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Appendix 9

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APPENDIX 9
BIORESTORATION MONITORING PLAN

Purpose of this document

The purpose of this Biorestoration Monitoring Plan is to:

- Outline post-construction biorestoration monitoring objectives and targets to demonstrate no net loss (NNL) of priority biodiversity features (PBFs) and net gain (NG) of critical habitats (CH).
- Outline monitoring methodologies and principles for PBFs and CH which will be developed in the Level 3 site files.

The information provided in this plan provides an overview of the biorestoration monitoring strategies, objectives and targets for CH and PBFs. Detailed biorestoration monitoring plans will be developed by the TAP Biodiversity Advisor for each individual entry in the REIR and included in the corresponding Level 3 site file.

TAP will ensure the implementation of post-construction monitoring at all CH and PBFs in accordance with the outline requirements of this plan.

TAP will manage and maintain all post construction monitoring data within the Level 3 site files for each REIR entry to ensure NNL of PBFs and NG of CH.

Introduction

The objectives of the biorestoration monitoring plan are to ensure appropriate monitoring regimes are in place to measure the success of biorestoration and are further streamlined with the guidelines suggested by *Richardson & al (2017)*[1] summarised in Table 1.

Table 1

Considerations to take into account when discussing indications of pipeline disturbance/recovery (*Richardson & al 2017)*[2]	**Application in the TAP biorestoration monitoring plan**
Emphasis on data-driven biodiversity priorities in diverse ecosystems along the linear infrastructure.	Species/habitats that are of conservation interest have been set as priority since the ESIA commencement. Data-driven information collection focuses on categorical (i.e. habitat types), binary (i.e. presence/absence of breeding sites) or

[1] Richardson M. & al (2017): A review of the impact of pipelines and power lines on biodiversity and strategies for mitigation Biodivers. Conserv. 26: 1801 - 1815

[2] Richardson M. & al (2017), as above

Considerations to take into account when discussing indications of pipeline disturbance/recovery (*Richardson & al 2017)*[2]	**Application in the TAP biorestoration monitoring plan**
	continuous (i.e. % plant cover at the Braun - Blanquet scale) variables. There is data input from almost all non-agricultural areas along the TAP route.
Determine the levels of impact (population? community?)	Local populations are considered for species, community types are considered for habitats.
Adjust for the geographic scale of the bioremediation plan.	The potentially impacted area comprises habitat 'parcels' (of relatively small size) at approximately the same latitude but different longitude along the TAP RoW. This forms the geographic basis of the sampling scheme.
Cost, safety, access and the time needed to collect useful data should be taken into account.	Health and Safety Plans are compiled for every field survey. Taxa of ambiguous/little known taxonomy (i.e. lichens) or taxa which are not readily distinguished in the field (e.g. several insect groups) have been considered as 'inadequate' to provide useful data and thus are not assessed for the TAP bioremediation plan.
Reevaluate indications of disturbance and recovery after a continuous input of appropriate data.	TAP has compiled an extensive ecological data set since 2011 and this allows for continuous screening of information.

The general objectives of all TAP biorestoration monitoring activities are:

- VEGETATION: monitor the establishment of preconstruction vegetation along the impacted RoW after taking into account the pre-construction status, natural dynamics and *in-situ* landscape characteristics .
- LARGE CARNIVORES: *Canis aureus*, *Canis lupus*, *Ursus arctos and Felis silvestris* - collect information on whether their breeding and foraging patterns of movement in the area have been disturbed by project-related activities; establish breeding success of animals whose ranges are bisected by the TAP alignment.
- BIRDS: assess the status of recorded taxa of conservation interest within the TAP corridor at a post-construction stage.
- REPTILES – AMPHIBIANS: monitor to provide evidence whether at a post-construction stage patterns of fine-grained distribution in areas along the RoW resemble those at similar control sites elsewhere in the vicinity of the project area.
- FRESHWATER FISH AND MACRO INVERTEBRATES: monitor to ensure that presence/absence data and relative proportions of catches in crossing points are the same to the ones recorded by means of similar tools in the pre-construction period or in scientific literature, otherwise consider offset measures.

KPIs

To assess the status of habitat types and animal/flora species that comprise CH and PBFs, outline Key Performance Indicators (KPIs)[3] have been developed to monitor the success of biorestoration. These will be developed further for each REIR entry and included in the monitoring plan for each Level 3 site file.

Where KPIs are not achieved, additional measures and/or offsets will be implemented to ensure NNL of PBFs and NG of CH.

[3] Key Performance Indicator: a measureable variable that demonstrates how effectively an objective is dealt with.

Table 2: Riparian habitat monitoring plan

RIPARIAN HABITATS: annual achievement criteria **All pre-construction locations** **Habitat codes: 32B0, 91E0, 92A0, 92C0, 92D0**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year ... achievement criteria**	**Period**	**Frequency**
At least QBR factors 3 and 4 should be the same as in the year before construction (i.e. native species should be recorded as seedlings). If not, reinstate with dominant riparian tree species of the preconstruction habitat.	As in Year 1. In addition, QBR factor 2 should be increasing with respect to Year 1 or projected to converge with the pre-construction status. If not, implement reinstatement as in Year 1.	The QBR should be the same or better than that of the preconstruction status. If no full data are available, compare with satellite/aerial photos for factors 1 and 4 at a preconstruction level.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.

THE PRINCIPAL KPI: QBR

TAP has adopted the Spanish index of riparian quality (QBR) as the principal Key Performance Indicator (KPI) to assess the status of riparian habitats (either forested or non-forested) at crossing points and the potential need for restoration. Developed[4] in Spain, the index has been tested in Greece[5] and shown to provide an efficient and objective concise assessment of the status of a riparian site, irrespective of regional differences in plant communities, basin characteristics or observer experience. Other major advantages of this index are:

1) Focused on riparian vegetation, thus is not prone to day-to-day changes in the stream channel.
2) Quantitative data are easy to measure in the field.
3) Ideal for collective use.

The index is based on four components of riparian habitat:

a) FACTOR 1 - total riparian vegetation cover; the % of cover of any kind of plant except annuals is measured and connectivity also considered.
b) FACTOR 2 - cover structure: the % of cover due to forest or shrubs or low lying vegetation.
c) FACTOR 3 - cover quality: the geomorphological type of stream is established and number of native tree species counted.
d) FACTOR 4 - channel alterations: the presence of fluvial terraces or other man-made structures is taken into account.

The index ranges from 0 to 100: the higher the number, the better the quality of the riparian habitat**.**

[4] Munné A. & al (2003): A simple field method for assessing the ecological quality of riparian habitat in rivers and streams: QBR index Aquatic Conserv: Mar. Freshw. Ecosyst. 13: 147ic Conserv:
[5] Chatzinikolaou Y. & al (2011): River riparian zone assessment using a rapid site-based index in Greece Fresenius Environmental Bulletin 20: 296 – 302

Table 3: Grassland monitoring plan

GRASSLAND – annual achievement criteria **All preconstruction locations** **Habitat codes 62A0, 6290, 6420, 6510, 6250**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	Period	Frequency
No statistical difference between quadrats sampled next to the RoW (outside reinstated areas) compared to quadrat sites of the same habitat type at control sites. If there is a statistical difference, implement remediation practices (e.g. allow/inhibit sheep grazing) next to the RoW. The practices should be defined in agreement	As in Year 1.	No statistical difference between quadrats sampled next to the RoW / reinstated areas compared to quadrat site of the same habitat type at control sites.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.

GRASSLAND – annual achievement criteria **All preconstruction locations** **Habitat codes 62A0, 6290, 6420, 6510, 6250**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	Period	Frequency
with the vegetation profile of the quadrats at the time of the survey.				

The KPI is the statistical distance (difference) between:

- Vegetation quadrats at random points but next to the RoW.
- Vegetation quadrats at control sites randomly selected at adjacent habitat strips not impacted by the project (control habitat type).

  The null hypothesis is that the TAP project has raised no impact outside the working strip, so quadrats outside the working strip should cluster together with quadrats at control sites i.e. that between-quadrats variability should show no statistical difference with within-quadrats variability.

This statistical distance will be calculated by multivariate statistics techniques (e.g. MANOVA)[6], the exact type to be determined in accordance with the site-specific monitoring plan.

[6] Gotelli N.J. & A.M. Ellison (2004): A primer of ecological statistics, Sinauer

GRASSLAND – annual achievement criteria **All preconstruction locations** **Habitat codes 62A0, 6290, 6420, 6510, 6250**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	Period	Frequency
METHODOLOGICAL ISSUES: please refer to Table 4.				

Table 4: Forest and scrubland monitoring plan

FOREST AND SCRUBLAND – annual achievement criteria **All pre-construction locations** **Habitat codes: 91MO, 92D0, 5160, 9110, 9130, 9170, 9340, 9530, 9540, 2260, 5110, 5130, 5210, 5340, 5350.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No statistical difference between quadrats sampled next to the RoW/ (outside reinstated areas) compared to quadrat sites of the same habitat type at control locations. If there is difference, implement remediation practices (e.g. afforestation) next to the RoW. The practices should be defined in agreement	As in Year 1.	No statistical difference between quadrats sampled next to the ROW (outside reinstated areas) compared to quadrat sites of the same habitat type at control locations.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.

FOREST AND SCRUBLAND – annual achievement criteria **All pre-construction locations** **Habitat codes: 91MO, 92D0, 5160, 9110, 9130, 9170, 9340, 9530, 9540, 2260, 5110, 5130, 5210, 5340, 5350.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
with the vegetation profile of the quadrats at the time of the survey.				
The KPI is the statistical distance (difference) between: • Vegetation quadrats at random points but next to the RoW. • Vegetation quadrats at control sites randomly selected at adjacent habitat strips not impacted by the project. The null hypothesis is that the TAP project has raised no impact outside the working strip so quadrats there should cluster together with quadrats at control sites i.e. that between-quadrats variability should show no statistical difference with within-quadrats variability. This statistical distance will be calculated by means of multivariate statistics techniques (e.g. MANOVA)[7], the exact type of which will be decided in accordance with the field survey plan.				

[7] Gotelli N.J. & A.M. Ellison (2004): A primer of ecological statistics, Sinauer

FOREST AND SCRUBLAND – annual achievement criteria **All pre-construction locations** **Habitat codes: 91MO, 92D0, 5160, 9110, 9130, 9170, 9340, 9530, 9540, 2260, 5110, 5130, 5210, 5340, 5350.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
METHODOLOGICAL ISSUES: This indicator is based on setting a 'next-to-the-RoW' zone versus a 'control' zone, both approximately in parallel to the RoW and both comprising the same habitat type with no other confounding factors. In theory, the principal difference between the two zones is only distance from the impacted RoW but in practice there may be other factors that influence the results: for example, the 'control' zone might be further away from the RoW yet closer to a mountain road that may also have an effect on several vegetation parameters. Alternatively, the topography of either zone might affect the micro-habitat irrespective of whether the RoW stands close to the sampling point or further away: i.e. sites that stand on a ridge are likely to have different floristic composition than sites within depressions. It is anticipated that candidate sites where such confounding variables prevail may be identified by desktop tools before the initiation of the field surveys. Within the rest of the areas, it is expected that using as guidelines the results of similar published studies on road effects would be helpful. Thus, setting a 'next-to-the-ROW' zone at approx. 20-30m from the edge of the RoW and a 'control' zone at approx. 50-200m from the RoW would probably be a realistic option: a study[8] on the effect of a road on Mediterranean forests of *Quercus cerris*, *Quercus pubescens* and *Fagus sylvatica* showed that the distance from the road edge that has the maximum difference in species richness is 0-20m. From then up to the 200m				

[8] Marcantonio M. & al (2013): Biodiversity, roads and landscape fragmentation: two Mediterranean cases Appl. Geogr.42: 63-72

FOREST AND SCRUBLAND – annual achievement criteria **All pre-construction locations** **Habitat codes: 91MO, 92D0, 5160, 9110, 9130, 9170, 9340, 9530, 9540, 2260, 5110, 5130, 5210, 5340, 5350.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
threshold the species richness changes only slightly; species evenness even after taking into account rare species is not really affected by distance from the road. Similar results are also reported[9] from pine and laurel forests in the Canary Islands which were almost free from alien species within 50m from the asphalt though alien species seemed to penetrate more in scrublands. In addition to this data, it is anticipated that field surveys will be repeated at exactly the same sampling points outside the RoW where pre-construction vegetation data from 2015 had been collected; there it is of interest to explore by 'repeated-measures' tools whether vegetation has actually changed after construction or not with emphasis on the effect of distance from the RoW. The number of quadrats to employ per km of pipeline is currently an open issue; it is anticipated that this will be calculated as soon as the first field data are available. Then, margins of errors may be considered and used as a guideline to gauge the appropriate sample size. Nevertheless, it is envisaged that for several habitat types the optimal sample size (i.e. the optimal minimum number of quadrats per zone to comply with certain margin of errors) will not be achievable. Either because these habitats within the corridor are of very small size (e.g. habitat types 5210, 5160) or are prone to being affected by confounding factors (i.e. stand next to roads and/or cultivations), such habitats				

[9] Otto R. & al (2014): Road Edge Effect and Elevation Patterns of Native and Alien Plants on an Oceanic Island (Tenerife, Canary Islands) Folia Geobot. 49:65–82

FOREST AND SCRUBLAND – annual achievement criteria **All pre-construction locations** **Habitat codes: 91MO, 92D0, 5160, 9110, 9130, 9170, 9340, 9530, 9540, 2260, 5110, 5130, 5210, 5340, 5350.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
are likely to be excluded from considerations of optimal sample size and be assessed in rough. The recommended variable to sample per quadrat is Braun-Blanqeut abundance / % cover. This data can serve as a baseline to estimate species richness as well as other composite variables such as species evenness and the taxonomic distinctness index which may be used for more detailed analysis[10].				

[10] *Marcantonio M. & al (2013),* as above

Table 5: Rocky outcrops monitoring plan

Rocky outcrops habitats – annual achievement criteria **All pre-construction locations** **8210, 8220**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
% similarity of habitat area at a post-construction level with its status at a pre-construction level as assessed by satellite photos (% to be defined in site-specific KPIs).	As in Year 1.	% similarity of habitat area at a post-construction level with its status at a pre-construction level as assessed by satellite photos. The post-construction areas (within the corridor) should be at least of the same coverage as at the pre-construction level.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
The KPI is % similarity of habitat area at a post-construction level with its status at a pre-construction level as assessed by satellite photos. Methodology: please refer to Table 4.				

Table 6: Beaches, dunes and salt marshes monitoring plan

BEACHES, DUNES AND SALTMARSHES – annual achievement criteria **All pre-construction locations** **Habitat codes: 2110, 2270, 1420**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No statistical difference between quadrats sampled next to the ROW/ (outside reinstated areas) compared to quadrat sites of the same habitat type at control locations. If there is difference, implement remediation practices (e.g. afforestation) next to the RoW. The practices should be defined in agreement with the vegetation	As in Year 1.	No statistical difference between quadrats sampled next to the RoW (outside reinstated areas) compared to quadrat sites of the same habitat type at control locations.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.

BEACHES, DUNES AND SALTMARSHES – annual achievement criteria **All pre-construction locations** **Habitat codes: 2110, 2270, 1420**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
profile of the quadrats at the time of the survey.				
The KPI is the statistical distance (difference) between: • Vegetation quadrats at random points but next to the RoW. • Vegetation quadrats at control sites randomly selected at adjacent habitat strips not impacted by the project. The null hypothesis is that the TAP project has raised no impact outside the working strip so quadrats there should cluster together with quadrats at control sites, i.e. that between-quadrats variability should show no statistical difference the same with within-quadrats variability. This statistical distance will be calculated using multivariate statistics techniques (e.g. MANOVA)[11], the exact type to be decided in accordance with the field survey plan. METHODOLOGICAL ISSUES: Please refer to Table 4.				

[11] Gotelli N.J. & A.M. Ellison (2004): A primer of ecological statistics, Sinauer

Table 7: Reed beds monitoring plan

Reed beds – annual achievement criteria **All pre-construction locations** **Habitat codes: 72A0**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
1.5m annual recolonisation rate.	As in Year 1.	No statistical difference between quadrats sampled next to the RoW (outside reinstated areas) compared to quadrat sites of the same habitat type at control locations.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
The KPI is the statistical distance (difference) between: • Vegetation quadrats at random points but next to the RoW. • Vegetation quadrats at control sites randomly selected at adjacent habitat strips not impacted by the project. The null hypothesis is that the TAP project has raised no impact outside the working strip so quadrats there should cluster together with quadrats at control sites, i.e. that between-quadrats variability should be the same with within-quadrats variability.				

This statistical distance will be calculated by using multivariate statistics techniques (e.g. MANOVA)[12], the exact type to be decided in accordance with the field survey plan.

METHODOLOGICAL ISSUES: please refer to Table 4.

[12] Gotelli N.J. & A.M. Ellison (2004): A primer of ecological statistics, Sinauer

Table 8: Invasive flora monitoring plan

Invasive flora species – annual achievement criteria **All pre-construction locations.** **Natural habitats.**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No increase or spread of invasive flora species compared to pre-construction levels.	As in Year 1.	No increase or spread of invasive flora species compared to pre-construction levels.	Annually once, any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
The KPI is the statistical distance (difference) between: • Invasive species presence pre-construction. • Invasive species presence post-construction.				

Table 9: Rare and endemic vascular plants monitoring plan

Rare and endemic vascular plants – annual achievement criteria **All DMUs as per Appendix 5 of the EMP**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No significant difference between pre- and post-construction plant numbers or densities at pre-recorded sites in DMU.	No significant difference between pre- and post-construction plant numbers or densities at pre-recorded sites in DMU. The following years' achievement criteria dependent on results of Year 2.	No significant difference between pre and post construction plant numbers or densities at pre-recorded sites in DMU.	Any time between May and July.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
The KPI is % similarity of species distribution at a post-construction level with its status at a pre-construction level.				

Table 10: Brown Bear monitoring plan

Brown Bear – annual achievement criteria **All DMUs as per Appendix 2.**			**Monitoring**	
Post-construction Year 1 Achievement criteria	**Post-construction Year 2 Achievement criteria**	**Post-construction Year 5 Achievement criteria**	**Period**	**Frequency**
Post-construction data should have the same spatial configuration within the TAP corridor as reported in the pre-construction level.	As in Year 1.	No significant difference between pre- and post-construction habitat suitability for the bear in the context of the DMU.	TBC - dependent on DMU characteristics, i.e. foraging, commuting, denning.	Two visits annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: comparison of the habitat suitability data at the preconstruction level with those at the post-construction level. (see also Table 12)				

Table 11: Wolf monitoring plan

Wolf (Canis lupus) – Annual Achievement Criteria **All DMUs as per Appendix 2.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
Post-construction data should have the same spatial configuration within the TAP corridor as reported in the pre-construction level.	As in Year 1.	No significant difference between pre- and post-construction habitat suitability for the wolf in the context of the DMU.	TBC - dependent on DMU characteristics, i.e. foraging, commuting, denning.	Two visits annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: comparison of the habitat suitability data at the pre-construction level with those at the post-construction level. (see also Table 12)				

Table 12: Large carnivores (*Canis lupus*, *Ursus arctos*) monitoring methodology

Field method and/or analysis	Description and enforcement period	Scope & Benefits
Survey point evaluation	Field sample areas over and close to TAP alignment to assess attributes related to LC habitat suitability. Fast method, facilitated by an extended forest road network.	• On-site evaluation of habitat suitability models. • Expert judgment on habitat characterisation (home site area, foraging area, rendezvous site area, resting area, movement corridor) especially when adequate field data are lacking. • Identification of LC critical areas according to landscape and vegetation attributes. • Evaluate: identify important foraging area/area with important trophic value for bears/ wolves (e.g orchards, fruit plantations, wild ungulate habitat suitability).
Interviews with local people (shepherds, hunters).	Asking people of recent LC activity, trends, consistence /frequency of LC reproduction in specific areas close to RoW.	• Record presence/absence, reproduction and denning areas. • Compensates well with short-timed field trips and limitations on field methods for direct LC spotting (e.g lack of suitable substrate to record tracks/scats) given also the spontaneous movement pattern of LCs.
Transects for recording LC signs.	Searching by feet on paths and dirt roads for tracks and signs of LC (scats, food remains, territorial markings). 2016 surveys also included searching for bear dens at rocky formations.	• Confirm LC presence, evaluate validity of interview data. • Evaluate importance of specific areas and frequency of LC occurrence on site • Identify TAP crossing areas. • Evaluate presence and relative abundance of wild ungulates (approximations only); useful to access wolf habitat.

Table 13: Jackal monitoring plan

Jackal (Canis aureus) – annual achievement criteria **All DMUs as per Appendix 5.**			**Monitoring**	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
Post-construction data should have the same spatial configuration within the TAP corridor as reported in the pre-construction level. At least post-construction data should indicate the same number of territorial groups within the TAP corridor as reported in the pre-construction level.	As in Year 1.	No significant difference between pre- and post - construction number of territorial groups in the DMUs.	TBC - dependent on DMU characteristics, i.e. foraging, commuting, denning.	Two visits annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: comparison of habitat suitability data at the pre-construction level with those at post-construction. The acoustic method will be employed and calling stations will be at least the same ones as in the pre-construction period.				

Table 14: Otter monitoring plan

Otter (*Lutra Lutra*) – annual achievement criteria **All DMUs as per WCMP.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
Post-construction data should indicate that pre-construction suitable sites preserve this feature.	As in Year 1.	No significant difference between pre- and post-construction habitat suitability for otter holts.	During seasonal flow of watercourse.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: comparison of habitat suitability data at the pre-construction level with those at post-construction. The pre-construction otter surveys used the following variables as of primary importance in assessing the habitat suitability of crossing points for otters: 1) perennial water flow, 2) freshwater fish presence, 3) evidence of otter presence at a pre-construction level (i.e. footprints, scat), 4) riparian vegetation cover, 5) presence of sites that can be used as holts. These will be used as reference to assess the post-construction status.				

Table 15: Avifauna monitoring plan

Avifauna – annual achievement criteria **All species and DMUs in Appendix 7 of the EMP.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No significant difference between the pre- and post-construction status.	As in Year 1.	As in Year 1.	Between April and July.	Three visits annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: as per Appendix 7. *For territorial species,* comparison of the locality and number of territories next to the RoW as recorded at a pre-construction level with those of the same species post-construction. *For non-territorial species*, population census at the wider area and comparison with the pre-construction status.				

Table 16: Amphibian and reptile monitoring plan

Amphibian and reptile – annual achievement criteria **All CH DMUs and all CH / PBF species recorded.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No significant difference between pre- and post-construction status in DMU.	As in Year 1.	As in Year 1.	As per Appendix 4.	As per Appendix 4, annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: as per survey species survey methods in Appendix 4 of the EMP.				

Table 17: Bat monitoring plan

Bats – annual achievement criteria **All CH DMUs.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
No significant difference between pre- and post - construction status in DMU. Monitoring of replacement roosts.	As in Year 1.	As in Year 1.	Monitoring of bat populations will need to cover both hibernation and maternity seasons (June-July and December - January).	One visit per season annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: the pre-construction surveys in Albania have compiled spatial data within the TAP corridor for 1) summer and winter roosting sites, 2) feeding areas, 3) maternity colonies[13]. This will be used as reference to assess the post-construction status.				

[13] Maternity colony: temporary association of reproductive female bats for giving birth to, nursing, and weaning their pups (https://en.wikipedia.org/wiki/Maternity_colony_(bats), access 3 December 2017)

Table 18: Freshwater fish and invertebrate monitoring plan

Amphibian and reptile – annual achievement criteria **All DMUs and CH species.**			Monitoring	
Post-construction Year 1 achievement criteria	**Post-construction Year 2 achievement criteria**	**Post-construction Year 5 achievement criteria**	**Period**	**Frequency**
% population proportions per sample assessed at a post-construction level should be similar to the ones at a pre-construction level	As in Year 1.	% population proportions per sample assessed at a post-construction level should be similar to the ones at a pre-construction level .	Spring – early summer.	Annually up to Year 5, frequency to be determined following Year 3 indicators for DMU.
Method: electrofishing.				