIA, targeted stakeholder engagement activities and additional biodiversity field studies undertaken since publication of the ESIA. The following biodiversity features were considered in the assessment of impacts:

- critical habitat
- natural habitat[10]
- priority biodiversity features
- protected areas
- EU Priority habitats (and some non-priority Annex 1 habitats offshore) (note these were included as a critical habitat trigger under Criterion 4 highly threatened and unique ecosystems)

The Critical Habitat Assessment (CHA) was based on a consolidated list of critical habitat criteria that generally reflect the more stringent requirements, from each of the Lenders.

The potential impacts to critical and natural habitats and priority biodiversity features are discussed further in the Supplementary Ecological Assessment (SEA), with a greater emphasis on the mitigation measures to be implemented to reduce the overall impact to these values. It is proposed in the SEA that offsets will be undertaken for residual impacts to terrestrial, freshwater and marine biodiversity features to achieve NG/NNL.

A conservation objective of NG shall apply to residual impacts to CH and a conservation object of NNL shall apply to residual impacts to PBFs.

6.1 Preliminary impacts to biodiversity features

The preliminary impacts to terrestrial biodiversity features were calculated in a desktop GIS by assessing the overlap between the proposed ROW with the extent of the Discrete Mapping Units (DMUs) described in the CHA. Due to the landscape scale delineation of the DMUs as part of the CHA, it is not expected that all land cover types within the DMU are habitat for a particular biodiversity feature and so the numbers derived in this desktop assessment have taken a precautionary approach, i.e. represent the “worst case” scenario.

It is proposed that more detailed information shall be captured on the disturbance to habitat, whereby the residual impacts shall be revised in the BOMP and adopted for use in the accounting model of NG/NNL. It is therefore expected that the impact values in

[10] During the screening process all natural habitat features were classified as either critical habitat or priority biodiversity features.

the proceeding tables shall be refined to reflect the impacts to specific habitat types, whereas open landcover types such as shrublands, grasslands or cultivation can be excluded from the residual impact calculations. Surveys shall include both the clearing for the ROW and new access roads for terrestrial habitats and sub-sea disturbances from the anchoring of the lay-barge.

6.1.1 Terrestrial and freshwater impacts

Based on screening of approximately 221 terrestrial or aquatic biodiversity features known to occur or potentially occurring within the project AOI, 74 biodiversity features were identified that could qualify for critical habitat under the adopted criteria. A further 115 biodiversity features were identified as Priority Biodiversity Features (PBFs).

The total area of potential residual impact to each of the biodiversity features assessed in the SEA are presented per host country, in Tables 6-1 to 6-3. The temporary impact is the area of natural habitat in the ROW that is proposed to be fully restored following construction and the permanent impact is the area of natural habitat within the PPS that cannot be fully restored, such as within habitat types comprising deep-rooted trees.

For aquatic features the residual impacts are all considered permanent, as it is not practical to undertake revegetation within a waterway, as well as most alluvial forest is deep rooted and not appropriate to be replanted in the PPS.

Table 6-1: Residual Impacts Summary for Greece

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Critical Habitat Criterion 1: Threatened species				
Amphibians DMU				
Italian crested newt (*Triturus carnifex*)	145.9	33.6	179.5	Net Gain
Bird DMU				
Greater spotted eagle (*Aquila clanga*)	41.8	10.2	52.0	Net Gain
Montagu's Harrier (*Circus pygargus*)	55.8	10.5	66.2	Net Gain
Lesser spotted eagle (*Clanga pomarina*)	41.8	10.2	52.0	Net Gain
Booted eagle (*Hieraaetus pennatus*)	41.8	10.2	52.0	Net Gain
Black kite (*Milvus migrans*)	41.8	10.2	52.0	Net Gain
Dalmatian pelican (*Pelecanus crispus*)	22.9	4.5	27.5	Net Gain
Botany DMU				
Deadly nightshade (*Atropa belladonna*)	4.2	1.6	5.8	Net Gain
Mammal DMU				
Brown bear (*Ursus arctos*)	122.7	32.1	154.8	Net Gain

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Golden jackal (*Canis aureus*)	93.9	18.9	112.8	Net Gain
Reptile DMU				
Four-lined snake (*Elaphe quatuorlineata*)	23.3	4.6	27.9	Net Gain
Aquatic DMUs				
European eel (*Anguilla anguilla*)		4.6	4.6	Net Gain
Otter (*Lutra lutra*)		3.2	3.2	Net Gain
Pelagos trout *(Salmo pelagonicus)*		0.3	0.3	Net Gain
Critical Habitat Criterion 2: Endemic / restricted range species				
Botany DMU				
Dianthus formanekii	0.1	0.0	0.1	Net Gain
Dianthus tenuiflorus	0.3	0.1	0.3	Net Gain
Verbascum dingleri	2.3	0.5	2.8	Net Gain
Aquatic DMUs				
Alburnus vistonicus		0.7	0.7	Net Gain
Barbus macedonicus		0.1	0.1	Net Gain
Turcorientalia hohenackeri		0.8	0.8	Net Gain
Aggitis spined loach (*Cobitis punctilineata*)		0.7	0.7	Net Gain
Greek brook lamprey (*Eudontomyzon hellenicus*)		0.2	0.2	Net Gain
Thick-shelled river mussel *(Unio crassus)*		1.1	1.1	Net Gain
Critical Habitat Criterion 3: Migratory / congregatory species				
Congregatory Bats DMU				
Congregatory Bats	-	-	-	
Critical Habitat Criterion 4: Highly threatened or unique ecosystems				
EU Priority Habitat DMU				
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-padion, Alnion incanae, salicion albae*) (91E0)	1.4	0.2	1.6	Net Gain
Mediterranean temporary ponds (3170)	4.7	1.2	5.9	Net Gain
Annex 1 Habitat DMU				
Asperulo-Fagetum beech forests (9130)	4.2	1.6	5.8	Net Gain

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Mediterranean pine forests with endemic Mesogean pines (9540)	17.3	4.7	22.1	Net Gain
Critical Habitat Criterion 5: Evolutionary processes				
Evolutionary DMU				
Macedonian and Western Crested Newt Interaction Zone	55.0	9.2	64.2	Net Gain
Priority Biodiversity Features				
Fauna				
Grey wolf (*Canis Lupus*)	120.5	36.7	157.2	No Net Loss
Forest habitat Avifauna	41.8	10.2	52.0	No Net Loss
Open habitat Avifauna	55.8	10.5	66.2	No Net Loss
Aquatic DMUs				
Alosa fallax		0.5	0.5	No Net Loss
Pungitius platygaster		0.3	0.3	No Net Loss
Annex 1 Habitat				
Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of *Salix* and *Populus alba* (3280)	0.1	0.0	0.1	No Net Loss
Arborescent matorral with *Juniperus spp*. (5210)	2.9	1.0	3.9	No Net Loss
Eastern sub-mediterranean dry grasslands (62A0)	22.6	5.5	28.1	No Net Loss
Mediterranean tall humid grasslands of the Molinio-Holoschoenion (6420)	5.1	1.2	6.3	No Net Loss
Greek hyper-mediterranean humid grasslands (6450)	5.4	1.3	6.7	No Net Loss
Calcareous rocky slopes with chasmophytic vegetation (8210)	0.1	0.0	0.1	No Net Loss
Quercus trojana woods (9250)	3.0	0.8	3.8	No Net Loss
Salix alba and P*opulus alba* galleries (92A0)	4.0	0.8	4.8	No Net Loss
Platanus orientalis and *Liquidambar orientalis* woods (*Platanion orientalis*) (92C0)	0.7	0.2	0.9	No Net Loss
Greek Habitat				
South-eastern sub-mediterranean deciduous thickets (5160)	16.5	3.4	19.8	No Net Loss

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Garrigues of eastern mediterranean (5340)	5.7	2.1	7.8	No Net Loss
Pseudomaquis (5350)	36.4	9.9	46.4	No Net Loss
Mediterranean subnitrophilous grasslands (6290)	31.5	7.9	39.4	No Net Loss
Reedbeds (72A0)	0.5	0.1	0.6	No Net Loss
Balkano-anatolian thermophilous (*Quercus*) forests (924A)	44.1	13.7	57.8	No Net Loss
Protected and Designated Areas				
Agios Timotheos-Koupia Wildlife Refuge	7.6	2.2	9.7	Net Gain
Alistrati-Petroto Wildlife Refuge	8.7	1.7	10.4	Net Gain
Chatisio (Kosmiou) Wildlife Refuge	7.2	1.4	8.6	Net Gain
Flamouria - Grammatikou Dimou Edessas Wildlife Refuge	8.7	3.0	11.7	Net Gain
Kouri (Ptolemaida) Wildlife Refuge	24.0	4.9	28.9	Net Gain
Perifereiaki zoni C Ethnikou Parkou ygrotopon ton limnon Koroneias - Volvis kai ton Makedonikon Tempon NP	65.0	13.2	78.2	Net Gain
Perifereiaki zoni Ethnikou Parkou Anatolikis Makedonias kai Thrakis NP	2.0	0.4	2.4	Net Gain
Pylaias - Kavissou - Ferron Dimou Ferron Wildlife Refuge	0.9	0.2	1.1	Net Gain

Table 6-2: Residual Impacts Summary for Albania

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Critical Habitat Criterion 1: Threatened species				
Amphibians DMU				
Albanian Pool frog (*Pelophylax shqipericus*)	14.1	2.4	16.4	Net Gain
Bird DMU				
Greater spotted eagle (*Aquila clanga*)	39.2	8.8	48.0	Net Gain
Eagle owl (*Bubo bubo*)	33.5	7.6	41.1	Net Gain
Lesser spotted eagle (*Clanga pomarina*)	33.5	7.6	41.1	Net Gain
Booted eagle (*Hieraaetus pennatus*)	33.5	7.6	41.1	Net Gain

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Black kite (*Milvus migrans*)	52.9	11.7	64.5	Net Gain
Botany DMU				
Yellow monk's-hood (*Aconitum lamarckii*)	22.9	5.8	28.7	Net Gain
Deadly nightshade (*Atropa belladonna*)	22.9	5.8	28.7	Net Gain
Albanian lily (*Lilium albanicum*)	28.6	5.7	34.3	Net Gain
Mountain tea (*Sideritis raeseri*)	28.6	5.7	34.3	Net Gain
Mammal DMU				
Brown bear (*Ursus arctos*)	75.4	17.0	92.4	Net Gain
Golden jackal (*Canis aureus*)	21.6	3.6	25.1	Net Gain
Wildcat (*Felis silvestris*)	75.4	17.0	92.4	Net Gain
Reptile DMU				
Four-lined snake (*Elaphe quatuorlineata*)	83.9	16.6	100.4	Net Gain
Aquatic DMUs				
European eel (*Anguilla anguilla*)		8.2	8.2	Net Gain
Otter (*Lutra lutra*)		8.4	8.4	Net Gain
Prespa minnow *(Pelasgus prespensi)*		0.1	0.1	Net Gain
Critical Habitat Criterion 2: Endemic / restricted range species				
Botany DMU				
Serpentine false-brome (*Festucopsis serpentinii*)	28.6	5.7	34.3	Net Gain
Albanian lily (*Lilium albanicum*)	28.6	5.7	34.3	Net Gain
Mountain tea (*Sideritis raeseri*)	36.9	7.1	44.0	Net Gain
Aquatic DMUs				
Devoll riffle minnow *(Alburnoides devolli)*		0.5	0.5	Net Gain
Osum riffle minnow *(Alburnoides fangfangae)*		7.8	7.8	Net Gain
Critical Habitat Criterion 3: Migratory / congregatory species				
Congregatory Bats DMU				
Congregatory Bats	82.7	17.9	100.6	Net Gain

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Critical Habitat Criterion 4: Highly threatened or unique ecosystems				
EU Priority Habitat DMU				
(Sub-)Mediterranean pine forests with endemic black pine (9530)	0.4	0.1	0.5	Net Gain
Wooded dunes with Maritime pine (*Pinus pinea*) and/or *Pinus pinaster* (2270)	0.4	0.1	0.5	Net Gain
Annex 1 Habitat DMU				
Luzulo-Fagetum beech forests (9110)	22.9	5.8	28.7	Net Gain
Mediterranean pine forests with endemic Mesogean pines (9540)	6.4	1.2	7.5	Net Gain
Critical Habitat Criterion 5: Evolutionary processes				
Evolutionary DMU				
Vithkuq-Ostrovice Serpentine outcrop	33.5	7.6	41.1	Net Gain
Priority Biodiversity Features				
Fauna				
Grey wolf (*Canis Lupus*)	58.4	13.4	71.8	No Net Loss
Forest habitat Avifauna	39.2	8.8	48.0	No Net Loss
Mountain habitat Avifauna	33.5	7.6	41.1	No Net Loss
Threatened Habitats				
Annex 1 Habitat				
Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (1420)	4.4	0.9	5.3	No Net Loss
Embryonic shifting dunes (2110)	0.2	0.1	0.3	No Net Loss
Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (Berberidion p.p.) (5110)	3.0	0.6	3.6	No Net Loss
Juniperus communis formations on heaths or calcareous grasslands (5130)	3.1	0.6	3.6	No Net Loss
Arborescent matorral with *Juniperus spp*. (5210)	5.9	1.2	7.1	No Net Loss
Mountain hay meadows (6520)	26.2	4.9	31.1	No Net Loss
Calcareous rocky slopes with chasmophytic vegetation (8210)	4.3	0.8	5.1	No Net Loss

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Siliceous rocky slopes with chasmophytic vegetation (8220)	2.1	0.4	2.5	No Net Loss
Galio-Carpinetum oak-hornbeam forests (9170)	32.6	7.2	39.8	No Net Loss
Pannonian-Balkanic turkey oak-sessile oak forests (91M0)	16.7	3.7	20.4	No Net Loss
Salix alba and P*opulus alba* galleries (92A0)	0.1	0.0	0.1	No Net Loss
Platanus orientalis and *Liquidambar orientalis* woods (*Platanion orientalis*) (92C0)	0.1	0.1	0.2	No Net Loss
Quercus ilex and Quercus rotundifolia forests (9340)	26.8	5.2	31.9	No Net Loss

Table 6-3: Residual Impacts Summary for Italy

Biodiversity Feature	Temporary Impact (ha)	Permanent Impact (ha)	Total Impact (ha)	Conservation Objective
Critical Habitat Criterion 4: Highly threatened or unique ecosystems				
EU Priority Habitat DMU				
Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea (6220)	0.6	0.2	0.8	Net Gain

Table 6-4 further summarises the impacts to biodiversity features with an offset requirement under the EU's Bird and Habitat Directives.

Table 6-4: Residual Impacts Summary for Natura 2000 Sites.

Type	Protected Area name	Total Impact (ha)	Conservation Objective
Greece			
Site of Community Importance	Delta Nestou Kai Limnothalasses Keramotis - Evryteri Periochi Kai Paraktia Zoni SCI	17	Net Gain
	Limnes Kai Limnothalasses Tis Thrakis - Evryteri Periochi Kai Paraktia Zoni SCI	15	Net Gain
	Potamos Filiouris SCI	1	Net Gain
Special Area of Conservation	Delta Nestou Kai Limnothalasses Keramotis - Evryte SAC	17	Net Gain
	Limnes Kai Limnothalasses Tis Thrakis - Evryteri P SAC	15	Net Gain
	Potamos Filiouris SAC	1	Net Gain
Special Protection Area	Delta Nestou Kai Limnothalasses Keramotis Kai Nisos Thasopoula SPA	15	Net Gain
	Notio Dasiko Symplegma Evrou SPA	43	Net Gain
Albania			
Emerald Site	Morava Protected Landscape (Emerald Site)	18	Net Gain
Corine Biotope	Cangonj-Bredhi Drenoves-Nikolice Corine Biotope	19	Net Gain
	Grykederdhja Semanit-Pishe Poro Corine Biotope	8	Net Gain
	Vithkuq-Ostrovice Corine Biotope	63	Net Gain

6.1.2 Marine/Offshore

6.1.2.1 Biodiversity features identified

Approximately 190 marine biodiversity features known to occur or potentially occurring within the project AOI were screened as part of the CHA. Three Annex I habitats (*Posidonia oceanica* seagrass beds, reefs and submarine leaking gas structures[11]), certain species within two lesser-order taxonomic groups (sponges and cnidaria) and seven higher-order species (European eel (*Anguilla anguilla*), bottlenose dolphin (*Tursiops truncatus*), striped dolphin (*Stenella coeruleoalba*), fin whale (*Balaenoptera physalus*), Cuvier's beaked whale (*Ziphius cavirostris*), Risso's dolphin (*Grampus griseus*) and loggerhead turtle (*Caretta caretta*) were identified that could qualify for critical habitat. The SEA identified the potential for residual impacts for benthic habitat features (CH and PBFs) in all marine DMUs, therefore offsets must be considered for these species and habitats.

Of the marine critical habitat triggers identified in the CHA and assessed in the SEA, residual impacts were deemed likely for the following benthic species and habitats;

- cnidaria (bamboo coral (*Isidella elongata*), tall sea pen (*Funiculina quadrangularis*), deepwater coral (*Lophelia pertusa*), zigzag coral (*Madrepora oculata*), white Gorgonian (*Eunicella singularis*), stony cup coral (*Dendrophyllia cornigera*), cockscombe cup coral (*Desmophyllum dianthus*), smooth black coral (*Leiopathes glaberrima*), slender sea pen (*Virgularia mirabilis*), *Pennatula rubra*);
- sponges (*Axinella cannabina*, *Axinella polypoides*);
- *Posidonia oceanica* beds, reefs (including bioconstructions), submarine structures made by leaking gases and the South Adriatic and Ionian Strait EBSA.

The SEA also identified the potential for residual impacts on nesting loggerhead turtles in Albania due to the temporal overlap of a month (June) of construction works and the nesting season. Provisions have been made in the Turtle Management Plan as well as the Marine Megafauna Mitigation Protocol (MMMP) to address potential for such impacts.

In addition to these critical habitat triggers the potential for residual impacts to two priority biodiversity features was also identified;

- Mediterranean tapeweed (*Posidonia oceanica*); and
- slender seagrass (*Cymodocea nodosa*).

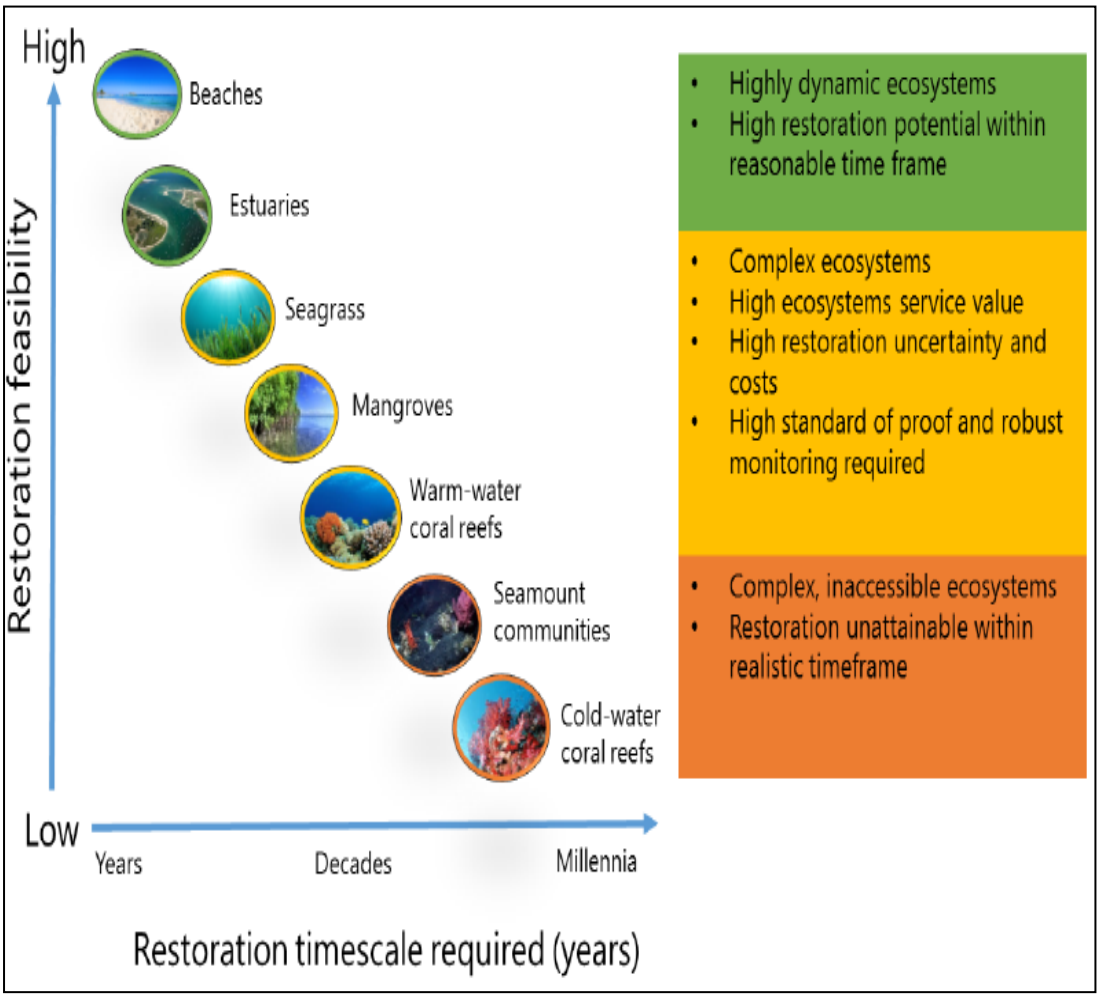
6.1.2.2 Limitations of marine offsets

The assessment and implementation of biodiversity offsetting is widely acknowledged to be far more complex and challenging within marine environments. This is due in part to restricted knowledge of marine ecosystem functioning, large range/extent of certain species and habitats, significant ecological data gaps and a limited capacity to propose

[11] This is a habitat type listed in Annex I of the Habitats Directive and refers to natural underwater vents rather than man-made structures. Structures made by leaking gases are; rocks, pavements and pillars <4m high composed of carbonate cement produced by microbial oxidation of gases and include carbonate chimneys, gas seeps and pockmarks (http://jncc.defra.gov.uk/page-1453).

effective direct offset measures (i.e. limited scope for ecological equivalence and the fact that ecological engineering approaches remain largely experimental (Bas *et al*., 2016)). There are limits to what can be offset (BBOP, 2012a) and for the above reasons, marine biodiversity features are often more challenging than terrestrial counterparts (Dickie *et al*., 2013).

While ecological restoration is increasingly recognized as a global priority in terrestrial and shallow-water ecosystems, restoration in the deep sea lags behind (Bayraktarov *et al*., 2016). To date very few studies have been undertaken into the application of the mitigation hierarchy, specifically restoration and offsetting, in the marine environment and even fewer in deep water (Céline, 2017). It is often difficult or impossible to provide direct marine offsets and approaches are unproven with uncertain outcomes – especially in deepwater, as illustrated below.



Source: Briefing Note: Marine Biodiversity Offsets (The Biodiversity Consultancy, 2017)

As discussed in Section 4.2 both direct and indirect offsets will be considered to achieve net gains. As illustrated above different approaches are better suited to some biodiversity features than others, and for this reason the appraisal of all offsetting options will consider the specific requirements, characteristics and location of each biodiversity feature. Should it not be possible to directly offset a marine biodiversity feature indirect biodiversity offsets such as research will be considered, Dickie *et al*., 2013 have demonstrated that such measures can be far more beneficial in marine than

in terrestrial contexts. Where is it not considered viable to undertake restoration of impacted biodiversity features, mechanisms to calculate the cost of such restoration presented in scientific literature could be used to identify equivalent funding for indirect measures.

6.1.2.3 Data collected to date

Offsetting requires reliable data to inform assessment of losses and gains, and in marine environments restricted knowledge of marine ecosystem functioning and significant ecological data gaps add further challenges (Dickie *et al*., 2013).

In the absence of readily available landscape and habitat mapping there is a greater reliance on survey data and secondary data to inform decision making. Extensive habitat surveys, classification and mapping of nearshore benthic species and habitats, namely seagrass and bioconstructions (included under the term 'reef' in the CHA), has been undertaken in Italy. Mitigations for these areas are under discussion with the Italian authorities at time of writing.

To identify the data gaps and uncertainties associated with potential presence of critical habitat triggering species and habitats in deep waters (≥200m), particularly those within the South Adriatic and Ionian Strait EBSA, TAP commissioned a review of all available information on deep water environments relevant to the TAP offshore alignment (see Appendix 7 of CHA: Deepwater Habitat Review). The review comprised a secondary literature review, and reviews of geophysical and drop down video survey data for the project. Data from seabed surveys confirmed the presence of sensitive species of conservation interest (e.g. solitary corals, seapens). The review identified known features and habitats in deep water (>200m) of the Mediterranean (incl. Adriatic) and their potential to occur along or in proximity to the TAP alignment based on available literature. It also identified, from the geophysical data, features in deep water and / or the EBSA to be considered for their potential to be critical habitat triggers. Where possible the review identifies the location of potential features of ecological interest in relation to the alignment and estimates the size and nature of the features.

6.1.2.4 Current status

The Deepwater Habitat Review is one of the data sources that will be used to inform the estimation of benthic habitat areas (ha) with potential to contain critical habitat triggers within the project construction footprint AOI (>2km).

To support the CHA a literature review has been completed as well as a review of the existing deepwater geophysical and imagery survey work. TAP (under the framework of the Ecological Management Plan) will:

- review the construction activities that will disturb benthic habitats and species
- undertake supplementary surveys in nearshore and deepwater (>100m depth) habitats to ensure benthic habitat mapping is consistent within the AOI
- use the supplementary survey data to develop construction mitigations to promote the implementation of the mitigation hierarchy i.e. avoidance of biodiversity features
- revise the Ecological Management Plan, Critical Habitat Assessment, and where relevant, the Biodiversity Offset Strategy to include pre-construction

marine survey data and construction phase and post-construction monitoring of benthic habitats within the AOI in all DMUs

- A literature review for other secondary data sources will also be undertaken to provide more species specific information, particularly for smaller, solitary species. This process for identifying offset requirements for benthic habitat features is currently ongoing as the methodology needs to be agreed and be more clearly defined

Whilst considered unlikely, any residual impacts on nesting turtles shall be identified through the monitoring proposed during the next nesting season (2018) at the Albanian landfall, which can also inform the offset measures as necessary.

For less spatially explicit receptors (e.g. the highly mobile qualifying features of the EBSA) a mechanism to quantify the equivalent investment in regional research will be identified.

6.1.2.5 Potential marine offsetting approaches

- **Averted loss**
  - support management of the EBSA possibly via workshops, conferences, research
- **Knowledge acquisition measures**
  - funding research (PhDs) and monitoring programmes for cold water corals, deep water habitats, turtles (could include bycatch recording via fishermen), marine mammals, marine megafauna (i.e. species listed as EBSA qualifying features)
  - fund Adriatic specific deep water marine offset research programmes
  - data sharing with research community, supporting scientific papers containing data for the project area
  - awareness raising, environmental education, capacity building
- **Restoration / Habitat creation**
  - may be appropriate in more nearshore areas (e.g. for seagrass should net loss be demonstrated post construction), artificial habitat creation through the provision of deep water hard substrates/structure to promote coral growth
- **Policy based**
  - supporting regional fisheries management of deep water habitats

The adoption of these direct and indirect marine offset approaches would enable TAP to adhere to the BBOP (2009) Principles of Biodiversity Offsets (as detailed in Section 5.1.2.).The specific marine offset measures that shall be employed by TAP will be described in the Biodiversity Offset Management Plan (BOMP) once additional surveys have been carried out and the methodology for calculating the NG/NNL has been refined.

7 OFFSET SITE AVAILABILITY

The assessment of offset site availability was approached separately for each host country, so as to ensure that offset management can be harmonised with national conservation objectives and existing management plans.

Due to the extensive and disparate size of the project and large number of biodiversity features with significant residual impacts requiring an offset, it is critical to undertake a high level desktop analysis to identify specific Areas of Investigation (AOIs) to focus more detailed studies into the type and condition of vegetation present and its suitability as habitat.

The overall purpose of this chapter is to illustrate that there is adequate habitat available within the project AOI that could be used as an offset site in order to meet the requirements of PS6/PR6/Standard 3. Focus was placed on demonstrating the feasibility of compensating residual impact to critical habitat features, rather than priority biodiversity features, as the former have more specific habitat requirements and a greater conservation goal. It shall be demonstrated in the BOMP that each CH and PBF biodiversity feature are fully compensated in compliance with the performance requirements.

The actual availability of sites will be greatly dependant on the effectiveness of the stakeholder engagement process, as the development and implementation of any offset sites shall occur in sympathy with existing conservation strategies.

For the implementation of successful offset sites, it is equally important to assess the social aspects of the site including land ownership, opportunities for lease or purchase of some or all of a land parcel and the current value of the land. It is the combination of these environmental and social parameters that ultimately will determine the suitability of a site for use as a land-based offset.

Information on these social parameters is not freely available within TAP's data holdings for the 20km study area, so the availability analysis presented within this strategy is limited to the broader assessment of biodiversity features and identification of AOIs that contain the broad habitat types required. Emphasis is placed on locating regions in which a number of individual biodiversity features can be co-located within the same area, so as to reduce to the total number of offset sites needing to be acquired and managed.

A 20km corridor along the pipeline route was selected for identifying prospective AOIs in which offset sites could be established. Detailed habitat mapping, from the ESIA, is only available for a 500m corridor along the pipeline route. Where the centreline had been re-routed outside of this corridor, the best publically available data was used to infill the corridor (where appropriate).

Ground-truthing surveys were undertaken in November 2017 to visit each of the prospective AOIs to confirm the occurrence of the correct habitat types and identify potential sites with obvious degradation that could benefit from restoration activities.

Extensive fauna and flora surveys have not been undertaken everywhere throughout the 20km search area, so it is not possible to be certain that vegetation within the selected AOIs is suitable for one or more of the biodiversity features. The DMUs from the CHA were used to estimate the availability of suitable habitat for terrestrial fauna and flora, within the 20km search corridor where vegetation type is not the sole predictor of habitat suitability.

7.1 Offset site co-location

Individual biodiversity features that occur in the same stand of a vegetation community are likely to share common habitat preferences. It stands to reason that if a particular vegetation type can support a variety of biodiversity features in the project area, an offset site with the same vegetation should be able to support a similar assemblage of biodiversity features.

Co-location is the process of defining the habitat requirements for each biodiversity feature with an offset liability and identifying commonalities between numerous biodiversity features, so as to allow for the characterisation of a prospective offset site which can simultaneously acquit the offset liability of numerous biodiversity features.

This process reduces the administration burden on offset site selection, implementation, monitoring and management though allowing for the fewest number of offset sites that satisfy the various habitat requirements for each of the biodiversity features with an offset liability.

7.2 Desktop search criteria - Greece

On the basis of the ESIA and subsequent biodiversity reports, a preliminary set of search parameters were defined for each biodiversity feature identified in Section 6, taking into account factors including broad habitat requirements, landscape scale factors and any other known constraints or threats to the biodiversity feature that might influence the success of a prospective offset site.

The following spatial layers were used in a desktop GIS to identify potential offset sites for each of the biodiversity features for Greece sourced from TAP and external third parties where appropriate to determine the feasibility of achieving a net gain for residual impacts to critical habitat:

- Greece ESIA EU Habitat Mapping (TAP 2016)
- Discrete Management Units – Critical Habitat Assessment (RSK 2017)
- Predicted distribution of habitat suitability for EUNIS habitat types (European Environment Agency, 2015)
- Corine landcover (European Environment Agency, 2012)
- Ecosystem types of Europe v2.1 (EUNIS Level 2) (European Environment Agency, 2015)
- Greece ESIA Landuse (TAP 2016)
- Protected and designated areas

AOIs were selected as close to the impact sites as practical, to increase the likelihood of a vegetation community being suitable habitat for the specific biodiversity feature. The results of the availability assessment are presented firstly as an overall estimate of

potentially available habitat followed by more detailed description of AOIs to demonstrate how offset sites may be established to acquit the residual impacts to biodiversity features.

7.2.1 Terrestrial fauna and flora habitat

The residual impacts to terrestrial fauna and flora are the greatest as these biodiversity features can occur in a range of vegetation types. The following table (Table 7-1) summarises the main habitat requirements for each biodiversity feature that were used to identify prospective areas that might be suitable for use as an offset site and an estimation of the available habitat within the investigated AOIs to demonstrate that it will be feasible to assess a number of prospective offset sites in an particular AOI and establish as offset site at the most suitable of these sites.

Indicative Offset Liability is conservatively assumed to be approximately twice that of permanent residual impact, to achieve net gain for biodiversity value and the same as the residual impact to achieve no net loss. This estimate is indicative only and actual offset liability size will depend on the success of the revegetation of the ROW and the condition of cleared vegetation in the ROW, which shall be confirmed with field surveys in 2018.

The estimated offset availability figures in the table are based on a rudimentary desktop GIS assessment of the reported broad habitat requirements, in combination with field surveys undertaken in November 2017 to verify the occurrence of these habitat types in the AOIs.

Table 7-1: Offset availability and summary of desktop search criteria for terrestrial biodiversity features in Greece

Biodiversity feature	Indicative Offset Liability (ha)	Broad habitat requirements	Landscape requirements	Estimated Offset Availability (ha)
Mammals				
Brown bear (*Ursus arctos*)	150	Mixed coniferous and hardwood vegetation	Rugged topography 900-1500m altitude Patch size 40-300km^2 Based on DMU	1,900
Grey wolf *(Canis lupus*)	150	Mixed coniferous and hardwood vegetation	Rugged topography 900-1500m altitude Patch size 40-300km^2	>2,000
Golden jackal (*Canis aureus*)	35	Mixed habitat preferences on river plains	Based on DMU	165

Biodiversity feature	Indicative Offset Liability (ha)	Broad habitat requirements	Landscape requirements	Estimated Offset Availability (ha)
Amphibian and reptile				
Four-lined snake (*Elaphe quatuorlineata*)	20	Meadows, forest edges, scrublands, cultivated areas	Based on DMU	1,100
Macedonian crested newt *(Triturus macedonicus)*	40	Deciduous woodlands	Based on DMU	3,000
Macedonian and Western Crested Newt Interaction Zone	20	Small wetland habitats	Within Macedonian and Western Crested Newt Interaction Zone Based on DMU	50
Flora				
Deadly nightshade (*Atropa belladonna*)	12	Beech forests		1,100
Dianthus formanekii	1	Grasslands/shrublands	Range restricted	18
Dianthus tenuiflorus	<1	Open pine forests, deciduous shrublands	Range restricted	Translocation
Verbascum dingleri	1	Open rocky grasslands	Range restricted	Translocation
Avifauna				
Greater spotted eagle (*Aquila clanga*)	20	Mature *Pinus nigra* forest	Migratory species.	65
Montagu's harrier (*Circus pygargus*)	21	Predominantly agricultural with some elevated areas containing more diverse vegetation Mixed deciduous forest	Confirmed in Mesopotamia area Nests on ground.	870
Lesser spotted eagle (*Clanga pomarina*)	20	Mature *Pinus nigra* forest	Breeds near forest edges, prefers moist woodland	65
Booted eagle (*Hieraaetus pennatus*)	20	Mature *Pinus nigra* forest Coniferous/ deciduous mixed forest and open oak forest		65
Black kite (*Milvus migrans*)	20	Mature *Pinus nigra* forest	Three areas in Greece for breeding, and three used for non breeding.	65

Biodiversity feature	Indicative Offset Liability (ha)	Broad habitat requirements	Landscape requirements	Estimated Offset Availability (ha)
Dalmatian pelican (*Pelecanus crispus*)	50	Wetlands		N/A[12]

Of all the critical habitat values assessed in Greece, the Dalmatian pelican is the only biodiversity feature without adequate habitat. It is anticipated however that the post-construction surveys will demonstrate that no impacts occurred to the wetland habitat within the designated/protected areas which were used as a DMU for the species.

In addition to this, it is assumed that there shall be no residual impacts to *Dianthus tenuiflorus* and *Verbascum dingleri* or due to the use of mitigation measures such as translocation and seed collection. Should post-construction monitoring demonstrate that these measures have been insufficient to avoid any residual impacts; additional offset sites shall be established.

7.2.2 Freshwater habitat

The implementation of offsets for freshwater biodiversity features are more difficult to implement due to the non-discrete nature of aquatic habitat. For each of the aquatic biodiversity features, it is proposed additional riparian restoration works shall be conducted upstream of the impact site to achieve a net gain in habitat condition. The accounting model shall be applied to riparian forest to demonstrate the achieving of a net gain, with the scoring metric customised to aquatic habitat.

Estimate offset availability area includes riparian vegetation along waterways known to contain the biodiversity feature as well as the adjacent land that could be restored to reduce soil erosion.

Table 7-2: Summary of desktop search criteria for aquatic biodiversity features in Greece

Biodiversity feature	Indicative Offset Liability[13]	Broad habitat requirements	Other constraints	Estimated Offset Availability (ha)
Mammals				
Otter (*Lutra lutra*)	12	Watercourses and wetlands	Extensive foraging range	39
Freshwater fish				
Alburnus vistonicus	2	Watercourses	Range restricted	8
European eel (*Anguilla*	10	Watercourses	Unimpeded flow to	90

[12] No wetland habitat impacted within Dalmatian pelican DMU, so residual impact expected to be confirmed as negligible during 2018 surveys

[13] Offset liability conservatively assumed to be approximately twice that of residual impact to achieve net gain for biodiversity value and the same as the residual impact to achieve no net loss. This estimate is indicative only and actual offset site size will depend on condition of extant vegetation present which shall be confirmed with field surveys

Biodiversity feature	Indicative Offset Liability[13]	Broad habitat requirements	Other constraints	Estimated Offset Availability (ha)
anguilla)			the sea	
Barbus macedonicus	1	Watercourses	Range restricted	58
Aggitis spined loach (*Cobitis punctilineata*)	2	Watercourses	Range restricted	2
Pelagos trout *(Salmo pelagonicus)*	1	Watercourses	Range restricted	58
Freshwater invertebrates				
Thick-shelled river mussel *(Unio crassus)*	1	Watercourses	Range restricted	1
Turcorientalia hohenackeri	1	Watercourses	Range restricted	1

No specific offset availability analysis was undertaken for the Aggitis spined loach, Thick-shelled river mussel or *Turcorientalia hohenackeri*. As these species are very range restricted it is proposed that a range of direct and indirect offset measure will be undertaken in their waterways to enhance the riparian forest, reduce the risk of soil erosion and potentially install fish passages where appropriate.

7.2.3 Threatened or unique ecosystems

Assessing the availability of vegetation suitable for use as an offset for each of the threatened or unique ecosystems is limited to the ESIA investigation corridor. During the next phase of the offset implementation, targeted flora surveys will be conducted in conjunction with stakeholder engagement to identify areas where suitable vegetation occurs or previously occurred.

In order to increase the likelihood of success for a threatened ecosystem it would be proposed that offsets sites are established as close to the impact site as possible, in areas with a mosaic of degraded patches of an ecosystem type and patches in a better condition.

7.2.4 Designated or Protected Areas

Residual impacts to designated or protected areas shall be compensated for through the placement of prospective offset sites in land adjacent or as close as practical to existing sites. These sites would be managed in a manner that complements the conservation objectives of the protected area and would be established in consultation with the relevant stakeholders.

7.3 Offset site areas of investigation - Greece

The following sections describe the primary regions in which an offset site shall be established in order to acquit the residual impacts to one or more biodiversity feature.

7.3.1.1 Provatonas/Evros River Coastal Plain AOI

The Provatonas/Evros River AOI is situated in the eastern border of Greece in the region of Thrace. The AOI is dominated by dryland and irrigated cultivation on the flat areas, but in more elevated areas the dominant habitat type is a shrubland *Paliurus spina-crista*, with sparse to closed deciduous *Quercus sp*. and *Phillyrea latifolia*. In one part of the AOI, it is understood a fire approximately 15 years ago burnt the existing Thermophilous oak woods (924a), leaving *P. spina-crista*, to recolonise the site. Pockets of 924a are present on the site in sheltered gullies where the fire may not have spread.

Table 7-3 Habitat availability within Provanonas/Evros River Coastal AOI

Habitat type	ESIA/Field verified	Desktop assessment
Thermophilous oak woods of East Mediterranean and Balkans (924a)	10.8 ha	
Transitional shrublands with *P. spina-crista* and *Quercus sp.*	55.7 ha	
South-eastern sub-mediterranean deciduous thickets	44.2 ha	
Pastures	26.9 ha	
Alluvial forests	25.8 ha	2.5 ha

The isolation of the site, due to its proximity to the border with Turkey and its historic use by the Greek defence forces, make it a highly suitable site for use as an offset site to acquit impacts to the Golden jackal, as well as other biodiversity values in the area that may utilise Thermophilous oak woods (924a) such as birds.

It is proposed that approximately 10 ha of elevated shrublands will be used to establish an offset site to acquit impacts to the golden jackal to achieve a net gain through the exclusion of known threats, protection against further clearing or degradation and the restoration of existing habitat

A number of watercourses were also identified within the AOI with evidence of severe erosion. The revegetation and stabilising of these drainage lines would also contribute indirectly to improving the water quality of the Evros River through reducing the sediment load in the watercourse.

7.3.1.2 Western Loutros Forest AOI

The Loutros Forest AOI is in the region of Thrace situated on the western borders with Notio Dasiko Symplegma Evrou SPA and Kirki Wildlife refuge, occupying an area from approximately KP 50-70.

The vegetation is a highly diverse mosaic of Thermophilous oak woods of east Mediterranean and Balkans (924a), Mediterranean pine forests with mesogean pines (9540), the shrubland habitats of Pseudomaquis (5350) and Garrigues of Eastern

Mediterranean and heathlands of *Erica sp*.. The distribution of these habitats across the AOI is complex with a number of successional areas displaying species from both forest and shrubland habitat.

Table 7-4 indicates the approximate availability of these habitat types in the AOI. It should be noted that detailed mapping of the extents of *Pinus* dominated woodlands were not undertaken due to the extensive occurrence of plantation foresting in the area.

Table 7-4 Habitat availability within the Western Loutros Forest AOI

Habitat type	ESIA/Field verified	Desktop assessment
Thermophilous oak woods of east Mediterranean and Balkans (924a)	290ha	1470ha
Mediterranean pine forests with mesogean pines (9540)	65ha	
Pseudomaquis (5350)	160ha	
Garrigues of Eastern Mediterranean	170ha	
Heathland	7ha	

The AOI also contains a number of disturbed areas, likely to be the result of natural storm damage, fire or in some instances abandoned cultivation. It is proposed that these areas would be targeted with additional land management practices to encourage the succession of the forest to 9540 to acquit the residual impacts to this habitat type, over an area of approximately 30ha through the exclusion of known threats, protection against further clearing or degradation and the restoration of existing habitat.

In addition to this habitat type, the AOI is also proposed for use as an offset for impacts to a range of avifauna known to occur within the Natura 2000 sites including greater spotted eagle (*Aquila clanga*), black kite (*Milvus migrans*), booted eagle (*Hieraaetus pennatus*) and lesser spotted eagle *(Clanga pomarina*). Whilst the key habitat requirement for roosting for these species is the occurrence of *Pinus nigra*, the residual impacts to the DMU for these species comprise of the mosaic of forest and shrubland areas. An additional 100ha of forest/shrubland mosaic could be used to meet the overall offset requirement for these species and the broader habitat requirements of the forest habitat PBF avifauna.

NG/NNL could be achieved on an offset site in this area through the restoration of degraded habitats, the elimination of pests and other threats and the averted loss of habitat for these features. It is proposed this will also satisfy TAP's obligations under the Habitats Directive for impacts to the Natura 2000 site due to its strong landscape connectivity with the Loutros Forest complex. If possible the site would be proposed to be added to the Kirki Wildlife Refuge to ensure future averted loss for the biodiversity features.

7.3.1.3 Filiouris River AOI

The AOI is situated in the Xanthi regional unit on the plains around the Ethniko Parko Anatolikis Makedonias kai Thrakis National Park and the west of the Koilada Kompsatou SPA. The vegetation in this AOI is dominated a mosaic of irrigated and dryland cropping with isolated patches of grasslands, wetland vegetation and limited intact riparian vegetation on the plains.

Table 7-5 Habitat availability within the Filiouris River AOI

Habitat type	ESIA/Field verified	Desktop assessment
Mixed shrubland	2ha	
Mixed pasture	60ha	
Wetland/alluvial forest	8ha	
Cultivation		>500ha

Offset sites within the AOI are proposed to acquit residual impacts to the four-lined snake (*Elaphe quatuorlineata*) which has a habitat preference for meadows, forest edges, scrublands and cultivated areas. The AOI contains extensive areas of 5340 in the hills above the coastal plain, although at higher altitudes the shrubland is dominated by deciduous *Quercus sp*. Field survey on the plains however identified a number of degraded sites with grassland and shrubland habitats along the Axaxades Stream that would be suitable habitat for the four-lined snake.

It is estimated that approximately 10 ha of restoration will be required to acquit the impacts to the habitat types for the four-lined snake that cannot be restored during the revegetation of the ROW. As this species resides in a mosaic of habitat types, additional indirect offset measures could be undertaken in this area to educate land managers of the benefits of maintaining riparian and other woody vegetation. Additional conservation gains may be achieved through land management around the Axaxades Stream for the benefit of the European eel, otter and freshwater fish such as *Alburnus vistonicus* which is found downstream in the Asmak River.

7.3.1.4 Chalkero AOI

The Chalkero AOI occurs in the rocky grasslands of Northern Greece within the Kavala regional unit. It is typically mapped as Greek Habitat type 5340 Garrigues of Eastern Mediterranean, consisting of the primary species of *Quercus coccifera*, *Phillyrea latifolia* and *Olea oleaster* on poor quality soils. It has also been proven to contain the Balkan endemic plant *Verbascum dingleri.*

As the distribution or specific habitat requirements of *V. dingleri* are not known, mitigation measures including seed collection and propagation were undertaken prior to clearing and grading activities in this AOI. It is therefore expected that the use of the collected seeds and propagated seedlings to assist in the restoration of the ROW will mitigate any residual impacts.

Should construction monitoring demonstrate that the replanted *V. dingleri* has not been successful in being restored; additional planting could be undertaken off the ROW where the soil has not been disturbed.

Verification surveys in November 2017 identified a number of individuals on the rocky slopes above the pipeline around KP 185. Additional surveys were conducted in the rehabilitated ROW from the DESFA pipeline, south of KP184, whereby further populations of *V. dingleri* were discovered. It is therefore expected that replanting in the wider area is likely to be successful in compensating for any residual impacts.

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7.3.1.5 Axios River AOI

The Axios River AOI encompasses both sides of the proposed Horizontal Directional Drilled crossing of the Axios River, in Central Macedonia. The AOI is characterised by dryland and irrigated cultivation for crops such as cotton and maize, poor quality grazing pastures, with the Delta Axiou SPA/SAC/SC splitting the site into an eastern and western component.

Table 7-6 below indicates the approximate availability of these habitat types in the AOI.

Table 7-6 Habitat availability within the Axios River AOI

Habitat type	ESIA/Field verified	Desktop assessment
Pasture/wetlands	53ha	
Cultivation		>1000ha

The AOI is situated with the Macedonian and Western Crested Newt Interaction Zone discussed in the CHA (CAL00-C5577-640-Y-TRB-0001) and the predicted habitat distribution of the Macedonian crested newt (*Triturus meacedonicus*). Both *T. Macedonicus* and *T. karelinii* (Western Crested Newt) have a preference for diverse terrestrial habitats, particularly woodland and agricultural land, with small, still water bodies (usually ponds and ditches) that are used as aquatic breeding habitat (Edgar and Bird, 2006).

The residual impacts within the Macedonian and Western Crested Newt Interaction Zone are estimated at 64ha, but this figure includes disturbance to the cultivated lands within the ROW which are not likely to provide key habitat for the newts. Additional surveys in 2018 will be used to revise the residual impacts to those land cover types in the zone, including forests and water pools.

Within the AOI, the eastern section was mainly cultivated or grazed with isolated patches of severe degradation, characterised by deep erosion and the occurrence of weed species such as *Solanum sp.* It was possible the site has historically experienced intensive earthworks as there were a number of high mounds and deep ditches.

The western section of the AOI appeared less disturbed but more degraded through over-grazing and periodic inundation from the Axios River. A number of depressions

were observed in the uncultivated areas of both sections containing species which indicate the presence of water. It is estimated there were 53ha of this landscape within the AOI which may be suitable habitat for the *Triturus sp*. and would benefit from restorative land management activities to reduce the risk of soil erosion, remove the weed species and re-establish wetland/riparian vegetation in places.

Whilst it was not identified in the field, a snake skin was observed in the western site, which in conjunction with the observed wetlands could also make this site a suitable offset for four-lined snake (*Elaphe quatuorlineata)* as it has previously been observed within the River Axios Complex.

In establishing these management practices in the land adjacent to the Axios River, it is presumed additional indirect benefits to freshwater fish including the *Barbus macedonicus,* Pelagos trout *(Salmo pelagonicus)* and European eel *(Anguilla anguilla)* can be achieved.

7.3.1.6 Ores Vermio AOI

The Ores Vermio AOI is situated in the Pella region, between KP437-447, in an area dominated by broad-leaved forests, primarily beech and oak forests but also presenting as mixed broad-leaved forests. Large stands of *Quercus* forest to the west of Flamouria - Grammatikou Dimou Edessas Wildlife Refuge are actively managed by the Greek Forestry Authority, which periodically clear-fell areas of the forest for timber products. The area also features isolated areas where the forests have been cleared to promote the growth of pastures. In these areas there are also heavily degraded *Quercus* forests that could be highly suited for use as an offset site.

Table 7-7Table 7-8 below indicates the approximate availability of these habitat types in the AOI.

Table 7-7 Habitat availability within the Ores Vermio AOI

Habitat type	ESIA/Field verified	Desktop assessment
Asperulo-Fagetum beech forests (9130)	1,100ha	
Thermophilous oak woods of East Mediterranean and Balkans (924a)	240ha	15ha
Broad-leaved forest/Mixed forest	1,240ha	610ha
Transitional Shrubland	60ha	405ha
Grassland/Pastures (6420)	25ha	80ha
Land principally occupied by agriculture, with significant areas of natural vegetation		140ha

The primary objective of this AOI is to establish an offset site of approximately 150ha to partially acquit the offset liability to the brown bear (*Ursus arctos*). Given the

predominantly good condition of the forest in the AOI, it is likely that a number of smaller sites would need to be managed to collectively achieve the required gains, rather than a single site.

As part of the stakeholder engagement, liaison with the Forestry Authority will occur to investigate the opportunities to convert some of the managed *Quercus* forest back to a more naturally occurring state, where it could provide more suitable habitat for species such as the brown bear. Under this scenario, linkages could be established within the forestry area to allow the passage of fauna from the Wildlife Refuge to surrounding intact forest.

Within this AOI it is estimated there is more than 2,000 ha of broadleaved deciduous forest and a further 400ha of modified habitat that could be restored back to a more natural state.

This AOI also contains the only observed location of the Annex 1 Priority Habitat 3170 * Mediterranean temporary ponds, occurring within cleared pastures. Any residual impacts to the temporary ponds shall be offset adjacent to the impact site through restoration measures such as weeding or the exclusion of grazing or human traffic to ensure the characteristic flora are able to survive.

The Annex 1 Habitat 9130 Asperulo-Fagetum beech forests can also be found extensively in this region as large tracts of forest or isolated patches on northern facing slopes, with over 1100ha mapped within the AOI. An offset site of approximately 6 ha can achieve NNL for this PBF, focused on the areas where the *Fagus* forest appears to have been historically disturbed.

The Asperulo-Fagetum beech forests in the AOI also provides habitat for the endemic plant deadly nightshade (*Atropa belladonna*). It is estimated that a 12 ha offset site within the AOI would achieve a NG for the deadly nightshade, through co-locating this offset site within the Asperulo-Fagetum beech forests offset site.

Establishing an offset site within this AOI also has the opportunity to create linkages between Oros Vermio SCI and the Flamouria - Grammatikou Dimou Edessas Wildlife Refuge which can support the movement of large carnivores such as the brown bear.

7.3.1.7 Trans-boundary AOI

The Trans-boundary AOI in the Kastoria region is situated in the hills and plains of the upper River Aliakmon catchment, close to the border between Greece and Albania. The AOI is composed of cultivated and grazed plains, with *Quercus* or *Pinus sp*. forests on the slopes and grasslands or *Juniperus sp*. matorral shrublands along the ridge lines. This mosaic of habitats is suitable for the brown bear. Caves and other exposed rocks were observed in certain locations which might be suitable denning habitat for the brown bear.

Table 7-8 below indicates the approximate availability of these habitat types in the AOI, along with the source and inferred accuracy of the estimation.

Table 7-8 Habitat availability within Trans-boundary AOI

Habitat type	ESIA/Field	Desktop

	verified	assessment
Thermophilous oak woods of East Mediterranean and Balkans (924a)	195ha	1870ha
Mediterranean pine forests with endemic Mesogean pines (9540)		160ha
Grassland/Pastures (62A0)	460ha	
Arborescent matorral with *Juniperus spp.* (5210)	61ha	40ha
Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion Incanae, Salicion Albae*). (91E0*)		5ha

Based on the current residual impacts, it is proposed an offset site of approximately 150 ha will be required in the AOI composed of a mosaic of Thermophilous oak woods and Arborescent matorral shrublands. In conjunction with the offsets within the Ores Vermio AOI, this will contribute to achieving a net gain for the brown bear.

At the time of implementation, consultation with local stakeholders and experts would be undertaken to determine the more appropriate method to manage the land for the benefit of the brown bear. Management actions could include the improving of connectivity in the grasslands/shrublands between forested patches through planting of successional species such as *Quercus* or *Pinus spp* or the establishment of foraging habitat within the AOI away from areas prone to human disturbance.

In the southern parts of the AOI, the pipeline crosses a permanently running stream at approximately KP542.7 which is mapped as the Annex 1 Priority Habitat 91E0* Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion Incanae, Salicion Albae*). This stream is forked into three tributaries upstream of the crossing point but it is only the western-most stream which contains the floral assemblage of 91E0. The other two streams were surveyed but found to contain *Quercus* and *Popularus* spp. These two streams showed signs of soil erosion and weed infestation (*Rubus sp*.) both near to the crossing point and further upstream.

The land surrounding these streams is dominated by a mix of cropping and grazing activities. It is estimated there was approximately 2-3km of waterways that could benefit from restoration activities to stabilise the riverbanks with riparian species of 91E0. These actions would also contribute to improved water quality in this stream as well as downstream in the Aliakmon River to the benefit of freshwater species including the European eel, otter, *Barbus macedonicus* and Pelagos trout *(Salmo pelagonicus).*

The endemic plant *Dianthus formanekii* is also found within the AOI, with approximately 18ha of suitable shrubland habitat within the AOI. Any residual impacts from unsuccessful reinstatement/revegetation shall be offset with additional restoration measures within the shrubland proximal to the impact site.

At a number of locations around the AOI, illegally dumped refuse was observed. Land management actions could include the removal of this refuse assisting the restoration of the land to its previous habitat type.

7.4 Desktop search criteria – Albania

On the basis of the ESIA and subsequent biodiversity reports, a broad set of search parameters were defined for each biodiversity feature identified in Section 6, taking into account factors including broad habitat requirements, landscape scale factors and any other known constraints or threats to the biodiversity feature that might influence the success of a prospective offset site.

Further to these features, there were two occurrences of impacts occurring to an Emerald Site which are being treated as per the Natura 2000 sites. To simplify the desktop analysis, it was presumed that the most beneficial location to undertake management actions to achieve a net gain in biodiversity is adjacent to the respective Emerald site.

The following spatial layers were used in a desktop GIS to identify potential offset sites for each of the biodiversity features for Albania sourced from TAP and external third parties where appropriate:

- Corine landcover (European Environment Agency, 2012)
- Ecosystem types of Europe v2.1 (EUNIS Level 2) (European Environment Agency, 2015)
- Albania ESIA Landuse (TAP 2016)
- Albania ESIA Flora and Fauna Mapping (TAP 2016)
- Discrete Management Units – Critical Habitat assessment (RSK 2017)
- Predicted distribution of habitat suitability for EUNIS habitat types (European Environment Agency, 2015)

AOIs were selected as close to the impact sites as practical, to increase the likelihood of a vegetation community being suitable habitat for the specific biodiversity feature. The results of the availability assessment are presented firstly as an overall estimate of potentially available habitat followed by more detailed description of AOIs to demonstrate how offset sites may be established to acquit the residual impacts to biodiversity features.

7.4.1 Terrestrial fauna and flora habitat

The residual impacts to terrestrial fauna and flora are the greatest as these biodiversity features can occur in a range of vegetation types. The following table (Table 7-9) summarises the main habitat requirements for each biodiversity feature that were used to identify prospective areas that might be suitable for use as an offset site.

Indicative Offset Liability is conservatively assumed to be approximately twice that of permanent residual impact, to achieve net gain for biodiversity value and the same as the residual impact to achieve no net loss. This estimate is indicative only and actual offset liability size will depend on the success of the revegetation of the ROW and the condition of cleared vegetation in the ROW, which shall be confirmed with field surveys in 2018.

The estimated offset availability figures in the table are based on a rudimentary desktop GIS assessment of the reported broad habitat requirements, in combination with field surveys undertaken in November 2017 to verify the occurrence of these habitat types in the AOIs.

Table 7-9 Offset availability and summary of desktop search criteria for terrestrial biodiversity features in Albania

Biodiversity feature	Indicative Offset Liability (ha)	Broad habitat requirements	Landscape requirements	Estimated Offset Availability (ha)
Mammals				
Brown bear (*Ursus arctos*)	180	Mixed coniferous and hardwood vegetation Broadleaved deciduous woodland	Rugged topography 900-1500m altitude Patch size 40-300km^2 Based on DMU	>2,000
Golden jackal (*Canis aureus*)	10	Mixed habitat preferences on river plains	Based on DMU	180
Wildcat (*Felis silvestris*)	32	Mixed coniferous and hardwood vegetation Broadleaved deciduous woodland	Based on DMU	>2,000
Amphibian and reptile				
Four-lined snake (*Elaphe quatuorlineata*)	35	Meadows, forest edges, scrublands, cultivated areas	Based on DMU	460
Albanian pool frog (*Pelophylax shqipericus*)	5	Natural or artificial wetlands or close access to permanent water	Coastal plains in Albania near, west of the Semani river	500
Flora				
Deadly nightshade (*Atropa belladonna*)	90	Beech forests		1,100
Festucopsis serpentinii	45	Mountain hay meadows		940
Albanian lily *(Lilium albanicum)*	45	Mountain hay meadows		940
Mountain tea *(Sideritis raeseri)*	45	Mountain hay meadows		940
Yellow monk's-hood *(Aconitum lamarkii)*	35	Understory component of Luzulo-Fagetum beech forests		1,100
Avifauna				
Greater spotted eagle (*Aquila clanga*)	140	Mature *Pinus nigra* forest	Migratory species	35
Lesser spotted eagle (*Clanga pomarina*)	82	Mature *Pinus nigra* forest	Breeds near forest edges, prefers moist woodland	35
Booted eagle (*Hieraaetus pennatus*)	82	Mature *Pinus nigra* forest Coniferous/ deciduous mixed forest and open	Migratory species, breeding in Europe.	1030

Biodiversity feature	Indicative Offset Liability (ha)	Broad habitat requirements	Landscape requirements	Estimated Offset Availability (ha)
		oak forest		
Black kite (*Milvus migrans*)	172	Mature *Pinus nigra* forest		35
Mediterranean horseshoe bat (*Rhinolophus euryale*) Blasius's horseshoe bat (*Rhinolophus blasii*) Greater horseshoe bat (*Rhinolophus ferrumequinum*) Schreiber's bat (*Miniopterus schreibersii*) Long-fingered bat (*Myotis capaccinii*) Lesser horseshoe bat (*Rhinolophus hipposideros*) Greater mouse-eared bat (*Myotis myotis*) Bechstein's bat (*Myotis bechsteinii*) Mehely's Horseshoe Bat (*Rhinolophus mehelyi*) Lesser mouse-eared bat (*Myotis blythii*) Geoffroy's bat (*Myotis emarginatus*)	50	Undisturbed cave systems for roosting (congregatory) behaviour	Rugged landscapes	1,100

Of the terrestrial biodiversity features assessed, the only group of species where there was a concern for a suitable availability of habitat is for the Black kite, Greater spotted eagle, and Lesser spotted eagle which preferred *Pinus nigra*. Whilst approximately 35ha of the habitat type was identified during the baseline surveys this is not adequate to compensate for the estimated offset requirement of 170ha. It is anticipated however that the residual impact to these avifauna is greatly exaggerated, as the DMU's were primarily based on the boundaries of the Vithkuq-Ostrovice Biotope rather than the specific habitat types within the area. The post construction surveys shall confirm the actual residual impact to these avifauna and an appropriate sized offset site be established accordingly.

Need to map more pine forest or revise residual impacts to determine amount of pine forest lost within the DMU which constitutes the preferred habitat type for

It is anticipated the post construction surveys planned for 2018 shall capture more information regarding the habitat usage of the areas of woodland within the congregatory bat DMUs. This information shall be used to confirm if any residual impacts have occurred and allow for appropriate offset sites to be established.

7.4.2 Freshwater habitat

The implementation of offsets for freshwater biodiversity features are more difficult to implement due to the non-discrete nature of aquatic habitat. For each of the aquatic biodiversity features, it is proposed additional riparian restoration works shall be conducted upstream of the impact site to achieve a net gain in habitat condition. The accounting model shall be applied to riparian forest to demonstrate the achieving of a net gain, with the scoring metric customised to aquatic habitat.

Table 7-10 Summary of desktop search criteria for aquatic biodiversity features in Albania

Biodiversity feature	Indicative Offset Liability (ha)	Broad habitat requirements	Estimated Offset Availability (ha)
Mammals			
Otter (*Lutra lutra*)	16	Watercourses and wetlands Extensive foraging range	77
Freshwater fish			
Devoll riffle minnow *(Alburnoides devolli)*	2	Watercourses Range restricted	nil
Osum riffle minnow *(Alburnoides fangfangae)*	16	Watercourses Range restricted	77
European eel (*Anguilla anguilla*)	26	Watercourses Range restricted	77
Pelasgus prespensis	2	Watercourses Range restricted	nil

No specific offset availability analysis was undertaken for the *Pelasgus prespensis* or Devoll riffle minnow as these species are very range restricted it is proposed that a range of direct and indirect offset measure will be undertaken in its waterways to create habitat such as riffles, enhance the riparian forest, reduce the risk of soil erosion.

7.4.3 Threatened or unique ecosystems

Assessing the availability of vegetation suitable for use as an offset for each of the threatened or unique ecosystems is limited to the ESIA investigation corridor. During the next phase of the offset implementation, targeted flora surveys will be conducted in

conjunction with stakeholder engagement to identify areas where suitable vegetation occurs or previously occurred.

In order to increase the likelihood of success for a threatened ecosystem it would be proposed that offsets sites are established as close to the impact site as possible, in areas with a mosaic of degraded patches of an ecosystem type and patches in a better condition.

7.4.4 Designated or Protected Areas

Residual impacts to designated or protected areas shall be compensated for through the placement of prospective offset sites in land adjacent or as close as practical to existing sites. These sites would be managed in a manner that complements the conservation objectives of the protected area and would be established in consultation with the relevant stakeholders.

7.5 Areas of investigation - Albania

7.5.1.1 Vithkuq Ostrovice

The Vithkuq Ostrovice AOI contains a mix of mountain hay meadows, pine, oak and beech woodlands and transitional shrublands which provide habitat for a wide range of biodiversity features impacted in Albania. The mixed coniferous and hardwood vegetation provides key habitat in Albania for the brown bear, with the species having been observed in the region during the large carnivore surveys (RSK 2015). Table 7-11 summarises the main habitat types within the AOI. No post ESIA verification was possible at this site due to obstructions on the access roads at the time of survey.

Table 7-11 Habitat availability within Vithkuq Ostrovice AOI

Habitat type	ESIA/Field verified	Desktop assessment
Luzulo-Fagetum beech forests (9110)	1,112 ha	
Broad-leaved forest		1,033 ha
(Sub-)Mediterranean pine forests with endemic black pine (9530)	23 ha	
Coniferous forest		12 ha
Transitional shrub	46 ha	363 ha
Mountain hay meadows	940 ha	470 ha

It is proposed that an offset site of approximately 100 ha would be established in this AOI to partially acquit the residual impacts to the Brown bear and Wild-cat in Albania, composed of a mix of beech and conifer forest, shrublands and grasslands. An area of this size will also provide suitable compensation for significant residual impacts to

avifauna (Greater spotted eagle, Black kite, Booted eagle and Eagle owl) considered present in this area, providing the final offset site can be situated close to the forest edges. The AOI's proximity to the Vithkuq Ostrovice Corine Biotope also means this offset site could be suitable to acquit the impacts to the protected area and upon completion of TAP's management of the site, it could be added to the protected area network.

The site is also adjacent to one of the key habitat areas for Congregatory Bat along the pipeline. It is expected the woodland vegetation in the proposed offset site could be suitable foraging habitat for congregatory bats in the area. It would take approximately 40 ha of habitat to compensate for the permanent loss of habitat for congregatory bats in the area.

It is expected this site would also acquit this offset liability and that of the deadly nightshade found within the Luzulo-Fagetum beech forests. The adjacent expanses of mountain hay meadows provide habitat for the mountain tea, Albanian lily and Serpentine false-brome. It is anticipated a site containing approximately 45 ha of hay meadow will be sufficient to acquit the offset liabilities for these vascular plants through averting further degradation or landcover change as well as promoting the restoration of their condition.

The final size of any proposed offset for grassland vegetation will be determined by the success of regeneration in the working strip, whereby the significant residual impacts may be limited to an 8m strip.

An indicative figure of the AOI is presented in Appendix 2.

7.5.1.2 Vokopola/Osumi River AOI

The Vokopola/Osumi River AOI is situated near the village of Vëndreshë in rugged mixed conifer and broadleaf forests, transitional shrublands dominated by *Quercus ilex* and cultivation in the lower parts adjacent to the Osumi River. Table 7-12 summarises the approximate extents of the main habitat types observed within the AOI.

Table 7-12 Habitat availability within Vokopola/Osumi River AOI

Habitat type	ESIA/Field verified	Desktop assessment
Broad-leaved forest		103 ha
Galio-Carpinetum oak-hornbeam forests	72 ha	
Pannonian-Balkanic turkey oak- sessile oak forests	315 ha	
Coniferous forest	5 ha	
Shrubland	915 ha	152 ha
Alluvial forest	11 ha	

It is proposed that an offset site of approximately 100ha will be required to partially offset the residual impacts to the Brown bear and Wild cat, using a mosaic of broadleaved, coniferous and alluvial forest with shrublands. On the site, restoration activities could be undertaken to create greater connectivity with broad-leaved forest patches and the creation of new foraging habitat to provide the bear with an alternative to foraging in modified/cultivated habitats. Net gains through averted loss could be achieved through the protection of habitat from further clearing or the limiting of access to the site.

In situating the offset site proximal to the Osumi and Vokopola rivers, restoration activities within the alluvial forests will also provide gains for the aquatic biodiversity features such as the European eel, Otter and Osum riffle minnow.

An indicative figure of the AOI is presented in Appendix 2.

7.5.1.3 Mali i Tomorrit National Park AOI

The Mali I Tomorrit National Park AOI is situated in the Osumi River valley the west of the protected area, centred on the village of Hoxhaj. The area is dominated by olive groves and vineyards on both the valley floor and terraced hill slopes. Natural vegetation is generally restricted to alluvial forests dominated by *Platanus orientalis* and broad-leaved forest to the west of the river. The western elevated parts are dominated by transitional shrubland.

Table 7-13 summarises the approximate extents of the main habitat types observed within the AOI.

Table 7-13 Habitat availability within Mali I Tomorrit National Park AOI

Habitat type	ESIA/Field verified	Desktop assessment
Broad-leaved forest	145 ha	327 ha
Transitional shrubland	280 ha	225 ha
Sclerophyllous shrubland	35 ha	400 ha
Coniferous forest	80 ha	
Alluvial forests	65 ha	

It is proposed approximately 125ha of degraded cultivation or transitional shrubland could be used as an offset for the residual impacts to the Four-lined snake (*Elaphe quatuorlineata*). As this species resides in a mosaic of habitat types, additional indirect offset measures could be undertaken in this area to educate land managers of the benefits of maintaining riparian and other woody vegetation. Net gains from averted loss can be achieved in this area through preventing further loss of the key wooded habitat types for the species.

In situating the offset site proximal to the Osumi River, restoration activities within the alluvial forests will also provide gains for the aquatic biodiversity features such as the European eel, Otter and Osum riffle minnow.

An indicative figure of the AOI is presented in Appendix 2.

7.5.1.4 Coastal Dunes AOI

The Coastal Dunes AOI is situated adjacent to the vegetated coastline on the shores of the Adriatic Sea dominated by cultivated pastures, olive groves and crops, transitional scrublands, alluvial forests and productive reed beds along the Osumi River and broad-leaved and coniferous forests in the more elevated parts to the northeast of the site.

Table 7-14 below indicates the approximate availability of these habitat types in the AOI, along with the source and inferred accuracy of the estimation.

Table 7-14 Habitat availability within the Coastal Dune AOI

Habitat type	ESIA/Field verified	Desktop assessment
Broad-leaved forest	170 ha	
Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*	10 ha	
Lowland hay meadows	500 ha	315 ha

It is anticipated that approximately 50ha of land could be used as an offset site in this AOI for compensation to the residual impacts to the Golden jackal and the Albanian pool frog. The site could focus on re-establishing a corridor of riparian vegetation along the Osumi river providing connectivity for the Golden jackal to forage between the coastal dunes and other non-cultivated land along the river.

The site also contains a network of streams and ponds that may support the Albanian pool frog. The impacts to the Albanian pool frog are expected to be very conservative, and its occurrence has only been inferred from one opportunistic observation. The AOI contains more than 500ha of ponds and streams that may support the Albanian pool frog.

An indicative figure of the AOI is presented in Appendix 2.

7.6 Offshore

Of the marine critical habitat triggers identified in the CHA and assessed in the SEA, along with priority biodiversity features, residual impacts were considered likely for the following species and habitats.

Table 7-15 Summary of marine biodiversity offsetting options

Marine biodiversity feature	Offsetting options to be considered	Potentially present in AOI Albania	Potentially present in AOI Italy
Critical habitat triggers			
Cnidaria bamboo coral (*Isidella elongata*), tall sea pen (*Funiculina quadrangularis*), deepwater coral (*Lophelia pertusa*), zigzag coral (*Madrepora oculata*), white Gorgonian (*Eunicella singularis*), stony cup coral (*Dendrophyllia cornigera*), cockscombe cup coral (*Desmophyllum dianthus*), smooth black coral (*Leiopathes glaberrima*), slender Sea Pen (*Virgularia mirabilis), Pennatula rubra*).	Averted loss Knowledge acquisition measures Policy based	Yes	Yes
Sponges (*Axinella cannabina, Axinella polypoides*).	Averted loss Knowledge acquisition measures Policy based	Yes	Yes
Loggerhead turtle (*Caretta caretta*)	Averted loss Knowledge acquisition measures Policy based	Yes	Yes
Annex I habitats (*Posidonia oceanica* beds, reefs (including bioconstructions), submarine structures made by leaking gases).	Averted loss Knowledge acquisition measures Policy based	Yes	Yes
South Adriatic and Ionian Strait EBSA (Benthic habitat features addressed under cnidarians, sponges & Annex I habitat, but not possible to rule out residual impacts on mobile qualifying features)	Averted loss Knowledge acquisition measures Policy based	Yes	Yes
Priority biodiversity features			
Seagrass Mediterranean tapeweed (*Posidonia oceanica*) and slender seagrass (*Cymodocea nodosa*).	Averted loss Knowledge acquisition measures	No	Yes

Marine biodiversity feature	Offsetting options to be considered	Potentially present in AOI Albania	Potentially present in AOI Italy
	Policy based Restoration		

The process for identifying offset requirements for benthic habitat features is currently ongoing as the methodology needs to be more clearly defined and agreed.

Any residual impacts on nesting turtles should be identified through the monitoring proposed during the next nesting season at the Albanian landfall, which if necessary can also inform the offset measures.

For less spatially explicit receptors (e.g. the highly mobile qualifying features of the EBSA) a mechanism to quantify the equivalent investment in regional research will be identified.

7.7 Italy

The three minor impacts to the EU Priority Habitat Pseudo- steppe with grasses and annuals of the Thero-brachypodietea within the 18 m working strip are expected to be fully rehabilitated to annual grassland. Should monitoring of the rehabilitation demonstrate a larger residual impact, additional measures will be considered including the establishment of an offset site adjacent to the impact area. Table 7-16 illustrates the availability of the habitat type in the local area.

Table 7-16 Habitat availability within Italy

Habitat type	ESIA/Field verified	Desktop assessment
– Pseudo- steppe with grasses and annuals of the Thero-brachypodietea	195ha	1870ha

8 DEVELOPMENT OF BIODIVERSITY OFFSET MANAGEMENT PLAN

With the finalisation of the project design and subsequent assessment of impacts to biodiversity features, a more detailed Biodiversity Offset Management Plan[14] (BOMP) will be developed detailing the following:

- biodiversity features to be covered by the offset site(s) and other indirect measures
- proposed pilot studies to establish the likelihood of success for selected biodiversity features.
- site specific management measures to be implemented for biodiversity factors
- key sensitivities to be addressed
- reconciliation of how offset sites meet the project's offset liability
- baseline conditions for offset sites
- budget and timeline (including duration) for implementation
- roles, rights and responsibilities (including reporting)
- indicators of success and corrective/adaptive actions

8.1 Implementation schedule

The following schedule illustrates the indicative timeframes for the identification, implementation and ongoing monitoring of the offset sites. Monitoring of offset sites is proposed annually for the first four years and then biannually for a total of 15 years or until NG/NNL is achieved for each biodiversity feature on a site.

Where on the ground land management activities are being undertaken, additional informal observations can be undertaken providing further evidence of success or opportunities to adapt the management plan. The BOMP is planned to be formalised by Q4 2020.

[14] Comparable to EIB's Offset Implementation and Management Plan

Activity		2018				2019				2020	2021	2022	2023	2024	2025	2030	2035
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4								
Planning	Review of residual impacts																
	Offset Site Identification																
	Development of Site Specific Management Plans																
	Landholder negotiation																
Implementation	Offset Site Baseline Assessment																
	Legal Site Security																
	Formalisation of BOMP																
Monitoring	Annual Monitoring Survey																
	Reporting																
Stakeholder engagement																	

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APPENDIX 1
FIGURES

Figure 2 Greece Areas of Investigation

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4535000

Vouna Evrou SCI

Vouna Evrou SAC

Ethniko Parko Dasous Dadias - Lefkimmis - Soufliou NP

Dasos Dadias - Soufli SPA

Provatonas/Evros River Coastal Plain AOI

Προβατώνας Provatonas

Τυχερό Tychero

Πέπλος Peplos

Αρδάνιο Ardanio

Εγνατία Οδός Egnatia Odos

Εθνική Οδός Αλεξανδρούπολης-Κήπων

Εθνική Οδός Αρδανίων-Ορεστιάδας

TURKIYE TURKEY

Sarıcaali

Kapucu

Saraç Ilyas

İpsala

Hurriyet Caddesi

Έβρος Evros

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Prizren Skopje Blagoevgrad Pazardzhik Plovdiv Haskovo Stara Zagora

THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

Thessaloniki Kozani Ioannina Larisa Lamia

Aegean Sea

GREECE

0 100 200 300 400 500

Albania Italy Greece

TAP base case route centreline

Kilometre points (KP)

Compressor station

Offset Site Area of Investigation

Aquatic Critical Habitat

Terrestrial Critical Habitat

Designated and Protected Area

Natura 2000 Site

National Protected Area

Offset Availability Habitat

Field Assessment

Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter

Rev	Date	Description	Drn	Chk	App
B	21/11/2017	Final Issue	TOD	NOD	CY
A	12/04/2017	First draft	TOD	NOD	CY

TAP Biodiversity Offset Strategy

RSK Trans Adriatic Pipeline

TITLE:
Proposed Offset Areas of Investigation
Greece
CAL00-C5577-640-Y-TRY-0001, Appendix 1
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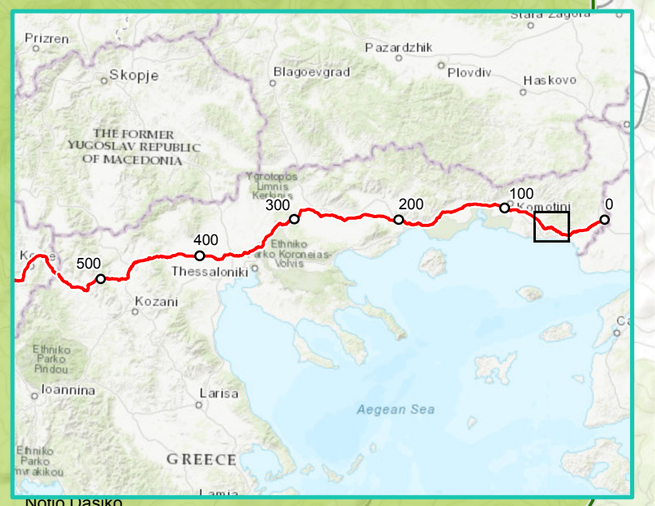
640000 645000 650000 655000 660000

4540000 4535000 4530000 4525000

Μαρώνεια-Σάπες
Maroneia
Sapes
Σάπες
Sapes
Αρσάκειο
Arsakeio
458 m
70
65
60
55
50
45
40
Σύκορράχη
Sykorrachi
Western
Loutros
Forest AOI
Kirki Dimou
Alexandroupolis
Wildlife Refuge
628 m
583 m
336 m
137 m
Δίκελλα
Dikella
Μάκρη
Makri
Νέα Χιλή
Nea Chili
Εξώπολης
Exopolis
Μαίστρος
Maistros
Απαλός
Apalos
Αβας
Avas
Ethniko
Ygrotopiko Parko
Delta Evrou NP
Egnatia Odos
Εγνατία Οδός
E90
A2
33
Notio Dasiko
Symplegma
Evrou SPA



- TAP base case route centreline
- Kilometre points (KP)
- Block valve station
- Camp site
- Pipe yard
- Offset Site Area of Investigation
- Aquatic Critical Habitat
- Terrestrial Critical Habitat

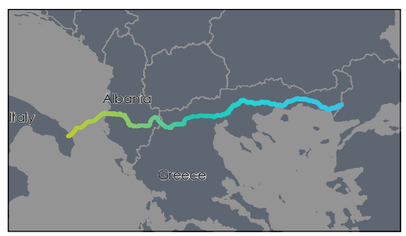
Designated and Protected Area

- Natura 2000 Site
- National Protected Area

Offset Availability Habitat

- Field Assessment
- Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter



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TAP Biodiversity Offset Strategy

RSK Trans Adriatic Pipeline

TITLE:
Proposed Offset Areas of Investigation
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0 1 2
Kilometers
SCALE: 1:75,000 @ A3

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REV 1

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590000
595000
600000
4560000
4555000
4550000

Filalos River AOI

Filalos River AOI

Potamos Kompsatos (Nea Koiti) SAC

Ethniko Parko Anatolikis Makedonias kai Thrakis NP

Limnes Kai Limnothalasses Tis Thrakis - Evryteri P SAC

Limnes Kai Limnothalasses Tis Thrakis - Evryteri Periochi Kai Paraktia Zoni SCI

Limnes Vistonis, Ismaris - Limnothalasses Porto Lagos, Alyki Ptelea, Xirolimni, Karatza SPA

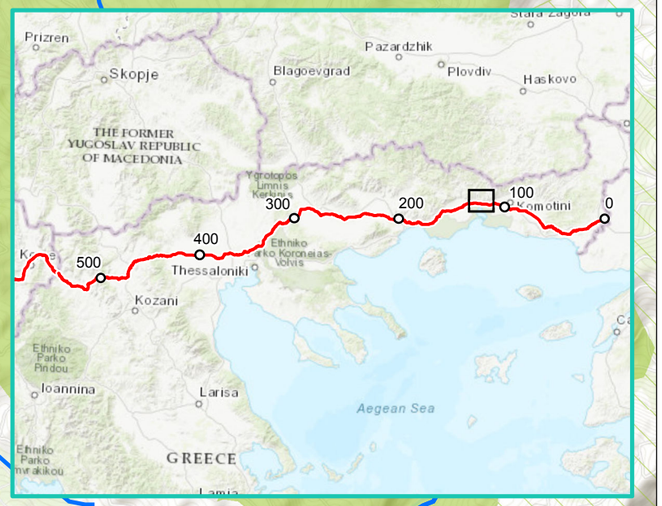
Lake Vistonis, Porto Lagos, Lake Ismaris & Adjoining Lagoons Ramsar Site

Limni Vistonida - Lagous Dimou Avdiron Wildlife Refuge

Kompsatou Dimou Iasmou Wildlife Refuge

Limnes Vistonis, Ismaris - Limnothalasses Porto Lagos, Alyki Ptelea, Xirolimni, Karatza SPA

125
120
115



- TAP base case route centreline
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- Offset Site Area of Investigation
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- Terrestrial Critical Habitat

Designated and Protected Area

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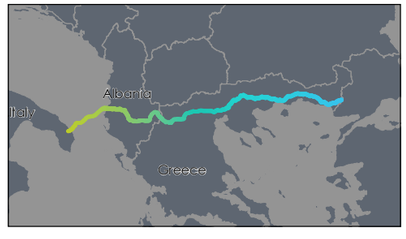
- National Protected Area

Offset Availability Habitat

- Field Assessment
- Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter



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TAP Biodiversity Offset Strategy

RSK Trans Adriatic Pipeline

TITLE:
Proposed Offset Areas of Investigation
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0 1 2
Kilometers
SCALE: 1:50,000 @ A3

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REV 1

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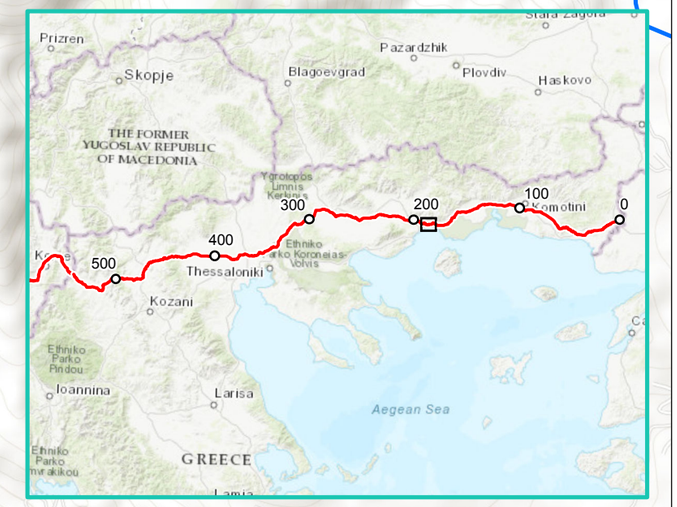
540000

4535000



190

185

Chalkero AOI

Χαλκερό
Chalkero

Agios
Timotheos-Koupia
Wildlife Refuge

Περιγιαλι
Άγιος Τρυφωνας
Perigiali
Agios Tryfonas

Άσπρη Άμμος
Aspri Ammos

Νέα
Καββαλη
Nea
Karvali

Εγνατια Οδος
Εθνικη Οδος Καβαλας-Ξανθης

- TAP base case route centreline
- Kilometre points (KP)
- Block valve station
- Offset Site Area of Investigation
- Aquatic Critical Habitat
- Terrestrial Critical Habitat

Designated and Protected Area

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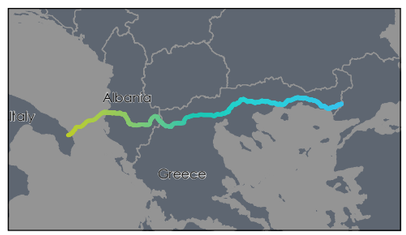
- National Protected Area

Offset Availability Habitat

- Field Assessment
- Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter



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TAP Biodiversity Offset Strategy

RSK

Trans Adriatic Pipeline

TITLE:
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CAL00-C5577-640-Y-TRY-0001, Appendix 1
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0 0.45 0.9
Kilometers
SCALE: 1:25,000 @ A3

N W E S

REV 1

Document Path: P:\08-International\P80661 TAP critical habitats assessment\02 GIS\P80661-046[B].mxd

385000

390000

4510000

Delta Axiou - Loudia - Aliakmona - Alyki Kitrous SPA

Delta Axiou - Loudia - Aliakmona - Evryteri Periochi - Axioupoli SCI

Delta Axiou - Loudia - Aliakmona - Evryteri Perioc SAC

Axios River

Axios River

Ethniko Parko Gallikou, Axiou, Loudia, Aliakmona, Alykis Kitrous, Limnothalassas Kalochoriou NP

375

Ελεούσα
Eleousa

Βαλτοχώρι
Valtochori

Κάτω Γέφυρα
Kato Gefyra

Γέφυρα
Gefyra

Βουλγαροκτόνου

Θεσσαλονίκης-Εδεσσας

Thessaloniki-Edessas

E86

111m

107 m

28 m

58 m

Prizren
Skopje
Blagoevgrad
Pazardzhik
Plovdiv
Haskovo
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
Thessaloniki
Kozani
Ioannina
Larisa
Aegean Sea
GREECE
0
100
200
300
400
500

TAP base case route centreline

Kilometre points (KP)

Pipe yard

Offset Site Area of Investigation

Aquatic Critical Habitat

Terrestrial Critical Habitat

Designated and Protected Area

Natura 2000 Site

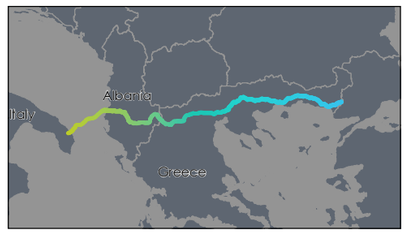
National Protected Area

Offset Availability Habitat

Field Assessment

Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter



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TAP Biodiversity Offset Strategy

RSK

Trans Adriatic Pipeline

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0 0.45 0.9
Kilometers
SCALE: 1:25,000 @ A3

N W E S

REV 1

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320000 325000 330000 335000

4510000 4505000 4500000

Flamouria - Grammatikou
Dimou Edessas
Wildlife Refuge

Ores
Vermio
AOI

Oros
Vermio
SCI

Dasos Dimou Naousas kai
Dason Seliou - Tsanakli kai
Giannakochoriou Wildlife Refuge

Korona
(Mesovouniou)
Wildlife Refuge

Κάτω Γραμματικό
Kato Grammatiko

Άνω Γραμματικό
Ano Grammatiko

Ροδοχώρι
Rodochori

ΠΕΛΛΑ-PELLA
ΗΜΑΘΙΑ-IMATHIA
ΚΕΝΤΡΙΚΗ ΜΑΚΕΔΟΝΙΑ

445 440 450

Prizren
Skopje
Pazardzhik
Blagoevgrad
Plovdiv
Haskovo
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
Thessaloniki
Kozani
Ioannina
Larisa
Aegean Sea
GREECE
300 200 100 0 400 500

TAP base case route centreline
Kilometre points (KP)
Block valve station
Offset Site Area of Investigation
Aquatic Critical Habitat
Terrestrial Critical Habitat

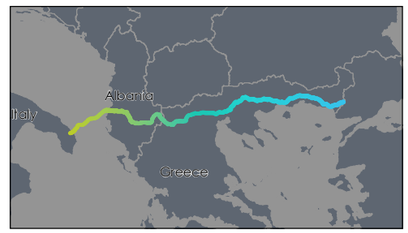
Designated and Protected Area

Natura 2000 Site
National Protected Area

Offset Availability Habitat

Field Assessment
Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter



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TAP Biodiversity Offset Strategy

RSK Trans Adriatic Pipeline

TITLE:
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Greece
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0 1 2
Kilometers
SCALE: 1:50,000 @ A3

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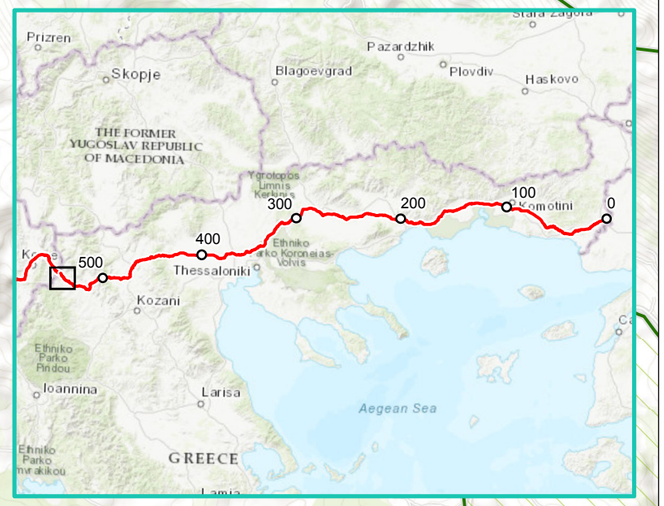
4495000 4490000 4485000



Trans-boundary AOI

550 545 540

Limni-Vouno Kastorias Wildlife Refuge

SHQIPERIA ALBANIA
ΕΛΛΑΔΑ GREECE

Καστράκι Kastraki
Πολυάνεμο Polyanemo
Πτερία Pteria
Διποταμία Dipotamia
Ακρίτες Akrites
Χιονάτα Chionata
Καλοχώρι Kalochori

PY

TAP base case route centreline
Kilometre points (KP)
Compressor station
Pipe yard
Offset Site Area of Investigation
Aquatic Critical Habitat
Terrestrial Critical Habitat

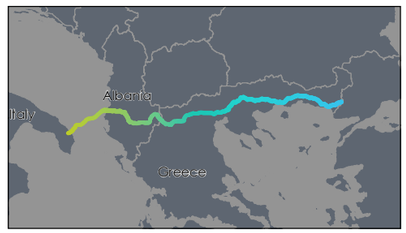
Designated and Protected Area

Natura 2000 Site
National Protected Area

Offset Availability Habitat

Field Assessment
Desktop Assessment

Coordinate System: Greek Grid
Projection: Transverse Mercator
Datum: GGRS 1987
Units: Meter



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TAP Biodiversity Offset Strategy

RSK Trans Adriatic Pipeline

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0 1 2
Kilometers
SCALE: 1:50,000 @ A3

N W E S

REV 1

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Figure 3 Albania Areas of Investigation

450000
455000
460000
4490000
4485000
4480000
200
150
100
50
0
85
80
75
70
Fier
Lushnje
Vlora
Korce
Elbasan
Ohrid
Lake Prespa
ALBANIA
GREECE
BERAT
KORCE
Staravecka
Trnova
Ballabanova
1932 m
1756 m
2342 m
2135 m

TAP base case route centreline
Kilometre points (KP)
Block valve station
Offset Site Area of Investigation
Aquatic Critical Habitat
Terrestrial Critical Habitat

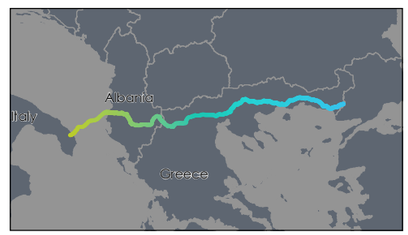
Designated and Protected Area

Natura 2000 Site (Emerald Site)
National Protected Area

Offset Availability Habitat

Field Assessment
Desktop Assessment

Coordinate System: WGS 1984 UTM Zone 34N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



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A	12/04/2017	First draft	TOD	NOD	CY

TAP Biodiversity Offset Strategy

RSK
Trans Adriatic Pipeline

TITLE:
Proposed Offset Areas of Investigation
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0 1 2
Kilometers
SCALE: 1:50,000 @ A3

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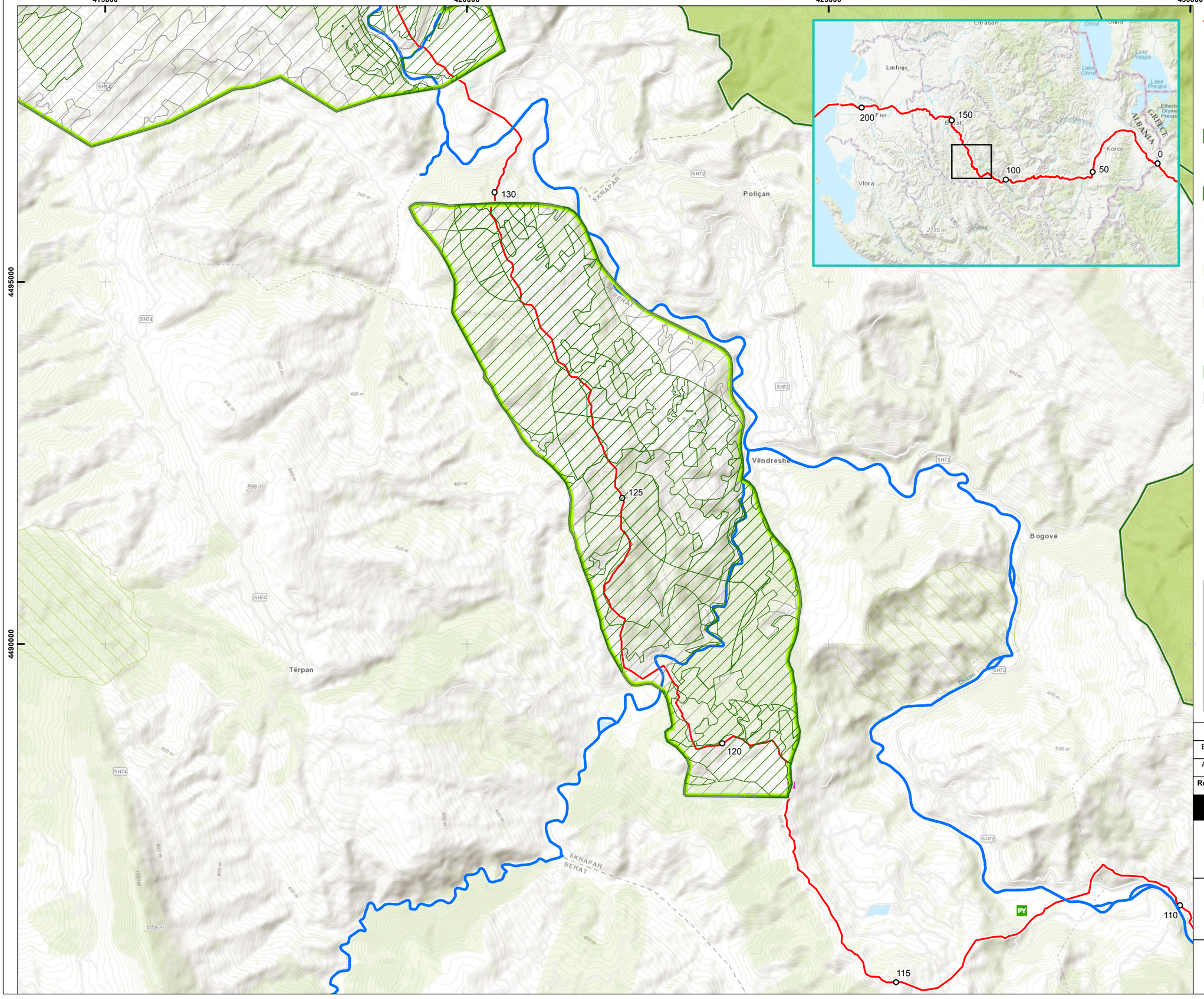

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TAP Biodiversity Offset Strategy

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Trans Adriatic Pipeline

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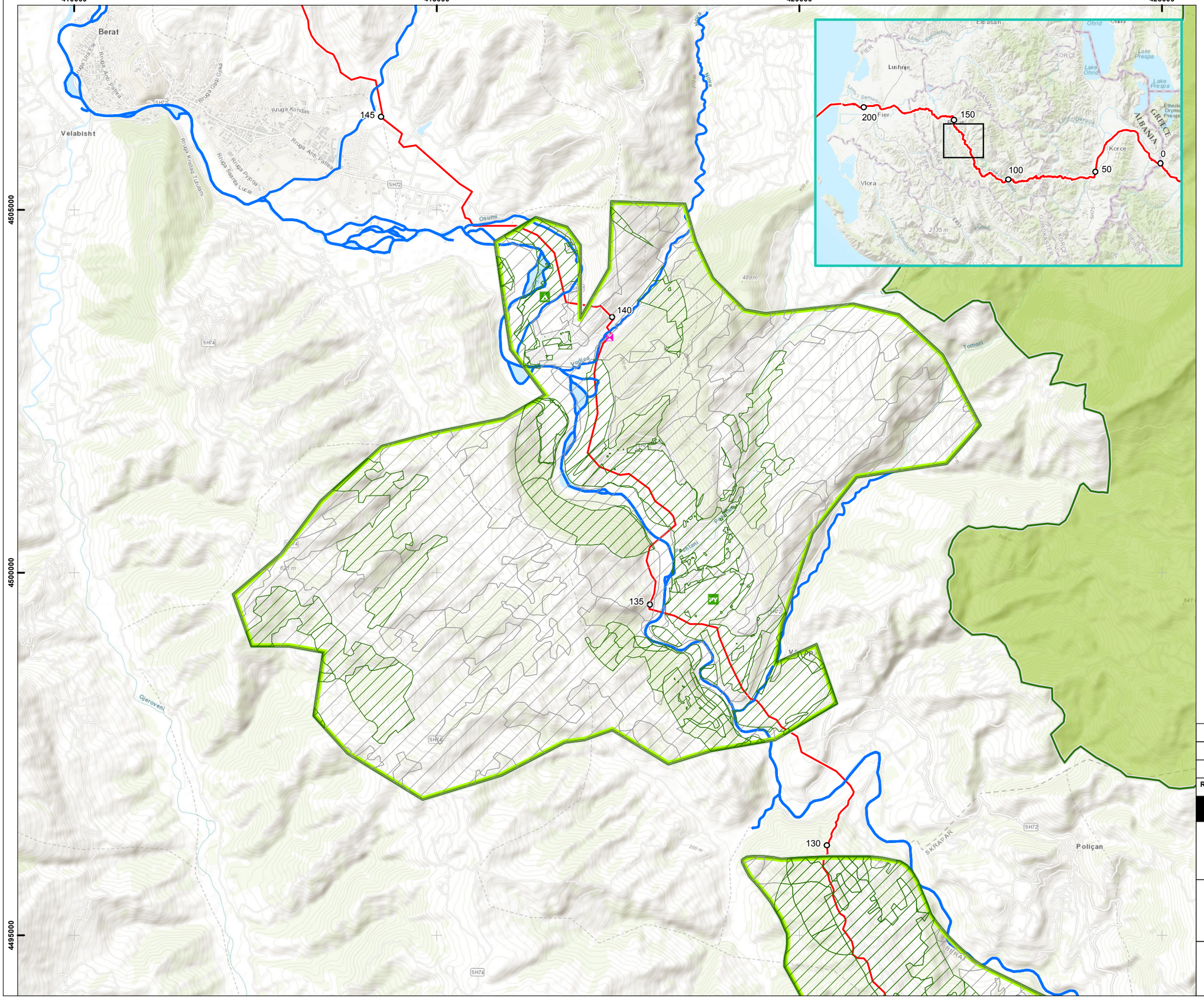
4505000 4500000 4495000



- TAP base case route centreline
- Kilometre points (KP)
- Block valve station
- Camp site
- Pipe yard
- Offset Site Area of Investigation
- Aquatic Critical Habitat
- Terrestrial Critical Habitat

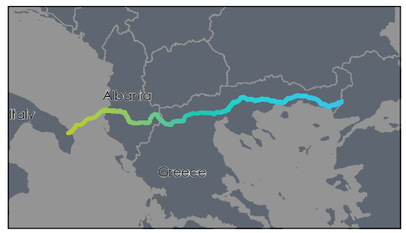
Designated and Protected Area

- Natura 2000 Site (Emerald Site)
- National Protected Area

Offset Availability Habitat

- Field Assessment
- Desktop Assessment

Coordinate System: WGS 1984 UTM Zone 34N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



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TAP Biodiversity Offset Strategy

RSK Trans Adriatic Pipeline

TITLE:
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0 1 2
Kilometers
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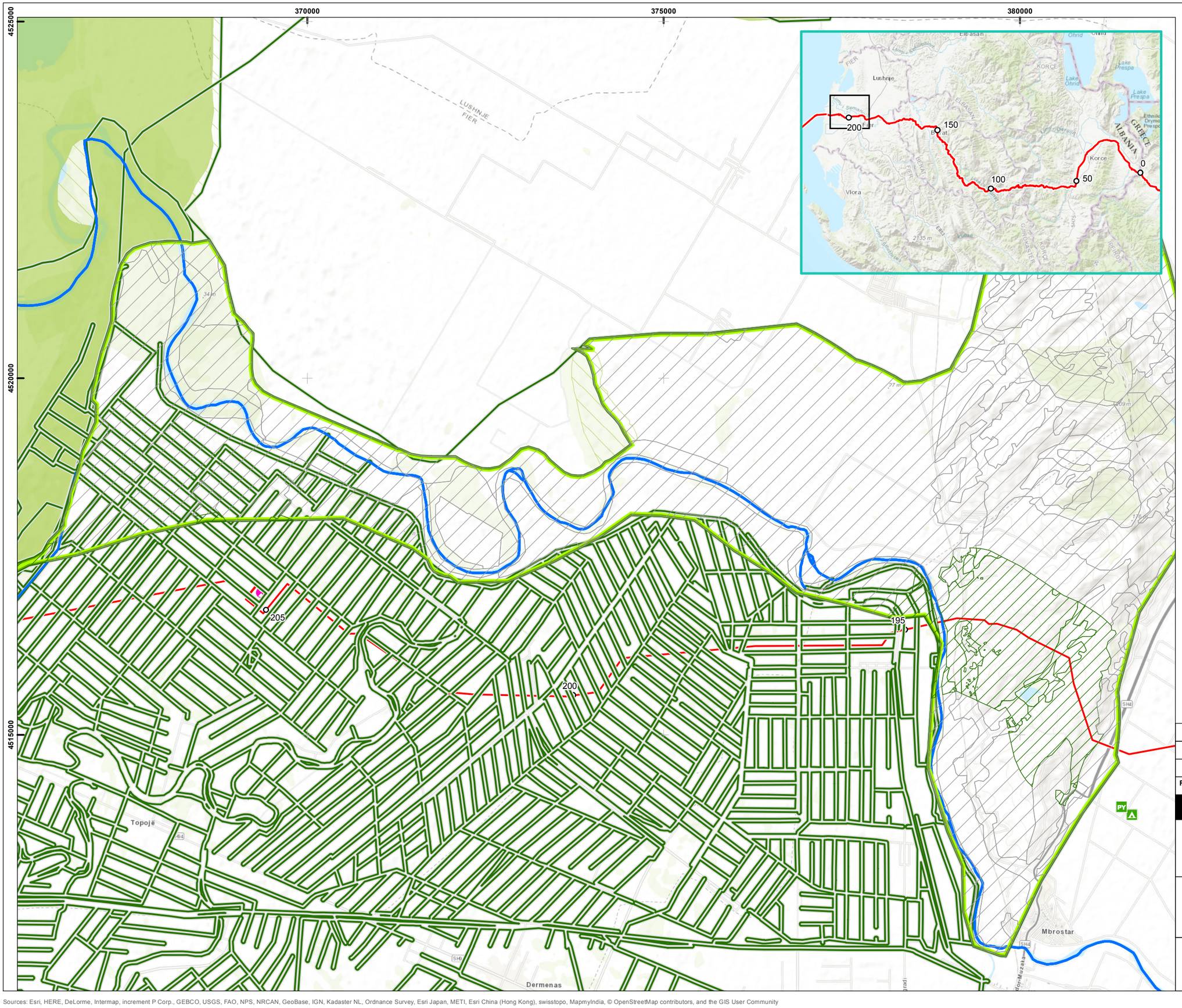


TAP base case route centreline

Kilometre points (KP)

Compressor station

Camp site

Pipe yard

Offset Site Area of Investigation

Aquatic Critical Habitat

Terrestrial Critical Habitat

Designated and Protected Area

Natura 2000 Site (Emerald Site)

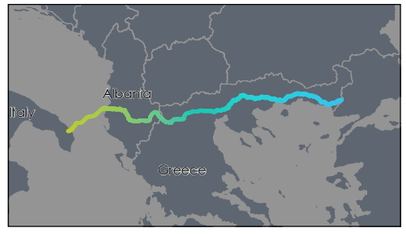
National Protected

Offset Availability Habitat

Field Assessment

Desktop Assessment

Coordinate System: WGS 1984 UTM Zone 34N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



Rev	Date	Description	Drn	Chk	App
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A	12/04/2017	First draft	TOD	NOD	CY

TAP Biodiversity Offset Strategy

RSK

Trans Adriatic Pipeline

TITLE:
Proposed Offset Areas of Investigation
Albania
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0 1 2
Kilometers
SCALE: 1:50,000 @ A3

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REV 1

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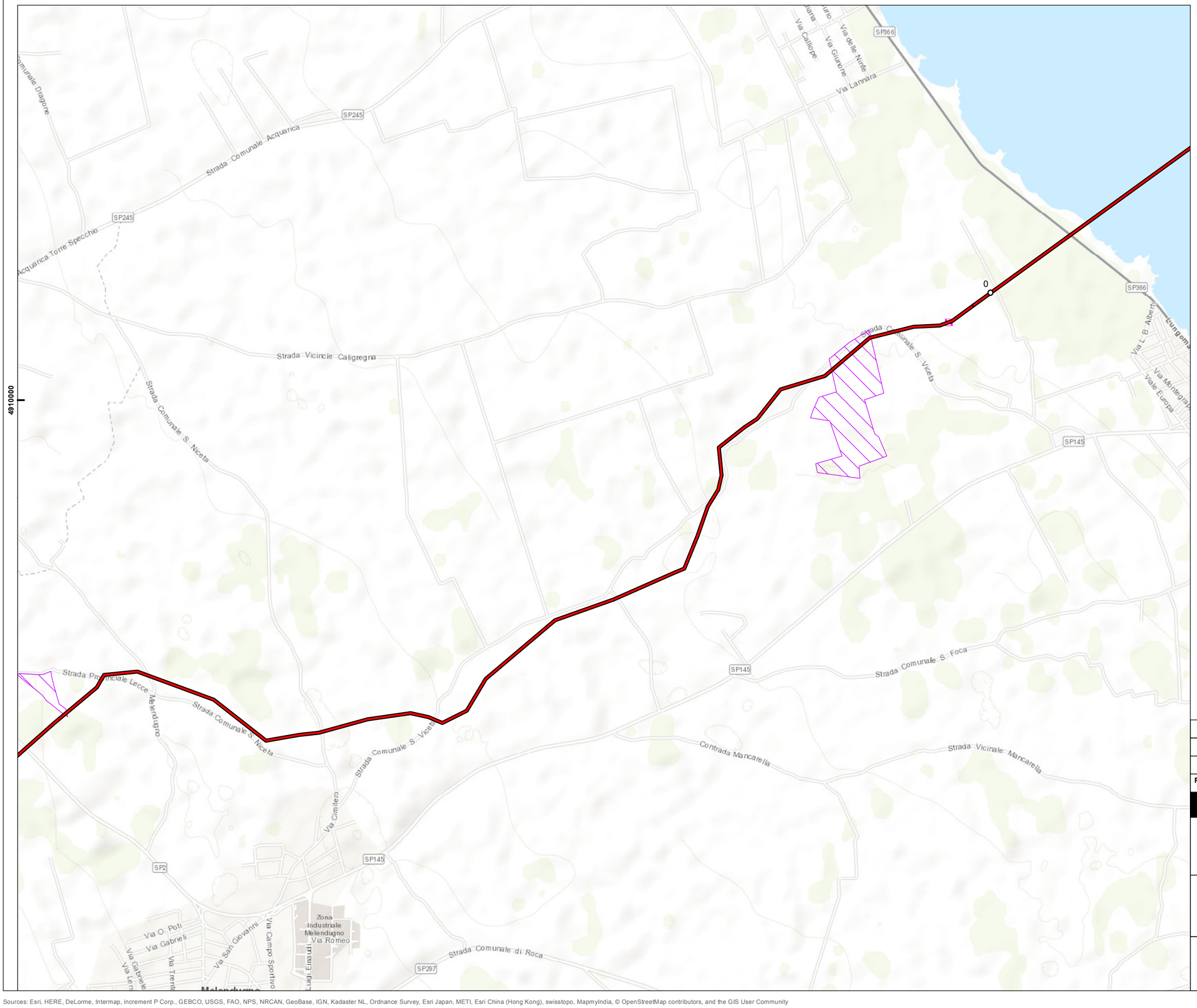
Figure 4 Italy Areas of Investigation



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0	12/12/2016	Final Issue	TOD	NOD	CY
B	02/11/2016	Second draft	TOD	NOD	CY
A	01/08/2016	First draft	TOD	NOD	CY

TAP Biodiversity Offset Strategy

RSK

Trans Adriatic Pipeline

TITLE:

Proposed Offset Area - Italy
CAL00-C5577-640-Y-TRY-0001, Appendix 1
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0 500 1,000
Meters
SCALE: 1:25,000 @ A3

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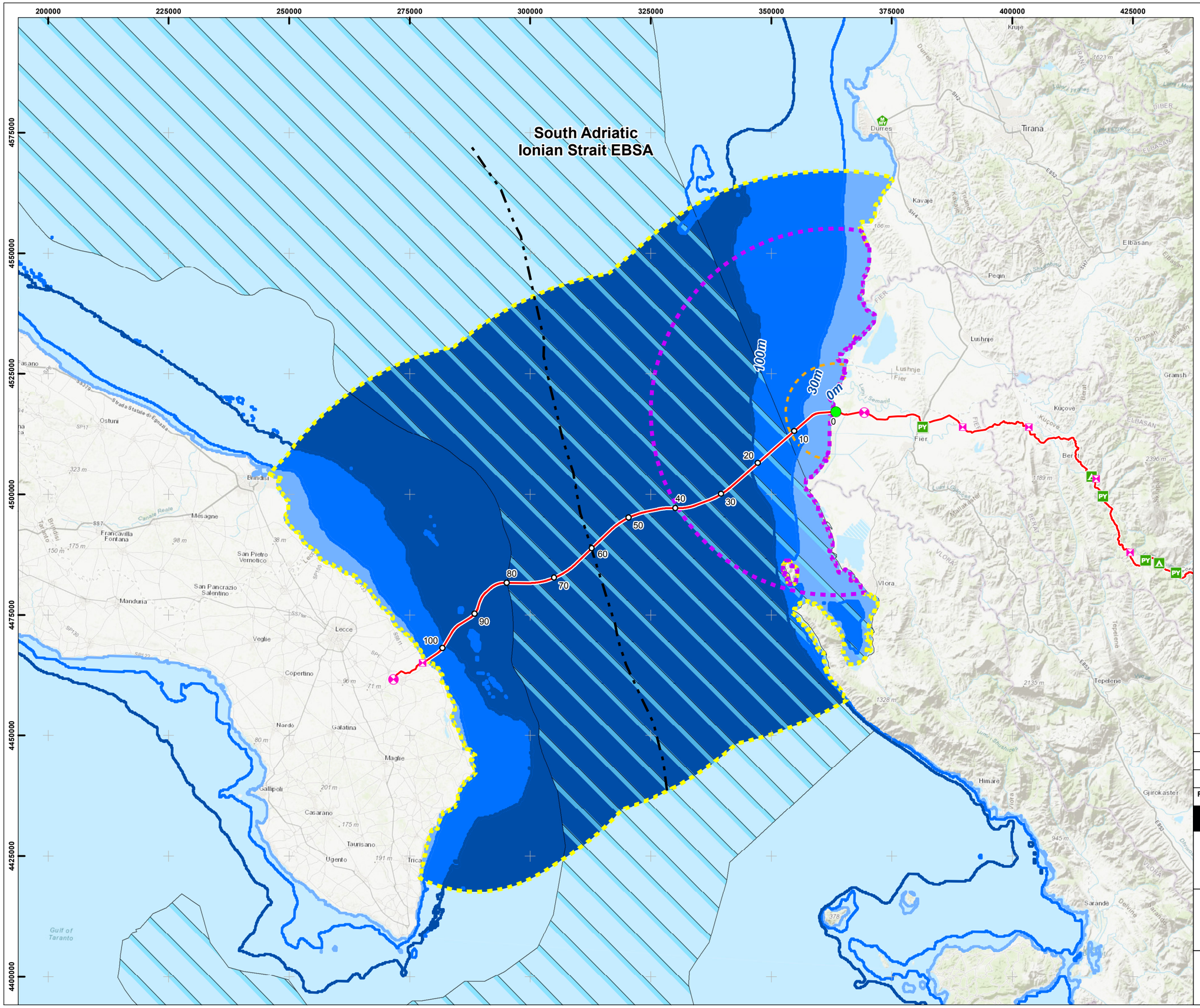
REV 1

Document Path: P:\08-International\P80661 TAP critical habitats assessment\02 GIS\P80661-062[A].mxd

Figure 5 Marine DMU Mapping

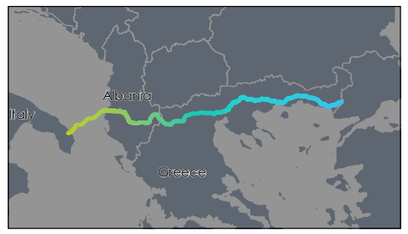


TAP base case route centreline
Kilometre points (KP)
Compressor station
Block valve station
Camp site
Pipe yard
Main marshalling yard
Landfall Site
Albania-Italy Boundary Agreement

Marine DMU

Coast DMU (0-30m Depth)
Nearshore DMU (30-100m Depth)
Offshore DMU (>100m Depth)
Sediment Plume - 10km Buffer
Seascape - 50km Buffer
Underwater Noise - 38km Buffer
Ecologically or biologically sensitive area (EBSA)

Coordinate System: WGS 1984 UTM Zone 34N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



Rev	Date	Description	Drn	Chk	App
1	02/02/2016	Final Issue	TOD	NOD	CY
0	12/12/2016	Final Issue	TOD	NOD	CY
A	01/08/2016	First draft	TOD	NOD	CY

TAP Biodiversity Offsets Strategy

RSK Trans Adriatic Pipeline

TITLE:

Marine DMUs
CAL00-C5577-640-Y-TRY-0001_Appendix 1
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Kilometers
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