P09

Biodiversity Impact Assessment – 2019

Raporti i plotë prej 79 faqesh nga dosja burimore. Projekt rrugor Shëngjin–Velipojë. Shih seksionin 5.5, faqet e shtypura 62–63. Nuk është financim i ndërtimit të portit.

Kopje për shqyrtim dokumentar. Shënimet e kësaj faqeje janë shpjegime të përgatitura më 06.10.2026 dhe nuk janë pjesë e dokumentit historik.



Biodiversity Impact Assessment

The Proposed Shëngjin to Velipojë Road Scheme, Albania

80765

AUGUST 2019

FONDI SHQIPTAR I ZHVILLIMIT
ALBANIAN DEVELOPMENT FUND

RSK

RSK GENERAL NOTES

Project No.: 80765-03-02 (00)

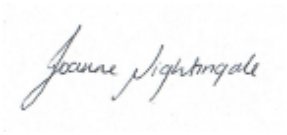
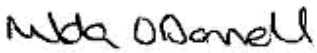
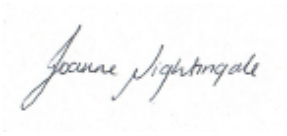
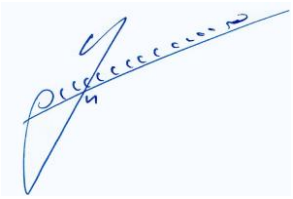
Title: Biodiversity Impact Assessment

Client: European Bank for Reconstruction and Development

Date: August 2019

Office: Helsby

Status: Rev00

Author	Dr J Nightingale	**Technical reviewer**	Nikki O'Donnell
Signature		Signature	
Date:	19/2/2019, updated 13/05/2019 and 28/8/2019	Date:	13/05/2019
Project manager	Dr J Nightingale	**Technical reviewer**	Simon Boulter
Signature		Signature	
Date:	28/08/2019	Date:	30/08/2019
Project Manager Albanian Development Fund	Ermir Omari	**Director of Infrastructure Department Albanian Development Fund**	Arben Skënderi
Signature		Signature	
Date:	18/09/2019	Date:	18/09/2019

Reviewer Environmental and Social Unit Albanian Development Fund	Nertis Mero and Genti Cupi	**Road Infrastructure Intervention Unit Albanian Development Fund**	Dritan Mehdi Agolli
Signature		Signature	
Date:	18/09/2019	Date:	18/09/2019

RSK Environment Ltd (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

Executive Summary

On behalf of the European Bank for Reconstruction and Development (EBRD) and the Albanian Development Fund (ADF), RSK undertook a biodiversity impact assessment in August 2019, for the proposed Shëngjin to Velipojë road scheme (hereafter 'the project'). This biodiversity impact assessment supplements the updated Environmental Impact Assessment (EIA): Design of Road Shëngjin – Velipojë Project Ideas (ADF, 2019) and as such this biodiversity impact assessment should be considered in combination with the EIA for the Project.

The proposed project is located on the west coast of Albania, approximately 55 km from Tirana and entails the rehabilitation and upgrade of an existing road and the construction of a new section of road (approximately 15 km in length) between these two towns. According to the Government of Albania, the project is of great public importance, especially for the tourism sector. The proposed project will traverse the Buna River Protected Landscape (IUCN Category 5; National Park), Ramsar, Important Bird Area, Important Plant Area and candidate Emerald Network Site. A dedicated Habitat Regulations Assessment (RSK, 2019) has been undertaken for the Project to identify and assess project-related impacts on the candidate Emerald site's conservation objectives. This was undertaken to ensure and demonstrate that the integrity of the site is not adversely affected by the proposed Project.

The biodiversity baseline of the Project Development Area (PDA) is described in the Albania National Roads Project: Supplementary Baseline Biodiversity Assessment – The Proposed Shëngjin and Velipojë Road Scheme (RSK, 2019c). This supplementary biodiversity assessment characterises the existing biodiversity features within the Project footprint and surrounding environs including the Priority Biodiversity Features (PBFs) and critical habitat-qualifying features for the Project based on screening. These features are of high conservation importance for the Project. This process of prioritisation provides focus to this impact assessment and ensures that the avoidance, mitigation and restoration measures focused on the highest biodiversity values and risks within the zone of influence.

This biodiversity impact assessment assesses project-related impacts on priority biodiversity features during the pre-construction,construction and operation phases. The assessment covers terrestrial habitats and flora; terrestrial fauna (including avifauna, reptiles and invertebrates) and their habitats; aquatic habitats and flora; and aquatic fauna. A precautionary approach was undertaken due to the paucity of project-based environmental and social information and data. The ADF is committed to filling these data gaps and will undertake pre-construction assessments for noise, air quality, water quality and soil conditions prior to the commencement of works. It is anticipated that the data will be used to refine the EIA and the Environmental Management Plan for the Project where necessary.

Some of the key impacts to priority biodiversity features, prior to mitigation, are summarised as follows:

- the permanent loss of a total of 13.7 ha of terrestrial habitat from within the Project footprint including the permanent loss of 11.4 ha habitat from within the Buna River Protected Landscape (a critical habitat-qualifying feature)

- loss of breeding bird habitats, including habitats used by five globally rare and threatened birds and 17 bird species that are classified as rare and threatened by the national Albania Red List arising from habitat clearance, arising from habitat clearance
- loss of a lesser horseshoe bat and greater horseshoe bat roost during habitat clearance
- clearance of 14 Albanian Red Listed plant species (including PBFs) from within the project footprint
- the permeant loss of oak woodland habitat for the great Capricorn beetle (IUCN listed VU, Albanian Red Data Book listed EN) arising from from habitat clearance
- habitat clearance, earth works, excavating and levelling works present a risk of accidental fauna collisions with vehicles and machinery resulting in injury or mortality to some individuals of priority biodiversity fauna including great Capricorn beetles, golden jackals, Eurasian badgers and wildcats that are PBFs for the project
- during operation, the physical structure of the proposed road (i.e. steep sided road embankments, safety barriers and concrete structures), compounded by noise and vehicle movement and artificial lighting is expected to form a barrier to the movement of medium sized fauna with home ranges that overlap the project footprint, in particular golden jackals
- Indirect Project-related impacts associated with facilitated access and Project-related in-migration, particularly the high influx of tourists, poses the greatest risk to habitats and species diversity and abundance within the Project area. It is anticipated that unchecked tourism will result in disturbance to species, habitat degradation and habitat loss.

The Biodiversity Management Plan (BMP; RSK, 2019), the Environmental and Social Action Plan (ESA) and the Environmental Management Plan (ESMP) detail specific avoidance, mitigation and restoration measures to minimise adverse Project-related impacts to habitats and species. Diligent application of best practice measures for minimising and managing the risk of potential Project-related impacts arising from habitat loss and degradation, noise and vibration, accidental vehicle collisions with fauna, artificial light spill, air and water pollutants, barriers to movement, changes in hydrology and water quality is expected to minimise the risks to both priority habitats, species and the Buna River Protected Landscape.

A key priority for the project is the continued safeguard and conservation of the Buna River Protected Landscape, Ramsar site and IBA. Pre-clearance checks will be undertaken to avoid any disturbance and injury to bats, badgers and breeding birds in the PDA during construction. Deadwood from within oak woodland located in the working width will be translocated to a suitable receptor site to minimise the habitat loss and risk of mortality for the great Capricorn beetle. Nationally endemic, rare and threatened plant species will be translocated from within the PDA to a suitable receptor site to minimise the risk of mortality or injury to these individual species. Roosting bats within the PDA will also be translocated to a purpose-built bat roost. The establishment of a wildlife crossing point for golden jackals and other priority fauna will be integral to enable golden jackals and other wildlife to retain access to resources in the PDA.

The implementation of the Reinstatement and Landscaping Plan will be integral to restoring the physical environment and ecosystem function within the PDA as ‘like for like’ (or better) than that which existed prior to Project construction where feasible.

Whilst avoidance, mitigation and restoration actions will reduce the significance of impacts to biodiversity, these actions will not eliminate all residual Project-related impacts. For example, a total of 0.012656 ha of common, natural habitats will be permanently lost from within the PDA.

Residual impacts will also arise from facilitated access and Project-related in-migration; and the magnitude of this impact was difficult to quantify. Hence a Sustainability / Eco-tourism Programme will be implemented by the project to minimise indirect project-related impacts to habitats and vascular plants (and other priority biodiversity features) arising from facilitated access and project-related in-migration (predominantly tourists). The objective of the Assignment is to establish a programme of activities and co-ordinated stakeholder consultation to support sustainable eco-tourism in the Shëngjin and Velipojë region of Albania by undertaking strategic and local actions. It is anticipated that the programme will support increased environmental awareness, sustainable and safe communities within the Shëngjin and Velipojë region, promote environmental preservation and conservation practices, circular economy through establishing stakeholder engagement networks, capacity building (through the provision of tools, management plans and awareness raising materials) and support policy dialogue.

The Project has also committed to establishing an Environmental Monitoring Plan (EMP). This will incorporate a Biodiversity Monitoring and Evaluation Programme to assess the efficacy of the avoidance and mitigation measures and to inform the requirement for adaptive management. The biodiversity monitoring actions has been developed based on the avoidance and mitigation measures designed for the Project; these are presented in the BMP. Where possible, thresholds will be established for each monitoring approach that will alert the Project that mitigation measures need to be adapted and revised biodiversity management measures are required. ADF are committed to implementing the BMP, EMP and ESAP and will work with and direct their contractors to ensure full implementation and compliance.

CONTENTS

1 GLOSSARY AND ACRONYMS 1
2 INTRODUCTION AND APPROACH 3
2.1 Introduction 3
2.2 Project Description 3
2.2.1 The Proposed Road Alignment 3
2.2.2 Road Design 8
2.2.3 Construction Approach 11
2.2.4 Operation 12
2.2.5 Timeline 12
2.3 The Biodiversity Baseline and Priority Biodiversity Features 12
2.3.1 Report Linkages 15
3 BIODIVERSITY IMPACT ASSESSMENT APPROACH 17
3.1.1 The Mitigation Hierarchy 17
3.1.2 Impact Assessment Criteria 18
3.2 Cumulative Impact Assessment Approach 23
4 BIODIVERSITY IMPACT ASSESSMENT 25
4.1 Terrestrial Habitats and Flora 25
4.1.1 Pre-Construction and Construction 25
4.1.2 Operation 32
4.1.3 Avoidance, Minimisation / Mitigation and Restoration Measures 33
4.1.4 Residual Impacts 38
4.2 Impact Assessment: Fauna and their Habitats 38
4.2.1 Pre-construction and Construction Phase 38
4.2.2 Operation 47
4.2.3 Avoidance, Minimisation / Mitigation and Restoration Measures 50
4.2.4 Residual Impacts 54
4.3 Impact Assessment: Aquatic Habitats and Species 55
4.3.1 Pre-Construction and Construction 55
4.3.2 Operation 57
4.3.3 Avoidance, Minimisation / Mitigation and Restoration Measures 58
4.3.4 Residual Impacts 59
4.4 Monitoring 59
5 CUMULATIVE BIODIVERSITY IMPACT ASSESSMENT 60
5.1 Overview 60
5.2 The Regional and Local Roads Connectivity Project and Other Road Projects 60
5.3 In-Migration and Unsustainable Tourism Infrastructure 60
5.4 Uncontrolled Development 61
5.5 Shëngjin Europort 61
6 CONCLUSION 63
7 REFERENCES 65

TABLES

Table 2.1: Summary of Critical Habitat-qualifying Features for The Project 13

Table 2.2: Summary of Priority Biodiversity Features for The Project 14
Table 2.3: Habitat Impact Assessment Matrix 20
Table 2.4: Species Impact Assessment Matrix 22
Table 3.1: Habitat Types and Areas of Permanent Habitat Loss from Within the Project Footprint.....26

FIGURES

Figure 2.1: Project location 5
Figure 2-2 Distribution of Protected Areas in proximity to the proposed rpad alignment 6
Figure 2.3: The unsurfaced road at Baks-Rrjollë 7
Figure 2.4: Mount Renci and dune.....7
Figure 2.5: Dune near Rrjolli 7
Figure 2.6: Mediterranean evergreen Quercus forest dominated by Quercus ithaburensis and exposed scree on Mount Renci 7
Figure 2.6: Sparsely vegetated scree on Mount Renci, overlooking wetland habitat within the Buna River Protected Landscape.....8
Figure 2.7: The ridge of Mount Renci, overlooking the Buna River Protected Landscape.....8
Figure 2.8: maquis, arborescent matorral and thermo-Mediterranean scrub and the existing unsurfaced track on Mount Renci 8
Figure 2.9: Pine plantation dominated by a monoculture of aleppo pine (Pinus halepensis) adjacent to the existing unsurfaced track near Shëngjin 8
Figure 2.11: Plan of the viewing platform and road alignment.....9
Figure 2.12: Section view of road with scaled embankment.....10
Figure 2.13: Section view of an open sided tunnel on steep sloping terrain 10
Figure 2.14: Geotextile – second layer 11
Figure 2.15: Size of geotextile 11
Figure 2.16: Geotextile with substrate 11
Figure 1.1: The Mitigation Hierarchy (BBOP, 2019) 18
Figure 4.1: Location of nationally endemic, rare and threatened flora species in the Project footprint 29
Figure 2.1: The Location of the Proposed Project Within the Buna River Protected Landscape 34
Figure 4-3: Location of oak dominated woodland 41
Figure 4.4: Bats roost location within the project footprint 42
Figure 4-5: Wildlife crossing point location 52

APPENDICES

Appendix 1 Biodiversity Impact Assessment Table Of Results 66

1 GLOSSARY AND ACRONYMS

A	
AOI	area of influence
B	
C	
CHA	critical habitat assessment
D	
E	
EBRD	European Bank For Reconstruction and Development
F	
FAO	Food and Agriculture Organization of the United Nations
H	
Ha	Hectares
I	
IBA	Important Bird Area
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
K	
KBA	Key Biodiversity Area
km	kilometre
L	
M	
m	metre
N	
P	
PS6	Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
PDA	Project development area and includes the project footprint, the working width, the extent of the rock stabilisation area, areas of associated facilities, stockpile area and borrow pits
R	

RoW	right-of-way
S	
V	
VEC	valued environmental component
Z	
ZOI	Zone of influence: the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities. This is likely to extend beyond the project footprint.

2 INTRODUCTION AND APPROACH

2.1 Introduction

On behalf of the European Bank for Reconstruction and Development (EBRD) and the Albanian Development Fund (ADF), RSK to undertook a biodiversity impact assessment in August 2019, for the proposed Shëngjin to Velipojë road scheme (hereafter 'the project'). This biodiversity impact assessment assesses project-related impacts on biological aspects during the pre-construction / construction and operation phases, including terrestrial habitats and flora; terrestrial fauna and their habitats; aquatic habitats and flora; and aquatic fauna. This biodiversity impact assessment supplements the updated Environmental Impact Assessment: Design of Road Shëngjin – Velipojë Project Ideas (August 2019) and as such this biodiversity impact assessment should be considered in combination with the EIA for the Project.

The proposed project is located on the west coast of Albania, approximately 55 km from Tirana and entails the rehabilitation and upgrade of an existing road and the construction of a new section of road (approximately 15 km in length) between these two towns (

Figure 2.1. According to the Government of Albania, the project is of great public importance, especially for the tourism sector.

It has been identified that the proposed project will traverse the Buna River Protected Landscape (IUCN Category 5; National Park), Ramsar, Important Bird Area, Important Plant Area and candidate Emerald Network Site. Hence a key priority for the project is the continued conservation of these protected areas.

The development of the project will result in impacts of varying degrees of significance to terrestrial and aquatic habitats and species during construction and operation, with some residual impacts continuing during operation. It is understood that the road will not be decommissioned within the foreseeable future and as such will remain in operation. This biodiversity impact assessment applies the steps of the mitigation hierarchy so that adverse expected project-related impacts are avoided, minimised, restored or rehabilitated where practicable. Diligent application of best practices for managing potential impacts is expected to significantly decrease the potential for residual impacts. It is anticipated that a biodiversity monitoring and evaluation programme will also be developed and implemented for the project to assess the efficacy of the mitigation measures to inform any requirements for adaptive management.

A sperate Habitat Regulations Assessment (RSK 2019) has been undertaken for the Project to assess project-related impacts on the candidate Emerald site's conservation objectives. This is to ensure and demonstrate that the integrity of the site is not adversely affected by the project.

2.2 Project Description

2.2.1 The Proposed Road Alignment

The Project is located on the west coast of Albania, approximately 55 km from Tirana and entails rehabilitation and upgrade of an existing road and the construction of a new section of road between two towns, Shëngjin to Velipojë (Figure 2.1). The proposed footprint of road alignment will traverse the Buna River Protected Landscape (IUCN Category 5; National Park), which is under the management of the Skadar Forestry Service Directorate and is also designated as a Ramsar wetland, Important Bird Area (IBA) and a candidate Emerald Site (Figure 2-2).

The footprint of the proposed road is 12.6 km in length and covers approximately 12.5 ha. Approximately 2.3 km of the road scheme, located at the north-western end of the proposed road in the village of Rrjoll (near Velipojë; Figure 2.1), falls within the alignment of the existing Rruga Banks Rrjollë road. This is a predominantly unsurfaced road that extends from the settlement at Baks-Rrjollë, beyond Rrjolli, across exposed sand (Figure 2.3). This existing sandy track is used mainly during summer season by tourists to access the beach.

From this point the proposed road alignment gradually rises across the rugged and generally exposed escarpment to the ridge of Mount Renci (at a high of approximately 280 m above sea level) and the site of a degraded settlement over approximately 5.25 km (Figure 2.4). This section of the proposed alignment crosses unvegetated dunes located at the base of Mount Renci (Figure 2.5 and Figure 2.5), followed by a mosaic of oak scrubland, small stands of Mediterranean evergreen Quercus forest dominated by *Quercus ithaburensis* (IUCN Least Concern, LC; Figure 2.6), areas of sparsely vegetated and bare scree, poorly vegetated cliffs and small areas of exposed rock faces (Figure 2.6 and Figure 2.7).

Over the ridge of Mount Renci (Figure 2.8), the alignment traverses a mosaic of degraded pasture, fallow and regenerating fallow that surrounds the degraded settlements. From this point the footprint crosses an adjoining area of maquis, arborescent matorral and thermo-Mediterranean scrub, before joining an existing unsurfaced road / track. The footprint of the proposed road then roughly follows the alignment of this existing road / track for approximately 3.7 km before joining Bulevardi Nënë Tereza near Shëngjin port. Habitats located along this portion of the proposed alignment are dominated by a mosaic of bare ground, maquis, arborescent matorral and thermo-Mediterranean scrub (Figure 2.9), and miscellaneous inland habitats with sparse or no vegetation. This transitioned into coniferous forest dominated by pine plantations (Figure 2.10), regenerating pine scrub (arising from the clearance of pine stands) with scattered housing and into the urban environment of Shëngjin. The very last section of the existing access route has the characteristics of an established urban road.



Figure 2.1: Project location

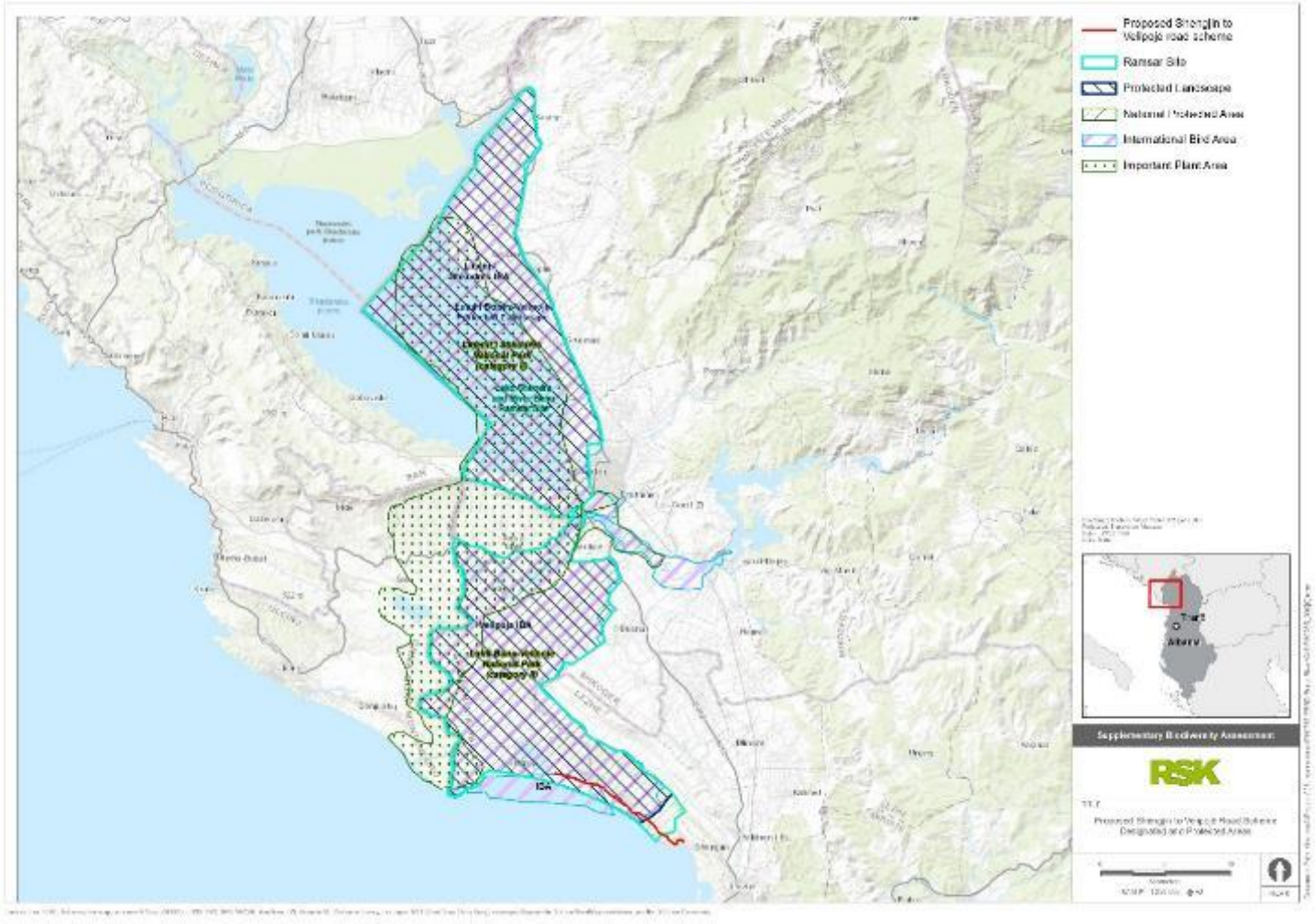


Figure 2-2 Distribution of Protected Areas in proximity to the proposed road alignment

.



Figure 2.3: The unsurfaced road at Baks-Rrjollë



Figure 2.4: Mount Renci and dune



Figure 2.5: Dune near Rrjolli



Figure 2.6: Mediterranean evergreen Quercus forest dominated by *Quercus ithaburensis* and exposed scree on Mount Renci



Figure 2.7: Sparsely vegetated scree on Mount Renci, overlooking wetland habitat within the Buna River Protected Landscape



Figure 2.8: The ridge of Mount Renci, overlooking the Buna River Protected Landscape



Figure 2.9: maquis, arborescent matorral and thermo-Mediterranean scrub and the existing unsurfaced track on Mount Renci



Figure 2.10: Pine plantation dominated by a monoculture of aleppo pine (*Pinus halepensis*) adjacent to the existing unsurfaced track near Shëngjin

2.2.2 Road Design

The proposed roadway will comprise two-lanes and will vary in width between 7 m to 9 m depending on the tip profile. Two hard shoulders will be located either side of the road (measuring between 0.5 m to 1 m depending on the location) in some sections. The road will also be fitted with safety barriers, retaining walls, protection walls and a drainage system. Artificial lighting will be installed along a 7 m section of the road located within Shëngjin. This section of the road will also comprise two shoulders measuring 0.5 m and two sidewalks measuring 1.5 m. Artificial lighting and pavements will also be installed along the end portion of the road at Rrjolli. The road will be surfaced with asphalt. The maximum slope of the road will be 8%, according to the predicted standard.

The section of the road from Shëngjin town to the top of Mount Renci will be constructed over an existing unsurfaced track, characterised by a continuously climbing slope. A viewing platform and access road will be constructed at the highest point to enable tourists to stop for a few minutes to enjoy the view (Figure 2.11).

Excavation will be undertaken to achieve a flat or gentle inclined road surface in sloped areas. In areas of steep gradient, the road embankment will be scaled every 6 m to 8 m height (Figure 2.12). These embankments will be contoured with drainage channels to avoid water damage to the road from surface runoff.

The section of the road from the top of Mount Renci to Baks-Rrjollë is characterised by a steep gradient and loose rockface. To protect the road and vehicle traffic from rockfalls and to avoid massive excavations of the rockface, 'open sided tunnels' will be constructed in key locations (i.e. in areas where the ground slope is above 60º), comprising reinforced concrete platforms situated over the road on concrete pillars (almost like a square tunnel; Figure 2.13).

The rockface within this section of the road will be stabilised using terramesh / geocell geotextile (a safety net that will support the establishment of vegetation), instead of concrete. This geotextile has two layers. The first layer comprises zinc plated wire mesh that is anchored to the rockface and protects the landscape from erosion. The second layer comprises a dense plastic net which can hold substrate for planting and natural revegetation (Figure 2.14**Figure 2.14**, Figure 2.15**Figure 2.15** and Figure 2.16**Figure 2.16**).

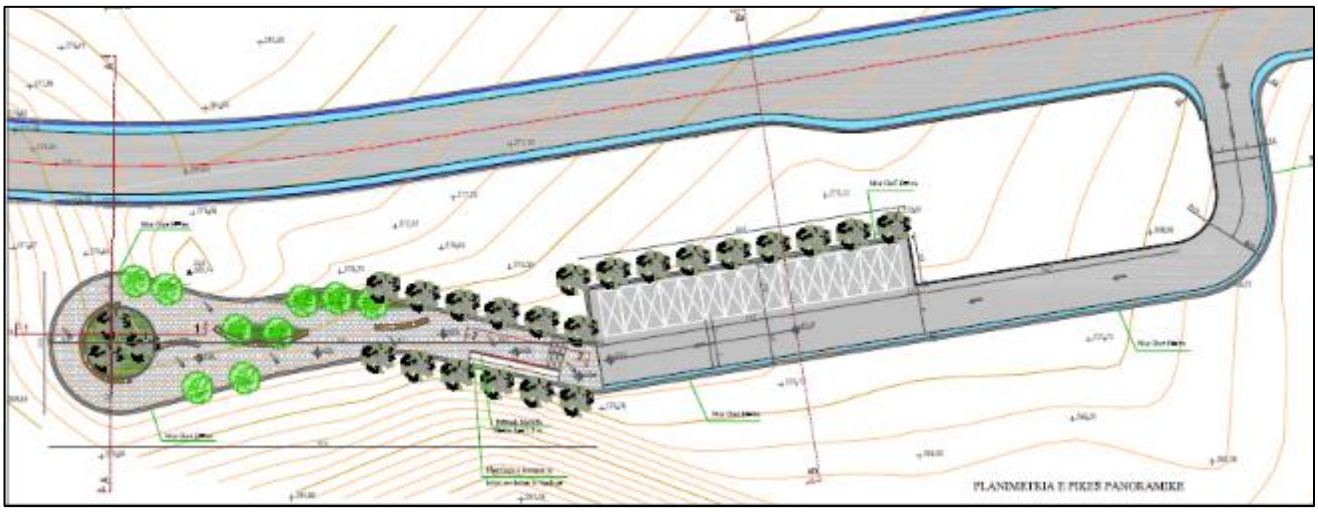


Figure 2.11: Plan of the viewing platform and road alignment

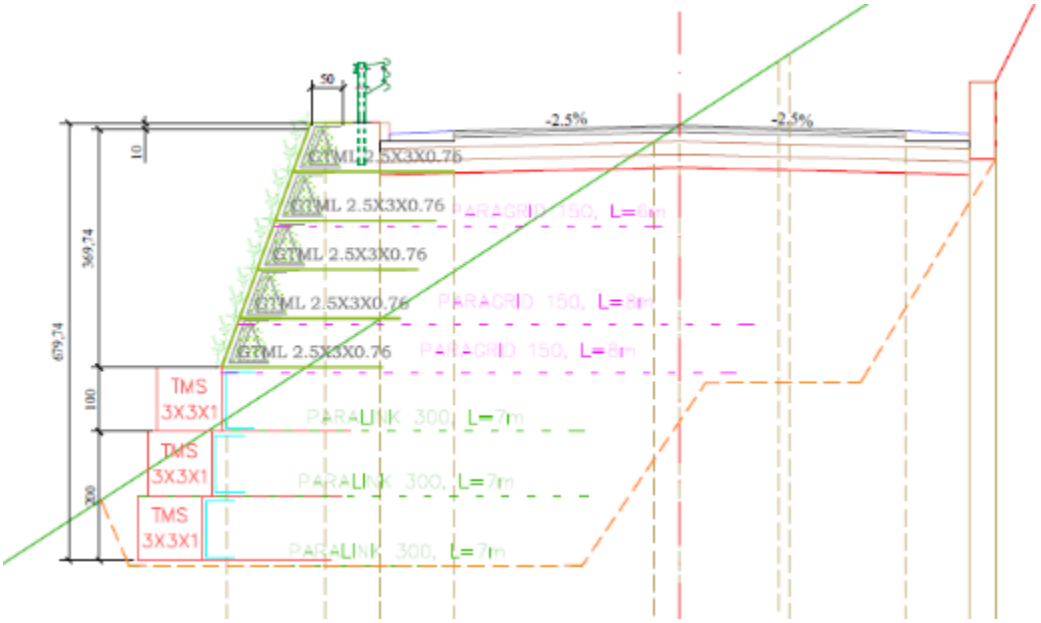


Figure 2.12: Section view of road with scaled embankment

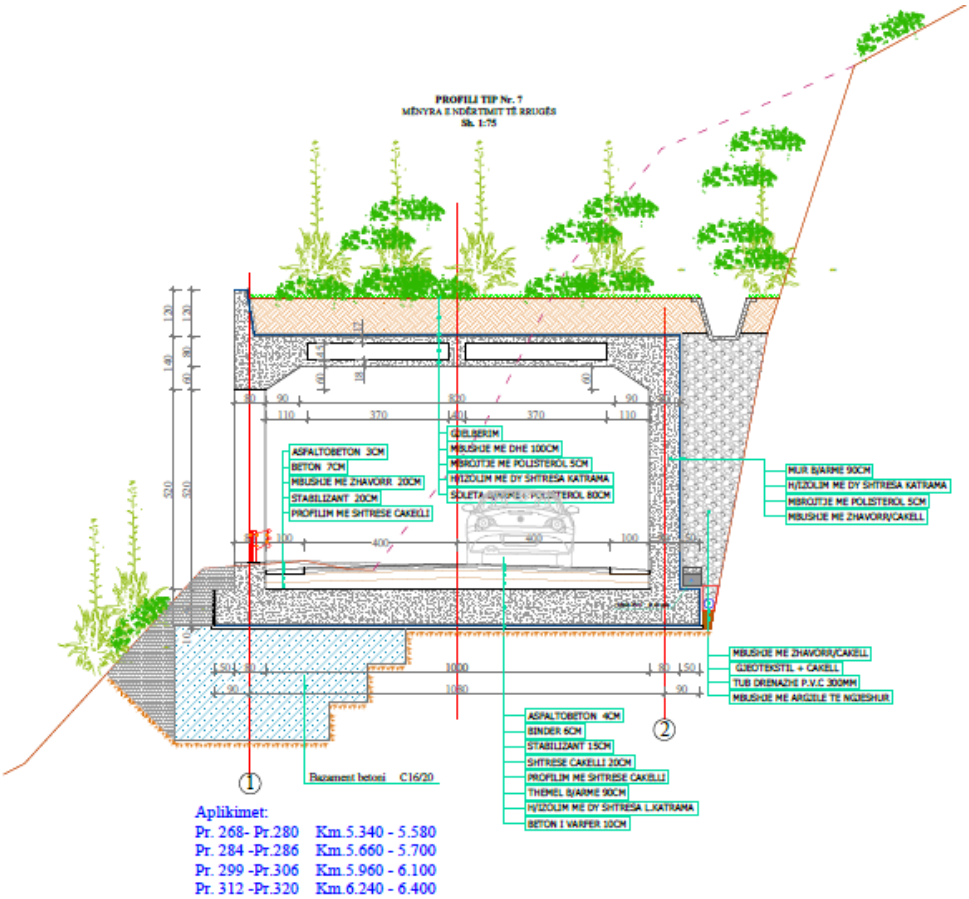


Figure 2.13: Section view of an open sided tunnel on steep sloping terrain

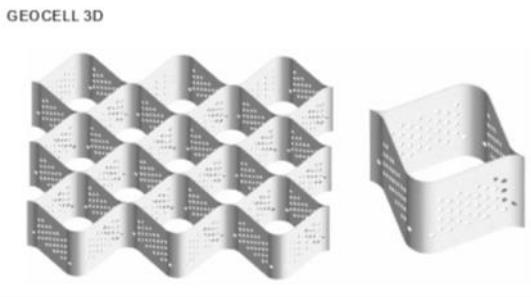


Figure 2.14: Geotextile – second layer

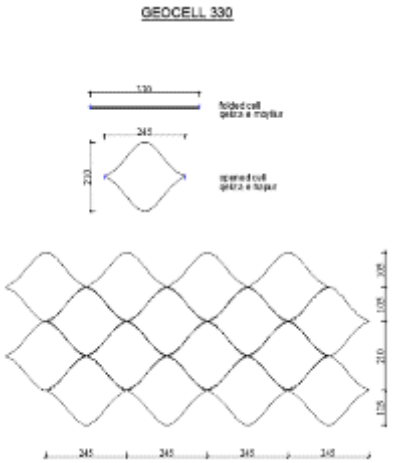


Figure 2.15: Size of geotextile

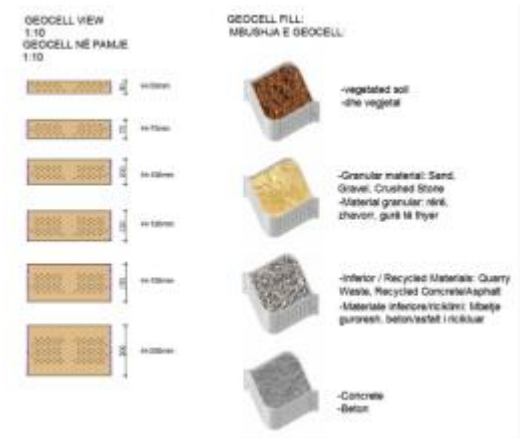


Figure 2.16: Geotextile with substrate

2.2.3 Construction Approach

Whilst there is much uncertainty regarding the detailed methods of construction at this stage in the Project development, some key aspects of the approach have been confirmed. For example, habitats and topsoil will be cleared using graders or bulldozers. In total, 434 trees and bushes will be moved from within the footprint / working width during habitat clearance and translocated (or relocated) to suitable receptor sites. Pneumatic drills and jackhammers will also be used during excavation and grading; blasting will not be used during construction. The exact area of habitat clearance beyond the road footprint is uncertain.

The excavated material (i.e. topsoil and rocky substrate) will be stockpiled and reused for construction and landscape restoration. The exact locations of stockpile areas and borrow pits are unknown at this stage. Four temporary waste disposal sites have been

will be used for storing inert materials, which will be reused for road construction. The locations of these sites is currently uncertain.

The materials used for road construction will be supplied by a licensed company. The waste materials will be deposed in accordance with the official process and the approach will be approved by the local authorities. Construction works will not be carried out at night; hence, security fencing and artificial lighting will be erected around machinery and plant at night along the proposed alignment. Water from waterbodies located in the project area and the Buna River Protected Landscape will not be extracted for construction activities (e.g. drilling) or for consumption by the workforce. Water for civil works will be supplied to the Project area using water tanks.

Personnel facilities such as a portable office and cabins for storage of personal items and equipment will also be installed within the project area approximately 1.6 km from the road but the exact location is unknown. The power supply to the office will be accessed through the existing network. It is anticipated that the workforce will use existing accommodation located in Shëngjin.

2.2.4 Operation

According to the Economic Analysis Report, Design of Road Shëngjin to Velipojë, Project Ideas (December 2017), the predicted volume of traffic utilising the proposed road is an estimated 1,238 vehicles per year with an average of 2.5 occupants per vehicle. Maintenance road works will be undertaken on an annual basis or when required. ADF will be responsible for the monitoring and maintenance work for the first 2 years of operation including the establishment of the landscaping scheme. This responsibility will then be devolved to the municipalities (namely Lezhe and Shkoder). ADF will retain a quality assurance role for monitoring the establishment of habitats and species as part of the Habitat and Species Rehabilitation / Restoration Pan and Landscaping Scheme.

2.2.5 Timeline

It is anticipated that the road will take 12 months to construct and the start date will be determined by the Investor according to the procurement process.

2.3 The Biodiversity Baseline and Priority Biodiversity Features

The biodiversity baseline of the Project Development Area is described in the Supplementary Biodiversity Baseline Assessment (RSK, August 2019). This assessment characterises the existing biodiversity features within the project footprint and surrounding environs based on the following components:

- habitat mapping
- site visit, rapid biodiversity walkover survey and targeted ecology surveys
- literature review

The report also identifies the Priority Biodiversity Features (PBFs) and Critical Habitat-qualifying features for the project based on screening. These features are of high conservation importance for the project. A summary of the Critical Habitat-qualifying features and PBF's are presented in

Table 2.1 and Table 2.2 respectively, and a more detailed account is presented in the Supplementary Biodiversity Baseline Assessment (RSK, 2019). Key PBFs for the Project are golden jackals, Eurasian badgers, bats (in particular *Rhinolophus hipposideros* and *R. ferrumequinum*), the great Capricorn beetle, key species of breeding birds and nationally endemic, rare and threatened plant species (i.e. *Punica granatum, Colchicum autumnale, Galatella albanica, Origanum vulgare, Hypericum perforatum, Quercus ilex, Arbutus unedo, Erica arborea, Juniperus oxycedrus ssp. Macrocarpa, Ostrya carpinifolia, Quercus pubescens, Salvia officinalis and Satureja montana*). Where possible, this biodiversity impact assessment has a focus on assessing project-related impacts on Critical Habitat-qualifying features and PBF's as these have been identified as being of the highest biodiversity risks within the zone of influence. A precautionary approach has been taken in the absence of detailed baseline information and / or information regarding project related activities and impacts.

Table 2.1: Summary of Critical Habitat-qualifying Features for The Project

EBRD PR6 Criteria	IFC PS6 Criterion Threshold Numbers	Critical Habitat-qualifying Features	Justification
Highly threatened or unique ecosystems	4a	No critical habitat qualifying features	-
	4b	Lake Shkoda and River Buna Ramsar complex Coastal lagoon	Protected area status Priority Annex 1 habitat
Habitats of significant importance to endangered or critically endangered species	1a:	• Slender-billed curlew • Atlantic sturgeon • Adriatic sturgeon • Starry sturgeon • European eel	Precautionary due to the paucity of data
	1b	No critical habitat-qualifying features	-
	1c	• Atlantic sturgeon • Adriatic sturgeon • Stellate sturgeon • European eel	Expert opinion is required to validate this

Habitats of significant importance to endemic or geographically restricted species	2	*Querqus robur* spp *scutariensis*	Precautionary due to the paucity of data
Habitats supporting globally significant (concentrations of) migratory or congregatory species	3a	No critical habitat-qualifying features	-
	3b	No critical habitat qualifying features	-
Areas associated with key evolutionary processes	N/A	No critical habitat qualifying features	-
Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)	N/A	Buna River, connecting waterbodies and wetland habitats of the Lake Shkoda and River Buna Ramsar complex	Precautionary basis assuming the presence of the critical habitat-qualifying species listed above

Table 2.2: Summary of Priority Biodiversity Features for The Project

EBRD PR6 Criteria	Priority Biodiversity Features
Vulnerable Species	Plants x 25; insect x1; fish x 5, mammals x 9; reptiles x 2; amphibians x1; birds x 33
Threatened Habitats (EU Habitats Directive Annex 1 priority habitats)	Calcareous rocky slopes with chasmophytic vegetation Embryonic shifting dunes A number of scree types are categorised as Annex 1 habitats (i.e. 8110, 8120, 8130, 8140, 8150, 8160) Coastal lagoon
Significant Biodiversity Features Identified by a Broad Set of Stakeholders or Government	Buna River Protected Landscape, IUCN Category 5; national park, Ramsar site, IBA, IPA and candidate Emerald Network Site
Ecological Structure and Functions Needed to Maintain the	The hydrology regime of these protected areas are essential for the structure and function of

Viability of Priority Biodiversity Features	the wetlands, coastal lagoon and associated network of rivers and waterways.

2.3.1 Report Linkages

There are important linkages between this biodiversity impact assessment and other Project documentation as follows:

- This Biodiversity Impact Assessment supplements the Environmental Impact Assessment: Design of Road Shëngjin – Velipojë Project Ideas (December 2017), in which an assessment was undertaken of the potential project related impacts on some physical, natural resources and social aspects. The EIA includes the following components:
  - Overview of the legislative requirements and baseline conditions relevant to the project
  - An assessment of project alternatives - the project considered four alternative alignments for the proposed project. The chosen alignment was identified as having the least impact to the biological environment within the zones of influence.
  - A short Environmental Impact Assessment
  - The identification of mitigation measures for the project.
- Albania National Roads Project: Supplementary Biodiversity Assessment – The Proposed Shëngjin and Velipojë Road Scheme (January, 2019). This report includes the following relevant information:
  - An overview of the relative legislation and guidance
  - Biodiversity baseline characterisation of the project area
  - Identification and prioritisation of biodiversity features for the project (refer to Section 2.3) based on priority biodiversity / critical habitat screening.
- Economic Analysis Report, Design Of The Road From Shëngjin – Velipojë, Project Idea (December 2017).
- An Appropriate Assessment (or Habitat Regulations Assessment) (2019) was prepared by RSK on behalf of EBRD which assesses project related impacts on the candidate Emerald site's conservation objectives to ensure that the integrity of the site is not adversely affected. This assessment entailed extensive stakeholder consultation.

Additional information related to the management of potential biological impacts, and proposed monitoring and mitigation measures, are provided in the following reports and assessments:

- Albania Regional and Local Roads Connectivity Project: Operational Manual (August 2018)
- Project for Rehabilitation of Regional and Local Roads in Albania: Environmental and Social Management Framework (December 2017). This is a tool for insuring

that sub-project (including the development of the proposed Shëngjin – Velipojë road) comply with existing laws, regulations and procedures in Albania. An account of the legislation and practices relevant to the EIA and permitting process is explained in detail in this document.

- Albania's Improvement of the Management and Conditions of the Secondary and Local Roads Project; Environment Safeguards Framework, 3rd Draft (March 10, 2008)
- Biodiversity Management Plan (RSK, 2019) which includes the Project mitigation strategy.

3 BIODIVERSITY IMPACT ASSESSMENT APPROACH

3.1.1 The Mitigation Hierarchy

The mitigation hierarchy is a framework for managing biodiversity and ecosystem services risks as well as direct and indirect project-related impacts to biodiversity receptors and important ecosystem services (CSBI, 2015). The project's adherence to the steps of the mitigation hierarchy is a requirement of EBRD Performance Requirement 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources. The steps of the mitigation hierarchy are presented in Figure 3.1 and are defined by BBOP (Forest Trends Association, 2019) as follows:

- **Avoidance:** this is the first step in the mitigation hierarchy and is defined as measures taken to avoid causing direct and indirect project-related impacts from the outset. Examples of avoidance measures include the spatial or temporal relocation or removal of infrastructure, to completely avoid impacting key components of biodiversity (i.e. particularly priority species, habitats or ecosystem services). Avoidance is often regarded as the most effective way of reducing potential negative impacts to biodiversity and ecosystem services.
- **Minimisation:** this is the second component of the mitigation hierarchy. Minimisation measures (or mitigation measures) are designed to reduce the duration, intensity and / or extent of direct, indirect and cumulative project-related impacts that cannot be completely avoided, as far as is practically feasible. Robust and pragmatic minimisation measures can be effective in reducing biodiversity impacts below significance thresholds.
- **Rehabilitation / Restoration:** this third step in the mitigation hierarchy should be applied to rehabilitate or restore biodiversity and / or ecosystem services that are impacted by project activities that cannot be completely avoided and / or minimised. An example includes rehabilitating degraded habitats or restoring cleared habitats to reduce residual project-related impacts.
- **Offset:** Biodiversity offsets are measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, to achieve no net loss or a net gain of biodiversity. Biodiversity offsets are measurable positive conservation outcomes on priority biodiversity features that are attributed to Project activities, and whose magnitude outweighs that of the residual adverse biodiversity impacts arising from the Project development. Offsets require investments in conservation management protection where the results of these investments can be quantified. Offsetting is based on systematic biodiversity accounting based on the explicit calculation of biodiversity losses and gains at matched impact and offset sites.

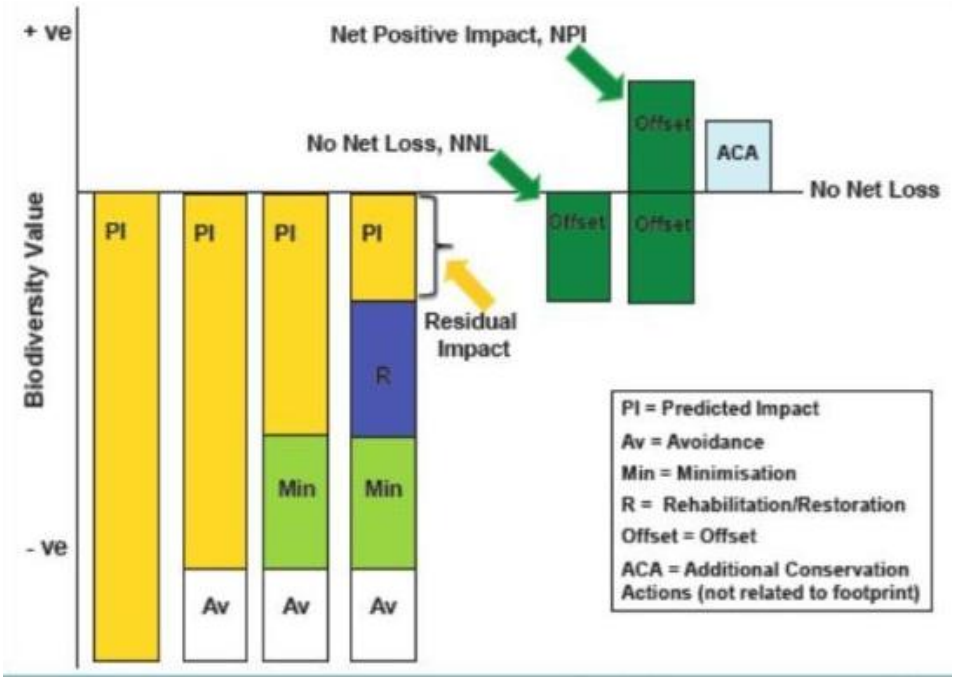


Figure 3.1: The Mitigation Hierarchy (BBOP, 2019)

An overview of the ecological, regulatory, economic and reputational driver for applying the mitigation hierarchy are summarised by Forest Trends Association (2019) as follows:

- Ecological drivers: include protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources, through limiting and/or repairing project impacts on BES.
- Regulatory drivers: application of the mitigation hierarchy is promoted and / or a requirement of many financial institutions (including EBRD), industries, governments and NGOs.
- Economic drivers: application of the mitigation hierarchy in combination with best practice biodiversity management can reduce risks, costs and increase the likelihood of permitting for projects and financial institutions.
- Reputational drivers: effective biodiversity and ecosystem service management can enhance stakeholders support for project development and the successful implementation of a project.

It is anticipated that the project will apply the steps of the mitigation hierarchy so that adverse potential project-related impacts are avoided, minimised and restored or rehabilitated where feasible.

3.1.2 Impact Assessment Criteria

The framework for this biodiversity impact assessment follows the general principles of the CIEEM Guidelines for Ecology Impact Assessment in The UK and Ireland (September, 2018). Biodiversity impacts identified in this assessment were characterised as follows:

- Positive or negative impacts: Positive project-related impacts are those that improve the biodiversity within the project development area (PDA) and zone of influence (ZOI). Negative project-related impacts are those that have an adverse

impact on habitat and species in the PDA and ZOI (e.g. a reduction in the range or abundance of species, decline in habitat coverage, etc)

- Extent: The spatial or geographical area in which the impact occurs is referred to as the extant of the impact.
- Magnitude: The magnitude is the size or amount of the impact that has been identified.
- Duration: This refers to the time-frame in which a project-related activity occurs, or the period in which an impact has on a particular habitat or species and may be expressed by a number of ways including a species lifecycle or number of generations of a particular species etc.
- Timing and frequency: The particular time and the number of times that a project-related activity occurs.
- Reversibility: Consideration is given to identify whether impacts are reversible or irreversible (permanent) where recovery is not possible within a reasonable timescale.

The assessment only describes the characteristics that are relevant to understanding the project related impacts to a particular biodiversity feature. Impacts were also classified as direct or indirect project-related impacts as follows:

- Direct Impacts:
  - Direct habitat loss from within the project footprint and RoW
  - Hydrological and water quality impacts
  - Air quality impacts (i.e. fugitive dust and pollution emissions)
  - Noise, vibration and airblast impacts
  - Artificial light spill
  - Accidental mortality and injury from collisions with vehicles and machinery
  - Barriers effects (i.e. physical obstruction to the movement of fauna)
- Indirect Impacts:
  - Habitat fragmentation, edge effects and barrier effects (i.e. through habitat fragmentation)
  - Induced access (or increased access) and project-related in-migration
  - Unsustainable exploitation of natural resources, illegal hunting and wildlife captures
  - Alien invasive species introductions

The assessment of impacts to biodiversity receptors was undertaken using the impact matrices presented in Table 3.1 and Table 3.2.

Table 3.1: Habitat Impact Assessment Matrix

		Magnitude of Impact			
		Negligible	Small	Medium	Large
		Impact is within normal range of variation.	Affects a small area of habitat but without the loss of viability / function of the habitat	Affects a significant proportion of the habitat such that the viability and function of part of the habitat or the entire habitat is reduced but does not threaten the long-term viability of the habitat or species dependent it.	Affects the entre habitat or significant proportion of the habitat, where the viability / function of the entire habitat is reduced and the long-term viability of the habitat and the species dependent on it are threatened.
Sensitivity	Negligible	Not significant	Not significant	Not significant	Not significant
	Low	Not significant	Not significant	Minor	Moderate
	Medium	Not significant	Minor	Moderate	Major
	High	Not significant	Moderate	Major	Major (high)

Habitat Receptor Sensitivity

Sensitivity Ranking	Characterisation
Negligible	Habitats that are very common and widespread across their natural global range. Habitats significantly degraded by anthropogenic activities that are characterised by a low floristic value (i.e. low species diversity and / or abundance, and / or a high proportion of non-native vascular plants). Habitats that have negligible biodiversity value for species as feeding or breeding areas (or migration routes). Habitats that are not nationally protected or internationally recognised areas for biodiversity.
Low	Habitats that are common and widespread in Albania and Europe. Habitats generally degraded by anthropogenic activities that are characterised by a low floristic value. Habitats with low conservation value in expert opinion. Habitats that are not nationally protected or internationally recognised areas for biodiversity. Habitats that naturally recover quickly following disturbance.

Medium	Habitats that are regionally rare and threatened and are small sized or scattered in their distribution but are not rare and threatened in Albania. Annex 1 priority habitats. Habitats that include an assemblage of species that are uncommon in Albania. Habitats that have a slow rate of recovery following disturbance. Low value habitats used by medium value species as important feeding or breeding areas (or migration routes). Internationally recognised areas such as Key Biodiversity Areas, Important Bird Areas and Important Plant Areas. Habitats that are nationally protected areas for biodiversity.
High	Habitats that are rare and threatened in Albania and Europe. Habitats with limited global extent. Habitats that are highly unlikely to naturally recover following disturbance. Habitats supporting an assemblage of unique or important species. This includes habitats used by high value species as important feeding or breeding areas (or migration routes). Highly threatened and/or unique ecosystems and areas illustrative of key evolutionary processes (i.e. including Areas for Zero Extinction). Sites of international importance / designated for protection at the international level (i.e. World Heritage Sites, Ramsar sites).

Table 3.2: Species Impact Assessment Matrix

Species Value		Magnitude of Impact			
		Negligible	Small	Medium	Large
		Impact is within normal range of variation.	Affects a small proportion of the population but does not substantially affect other species dependent on it or the population of the species itself.	Affects a sufficient proportion of a species population such that it may bring about substantial change in abundance and / or distribution over one or more generations, but does not threaten the long-term viability of that population or any population dependent on it. The size and cumulative effect is also sufficient such that a medium magnitude impact multiplied over a wide range area would be regarded as a large magnitude	Affects an entire population or species in sufficient scale to cause sufficient decline in abundance and / or change in distribution beyond which natural recruitment (reproduction, in-migration from unaffected areas) may not return that population or species, or any population of species dependent upon it to its former level within several generations, or when there is no possibility of recovery.
Sensitivity	Negligible	Not significant	Not significant	Not significant	Not significant
	Low	Not significant	Not significant	Minor	Moderate
	Medium	Not significant	Minor	Moderate	Major
	High	Not significant	Moderate	Major	Major (High)

Species Receptor Sensitivity

Sensitivity Ranking	Characterisation
Negligible	Commonly occurring species, not subject to significant decline (i.e. distribution and abundance) at their range at the global and national scales (i.e. species listed as Least Concern by IUCN (2018) or The National Red Data Book for Albania). No specific value or importance attached to the species. Species that are not legally protected. Introduced or alien invasive species.
Low	Species not protected, listed as widespread or abundant at the national scales but are listed as Near Threated at the global scale by IUCN (2018) or The National Red Data Book for Albania and does not meet the criteria for high or medium value species. Species that will re-colonise disturbed areas, particularly following habitat restoration and rehabilitation but perhaps at a slower rate that other commonly occurring species.
Medium	Species listed as Vulnerable or Data Deficient on the IUCN Red List of Threatened Species. Not meeting the criteria for high value species.
High	Species included on the IUCN Red List of Threatened Species as Critically Endangered and Endangered. Edge species. Keystone species that are critical for the maintenance of high biodiversity in Albania and / or a single population of Critically Endangered and Endangered species. Endemic and/or range-restricted species that trigger Critical Habitat in accordance with Performance Standard 6 IFC thresholds. A migratory and/or congregatory species that is present in globally significant numbers thus triggering Critical Habitat in accordance with Performance Standard 6 IFC thresholds.

3.2 Cumulative Impact Assessment Approach

Cumulative impacts result from the successive, incremental and/or combined effects of a project or activity, when added to other past, existing, planned and/or reasonably anticipated future ones. They may occur because, for example, several projects of the same type are being developed in close spatial or temporal proximity.

EBRD Performance Requirement 1 references the need for the ESIA process to consider cumulative impacts of the project in combination with impacts from other relevant past, present and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the project that may occur later or at a different location.

This chapter focuses on previously known and foreseeable developments which may impact upon the biodiversity of the Shëngjin and Velipojë region and investigate whether any of these projects will cause additional impacts when their influence is combined with the Shëngjin to Velipojë road project. It aims to identify environmental and social

receptors which are most at risk from the combined impacts of all the existing and potential development identified within the study area.

The spatial area of influence (AOI) is the geographical area impacted by the project and cumulative impacts. The Shëngjin to Velipojë road scheme project AOI was defined as the spatial area impacted by:

- the project footprint and the adjoining habitats of Mount Renci, the beach and dunes, and connecting protected areas.
- The zone of influence (including direct and indirect project-related impacts)
- cumulative impacts, as defined based on the valued environmental components impacted upon by the project.

The spatial scope of the cumulative assessment focuses on potential developments within the Shëngjin and Velipojë area that may interact with impacts (both positive and negative) arising from the project. The study area included within the cumulative assessment will also include the Ramsar site

The temporal AOI is the timescale over which a project is likely to have impacts. The temporal boundaries of the CIA are also limited by the extent of current knowledge of other sources of cumulative impact, particularly non-project related activities. Different development projects within the area are likely to occur at different stages. The temporal scope of the analysis can also be defined as the period of time during which the proposed mitigation measures and post construction monitoring and management practices will be implemented.

4 BIODIVERSITY IMPACT ASSESSMENT

4.1 Terrestrial Habitats and Flora

4.1.1 Pre-Construction and Construction

4.1.1.1 Habitat Loss and Degradation

The most significant impact to terrestrial habitats and vascular plant species associated with the project is expected to occur during the pre-construction and construction phase when habitats within the footprints of the proposed road alignment, the adjoining project area and associated facility areas (i.e. borrow pits, stockpiling areas etc) will be cleared.

It is expected that a total of 17.8 ha of terrestrial habitat will be removed from within the footprint of the road alignment (

Table 4.1). This will result in the permanent loss of existing natural Annex I habitats in this area, namely: Mediterranean evergreen Quercus woodland, maquis, arborescent matorral and thermo-Mediterranean scrub, screes and coastal dune and sandy shore. In total 12 ha of terrestrial habitats will be cleared from within the Buna River Protected Landscape.

Terrestrial habitats within the vicinity of the project footprint are at risk of being damaged by project activities, particularly during construction. It is therefore anticipated that site preparation works will result in the degradation or loss of an additional area of terrestrial habitats from within the landscapes adjoining the project footprint (e.g. through the transport of vehicles, stabilisation works, etc.), the footprints of borrow pits, stockpile sites, workers facilities, the office and equipment storage facilities. The locations of these components and the area of temporary habitat loss or degradation is currently unknown.

Impacts to habitats located within the project footprint, outside of the Buna River Protected Landscape, arising from habitat loss and degradation are expected to be of Minor significance prior to mitigation. Impacts to habitats located inside the Buna River Protected Landscape are expected to be of Moderate significance prior to mitigation.

There is also risk of habitat loss and degradation through accidental spills or seepages of hazardous substances (i.e. diesel fuel, oil, bitumen, concrete etc) and grey-water or septic systems (i.e. portaloos). This impact would most likely occur within the project footprint, the concrete mixing station and near the workers facilities. Impacts to habitats arising from accidental spills and leakages may be of Moderate significance, depending on substance type, volume and location of the accident.

Table 4.1: Habitat Types and Areas of Permanent Habitat Loss from Within the Project Footprint

EUNIS Habitat Types	Annex 1 Habitat Status (Current Name as Adopted in Directive 97/62/EC)	Estimated Coverage (ha) in the Road Footprint
Broadleaved deciduous woodland (G1.78 *Quercus trojana* woodland)	Does not qualify	4.1
Coniferous woodland	Does not qualify	2.0
Punica granatum dominated communities	Does Not qualify	0.8
Temperate and Mediterranean-montane scrub (Illyrian Paliurus spina-christi garrigues)	Does not qualify	1.3
Maquis, arborescent matorral and thermo-Mediterranean scrub	Does not qualify	2.1
Miscellaneous inland habitats with sparse or no vegetation	Does not qualify	1.5

EUNIS Habitat Types	Annex 1 Habitat Status (Current Name as Adopted in Directive 97/62/EC)	Estimated Coverage (ha) in the Road Footprint
Bare screes and stony / rocky Mediterranean grasslands	A number of scree types are categorised as Annex 1 habitats (i.e. 8110, 8120, 8130, 8140, 8150, 8160). Annex 1 scree habitat was not encounter during the field survey. Some screes were observed, but these were bare screes with no typical vegetation and as such were not classified as any of the Annex I scree habitats.	1.3
Coastal dune and sandy shore	(EU code 2110) Embryonic shifting dunes	1.2
Arable and market gardens	Does not qualify	0.2
Low density buildings	Does not qualify	3.9

4.1.1.2 Habitat Fragmentation and Edge Effects

Habitat clearance for the project will result in habitat fragmentation. Residual fragments may be vulnerable to further degradation caused by edge effects (e.g. altered environmental conditions). Increased edge effects are created by the remaining fragments having a larger/longer edge than the previous patches of vegetation or contiguous forest (Laurance et al., 2009). This will result in the edge being exposed to increased light (solar radiation), different temperatures, wind and generally a different climate than to previous (Murcia, 1995). Edge effects are major drivers of change in many fragmented landscapes, but the effects are often highly variable (Laurance et al., 2007). The new fragments may be impacted by one or a combination of increased:

- Soil erosion and sediment transport during rain events;
- Exposure to solar radiation and altered microclimate;
- Exposure to weeds and parasites carried by wind and increased traffic; and/or
- Risk of fire.

Edge effects may contribute to the degradation of remnant habitats adjacent to the cleared habitat from within the project footprint. It is expected that this impact will be of Moderate significance prior to mitigation.

4.1.1.3 Loss of Rare or Threatened Vascular Plant Species

Habitat clearance in the footprint of the proposed road alignment and the associated facilities (i.e. borrow bits, stockpiles, office, worker's facilities etc) will result in the loss of common plant species and individual plants that are rare or threatened in Albania and

are PBFs for the project. The removal of topsoil and long-term stockpiling will also decrease the viability and longevity of the soil seed banks of these Red Listed species.

The botanical survey, undertaken in the PDA in June 2019, confirmed the presence of 97 plant species in the PDA. Only a small proportion of these species have been assessed by the IUCN Red List of Threatened Species (2019) and these assessed species are categorised as LC. In total, 14 Albanian Red Listed (MOE 2013) plant species will be cleared from within the project footprint; 13 of these species are PBF for the project. It is likely that these species are also present elsewhere in the PDA. These species are listed as followed and their locations are illustrated in Figure 4.1

- Albanian Red Listed Critically Endangered (CR):
  - *Punica granatum*
- Albanian Red Listed Endangered (EN):
  - *Colchicum autumnale*
  - *Galatella albanica* - A national endemic located in *Quercus trojana* woodlands
  - *Origanum vulgare*
  - *Hypericum perforatum*
  - *Quercus ilex*
- Albanian Red Listed Vulnerable (VU):
  - *Arbutus unedo*
  - *Erica arborea*
  - *Juniperus oxycedrus ssp. Macrocarpa*
  - *Ostrya carpinifolia*
  - *Quercus pubescens*
  - *Salvia officinalis*
  - *Satureja montana*
- Albaian Red Listed Near Threatened (LRcd):
  - *Crataegus heldreichii.*

It is anticipated that only a few individuals of each species will be cleared, which is unlikely to have substantial adverse impact on the abundance and / or distribution of the national or global populations of these species over one or more generations and is highly unlikely to threaten the long-term viability of these populations or any populations dependent on it. Impacts to endemic, rare and threatened flora arising from habitat clearance works are therefore expected to be of Moderate significance prior to mitigation.

Lake Skadar and River Buna Ramsar site also reportedly supports the following vascular plant species which are threatened and rare in Albania including the endemic *Querqus robur* spp *scutariensis*, a critical-habitat-qualifying species (Ramsar, 2005). This species was not recorded within the project footprint during baseline surveys and, as such, are will not be impacted by the habitat clearance works.



Figure 4.1: Location of nationally endemic, rare and threatened flora species in the Project footprint

4.1.1.4 Invasive Alien Species Introduction

In the absence of control measures, the increase in the movement of people and vehicles arising from pre-construction and construction activities increases the risk of the introduction and transfer of invasive alien species of vascular plants into the project area. Impacts to habitats and flora arising from invasive species are expected to be of Moderate significance prior to mitigation. Alien invasive species are often aggressive competitors, rapidly outcompeting existing plant species thus degrading the floristic diversity of habitats and dominating areas. The use of herbicides, burning, mowing and clearing generally favours disturbance-tolerant invasive plants which can rapidly colonise human-disturbed areas. Likely colonisation sites will be on the edges of new and old roads and tracks and cleared areas (ISSG, 2018). Whilst alien invasive vascular plants were not identified within the zone of influence during the baseline assessment, seeds or rhizomes of invasive species could potentially be transferred from affected areas into the project area by vectors e.g. workers and project vehicles. Furthermore, absence of invasive alien species cannot currently be confirmed based on the existing level of baseline information.

4.1.1.5 Hydrology and Water Quality

There are no major tributaries or creeks located within the footprint of the proposed road alignment. Ten small ephemeral creeks transect the proposed road alignment. It is anticipated that these will be redirected or culverted during construction resulting in minor changes to the hydrology of the existing surface water in the PDA. Prior to mitigation it is expected that changes in surface water hydrology will have an impact of minor to negligible significance to the terrestrial habitats and vascular plant species dependent on these water resources .

Furthermore, the hydrology of the coastal lagoon (a critical habitat-qualifying features), associated waterways and wetlands (including the dune wetlands) within the Buna River Protected Landscape (critical habitat-qualifying feature) will not be directly impacted by project-related clearance activities or water abstraction (i.e. used to for drilling, piling, consumption etc).

The primary impact to surface water quality during the pre-construction and construction phase is expected to arise from suspended sediments generated from earthwork activities (e.g. habitat clearance, grading, the creation of burrow pits, stockpiling, bedrock extraction and the use of unsurfaced access roads). Sediment-laden runoff may smother flora, resulting in injury or mortality to plants, and habitat degradation. Sediment-laden runoff may also impact downstream terrestrial habitat and flora within the Buna River Protected Landscape (particularly Zones 1b and 2b). The magnitude of impacts is likely to be higher during the winter months in periods of high rainfall. Sediment-laden runoff from the construction site is expected to result in localised degradation of terrestrial habitats, which is expected to be of Moderate significance prior to mitigation.

Accidental spills of hazardous substances (i.e. diesel fuel, asphalt, oil and bitumen) and grey-water or septic systems (i.e. portaloos) may potentially contaminate and adversely impact receiving terrestrial habitats resulting in injury or mortality to plants, and habitat degradation or loss. This impact would most likely occur within the project footprint, near the workers facilities or the source of the spillage and be of a Moderate impact for receiving habitats and flora, dependent on substance type and volume.

4.1.1.6 *Air Quality*

Fugitive dust emissions measured as particulate matter of varying particle size (e.g. PM_{10} and $PM_{2.5}$) will be generated by land clearance and earthwork activities. Construction of the new sections road on Mount Renci will expose a moderately sized surface area to wind erosion resulting in dust generation. Significant dust emissions are also expected to result from the use and upgrade of the existing unsurfaced Rruga Banks Rrjollë road within the Buna River Protected Landscape. Air quality impacts arising from fugitive dust emissions are expected to be relatively localised and occur within approximately 200 m of the unsealed access roads. Dust emissions generated by the construction of the proposed road alignment are likely to be wider reaching as the alignment is located on an exposed face of Mount Renci. Depending on weather conditions during the pre-construction / construction phase, habitats located within Zone 1b of the Buna River Protected Landscape (i.e. wetlands) could potentially be impacted.

An accumulation of dust on leaves can block stomata and thereby impact on normal photosynthetic, transpiration and cellular respiration rates (Sharifi et al., 1997) and finer dust can be directly taken into the stomatal openings (Farmer, 1993) impairing the biological fitness of plants. Prolonged smothering can result in the mortality of an individual. Habitats (i.e. Mediterranean Quercus woodland, vegetated scree and maquis) and flora located in close proximity to the dust emission sources are expected to experience the greatest impacts during construction. Impacts to the habitat and plants in these areas are expected to be of Major significance prior to mitigation.

Baseline air quality monitoring (i.e. PM_{10} and $PM_{2.5}$ CO, SO_2, NO_x and VOCs) has been undertaken in the Project area. Ambient air quality monitoring identified elevated levels of SO_2 and NO_2 which exceed EU standards. Vehicles and plant machinery that use diesel fuel will generate combustion emissions such as CO, SO_2, NOx, particulate matter (PM_{10} and $PM_{2.5}$) and VOCs. Respiration of oxides of nitrogen and sulphur can potentially have a significant impact on the biological fitness of vascular plants (Emberson et al., 2001). However, the magnitude of air quality impacts from the combustion of diesel fuel during pre-construction and construction is expected to be relatively low. Construction phase impacts to local air quality, generated by combustion emissions will be short term, localised and staged over a two year period. Localised, adverse air quality impacts on flora and habitats are expected to occur within approximately 200 m of the working width, depending on weather conditions. It is anticipated there will be a Minor impact on flora and habitats due to combustion emissions.

4.1.1.7 *Induced Access and Project-related In-migration*

Project-related in-migration is expected to initially occur during the construction phase with the mobilisation of the workforce but is unlikely to significantly increase until the proposed road is in operation. The predicted extent of project induced in-migration during the construction phase of project development is uncertain.

The main risks to habitats and vascular plant species of conservation importance arising from project-related in-migration are the unsustainable collection of natural resources (i.e. timber and non-timber products) and indirect habitat loss as the result of increased access to habitats near the project area. The unsustainable collection of natural resources by the workforce and local residents may result in habitat degradation and the decline in abundance and distribution of trees, herbs and grasses. The local populations

of vascular plants of conservation importance may also be adversely impacted by increased collection. The road construction may also stimulate urban development and agro-pastoral activities within the project area, leading to indirect habitat loss. This is likely to be of greater risk during operation than construction. Impacts to habitat and flora is expected to be of Moderate significance prior to mitigation.

4.1.2 Operation

Many of the adverse impacts to habitats and vascular plant species which occur during the pre-construction / construction phase will continue in varying degrees and intensities into the operation phase. The following discussion of impacts to terrestrial habitats and flora during the operation phase should be considered in addition to those impacts outlined above.

4.1.2.1 Induced Access and Project-related In-migration

The beaches, sea and other scenic habitats of the Bojana -Buna delta attract approximately 250,000 tourists a year, predominantly between July and August (UN 2002). According to the project's economic analysis report (December 2017), 830,000 tourists visited Velipojë and 1,000,000 tourists visited Shëngjin in 2017. Tourism is fuelling regional development and long-term economic growth of the region (UN 2002). Shëngjin and Velipojë experiences high rates of annual in-migration of tourists during the holiday season and both towns have experienced relatively rapid development associated with the tourist trade. This is already putting pressure on natural resources and is impacting the quality of coastal and wetland habitats.

The proposed road alignment has been developed to facilitate tourist vehicle access and as such is likely to lead to an influx of tourism, particularly to Banks Rrjollë and the surrounding landscapes. The predicted extent of project induced in-migration is unknown, however it is expected to be greater during operation compared to the construction phase and could lead to impacts of Major significance prior to mitigation. Project-induced in-migration is expected to lead to an increase in the exploitation of natural resources (i.e. herbs, grasses and timber) and habitat clearance for agro-pastoral activities and the establishment of settlements, particularly along the edge of the proposed road on the flatter topographic areas of Mount Renci. Increased natural resource collection (herbs, grasses and timber) is expected to be concentrated in the vicinity of Shëngjin and Banks Rrjollë but may extend further into the Buna River Protected Area Landscape. Mediterranean evergreen *Quercus* forest, coniferous forest and maquis scrub are likely to be targeted for timber collection. Sage growing within vegetated scree habitats of Mount Renci (including areas within the River Buna Protected Landscape) is likely to be targeted for collection. There is therefore likely to be an increased pressure on natural resources.

Indirect habitat loss and degradation from habitat clearance and the encroachment of settlements adjacent to the proposed road alignment poses a significant threat, further contributing to direct project-related impact of habitat loss and fragmentation. The operating road system will also increase accessibility along Mount Renci and Banks Rrjollë which may stimulate renewed interest in farming in this area leading to the loss of natural habitats.

The significant influx of tourists trampling and authorised and unauthorised vehicle activity within the coastal habitats (i.e. dune, beach) and wetlands at Banks Rrjollë and the foot of Mount Renci pose a risk to the quality of these sensitive habitats.

If unregulated, project-related in-migration may potentially lead to habitat degradation, habitat loss and a decline in the diversity and abundance of vascular plant species (potentially including PBFs). Habitats and species near the proposed road alignment are more vulnerable, including those within Zones 1b and 2b of the Buna River Protected Landscape, near Banks Rrjollë. However, impacts could be wider reaching within the protected area. Taking a precautionary approach, the impacts to habitats and species arising from project related in-migration could potentially be of Major significance over time (i.e. within 10 years) if unregulated and mitigated.

4.1.3 Avoidance, Minimisation / Mitigation and Restoration Measures

The Biodiversity Management Plan (BMP), the Environmental and Social Action Plan (ESA) and the Environmental Management Plan (EMP) detail specific avoidance, mitigation and restoration measures to minimise adverse Project-related impacts to habitats and priority vascular plants. A summary of these measures are provided below.

4.1.3.1 Avoidance

- The proposed road alignment has been rerouted, based on advice from The National Agency of Protected Areas, to avoid the core zone (1A) of the Buna River Protected Area to avoid impacting key habitats and wildlife (Figure 4.2).
- An alien invasive species prevention protocol will be implemented to prevent the introduction and transfer of invasive plant species. This will include the avoidance of affected areas by staff and vehicles where possible and washdown procedures of Project vehicles where necessary. A record will be kept of all affected areas to avoid transfer of alien invasive plant species.
- Bushfire controls will be developed for the Project, including a Project ban on open-burning of waste, specific emergency response procedures developed for managing bushfires and the establishment of fire breaks where required.

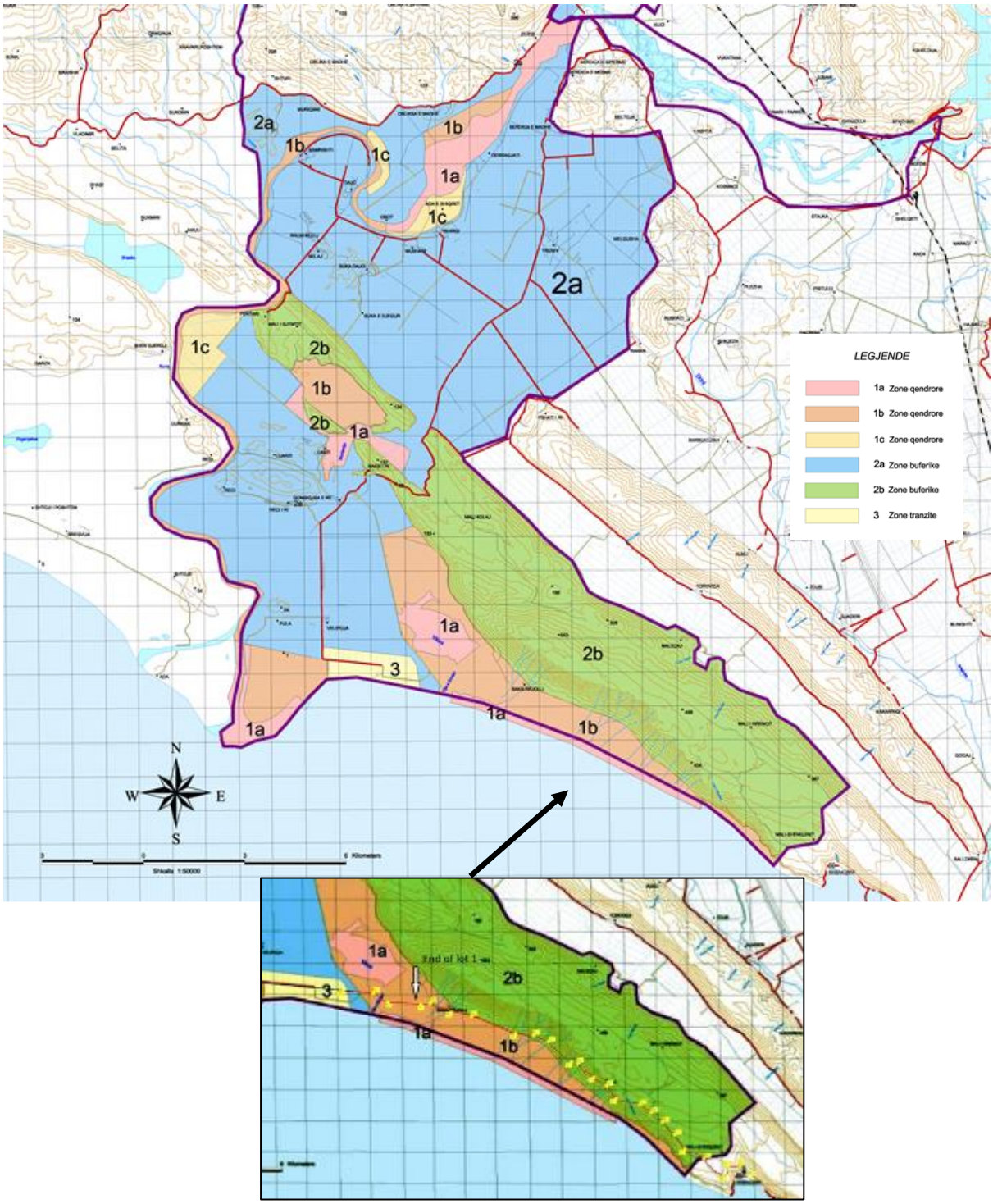


Figure 4.2: The Location of the proposed project within the Buna River Protected Landscape

4.1.3.2 Minimisation

Pre-construction / Construction

Staff and Project contractors will adhere to a standard operating procedure for land clearance and stockpiling (i.e. soil, gravel, hardcore etc) to minimise the loss of habitats and vascular plant species to the extent practicable. This will include the provision of the method statement for habitat clearance which will be prepared by an experienced ecologist. This will be communicated to all relevant personnel (i.e. staff and contractors) during the inductions. Key mitigation measures to be included in this statement are listed as follows:

- To minimise habitat loss to the extent practicable, areas scheduled for habitat and land clearance will be demarcated and mapped in advance and personnel informed that any activities outside the designated areas will be strictly forbidden except for entry and exit along designated access routes. These mapped areas will be incorporated into this Biodiversity Management Plan. This will minimise the risk of habitat clearance outside of these areas.
- Environmentally sensitive areas will be clearly marked and mapped as 'No Go Areas' (i.e. wooded areas, wetlands, the beach and dune system at the foot of Mount Renci) and access by staff and contractors will be strictly forbidden.
- The footprint of the road alignment and PDA will be minimised to limit fauna habitat clearance to the extent practicable.
- A land disturbance permit system will be established and managed by the contractors' Environment Team.
- Habitats clearance will be undertaken by the contractors in a progressive and sensitive manner to enable fauna to move away from the area of works, disperse into surrounding habitats and to avoid fauna from being isolated in fragmented areas of habitat.
- Herbicide and fire will not be permitted to clear vegetation to ensure a minimal impact footprint during habitat clearance and to reduce the risk of mortality and injury to wildlife.
- An ecologist will be on hand to supervise the habitat clearance works and provide advice to the workforce when required.
- Routine checks will be undertaken by the contractors Environmental Team to ensure vegetation clearance is confined to defined areas of disturbance and periodic checks will also be undertaken by ADF and a supervising engineer.

Nationally endemic, rare and threatened plant species will be translocated from within the PDA to a suitable receptor site to minimise the risk of causing mortality or injury to these individual species. A method statement for the translocation scheme will be prepared by an experienced botanist prior to the commencement of works and suitable receptor sites identified and secured prior to any habitat clearance works taking place. The botanist will also supervise the translocation works.

Staff and contractors will adhere to a Standard Operating Procedure for Emission and Dust Control, Erosion and Suspended Sediment Control to minimise impacts from fugitive dust emissions, erosion and suspended sediments on habitats and plants. includes the

provision of measures to minimise the adverse impact to habitats and flora in areas of biodiversity sensitivity. This includes the use of dust control measures (i.e. watering, gravel application and wheel washes) on unsealed access tracks and exposed surfaces heavily trafficked by machinery and vehicles (i.e. entry / exit points, vehicle routes and loading and unloading areas.) during the summer months when conditions are dry, when excessive dust generation is evident and during periods of high risk (e.g. dry and windy conditions). Dust suppression water will be taken from suitable recycled water sources where possible. Geotextiles will also be used to stabilise slopes, instead of concrete and cover exposed areas of rockface and soil prior to the establishment of vegetation in areas of biodiversity sensitivity. Sediment control dams and traps will be installed in suitable locations, particularly along higher elevations above ecologically sensitive areas (i.e. the Buna River Protected Landscape) to further minimise the risk of sediment loading impacts. Vegetation located on the steep slopes of Mount Renci within the project area will also be preserved where possible to minimise the risk of erosion.

Emergency spill management procedures will be in place and communicated to all relevant staff and contractors during their induction to minimise the impacts to habitats and plants in the event of an incident.

Emergency response procedures will be prepared for the Project which will include a protocol for responding to accidental spills and leakages of non-hazardous waste and hazardous compounds. Staff and contractors will receive training in spill events management.

Project staff and contractors will be banned from the collection of timber and non-timber natural resources within the project area and River Buna Protected Landscape to minimise impacts to fauna and their habitats. This will be communicated to staff and contractors through staff inductions.

Operation

ADF will be responsible for project maintenance, including maintenance of the Project's drainage system, during the first two years of operation to ensure that impacts to habitats and plants arising from suspended sediments and runoff continue to be minimised. After this period the responsibility will be handed over to the municipalities, namely Lezhe and Shkoder.

The Project is intending to develop a Sustainability / Eco-tourism Programme to minimise indirect project-related impacts to habitats and vascular plants (and other priority biodiversity features) arising from facilitated access and project-related in-migration (predominantly tourists). The objective of the assignment is to establish a programme of activities and co-ordinated stakeholder consultation to support sustainable eco-tourism in the Shëngjin and Velipojë region of Albania by undertaking strategic and local actions. It is anticipated that the programme will support increased environmental awareness, sustainable and safe communities within the Shëngjin and Velipojë region, promote environmental preservation and conservation practices, circular economy through establishing stakeholder engagement networks, capacity building (through the provision of tools, management plans and awareness raising materials) and support policy dialogue.

4.1.3.3 Rehabilitation / Restoration

Reinstatement and Landscaping Plan will be prepared and implemented for the Project by ADF in consultation with experienced ecologists (including a botanist and a mammal specialist) and approved by the National Agency for Protected Areas or the Regional Agency of Protected Areas (Shkoder and Lezhe). This plan will provide a clear methodology for the reinstatement of the physical environment within PDA. Rehabilitation and restoration works will aim to re-establish ecosystem function in a 'like for like' (or better) than that which existed prior to Project construction where feasible. Habitats temporarily cleared or degraded from within cleared areas (i.e. the working width, borrow pits and stockpiling areas, worker facilities etc) will be restored using native species of local provenance to establish self-sustaining habitats.

The Reinstatement and Landscaping Plan will include the following mitigation measures:

- All rubbish and waste materials within the project area (including the project footprint, the working width, borrow pits, stockpiling areas and contractor facility area) will be cleared of all rubbish and waste material in accordance with the project's waste management principles.
- The physical landscape of the project area (i.e. escarpments and embankments) will be restored by clearing the area of debris, filling holes with recycled material from the road works.
- A planting scheme will be developed for the Project by ADF in consultation with an experienced ecologist and implemented by the contractor. This will include planting native 219 trees and 35 bushes along the sidewalks of the proposed road.
- The geocells geotextile, installed along the escarpments and embankments, will be seeded with grasses and herbs using native species of local provenance. A list of potential species for planting will be prepared for the Project by an experienced botanist during to construction phase and is likely to include nationally rare and threatened species. Seeding will be overseen by an experienced ecologist.
- The Project has committed to translocating (or relocating) a total of 434 trees and bushes (including native oak and pine trees) from within and near the footprint of the proposed road alignment over the period December to January.
- All planted and translocated vascular plants (i.e. trees, bushes, grasses, herbs, including rare and threated species) will be regularly watered by the contractors to promote establishment for the first 5 years following planting / translocation, or until successful establishment has been achieved. Water will be transported to the site via water tanks and will not be extracted from local water sources.
- ADF will monitor the establishment of all planted and translocated vascular plants on a regular basis for the first 2 years following the completion of the construction works. Any dead vascular plants will be replaced as 'like for like' during this timeframe. Following this period, the municipalities (namely Lezhe and Shkoder) will take over the responsibility for the watering and monitoring works, as specified in the maintenance agreement. ADF will retain a quality assurance role over the first 3 years of handover to ensure that these tasks are completed. Any dead vascular plants will also be replaced as 'like for like' during this timeframe.

4.1.4 Residual Impacts

Whilst avoidance, mitigation and restoration actions will reduce the significance of impacts to biodiversity, residual impacts will remain for some priority habitats (i.e. Mediterranean evergreen *Quercus* forest, maquis, arborescent matorral and thermo-Mediterranean scrub, screes and coastal dune and sandy shore). A residual impact to habitats and flora from the project will arise from direct habitat loss within the project footprint, which is necessary for the construction of the project. A total 13.7 ha of habitats will be cleared. The majority of this habitat will comprise Mediterranean evergreen Quercus forest, maquis, arborescent matorral and thermo-Mediterranean scrub, screes and coastal dune and sandy shore.

Indirect habitat loss, fragmentation and degradation arising from project-related in-migration and increased population pressure, particularly during the tourist season, pose a significant risk to the integrity and floristic composition of habitats, including those located within the Buna River Protected Landscapes. The proposed mitigation measures will reduce the risk but are unlikely to completely eliminate residual impacts.

A detailed breakdown of the project-related impacts to habitats and flora, recommended measures to avoid, restore / rehabilitate and minimise impacts and the residual impacts are presented in Appendix 1.

4.2 Impact Assessment: Fauna and their Habitats

4.2.1 Pre-construction and Construction Phase

4.2.1.1 Loss and Degradation of Fauna Habitat

It is expected that 13.7 ha of fauna (i.e. mammals, reptiles, avifauna and insects) habitat will be permanently cleared from within the footprint of the road alignment; including 11.4 ha of fauna habitats within the Buna River Protected Landscape. This will include the permanent loss of habitat used by fauna that are PBFs for the Project, whose presence has been confirmed within the PDA, namely: golden jackals, Eurasian badgers, bats (in particular *Rhinolophus hipposideros* and *R. ferrumequinum),* the great Capricorn beetle *and* birds in particular European turtle-dove, oystercatcher, European curlew, golden eagle, grey heron, eagle owl, common buzzard, short-toed eagle, little egret, peregrine falcon, hobby, common kestrel, oystercatcher, black-winged, yellow-legged gull, European bee-eater, pygmy cormorant, Dalmatian pelican and European hoopoe.

It is anticipated that site preparation and construction works will also result in the degradation or loss of an additional area of fauna habitats from within the wider PDA (e.g. through the transport of vehicles, rock stabilisation works etc) including the footprints of borrow pits, stockpile sites, workers facilities, the office and equipment storage facilities. The locations of these components and the area of temporary habitat loss or degradation is currently unknown. The expected impacts to fauna arising from habitat clearance are considered to be of Major significance prior to mitigation.

Fauna habitat loss is expected to initially result in the displacement of some fauna species (i.e. mammals and birds) from within these areas. The existing level of habitat connectivity within the zone of influence is expected to facilitate the movement of fauna during habitat clearance. Displacement of fauna may increase competition for resources depending on the species range and the current carrying capacity (number of individuals

per area/resources) of the area (Hayward et al., 2007). If the carrying capacity is low and resources are already limited, then competition will be high. Predation is also a likely consequence of reduced habitat size and increased fragmentation (e.g. competitor avoidance (Durant, 2000)). It is anticipated that a few individuals will be displaced during habitat clearance and the adjoining habitats are expected to hold sufficient resources and habitat availability to support the movement of fauna.

Taking a precautionary approach, it is assumed that the clearance of oak woodland located in the project footprint will result in the permeant loss of habitat for the great Capricorn beetle (IUCN listed VU, Albanian Red Data Book listed EN) which is a PBF for the project. The locations of these woodland sites are illustrated by the habitat map and are summarised in Figure 4-3. Due to their limited mobility, it is unlikely that these beetles would be able to move out of the clearance zone and as such are likely to be injured or killed by project vehicles and machinery in the absence of mitigation.

Targeted ecological surveys confirmed that 18 bat species use habitats within the wider project area and surrounding environs, of which, five bat species are rare and threatened at the national, regional and global scales, namely: long-fingered bat (*Myotis capaccinii*; IUCN VU; Albania Red Listed VU); Blasius' horseshoe bat (*Rhinolophus blasii*; IUCN VU in the Mediterranean); Mediterranean horseshoe bat (*Rhinolophus Euryale*; IUCN Mediterranean VU; Albanian Red Listed VU); lesser horseshoe bat (*Rhinolophus hipposideros*; NT in Europe); and Schreiber's bent-winged bat (*Miniopterus schreibersi*; IUCN NT). Habitat clearance within the PDA, particularly the removal of stands of oak woodland, is therefore expected to result in the permanent loss of bat foraging and commuting habitat. Habitat clearance will also result in the permanent loss of oak woodland (approximately 2.3 ha) from within the footprint located on Mount Renci which offers potentially suitable habitat for roosting bats.

Land clearance is also expected to result in the permanent loss of a bat roosting site within an abandoned house located within the PDA (Figure 4.4). Two bat species were observed roosting in this house; lesser horseshoe bats and greater horseshoe bats. Survey results indicate that the house may serve as a maternity roost for lesser horseshoe bats. Roosting bats would be less likely to naturally disperse from the habitat during clearance. Hence, there is a high risk of injury and mortality to roosting bats arising from vehicle and machinery use during land clearance in the absence of suitable mitigation.

The PDA provides important habitat for breeding and nesting birds of which five species are globally rare and threatened (namely: European turtle-dove (*Streptopelia turtur;* IUCN VU; rock partridge (*Alectoris graeca*; IUCN NT); oystercatcher (*Haematopus ostralegus*; IUCN NT at the global scale and VU in Europe); European curlew (*Numenius arquata*; IUCN NT at the global scale and VU in Europe); and Dalmatian pelican (*Pelecanus crispus*; IUCN NT).The PDA also provides nesting habitat for 17 bird species that are classified as rare and threatened by the national Albania Red List as follows:

- golden eagle (*Aquila chrysaetos*) - EN
- grey heron (*Ardea cinerea*) – EN (during breeding)
- eagle owl (*Bubo bubo*) – CR
- common buzzard (*Buteo buteo*) – VU (during breeding)
- short-toed eagle (*Circaetus gallicus*) – VU
- little egret (*Egretta garzetta*) – VU (during breeding)

- peregrine falcon (*Falco peregrinus*) – VU (during breeding)
- hobby (*Falco subbuteo*) – VU
- common kestrel (*Falco tinnunculus*) – VU (during breeding)
- oystercatcher (*Haematopus ostralegus*) – VU
- black-winged stilt (*Himantopus himantopus*) – EN
- olive-tree warbler (*Hippolais olivetorum*) – Data deficient
- yellow-legged gull (*Larus michahellis*) – EN (during breeding)
- European bee-eater (*Merops apiaster*) – EN
- pygmy cormorant (*Mycrocarbo pygmaeus*) – CR (during breeding)
- Dalmatian pelican – CR (during breeding)
- European hoopoe (*Upupa epops*) – VU

Habitat clearance will therefore result in permanent loss of bird nesting habitat from within the project footprint and the temporary loss of bird nesting habitat from within the wider PDA. These works also pose a threat to nesting birds and their eggs if clearance is undertaken during the peak bird nesting season. Whilst some species may not be able to breed again that same season, this is unlikely to significantly impact national and global population numbers. Habitat clearance is highly unlikely to entail the loss of nesting habitat for the slender-billed curlew (IUCN CR and a critical habitat-qualifying species) which are more likely to nest within or near dry patches of wetland habitat (IUCN, 2018).



Figure 4-3: Location of oak dominated woodland



Figure 4.4: Bats roost location within the project footprint

4.2.1.2 Fragmentation of Fauna Habitat / Barriers to Movement

Habitat clearance for the construction of the road and habitat fragmentation may deter some fauna species from crossing the cleared area, particularly in combination with disturbance arising from vehicle activity, machinery and workers. Hence habitat fragmentation may serve as a barrier to the movement of fauna with home ranges that overlap the project footprint and the PDA namely golden jackals (a PBF), Eurasian badgers (a PBF), wildcats (a PBF), stone marten, grey wolf (a PBF if present) and brown bear (a PBF if present). This is likely to limit access to habitats and resources for some fauna species categories as PBF for the project, particularly golden jackal, grey wolf and Eurasian badger. It is expected that some birds may perceive habitat clearance and fragmentation as a barrier to movement. However large ranging birds, particularly those that are adapted to urban environments, will be unaffected.

Cleared land, fragmented habitats and roads are known to create barriers to the movement of fauna. Barriers to home-range use and movement can alter communication, sociality and reproduction. If populations of the same species are permanently separated by artificial barriers, the resultant isolation can lead to genetic diversification and speciation in isolated populations, reduced gene flow, inbreeding or local extinction (Taylor and Goldingay, 2010). There is a high proportion of species that will avoid even narrow (<30 m wide) clearings (Laurance et al., 2009). It appears that some species have specialised locomotion adaptations (e.g. strictly arboreal), exhibit strong psychological avoidance of clearances (e.g. past predation), align their territories along clearings, avoid humans and human-associated activities, avoid generalist or invasive species that are found in clearings or are adapted to the darker, dense forest of interiors and therefore clearings become barriers to movement (Laurance et al., 2009). Impacts to fauna arising from habitat fragmentation and barriers to movement are expected to be of Moderate significance prior to mitigation.

4.2.1.3 Air Quality

Fugitive dust emissions (e.g. PM_{10} and $PM_{2.5}$) and combustion emissions air pollutants (i.e. SO_2, CO, NOx, particulate matter and VOCs) will be generated during the pre-construction / construction phase which will be short term, localised and staged over two years. Combustion emissions are likely to be less of a risk to fauna during the construction phase compared to dust emissions, due to limited vehicle and machine usage within the project area.

Significant dust emissions are expected to result from the use and upgrade of the existing unsurfaced Rruga Banks Rrjollë road within the Buna River Protected Landscape. Air quality impacts arising from fugitive dust emissions are expected to be relatively localised and occur within approximately 200 m of the unsealed access roads. Dust deposition drop-out may also impact fauna habitats in areas near the source site in the dry weather conditions. Dust emissions are however likely to be wider reaching in windy conditions, particularly along the section of the alignment located on an exposed face of Mount Renci. Depending on weather conditions during the pre-construction / construction phase, fauna habitats located within Zone 1b of the Buna River Protected Landscape (i.e. wetlands) could potentially be impacted.

The magnitude of impacts to fauna arising from the inhalation of these dust emissions and air pollutants is dependent on the quantity, composition, respiratory rates and health

of fauna. Emissions can cause irritation and impairment of respiratory functions, skin irritation and vision impairment of fauna. Potential impacts may be cumulative in nature. Pollutants could also be ingested (for example when deposited on plants or fruit which is then consumed) and then adversely affect the health of fauna. Impacts to priority fauna from fugitive dust emissions during the construction phase could be of Moderate significance prior to mitigation, whilst impact to fauna arising from combustion emissions could potentially be of Moderate significance prior to mitigation.

4.2.1.4 Hydrology and Water Quality

The hydrology of the coastal lagoon, associated waterways and wetlands (including the dune wetlands) within the Buna River Protected Landscape (critical habitat-qualifying features for the Project) will not be directly impacted by project-related clearance activities. There are no major tributaries or creeks located within the footprint of the proposed road alignment. Ten small ephemeral creeks, that transect the Project footprint and are active during the raining season will be diverted using culverts. There will no water extraction (i.e. to be used during drilling, piling or consumption) within the zone of influence will not be undertaken for the project. Water for civil works will be supplied to the project area using water tankers. Hence fauna water resources will not be significantly impacted for the construction of the proposed road.

Suspended sediments generated by site preparatory works and construction activities (i.e. habitat clearance, earthworks, drilling, top-soil and gravel stockpiling etc) are expected to impact surface water quality prior to the implementation of mitigation measures. During the raining season, the water quality of downhill and / or downstream water bodies (i.e. wetland pools, coastal lagoon, wetlands and associated waterways) located within Zones 1b of the Buna River Protected Landscape are at risk of potentially be impacted by suspended sediment-laden runoff prior to mitigation. Waterbodies located nearest to the project area (i.e. dune wetlands and ponds) are more vulnerable to the risk of being impacted during construction. The ingestion of water with a high sediment content may adversely affect the health of fauna species of conservation importance by reducing the biological fitness of individuals, or causing the mortality of vulnerable individuals reliant on heavily affected water resources. Whilst impacts to fauna and their habitats have the potential to be of Major significance prior to mitigation, many fauna species of conservation importance are expected to avoid using water sources with a high turbidity.

There is also risk of surface and groundwater contamination through accidental spills or seepages of hazardous substances (i.e. diesel fuel, oil, bitumen etc) and grey-water or septic systems (i.e. portaloos) during construction could contaminate receiving waters and terrestrial fauna habitats. This would be detrimental to the health of fauna if ingested and may compound the impact of habitat loss. This impact would most likely occur within the RoW, near the workers facilities or the source of the spillage but could be far reaching if receiving waters are impacted. Impacts to fauna and their habitats arising from accidental spills and leakages may be of Major significance, depending on substance type, volume and location of the accident.

4.2.1.5 Noise, Vibration and Airblast

Baseline noise and vibration monitoring and predictive modelling have not been undertaken for the project to date; however the Project has committed to undertaking

noise and vibration pre-construction baseline surveys and monitoring works during construction. Hence a precautionary approach to this assessment has been taken.

The project does not intend to use blasting during the pre-construction / construction phase, hence there will be no airbast impacts generated by the project. The predominant noise emissions generated during the pre-construction and construction phase will be generated by sources such as vehicle traffic, plant vehicles, pneumatic drills and jackhammers and machinery (i.e. drilling rigs, pile drivers, excavators / grader and vibratory rollers). Construction noise emissions will relatively localised, temporary and generated over a 2-year period. The impact from noise generated by project construction could potentially be significant within 1 km of the construction site. This would be expected to cause disturbance to fauna and avifauna near the project footprint and fauna within zones 1a, 1b and 2b of the River Buna Protected Area Landscape. It is anticipated that ground vibration generated during construction by vehicle traffic, plant vehicles, pneumatic drills and jackhammers and machinery (i.e. drilling rigs, pile drivers, excavators / grader and vibratory rollers) will be relatively more localised and nuisance level vibration impacts are expected to be perceptible within 200 m of the construction site.

Unfamiliar and/or loud noise and vibration emissions are known to evoke a flight reaction in fauna. Mammals and birds are also known to experience stress, reduced biological fitness and decreased breeding success on exposure to noise (Francis and Barber, 2013). Chronic stress can increase species' susceptibility to diseases, pathogens and parasites (Dhabhar, 2002; Sapolsky et al., 2000). High noise and vibration levels may also compromise hearing by damaging inner-ear structures, provided that the acoustic energy is within an animal's sensory range and the animal is close to the source (Barber et al., 2010). The behaviour of birds and social mammals could be adversely affected if vocalisations are masked or the perception of sound is inhibited by high noise and vibration levels, as a large proportion of these species rely on acoustic signals for courtship and mating and predator detection and avoidance. However, some birds and mammals are known to develop short-term adaptations to noise, such as vocal adjustments (i.e. changing song frequencies, amplitude or timing; Barber et al., 2010). Species that are quickly able to adapt to changes in ambient noise and vibration levels are less affected than species that are unable to adapt. If noise or vibration is perceived as a threat, animals can increase vigilance and anti-predator behaviour (Francis and Barber, 2013).

It is anticipated that noise and vibration emissions arising from habitat clearance and construction activities will result in the displacement of fauna from habitats near the project footprint, RoW and the associated facilities. Some species may be able to habituate to consistent noise and vibration levels during construction while other species are unlikely to adjust. Disturbance caused by noise and vibration during construction to priority mammals and birds is expected to be of Moderate significance prior to mitigation.

4.2.1.6 Light-spill

Project construction will not be undertaken at night. Artificial lighting will only be used to light the office, equipment compound and the plant / machinery storage area located within or near the footprint of the proposed road for security reasons. It is anticipated that the resulting light-spill will be localised and temporary.

Light-spill is known to cause disturbance to crepuscular (fauna that are active primarily during dawn and dusk) and nocturnal species (i.e. leopards, bats and some birds) and can cause a range of behavioural changes such as altered feeding and roosting patterns. Light-spill may affect the circadian rhythms and cycles of activity of nocturnal, crepuscular and diurnal species, including disruption of seasonal acclimatisation, disruption of predator-prey relationships, increased prey intake and altered reproduction behaviour (Gaston et al., 2013; Longcore and Rich, 2004). Many species use lightscapes (e.g. moonlight) as cues for movement around their environment and altering these lightscapes by light pollution may disrupt these movements by disorienting the animal (Gaston et al., 2013). This can potentially result in physiological stress and thereby reduced biological fitness.

It is expected that artificial lighting may result in the localised displacement of crepuscular and nocturnal species from within the project area (i.e. golden jackal, Eurasian badger and bats). Disturbance from artificial lighting is expected to be of Minor significance to fauna prior to mitigation.

4.2.1.7 Vehicle / Machinery Collisions

Pre-construction and construction activities (i.e. habitat clearance, earth works, excavating and levelling works etc) present a risk of accidental fauna collisions with vehicles and machinery resulting in injury or mortality to some individuals. The project areas where fauna will be most at risk are the project footprint and wider PDA where the majority of vehicle movement and machinery activity will occur, and fauna will be particularly vulnerable during habitat clearance works. Whilst the likelihood of death or injury may be partly reduced as medium sized fauna and avifauna are expected to avoid areas of high construction activity due to disturbance (i.e. noise, vibration, artificial lighting and presence of humans etc), small-ranging species, slow moving species and small sized mammals which are less able to quickly move away from operating machinery and vehicles and are expected to be killed or injured during the construction phase prior to mitigation.

Habitat clearance works and grubbing within the oak woodland on Mount Renci is likely to result in vehicle and machinery collisions with great Capricorn beetles (IUCN listed VU, Albanian Red Data Book listed EN; and PBF) as it is unlikely that these beetles would be able to move out of the clearance zone resulting in the mortality of individuals in the absence of mitigation. The locations of the oak woodlands is illustrated in Figure 4-3.

Targeted survey work has confirmed that the PDA provides habitat for the Eurasian badger, however the location of any badger setts within the project footprint and PDA is currently uncertain. There is a risk that vegetation clearance and grubbing works may result in the destruction of an active badger set resulting in the injury and / or mortality to any badgers occupying the sett from a vehicle / machinery collision. The risks are greater during the day when badger setts are most likely to be occupied.

Prior to the implementation of mitigation measure, land clearance and preparation works is expected to result in the destruction of an active bat roosting site within an abandoned (Figure 4.4). Collisions with machinery during the removal of the building is expected to result in the injury and / or mortality of approximately eleven lesser horseshoe bat and one individual greater horseshoe bat.

The PDA provides important habitat for breeding and nesting birds of which five species are globally rare and threatened and 17 bird species that are classified as rare and threatened by the Albania Red List (MoE, 2013). Habitat clearance during the breeding bird season is expected to result in the injury and / or mortality of nesting birds and their young arising from collisions machinery and vehicles prior to application of mitigation measures.

Night working during the pre-construction and construction phase would increase the risk of vehicle collisions with moving nocturnal fauna (i.e. badgers, golden jackals, grey wolves, bats and wildcats), which are less likely to be seen by drivers and may be startled by vehicle headlights. Predators feeding on carrion on or beside roads (i.e. magpies) are vulnerable to collision (Forman and Alexander, 1998) and ground dwelling or low-flying bird species may collide with vehicles and machinery, particularly at dusk or dawn when birds are generally more active.

The expected impacts associated with potential vehicle collisions with fauna is considered to be of Moderate significance prior to mitigation.

4.2.1.8 Induced Access and Project-related In-migration

Project-related in-migration is expected to initially occur during the construction phase with the mobilisation of the workforce but is unlikely to significantly increase until the proposed road is in operation. The predicted extent of project induced in-migration during the construction phase of project development is uncertain.

The main potential risks to fauna and their habitat associated with project-related in-migration and facilitated access to the project area are listed as follows:

- The decline in abundance and diversity of fauna species due to the hunting and capture of fauna for food, substance and trade by the workforce and residence
- The decline in fauna resource availability (i.e. food, water, etc) due to the unsustainable collection of natural resources by the workforce and residents which may contribute to existing pressures on local wildlife populations.
- Inappropriate waste management by the workforce, attracting pest species into the project area. The workers facilities are most at risk.
- The stimulation of urban development and agro-pastoral activities within the project area resulting in indirect habitat loss.

These adverse impacts to fauna and their habitats are likely to be of greater risk during operation than construction. Impacts to habitat and flora are expected to be of Moderate significance prior to mitigation.

4.2.2 Operation

Many of the adverse impacts to fauna and their habitats which occur during the pre-construction / construction phase will continue in varying degrees and intensities into the operation phase. The following discussion of impacts to fauna and their habitats during the operation phase should be considered in addition to those impacts outlined above.

4.2.2.1 *Fragmentation of Fauna Habitat / Barriers to Movement*

Golden jackals (a PBF for the project) are present within the PDA and the Buna River Protected Landscape with 6 to 7 different territorial groups present in the region of the PDA, comprising approximately 10 to 14 individuals in total. Jackal groups have a stronger preference for lowland areas, agricultural fields and wetland ecosystems, rather than the dry rocky areas in the uplands of Mount Renci. Golden jackals are thought to use the upland areas of Mount Renci to commute back and forth from one lowland area to another, whilst denning / residing in the lowland habitats. The evidence of cubs in the vocalisation recall survey further supports this assumption.

During operation, the physical structure of the proposed road (i.e. steep sided road embankments, safety barriers and concrete structures), compounded by noise and vehicle movement) is expected to form a barrier to the movement of medium sized fauna with home ranges that overlap the project footprint, such as golden jackals. This may limit access to habitats and resources including prey species. The road may also reduce the carrying capacity of the project area and surrounding landscapes to support golden jackals if the road cannot be circumnavigated by fauna (Forman and Alexander, 1998). These impacts are of Major to Moderate significance to golden jackals prior to mitigation. These impact to smaller ranging mammals with habitats that overlap the PDA (i.e. badgers, wildcats and stone martens) is expected to be of Minor to Moderate significance prior to mitigation.

The proposed project is reportedly located within a wider wildlife corridor for mammal species. This corridor extends from Klezna to Shëngjin and comprises the two parallel hill ranges (Mount Renci where the project is located and Mount Jushi - Mali i Jushit), surrounded by agro-pastoral land, the beach and delta. According to Schneider-Jacoby et al (2006). This may potentially provide habitat for commuting grey wolf (*Canis lupus* IUCN LC and National Red List NT) and European roe deer (*Capreolus capreolus;* IUCN LC; National Red List VU) (Schneider-Jacoby et al, 2006). According to Schneider-Jacoby et al (2006) the presence of bears (*Ursus arctos;* IUCN LC; National Red List VU) has been reported in the area, however other comprehensive accounts (Kaczensky et. al. 2013) do not indicate that the area is permanent bear habitat. There is some potential that the area is sporadically used by bears as a transitory corridor. Project-related impacts to these species arising from a reduction in habitat is likely to be of Minor significance, given their large range sizes and low level habitat usage in the project area.

4.2.2.2 *Air Quality*

Air quality combustion emissions generated by vehicle activity are likely to be elevated during the operation phase compared to construction phase, as vehicle traffic increases within the project area to an estimated 1238 vehicles per year. The Environmental Impact Assessment: Design of Road Shëngjin – Velipojë Project Ideas (December 2017) has identified that 90% of all passenger cars registered in Albania are equipped with diesel engines and a large proportion are old imported vehicles with high SO_2 and particulate matter emissions. Furthermore, this EIA states that sulphur content in fuel is likely to be higher than European standards. Hence, impacts to fauna arising from combustion emissions are expected to be of Moderate significance prior to mitigation. Impacts to fauna and their habitats arising from fugitive dust emissions are likely to reduce during operation and as such are considered to be of Moderate significance prior to mitigation.

4.2.2.3 Noise and Vibration

Noise and vibration emissions during operation will predominantly be generated by vehicle traffic using the proposed Shëngjin and Velipojë road. The predicted extent is unknown; however noise and vibration emissions are likely to be of lower levels during operation than construction. It is expected that these emissions will result in the continued displacement of medium sized mammals and some sensitive bird species from habitats near the road but is unlikely to significant impact reptile species. Impacts to fauna from noise and vibration emissions during operation is expected to be of Minor significance prior to mitigation.

4.2.2.4 Light-spill

Impacts to fauna arising from artificial lighting will continue into the operation phase as artificial lighting will be installed along a 7 m section of the road located within Shëngjin and along the end portion of the road at Rrjolli.

4.2.2.5 Induced Access and Project-related In-migration

Currently the region is exposed to high number of beach tourists with approximately 80,000 to 200,000 visitors a year who stay for a short period of time. According to the project's economic analysis report (December 2017), 830,000 tourists visited Velipojë and 1,000,000 tourists visited Shëngjin in 2017. This type of high-volume, low-cost tourism exerts high pressure on local resources and continues to stimulate uncontrolled urban development. It is expected that the development of the new road will facilitate access to the project area by tourists that will contribute to and increase the level of existing pressures on natural resources if unmitigated. The predicted extent of project-related in-migration within the project area is currently unknown.

Increased natural resource collection (i.e. fruits, herbs and timber) may degrade fauna habitat quality and may increase conflict with wildlife for remaining resources, including fauna of conservation importance (i.e. Eurasian badgers which are omnivorous). Fauna and avifauna that inhabit areas that are less accessible to humans (i.e. the steep sided slopes of Mont Renci) are probably less in direct competition or conflict with people for natural resources. This may also apply to some areas of the Buna River Protected Landscape (i.e. some section of Zone 1a).

The operating road may stimulate the establishment of urban development along the alignment (i.e. for the development of housing and holiday accommodation), particularly along the flat topographical landscapes of Mount Renci and may renew interests in farming in this area due to the facilitated access. These forms of indirect fauna habitat loss would further compound the impact of direct fauna habitat loss, habitat fragmentation and further serve as an additional barrier to the movement of wildlife, particularly wide-ranging species such as golden jackal, grey wolves and commuting bears (if present). This may limit access to the resources and reduce the current carrying capacity of the species' home ranges.

The proposed road may also facilitate access to habitats in the project area for illegal hunting. It is important to acknowledge that evidence of hunting was identified by the Supplementary Biodiversity Assessment – The Proposed Shëngjin and Velipojë Road Scheme (January, 2019).This will increase pressure on local fauna populations in the vicinity of the road if the hunting ban is not enforced.

In-migration is expected to increase the presence of people within the coastal reaches (i.e. beach, sea, dune system, coastal lagoon and wetlands) of the Buna River Protected Landscape, particularly the beaches and dune systems at the foot of Mount Renci. This is likely to increase the disturbance to fauna (i.e. through elevated noise levels and increased presence of people) and poses a risk to the quality and integrity of fauna habitats (i.e. degrading and fragmenting habitats though increased vehicle movement, trampling etc).

Pest species (i.e. rodents and birds) and feral dogs may be attracted to the area if litter and food scraps are inappropriately disposed of by passengers and drivers when using the road, thereby creating potential for conflict and disease transmission.

4.2.3 Avoidance, Minimisation / Mitigation and Restoration Measures

The BMP, ESMP and ESAP details specific measures to avoid, minimise and mitigate impacts to fauna and their habitats. A summary of these measures is provided below.

4.2.3.1 Avoidance

The proposed road alignment has been rerouted, based on advice from The National Agency of Protected Areas, to avoid the core zone (1A) of the Buna River Protected Area to avoid impacting key habitats and wildlife (Figure 2.1).

Project construction will not be undertaken at dusk, dawn and at night to avoid disturbance to nocturnal and crepuscular fauna (i.e. bats) from increased noise and vibration.

Prior to the commencement of works, a bat ecologist will undertake pre-clearance checks of key potentially suitable trees within areas of oak wooded in the PDA to avoid causing disturbance or injury to roosting bats.

Pre-clearance checks will be undertaken by an experienced ornithologist for ground and tree nesting birds within the working width prior to the commencement of the habitat clearance works to avoid causing disturbance or harm to nesting birds and their young from collisions with machinery. A ‘no-go area’ comprising a 5 m radius will be demarcated around each active nest by the Project contractors with guidance from the ornithologist. Habitat clearance will be prohibited within these ‘no-go areas’ until the chicks have fledged. A method statement for this check and the management of active nesting sites will be prepared by an experienced ecologist. This method statement will be followed by the Project contractors and ADF

Pre-clearance checks for badger setts will be undertaken by an experienced ecologist within the PDA prior to the commencement of the habitat clearance works to avoid causing injury or harm to badgers and the destruction of their setts.

4.2.3.2 Minimisation

<u>Pre-construction / Construction</u>

Staff and Project contractors will adhere to a standard operating procedure for land clearance and stockpiling (i.e. soil, gravel, hardcore etc) to minimise the loss of fauna habitats to the extent practicable and the risk of injury or mortality to fauna arising from accidental collusion with machinery and vehicles. This will include the provision of the

method statement for habitat clearance which will be prepared by an experienced ecologist. This will be communicated to all relevant personnel (i.e. staff and contractors) during the inductions. Key mitigation measures to be included in this statement (in addition to those are presented in Section 4.1.3.2) are listed as follows:

- The footprint of the road alignment and RoW will be minimised to limit fauna habitat clearance to the extent practicable.
- Habitats to be cleared will be clearly delineated to minimise the risk of fauna habitat clearance outside of these areas.
- Environmentally sensitive areas for priority fauna will be clearly marked as 'No Go Areas' (i.e. wooded areas, wetlands, the beach and dune system at the foot of Mount Renci).
- Habitat clearance will be undertaken in a progressive and sensitive manner to enable fauna to move away from the area of works, disperse into surrounding habitats and to avoid fauna from being isolated in fragmented areas of habitat.
- Slow moving fauna will be translocated to a designated receptor site during the clearance works.
- An ecologist will be on hand to supervise the habitat clearance works and provide advice to the workforce.

Dead wood from within Oak woodland located in the working width will be translocated to a suitable receptor site to minimise the habitat loss for the great Capricorn beetle and minimise the risk of accidental collision with vehicles and machinery. A method statement for the translocation scheme will be prepared by an experienced ecologist prior to the commencement of works. The ecologist will also supervise the translocation works.

In the event that the presence of roosting bats are identified within trees amongst stands of oak woodland in the PDA, a bat ecologist will either exclude the bats from their roost or translocate these bats to bat boxes prior to the commencement of works at a suitable time of year (i.e. spring and autumn as appose to summer and winter) in accordance with a method statement prepared by the bat ecologist. These bat boxes will be located within suitable receptor sites.

The bat roosting site, an abandoned house, located within the PDA will be 'soft stripped' by the contractors under supervision of a bat ecologist prior to the commencement of works at a suitable time of year. The bats will then be excluded and/or translocated to a purpose-built bat roost that has been designed by a bat ecologist and constructed by the contractors. The scope of this roost has yet to be determined but could include the provision of bat boxes.

In the event that an active badger sett is identified, an experienced ecologist will prepare a method statement for the sett closure and the construction of a substitute artificial sett in a suitable location. These method statements will be followed by the contractors.

The risk of accidental injury and mortality to fauna from vehicle collisions will be minimised by enforcing reduced speed limits within the construction site and adherence to the Highway Code at all times. An Injured Wildlife Protocol will be also developed for the project by an experienced ecologist and followed by staff and contractors in the event of an incident. This will include a mandatory reporting system which will enable an assessment of the incident to be undertaken and the requirements for any further actions or mitigation measures to be determined. Reports will include encounters of wildlife and observation of natural resource collection, illegal hunting and wildlife trade.

To minimise the loss of golden jackals' habitat range and other fauna during Operation, the contractors will establish a wildlife crossing point (above ground). The location of the wildlife crossing point is illustrated in Figure 4-5. This will facilitate the movement of golden jackals and other medium sized mammals across the road at night with reduced risk of vehicle collisions, which in addition to killing or injuring wildlife may cause injury to people and vehicles. The wildlife crossing point will comprise the following components:

- Reduced speed limits will be signposted during operation along the length of the proposed road to minimise the risk of accidental injury and mortality to fauna arising from vehicle collision.
- Vehicle traffic will be slowed further at the wildlife crossing point. This reduction in speed limit will be signposted and rumble strips (or alert strips) or a suitable alternative will be installed on the approach to the wildlife crossing point.
- Signs will be installed to identify the wildlife crossing point to vehicle traffic.
- Streetlighting will not be installed along or near the wildlife crossing point to avoid causing disturbance from artificial lighting.
- Safety barriers and sidewalks will not be installed along or near the wildlife crossing point to facilitate fauna movement across the road.
- Strategic planting will be undertaken by the contractors along and near the wildlife crossing point to facilitate fauna movement. The planting scheme will be designed by an ecologist with experience of surveying and monitoring golden jackals.

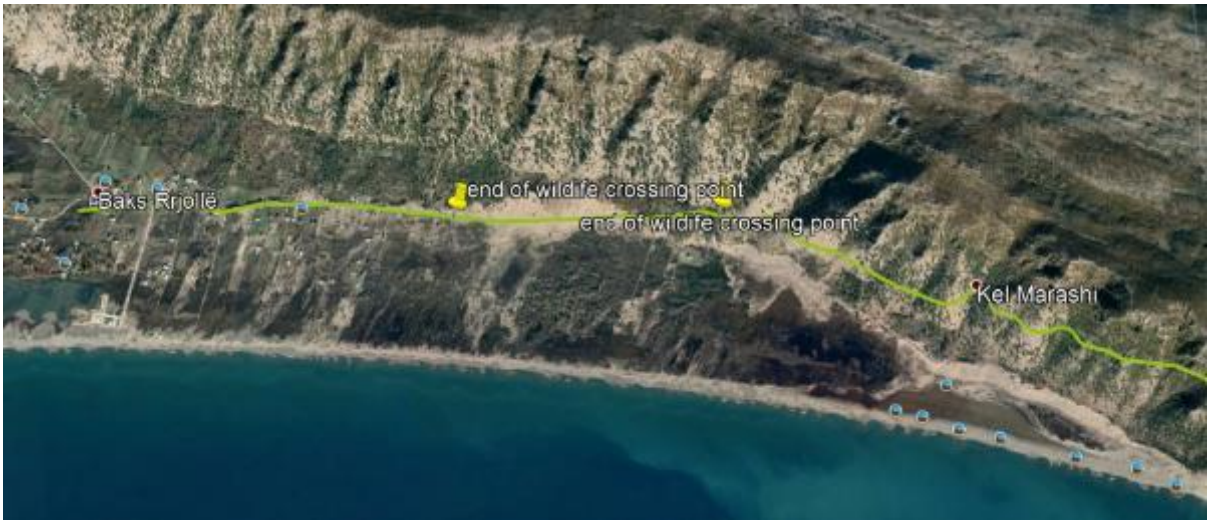


Figure 4-5: Wildlife crossing point location

Staff and contractors will adhere to a Standard Operating Procedure for Emission and Dust Control, Erosion and Suspended Sediment Control to minimise impacts from This should include the provision of measures to minimise the adverse impact to fauna and their habitats arising from fugitive dust emissions, erosion and suspended sediments on fauna and their habitats. These are described in Section 4.1.3.2.

Staff and contractors will adhere to a Standard Operating Procedure for Noise and Vibration Management throughout the pre-construction and construction phases to

minimise disturbance fauna. This includes the use of silencers and sound barriers (natural and artificial), particularly within and near the Buna River Protected Landscape, and regular vehicle / machinery maintenance to minimise noise and vibration. It understood that monitoring will be undertaken throughout the construction phase by the project to ensure that project generated noise, vibration and air quality emissions comply with legislative levels and meet international guidelines.

Impacts to fauna caused by disturbance from artificial lighting should be minimised using capped and directional lighting from ecologically sensitive habitats (i.e. the coastal habitats and wetlands of the Buna River Protected Landscape).

Project staff and contractors will be banned from hunting, buying or trading wildlife and collecting natural resources to minimise pressure on fauna populations and their habitats

ADF will ensure the safe handling of diesel fuel, non-hazardous waste and hazardous compounds by staff and contractors in accordance with health and safety requirements. Emergency response procedures will be prepared for the Project which will include a protocol for responding to accidental spills and leakages of non-hazardous waste and hazardous compounds. Staff and contractors will also receive training in spill events management

Staff and contractors will be briefed on the standard operating procedures, emergency response procedures and mitigation measures during a mandatory induction as relevant to their roles and responsibilities (e.g. through staff inductions). The workforce will be informed of the importance of biodiversity and the priority habitats and species present in the project area to raise awareness and improve their understanding regarding the importance of conserving threatened habitats, species and natural resources for the environment and communities.

Operation

ADF will be responsible for project maintenance (including the drainage system) during the first two years of operation to ensure that impacts to fauna and their habitats arising from suspended sediments and runoff continue to be minimised. After this period the responsibility will be handed over to the municipalities, namely Lezhe and Shkoder.

Impacts to fauna caused by disturbance from artificial lighting will continued to be minimised through the use of capped and directional lighting from ecologically sensitive habitats (i.e. the coastal and wetland habitats of the Buna River Protected Landscape).

The risk of injury and mortality to fauna arising from vehicle collisions will be minimised by enforcing reduced speed limits particularly near sensitive fauna habitats in the Buna River Protected Landscape along the Rruga Banks Rrjollë road.

The Project is intending to develop a Sustainability / Eco-tourism Programme to minimise indirect project-related impacts to habitats and vascular plants (and other priority biodiversity features) arising from facilitated access and project-related in-migration (predominantly tourists). The objective of the Assignment is to establish a programme of activities and co-ordinated stakeholder consultation to support Sustainable/Eco Tourism in the Shëngjin and Velipojë region of Albania by undertaking strategic and local actions. It is anticipated that the programme will support increased environmental awareness, sustainable and safe communities within the Shëngjin and Velipojë region, promote environmental preservation and conservation practices, circular economy through

establishing stakeholder engagement networks, capacity building (through the provision of tools, management plans and awareness raising materials) and support policy dialogue.

4.2.3.3 Rehabilitation / Restoration

A Reinstatement and Landscaping Plan will be prepared and implemented for the Project by ADF in consultation with experienced ecologists (including a botanist and a mammals specialist) and approved by the National Agency for Protected Areas or the Regional Agency of Protected Areas (Shkoder and Lezhe).Thus plan will provide a clear methodology for the reinstatement of the physical environment within the PDA in addition to the progressive rehabilitation and restoration of fauna habitat within the project area. This plan is described in more detail in Section 4.1.3.3.

4.2.4 Residual Impacts

Whilst avoidance, mitigation and restoration actions will reduce the significance of impacts to fauna and their habitat, the project will result in some residual impacts. A total of 13.7 ha of fauna habitats will be permanently lost from within the project area. The majority of this habitat will comprise Mediterranean evergreen *Quercus* forest, maquis, arborescent matorral and thermo-Mediterranean scrub, screes and coastal dune and sandy shore.

The physical structure of the operating road compounded by vehicle traffic and noise emissions is highly likely to serve as a barrier to the movement of some fauna species of conservation importance. This may restrict access to resources for some fauna species of conservation importance and potentially reduce the carrying capacity of the project area to support wildlife. However, it is anticipated the wildlife crossing will lower the significance of the residual impacts if successful over time.

One of the most significant residual impacts to fauna is likely to be generated by project-related in-migration. Indirect habitat loss, fragmentation and degradation arising from project-related in-migration and increased population pressure, particularly during the tourist season, pose a significant risk to the integrity of fauna habitats, including those fauna habitats located within the Buna River Protected Landscapes. It is difficult to quantify the residual impact of increased natural resource collection and hunting on fauna populations and their habitats from in-migration however this poses a risk to fauna species of conservation importance. It is anticipated that the proposed mitigation measures will reduce the risk to fauna and their habitats but are unlikely to completely eliminate residual impacts.

A detailed breakdown of the project-related impacts to fauna and their habitats, recommended measures to avoid, restore / rehabilitate and minimise impacts and the residual impacts are presented in Appendix 1.

4.3 Impact Assessment: Aquatic Habitats and Species

4.3.1 Pre-Construction and Construction

4.3.1.1 Habitat Loss and Degradation

The construction of the proposed project will not entail the direct loss of any major tributaries or creeks located within the footprint of the proposed road alignment. This includes the Vilunit coastal lagoon, the Buna River, connecting waterbodies and wetland habitats of the Lake Shkoda and River Buna Ramsar complex which are critical habitat-qualifying features for the Project. Hence, critical habitat-qualifying species associated with these (i.e. Atlantic sturgeon, Adriatic sturgeon, starry sturgeon, European eel and slender-billed curlew) will not be directly impacted by project-related habitat clearance.

Ten small ephemeral creeks, that transect the Project footprint and are active during the raining season will be diverted using culverts. These creeks are not characterised by aquatic habitats and species. Hence aquatic habitats and species arising from habitat clearance is expected to be of negligible significance.

4.3.1.2 Hydrology and Water Quality

Ten small ephemeral creeks transect the proposed road alignment. These carry runoff from the slopes of Mount Renci are likely to be active during periods of high rainfall. It is anticipated that these will be redirected under or around the proposed road using culverts and a drainage system during construction resulting in minor changes to the hydrology of the existing surface water in the PDA. This is not expected to impact the hydrology of any receiving waters such as the wetlands located at the base of Mount Renci and the aquatic fauna associate with these waterbodies.

No significant changes to the surface hydrology of the coastal lagoon (critical habitat-qualifying feature, associated waterways and wetlands within the River Buna Protected Landscape. Hence critical habitat-qualifying species of fish i.e. the Atlantic sturgeon, Adriatic sturgeon, starry sturgeon and European eel) will be unaffected. There will no water extraction (i.e. to be used during drilling or consumption) undertaken for the project. Water for civil works will be supplied to the project area using water tanks.

It is anticipated that the main risk to the surface water quality of aquatic receptors (i.e. wetland pools, coastal lagoon (an Annex I priority habitat), wetlands and associated waterways) during construction is suspended sediments prior to mitigation. These are generated by site preparatory works and construction activities (i.e. habitat clearance, earthworks, drilling, top-soil and gravel stockpiling etc). The main input will result from water erosion of disturbed areas during periods of rain resulting in sediment laden runoff, while wind erosion will provide some additional input during drier months. Whilst the full extent of this impact is uncertain, the water quality of downhill and / or downstream water bodies (i.e. wetland pools, coastal lagoon, wetlands and associated waterways) located within Zone 1b of the Buna River Protected Landscape may also be potentially be impacted by suspended sediment-laden runoff prior to mitigation. Waterbodies located nearest to the project area (i.e. dune wetlands and ponds) are more vulnerable to the risk of being impacted during construction.

Suspended sediments may smother emergent and riparian vegetation causing a reduction in biological fitness and mortality in severely impacted areas. The deposition of

sediments in aquatic environments may result in the localised loss of benthic habitats and macrophytes which are smothered by sediment if unmitigated and may potentially impair the biological fitness of fauna e.g. macro-invertebrates and some species of fish.

Increased nutrients and turbidity from sediment runoff can also lead to the formation of blue-green algal blooms (Conley et al., 2009) which can impair water quality and adversely affect some aquatic fauna. Nutrients can also accumulate along the bottom of streams and lakes in calmer conditions and enhance eutrophication (Webster et al., 2001). Nitrogen and phosphorus are important nutrients in aquatic systems and phosphorus is considered the limiting nutrient for phytoplankton production in freshwater systems (Rabalais, 2002). Algal blooms are less likely to remain in systems that are periodically flooded, but the risk of occurrence is increased in areas of standing water such as the dune pools. Impacts from suspended sediments to aquatic habitats and species have the potential to be of Major significance prior to mitigation.

There is also risk of surface and groundwater contamination through accidental spills or seepages of hazardous substances (i.e. diesel fuel, oil, bitumen etc) and grey-water or septic systems (i.e. portaloos) during construction could contaminate receiving aquatic habitats and pose a risk to downstream water quality and aquatic biodiversity. This would be detrimental to the health of fauna and may result in the loss of aquatic habitats. Waterbodies located in close proximity to the road alignment are most vulnerable. However, there is a risk that the coastal lagoon (an Annex 1 priority habitat) could be impacted, particularly during transportation of hazardous substances. Impacts to aquatic habitats and species arising from accidental spills and leakages may be of Major significance, depending on substance type, volume and location of the accident.

4.3.1.3 Noise, Vibration and Airblast

The project does not intend to use blasting during the pre-construction / construction phase, hence there will be no airbast impacts generated by the project. The predominant noise emissions generated during the pre-construction and construction phase will be generated by sources such as vehicle traffic, plant vehicles, pneumatic drills and jackhammers and machinery (i.e. drilling rigs, pile drivers, excavators / grader and vibratory rollers). Construction noise emissions will relatively localised, temporary and generated over a 2-year period. The impact from noise generated by project construction could potentially be significant within 1 km of the construction site. This is not expected to cause disturbance to aquatic fauna within zones 1a, 1b and 2b of the River Buna Protected Area Landscape.

It is anticipated that ground vibration generated during construction by vehicle traffic, plant vehicles, pneumatic drills and jackhammers and machinery (i.e. drilling rigs, pile drivers, excavators / grader and vibratory rollers) will be relatively more localised and nuisance level vibration impacts are expected to be perceptible within 200 m of the construction site. It is anticipated that fauna (i.e. fish) inhabiting ponds within 200 m of the vibration emission source (if present) may potentially experience some level of disturbance. However, based on the existing level of information, impacts to aquatic fauna arising from noise and vibration are unlikely to be significant.

4.3.1.4 Induced Access and Project-related In-migration

Project-related in-migration is expected to initially occur during the construction phase with the mobilisation of the workforce but is unlikely to significantly increase until the proposed road is in operation. The predicted extent of project induced in-migration during the construction phase of project development is uncertain. The main potential risks to aquatic habitats and species associate with project-related in-migration and facilitated access to the project area are listed as follows:

- The decline in abundance and diversity of aquatic fauna species and macrophytes (including species of conservation significance) due to increased collection of natural resources, thus contributing to existing pressures on populations at the local level.
- The decline in fish stocks due to unsustainable fishing practices
- The degradation of aquatic and riparian habitats though the unsustainable collection of aquatic resources and eutrophication caused by increased aquaculture. This may pose a significant risk to critical habitat qualifying fish species and eels that potentially inhabit the Ramsar site.
- The stimulation of agro-pastoral activities near the coastal lagoon and Buna River resulting in the pollution of water from agricultural runoff and eutrophication from increased nutrient input.

These adverse impacts to aquatic habitats and species are likely to be of greater risk during operation than construction. Impacts to aquatic habitats and species are expected to be of Moderate significance prior to mitigation.

4.3.2 Operation

Many of the adverse impacts to aquatic habitats and species which occur during the pre-construction / construction phase will continue in varying degrees and intensities into the operation phase. It is expected that erosion and sediment loading in receiving waters during operation will be less extensive than during the pre-construction and construction phase, however the risk to aquatic habitats and species associated with spills of non-hazardous compounds and vehicle fuel will remain during operation. The most significant risks to aquatic biodiversity are associated with project-related in-migration, in which the Bun River Protected landscape is particularly vulnerable. These are described below in more detail.

4.3.2.1 Induced Access and Project-related In-migration

According to the project's economic analysis report (December 2017), 830,000 tourists visited Velipojë and 1,000,000 tourists visited Shëngjin in 2017. This type of high-volume, low-cost tourism puts high pressure on local resources and continues to stimulate uncontrolled urban development. It is expected that the development of the new road will facilitate access to the project area by tourists that will contribute to and increase the level of existing pressures on aquatic habitats and species if unmitigated. The predicted extent of project-related in-migration during the operation phase within the zone of influence is currently unknown.

Project-induced in-migration may increase pressure on aquatic resources in the vicinity of the Project. The proposed road is expected to facilitate access to Shëngjin and Velipojë

by tourist and trades people. An influx of migrants to Shëngjin and Velipojë and other settlements near the project may lead to increased fishing activity, natural resource collection and aquaculture practices in the coastal lagoon, the near-shore reaches of the adjacent coastline, the River Buna, wetlands and associated waterways. Over-exploitation of fish stocks, eels and shellfish could potentially reduce fish diversity, abundance and breeding success. Project-induced in-migration combined with improved road access could stimulate the commercial development of fishery resources. Such development would be detrimental to fish stocks and fish species of conservation importance unless regulated by the local authorities to ensure sustainable management of aquatic natural resources.

Project-related in-migration may stimulate agricultural practices and / or timber and non-timber product collection within the riparian zones of the Buna River, coastal lagoon and wetland of the River Buna Protected Landscape. This would result in the degradation and loss of riparian habitats and increase the risk of soil erosion along the river and lagoon banks. An increase in suspended sediments and nutrient input may have an adverse impact on the biological health of the Buna River, coastal lagoon, wetlands and associated waterways, resulting in the pollution of water from agricultural runoff and eutrophication from increased nutrient input. The construction of the proposed road may also stimulate urban development and encroachment resulting in the loss of wetland habitats within the protected landscape. Impacts to aquatic habitat and species could potentially be of Major significance prior to mitigation.

4.3.3 Avoidance, Minimisation / Mitigation and Restoration Measures

The BMP, ESAP and ESMP detail specific measures to avoid, minimise and mitigate impacts to aquatic habitats and species. A summary of these recommended measures is presented below and a detailed account is presented in Appendix 1.

4.3.3.1 Avoidance

Not applicable.

4.3.3.2 Minimisation

Pre-construction / Construction

Staff and contractors will adhere to a Standard Operating Procedure for Emission and Dust Control, Erosion and Suspended Sediment Control to minimise the risk of adverse impacts to waterbodies near the PDA arising from fugitive dust emissions, erosion and suspended sediments on fauna and their habitats. These include surface water management infrastructure (e.g. cut-off / diversion drains, velocity dissipation devices, culverts) to be installed in appropriate locations to minimise and control surface water flow over disturbed areas and impacts to sensitive wetlands and waterbodies located at lower elevations of the Buna River Protected Landscape. These measures are described in Section 4.1.3.2.

Emergency spill management procedures will be in place to minimise the risk of impacts to receiving aquatic habitats and species. This will be communicated to all relevant staff and contractors during their induction.

Project staff and contractors will be banned from fishing and the collection of aquatic natural resources in the vicinity of the project to minimise impacts to aquatic habitats and species. Environmental education and awareness programmes will be conducted for project staff and contractors (e.g. through staff inductions) to emphasise the importance of conserving biodiversity for wildlife and communities.

Operation

Surface water management infrastructure (e.g. cut-off / diversion drains, velocity dissipation devices, culverts) will be in place in appropriate locations and actively maintained to minimise and control surface water flow across / under the proposed road thus minimising the risk of sediment loading and surface pollution to waterbodies in the Buna River Protected Landscape.

The Project is intending to develop a Sustainability / Eco-tourism Programme to minimise indirect project-related impacts to habitats and vascular plants (and other priority biodiversity features) arising from facilitated access and project-related in-migration (predominantly tourists). This programme is described in more detail in Section 4.1.3.2.

4.3.3.3 Rehabilitation / Restoration

The restoration / rehabilitation of aquatic habitats is not required for the project. This should however be reviewed if the project design changes in the future.

4.3.4 Residual Impacts

It is difficult to quantify the residual impact from project-related facilitated access and in-migration to aquatic habitats and species; however, it is anticipated the proposed mitigation measures will reduce the risk to fauna and their habitats but are unlikely to completely eliminate residual impacts.

A detailed breakdown of the project-related impacts to fauna and their habitats, recommended measures to avoid, restore / rehabilitate and minimise impacts and the residual impacts are presented in Appendix 1.

4.4 Monitoring

The Project has committed to establishing an Environmental Monitoring Plan. This will incorporate a Biodiversity Monitoring and Evaluation Programme to assess the efficacy of the avoidance and mitigation measures and to inform the requirement for adaptive management. A range of biodiversity monitoring actions have been developed based on the avoidance and mitigation measures designed for the Project. These are presented in the BMP. Where possible, thresholds will be established for each monitoring approach that will alert the Project that mitigation measures need to be adapted and revised biodiversity management measures are required. ADF are committed to implementing the BMP, EMP and ESAP and will work with and direct their contractors to ensure full implementation and compliance.

5 CUMULATIVE BIODIVERSITY IMPACT ASSESSMENT

5.1 Overview

Activities within the Project area and wider region that could have the potential for cumulative impacts include:

- Other road upgrades in the surrounding area including the transnational Adriatic Ionian highway. The Albanian stretch is part of the Blue Highway which connects the coast of Montenegro with Greece
- Upgraded infrastructure within Velipojë and Shëngjin
- Illegal housing and industrial developments in Velipojë, Shëngjin and the surrounding environs
- Shëngjin Europort

These are discussed below in more detail.

5.2 The Regional and Local Roads Connectivity Project and Other Road Projects

The Regional and Local Roads Connectivity Project aims to rehabilitate key regional and local roads in Albania. The Project is part of a larger investment programme for the rehabilitation of Albania's regional and local road network. This entails linking the entire of Albania's coast with Macedonia to the north and Greece to the south. These developments are likely to lead to increased vehicle traffic though the region of the project and further contribute to in-migration into the Project area.

It is anticipated that future road developments within the Buna River Protected Landscape will lead to further habitat loss and degradation and adverse impacts to species, particularly the increase risk barriers to movement for fauna. Habitats and species within the Protected Landscape are further vulnerable to indirect impacts associated with facilitated access (i.e. uncontrolled coastal development, poor management of urban waste and wastewater and disturbance levels from tourists) that are likely to increase the pressure on the integrity of the Protected Landscape and species populations.

5.3 In-Migration and Unsustainable Tourism Infrastructure

The Adriatic coastline, beaches and seascapes of the Bojana -Buna delta are important for tourism which fuel regional development and long-term economic growth of the region, in which beaches and woodlands attract nearly 250,000 tourists a year, mostly between July and August (UN 2002). The economy of Velipojë and Shëngjin are heavily dependent on tourism, particularly during the summer months. In 2017, the official number of tourists visiting Velipojë was 830,000 and in Shëngjin, the number was over 1 million tourists. These numbers are likely to increase following Project development as the road provides quicker vehicle access than the existing route.

Unchecked tourism poses a risk to habitat quality and species diversity in the region. Disturbance arising from increased noise and human activity arising from tourist activity has the potential to cause disturbance and displacement of wildlife particularly within the coastal habitats of the Buna River Protected Landscape. Unauthorised vehicle use on the beaches, secondary dune systems and dune wetland and high levels of trampling already pose a risk to the quality of these sensitive habitats and an influx of tourist are likely to further contribute to habitat degradation and disturbance to fauna.

Albania's waste management infrastructure is limited, and much household waste is not appropriately disposed (Lico et al 2015). Littering in Shëngjin, Velipojë and the Buna River Protected Landscape is problematic. Plastic waste can have detrimental effects on the biological fitness of wildlife and / or result in the mortality of individuals if ingested. Chlorinated plastic can release harmful chemicals into the surrounding soil, which can then seep into groundwater, causing potentially harmful effects to the aquatic environment and species dependant on it (UNEP website). Poor waste management may also attract pest species (i.e. vermin) which in turn may result in the displacement of natural wildlife and act as vectors of disease. The impacts are likely to increase with Project-related facilitated access and the tourist in-migration.

Protected areas have great potential for the development of sustainable tourism; they can improve the socio-economic status of the local communities while contributing to biodiversity conservation. A visitor centre opened in 2016 in Velipojë, aiming to support the development of sustainable tourism in the Buna River Protected Landscape. The visitor centre raises awareness of the protected area's biodiversity, coastal and wetland ecosystems located along the border of Montenegro and natural heritage values of the area. The project was financed by the Italian Development Cooperation and implemented by IUCN in close collaboration with the Ministry of Environment and the National Agency for Protected Areas of Albania (NAPA). The IUCN is committed to continuing to support the Albanian authorities in the development of sustainable tourism in protected areas, including visitor management planning, development of soft tourism infrastructure, and capacity building for interpretation and visitor management (IUCN, 2016).

5.4 Uncontrolled Development

The region is characterized by recent rapid development, particularly along a narrow strip within 5 km of the coastline and highways (GWP-Med, PAP/RAC, UNESCO-IHP 2015). A construction boom, mainly affecting the coastal zone and the urban centres, in the 1990s was followed by increased informal development, of which there is insufficient control and inadequate mechanisms for the sanctioning of illegal buildings leading to habitat loss and degradation.

5.5 Shëngjin Europort

The Shëngjin Europort is a proposed development of the port of Shëngjin, with aims to make it Albania's largest industrial port. This will enhance the connections between the South Adriatic and East Mediterranean with the rest of Europe. With an estimated capacity of 60 million tonnes per year, the port is expected to significantly increase the connectivity of neighbouring countries such as Kosovo, Serbia and Macedonia. Along with the port development, two tunnels were proposed to link the port beyond the Renci

mountain rage. As of the time of writing, no investment has been made in this project. If this development proceeds, the increase shipping activity is likely to contributed to water quality impacts and underwater noise impacts to aquatic biodiversity in the region.

6 CONCLUSION

This biodiversity impact assessment assessed the project-related impacts on biodiversity aspects during the pre-construction / construction and operation phases, including terrestrial habitats and flora; terrestrial fauna and their habitats; aquatic habitats and flora; and aquatic fauna. A precautionary approach was undertaken due to the paucity of project-based information and data. The ADF is however committed to filling these data gaps and will undertake pre-construction assessments for noise, air quality, water quality and soil conditions prior to the commencement of works. It is anticipated that the data will be used to refine the EIA and EMP where necessary.

The assessment identified that the project will result in impacts of varying degrees of significance to terrestrial and aquatic habitats and species during construction and operation, with some residual impacts continuing during operation. It is understood that the road will not be decommissioned within the foreseeable future and as such will remain in operation.

A key priority for the project is the continued conservation of the Buna River Protected Landscape, Ramsar site and IBA (a critical habitat-qualifying feature for the Project). Diligent application of best practice measures for minimising and managing the risk of potential Project-related impacts arising from habitat loss and degradation, noise and vibration, accidental vehicle collisions with fauna, barriers to fauna movement, artificial light spill, air and water pollutants, adverse changes in hydrology and water quality is expected to minimise the risks to the critical habitat-qualifying fish species, PBFs and the Buna River Protected Landscape. Pre-clearance checks will also be undertaken to avoid and disturbance and injury to bats, badgers and breeding birds in the PDA during construction. Dead wood from within oak woodland located in the working width will be translocated to a suitable receptor site to minimise the habitat loss and risk of mortality for the great Capricorn beetle (a PBF). Nationally endemic, rare and threatened and PBF plant species will be translocated from within the PDA to a suitable receptor site to minimise the risk of mortality or injury to these individual species. Roosting bats within the PDA will also be translocated to a purpose-built bat roost. The establishment of a wildlife crossing point golden jackals (a PBF) and other priority fauna will be integral to enable golden jackals and other wildlife to retain access to resources in the PDA.

The implementation of the Reinstatement and Landscaping Plan and habitat establishment monitoring will be integral to restoring the physical environment and ecosystem function within the PDA as 'like for like' (or better) than that which existed prior to Project construction where feasible.

Whilst avoidance, mitigation and restoration actions will reduce the significance of impacts to biodiversity, these actions will not eliminate all residual Project-related impacts. For example, a total of 17.8 ha of habitats will be permanently lost from within the PDA and 11.4 ha will be permanently lost from within the Buna River Protected Landscape (critical habitat-qualifying feature). Residual impacts will also arise from facilitated access and Project-related in-migration; and the magnitude of this impact was difficult to quantify. Hence a Sustainability / Eco-tourism Programme will be implemented by the project to minimise indirect project-related impacts to habitats and vascular plants (and other priority biodiversity features) arising from facilitated access and project-related in-migration (predominantly tourists). The objective of the assignment is to establish a programme of activities and co-ordinated stakeholder consultation to support sustainable ecotourism in the Shëngjin and Velipojë region of Albania by undertaking strategic and local actions. It is anticipated that the programme will support increased environmental awareness, sustainable and safe communities within the Shëngjin and Velipojë region, promote environmental preservation and conservation practices, circular economy through establishing stakeholder

engagement networks, capacity building (through the provision of tools, management plans and awareness raising materials) and support policy dialogue.

The Project has also committed to establishing an Environmental Monitoring Plan. This will incorporate a Biodiversity Monitoring and Evaluation Programme to assess the efficacy of the avoidance and mitigation measures and to inform the requirement for adaptive management. Biodiversity monitoring actions has been developed based on the avoidance and mitigation measures designed for the Project. These are presented in the BMP. Where possible, thresholds will be established for each monitoring approach that will alert the Project that mitigation measures need to be adapted and revised biodiversity management measures are required. ADF are committed to implementing the EMP, BMP and ESAP and will work with and direct their contractors to ensure full implementation and compliance.

7 REFERENCES

Barber, J. R., Crooks, K. R. and Fristrup, K. M. (2010). The costs of chronic noise exposure for terrestrial organisms. Trends in Ecology and Evolution, vol. 25, no. 3, pp. 180-189.

Conley, D. J., Paerl, H. W., Howarth, R. W., Boesch, D. F., Seitzinger, S. P., Havens, K. E., Lancelot, C. and Likens, G. E. (2009). Controlling eutrophication: nitrogen and phosphorus. Science, vol. 323, pp. 1014-1015.COTECO Group for OMVG (2004). “Environmental and Socio-Economic Impacts Assessment Summary of the Sambangalou Hydroelectric Development”.16p

CSBI (2015). A cross-sector guide for implementing the Mitigation Hierarchy Prepared by The Biodiversity Consultancy. file:///C:/Users/jnightingale/Downloads/Guidance.pdf

Farmer, A. M. (1993). The effects of dust on vegetation - a review. Environmental Pollution, vol. 79, no. 1, pp. 63-75.

Francis, C. D. and Barber, J. R. (2013). A framework for understanding noise impacts on wildlife: An urgent conservation priority. Frontiers in Ecology and the Environment, vol. 11, no. 6, pp. 305-313.

Gaston, K. J., Bennie, J., Davies, T. W. and Hopkins, J. (2013). The ecological impacts of night-time light pollution: a mechanistic appraisal. Biological Reviews, vol. 88, no. 4, pp. 912-927.

IUCN (2018). ‘The IUCN Red List of Threatened SpeciesTM’. www.iucnredlist.org, International Union for Conservation of Nature.

IUCN (2016). Towards sustainable tourism in protected areas in Albania. https://www.iucn.org/news/eastern-europe-and-central-asia/201609/towards-sustainable-tourism-protected-areas-albania

Laurance, W. F., Goosem, M. and Laurance, S. G. (2009). Impacts of roads and linear clearings on tropical forests. Trends in Ecology and Evolution, vol. 24, no. 12, pp. 659-669.

Longcore, T. and Rich, C. (2004). Ecological light pollution. Frontiers in Ecology and the Environment, vol. 2, no. 4, pp. 191-198.

Murcia, C. (1995). Edge effects in fragmented forests: implications for conservation. TREE, vol. 10, no. 2, pp. 58-62.

Sharifi, M. R., Gibson, A. C. and Rundel, P. W. (1997). Surface dust impacts on gas exchange in Mojave Desert shrub. Journal of Applied Ecology, vol. 34, pp. 837-846.

Taylor, B. D. and Goldingay, R. L. (2010). Roads and wildlife: impacts, mitigation and implications for wildlife management in Australia. Wildlife Research, vol. 37, no. 4, pp. 320-331.

Webster, I. T., Parslow, J. S., Grayson, R. B., Molloy, R. P., Andrewartha, J., Salkov, P., Tan, K. S., Walker, S. J. and Wallace, B. B. (2001). Gippsland Lakes Environmental Study: Assessing Options for Improving Water Quality and Ecological Function - Final Report. South Australia, Gippsland Coastal Board; CSIRO.

APPENDIX 1
BIODIVERSITY IMPACT ASSESSMENT TABLE OF RESULTS

Receptor Type	Project-related Impacts	Summary Description	Pre-construction & Construction	Operation	Sensitivity	Magnitude	Impact Significance	Avoidance	Minimisation	Rehabilitation / Restoration	Monitoring	Sensitivity	Magnitude	Impact Significance	Residual Impact
Habitat and Flora															
Habitat and Flora	Habitat Loss and Degradation	Loss of terrestrial habitat arising from habitat clearance within the Project Development Area (PDA) outside of the Buna River Protected Landscape	✓		Medium	Small	Minor	N/A	Adherence to a Standard Operating Procedure (SOP) 1: Habitat/ Land Clearance, Accidental Vehicle and Machinery Collisions with Fauna, Stockpiling and Alien Invasive Species Control. This includes the provision and implementation of a method statement for habitat clearance that aims to minimise habitat loss to the extent practicable.	Habitat restoration in accordance with the Reinstatement and Landscaping Plan. This will include: clearance of waste, debris and filling of geocells; a planting scheme; and a vascular plant translocation scheme.	Monitoring of habitat restoration and landscaping establishment as specified in the Reinstatement and Landscaping Plan	Medium	Small	Minor	Permanent loss of 5 ha
		Loss of terrestrial habitat arising from habitat clearance within the PDA inside the Buna River Protected Landscape	✓		Medium	Medium	Moderate	Rerouting the road alignment to avoid habitat clearance in core zone (1A) of the Buna River Protected Landscape	Adherence to a Standard Operating Procedure (SOP) 1: Habitat/ Land Clearance, Accidental Vehicle and Machinery Collisions with Fauna, Stockpiling and Alien Invasive Species Control. This includes the provision and implementation of a method statement for habitat clearance that aims to minimise habitat loss to the extent practicable.			Medium	Small	Minor	Permanent loss of 12.8 ha
		Accidental spills of hazardous and non-hazardous substances resulting in habitat loss and degradation	✓		Medium	Medium	Moderate	Adherence to SOP4: Water Quality and Pollution Management.	Adherence to SOP4: Water Quality and Pollution Management. Emergency response procedures will be developed for the Project to effectively manage any accidental spills and leakages of non-hazardous waste and hazardous compounds. Staff and contractors will receive training in spill events management. This will include the development of a spill, incident, accident and response and management plan by the contractor.			Medium	Negligible	Not Significant	
	Habitat Fragmentation and Edge Effects	Habitat fragmentation and edge effects contributing to project-related degradation of remnant habitat areas.	✓		Medium	Medium	Moderate	N/A	Adherence to a Standard Operating Procedure (SOP) 1: Habitat/ Land Clearance, Accidental Vehicle and Machinery Collisions with Fauna, Stockpiling and Alien Invasive Species Control. This includes the provision and implementation of a method statement for habitat clearance that aims to minimise habitat loss to the extent practicable.			Medium	Negligible	Not Significant	Assuming successful establishment
	Loss of nationally endemic, rare and threatened plant species	Habitat clearance resulting in the loss of nationally endemic, rare and threatened plant species from within the PDA	✓		Medium	Medium	Moderate	Pre-clearance checks of trees for roosting bats, with translocation of any detected bats.	Nationally endemic, rare and threatened plant species will be translocated from within the PDA to a suitable receptor site under supervision of a botanist an in accordance with a method statement.		Monitoring nationally endemic, rare and threatened plant species establishment	Medium	Negligible	Not Significant	Assuming successful establishment
	Invasive Alien Species Introduction	Habitat loss and degradation and species loss arising from invasive alien species encroachment	✓		Medium	Medium	Moderate	Alien species prevention protocol will be implemented. A record will be kept of all affected areas to avoid transfer. Only non-invasive plant species used for revegetation.	An invasive species prevention protocol will be implemented to prevent the introduction and transfer of invasive species. This will include the avoidance of affected areas by staff and vehicles where possible and washdown procedures of project vehicles where necessary. A record will be kept of all affected areas.	N/A	Anecdotal observations	Medium	Negligible	Not Significant	
				✓	Medium	Negligible	Not Significant	Alien species prevention protocol will be implemented. A record will be kept of all affected areas to avoid transfer. Only non-invasive plant species used for revegetation.	Actively monitor and eradicate invasive vascular plant species along the right of way			Medium	Negligible	Not Significant	
	Hydrology and Water Quality	Impacts to terrestrial habitats and vascular plant species from changes in surface water hydrology from redirection or culverting of small creeks	✓		Medium	Small to negligible	minor to negligible		Adherence to SOP4: Water Quality and Pollution Management; SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control; and SOP 1: Habitat/ Land Clearance, Accidental Vehicle and Machinery Collisions with Fauna, Stockpiling and Alien Invasive Species Control.	Undertake progressive habitat restoration and rehabilitation of impacted areas in accordance with the Reinstatement and Landscaping Plan.	Monitoring of habitat restoration and landscaping establishment as specified in the Reinstatement and Landscaping Plan	Medium	Negligible	Not Significant	
		Impacts to habitats and plants from sediment-laden runoff (i.e. habitat loss and degradation)	✓		Medium	Medium	Moderate	N/A	Adherence to SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control			Medium	Negligible	Minor	
									Surface water management infrastructure (e.g. cut-off / diversion drains, velocity dissipation devices, culverts) will be constructed in appropriate locations to minimise and control surface water flow over disturbed areas and to minimise impacts to habitats and plants.						
									Sediment control dams and traps will be installed in suitable locations, particularly along higher elevations above ecologically sensitive areas to further minimise the risk of sediment loading impacts						
									Preparatory works (i.e. habitat clearance, grading and stockpiling etc) will be undertaken during the dry season to minimise impacts from erosion and suspended sediments on habitats and plants						
									Erosion prevention measures will be employed (i.e. terramesh,) to stabilise exposed soil and unstable surfaces.						
									Vegetation located on the steep slopes of Mount Renci within the project area will also be preserved where possible to minimise the risk of erosion.						
				✓	Medium	Small	Minor	N/A	Surface water management infrastructure (e.g. drains and culverts) designed to control surface water flow and runoff from the road will be fully operational and regularly maintained to ensure that they are fit for purpose.			Medium	Negligible	Not Significant	
	Air Quality	Fugitive dust emissions smothering plants and habitats adversely impacting the biological fitness of plants and habitat quality	✓		Medium	Large	Major	Ban open-burning of general wastes and vegetation	Adherence to SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control to minimise impacts to habitats and species arising from fugitive dust emissions.	Undertake progressive habitat restoration and rehabilitation of impacted areas in accordance with the Reinstatement and Landscaping Plan.	Continued air quality monitoring to inform adaptive management	Medium	Medium	Moderate	
									To minimise smothering impacts to plants and habitats arising from fugitive dust emissions, the project will use dust controls (e.g. dust suppression watering, gravel application) on unsealed access tracks and exposed surfaces heavily trafficked by machinery and vehicles (e.g. site entry/exit points, loading and unloading areas, etc.) during the dry season or when excessive dust generation is evident.						
									Stabilisation of landforms (using geotextiles) to minimise wind erosion where appropriate						
									Sediment controls and dams installed in suitable locations, i.e. high elevations above ecologically sensitive areas						

									Vegetation located on the steep slopes of Mount Renci within the project area will also be preserved where possible to minimise the risk of wind erosion. Ban open-burning of general wastes and vegetation.							
				✓	Medium	Negligible	Not Significant	N/A				Medium	Negligible	Not Significant		
		Air quality impacts to habitats and vascular plants arising from combustion emissions (i.e. reduced biological fitness and mortality of vascular plants and habitat degradation)	✓		Medium	Small	Minor	N/A	Adherence to SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control	N/A	N/A	Medium	Negligible	Not Significant		
				✓	Medium	Small	Minor	N/A				Medium	Negligible	Not Significant		
	Facilitated access and Project-related In-migration	Over exploitation of plants, habitat degradation and the potential loss of priority vascular plant species within the Buna River Protected Landscape and surrounding environs	✓		Medium	Small	Minor	N/A	Project staff and contractors will be banned from the collection of timber and non-timber natural resources within the zone of influence to minimise impacts to habitats and plants. This will be communicated to staff and contractors through staff inductions.	N/A	N/A	Medium	Small	Minor		
				✓	High	Large	Major (high)	N/A	Development and implementation of the Sustainability / Eco-tourism Programme	N/A	A biodiversity monitoring and evaluation plan will be developed for the project. This plan will assess the effectiveness of the mitigation measures and to inform the requirement for adaptive management.	High	Negligible	Not Significant	Depending on the success	
Fauna and Their Habitats																
Fauna and Their Habitats	Fauna Habitat Loss and Degradation	Loss of 17.8 ha of fauna habitat arising from habitat clearance including, bat roosting and foraging habitat, habitat for the Capricorn beetle and habitat for breeding and nesting birds	✓		Medium	Large	Major	Rerouted road alignment to avoid impacting fauna and their habitats in the core zone (1A) of the Buna River Protected Area.	Adherence to a Standard Operating Procedure (SOP) 1: Habitat/ Land Clearance, Accidental Vehicle and Machinery Collisions with Fauna, Stockpiling and Alien Invasive Species Control. This includes the provision of a method statement for habitat clearance to minimise the extent of fauna habitat clearance, ensure that habitats clearance will be undertaken by the contractors in a progressive and sensitive manner and to safeguard the extent of the existing fauna habitat. Dead wood from within the oak woodland will be translocated to provide a receptor site for the great Capricorn beetle.	Restoration of habitat in accordance with a Reinstatement and Landscaping Plan	Establishment of a remote sensing monitoring programme and avifaunal monitoring. Establishment of a reporting system for anecdotal observations of priority wildlife.	Medium	Negligible	Minor	Permanent loss of 17.8 ha of fauna habitat from within the project footprint
		Risk of degradation and loss of fauna habitat and impacts to fauna arising from accidental spills of hazardous and non-hazardous compounds	✓		Medium	Large	Major	N/A	Adherence to SOP4: Water Quality and Pollution Management. Emergency response procedures will be developed for the Project to effectively manage any accidental spills and leakages of non-hazardous waste and hazardous compounds. Staff and contractors will receive training in spill events management. This will include the development of a spill, incident, accident and response and management plan by the contractor. The workforce will also be made aware of the importance of priority biodiversity features present in the project area to raise awareness and improve their understanding regarding the importance of conserving threatened habitats, species and natural resources for the environment and communities.	Undertake progressive habitat restoration in accordance with a Reinstatement and Landscaping Plan		Medium	Negligible	Not Significant	
	Fragmentation of Fauna Habitat / Barriers to Movement	Habitat fragmentation arising during habitat clearance compounded with project-related disturbance (i.e. from noise, vibration, presence of the workforce etc) causing a barrier to movement of priority species	✓		Medium	Medium	Moderate	N/A	Minimised via application of mitigation measures for light-spill, noise, vibration and airblast etc.	Undertake progressive habitat restoration in accordance with a Reinstatement and Landscaping Plan	N/A	Medium	Medium	Moderate		
		Barrier to movement of medium sized fauna in particular golden jackals		✓	Medium	Medium	Moderate	N/A	The establishment of a wildlife crossing point for golden jackals (and other fauna) to facilitate access to habitats	N/A	Monitoring the efficacy of the wildlife crossing point by experienced ecologists	Medium	Small	Minor	Dependent on success	
	Air Quality	Impacts to fauna arising from the inhalation and ingestion of fugitive dust emissions (i.e. reduced biological fitness or mortality) and combustion emissions	✓		Medium	Medium	Moderate	N/A	Adherence to SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control to include, but not be limited to, the following mitigation measures: Dust control measures (i.e. watering, gravel application and wheel washes) will be used on unsealed access tracks and exposed surfaces heavily trafficked by machinery and vehicles (i.e. entry/exit points, vehicle routes and loading and unloading areas.) during the summer months when conditions are dry, when excessive dust generation is evident and during periods of high risk (e.g. dry and windy conditions). Dust suppression water should taken from suitable recycled water sources. Vegetation on steep slopes of Mount Renci will be preserved where possible to minimise the risk of wind erosion. The project will enforce speed restrictions of mobile plant on roads to minimise dust generation Exposed areas of soil and scree will be quickly stabilised (i.e. cover with geotextiles), and progressively restore the habitats in accordance with the projects rehabilitation and restoration plan. Open-burning of general wastes and vegetation will be banned Apply dust management measures to minimise fugitive dust emissions from stockpiles (i.e. soil and gravel) in accordance with SOPs.	Undertake progressive habitat restoration in accordance with the Restoration of habitat in accordance with a Reinstatement and Landscaping Plan		Medium	Negligible	Not Significant	

	Impacts to fauna arising from the inhalation and ingestion of fugitive dust emissions (i.e. reduced biological fitness or mortality) and combustion emissions		✓	Medium	Small	Minor	N/A	Regular road maintenance to prevent degradation	N/A	N/A	Medium	Negligible	Not Significant	
Hydrology and Water Quality	Impacts to fauna and their habitats from sediment-laden runoff	✓		Medium	Large	Major	N/A	Adherence to SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control. This will include, but is not limited to, the following mitigating measures:	Restoration of habitat in accordance with a Reinstatement and Landscaping Plan	Monitoring habitat establishment	Medium	Small	Minor	
								Surface water management infrastructure (e.g. cut-off / diversion drains, velocity dissipation devices, culverts) will be constructed in appropriate locations to minimise and control surface water flow over disturbed areas.						
								Sediment control dams and traps will be installed in suitable locations, particularly along higher elevations above ecologically sensitive areas, to further minimise the risk of sediment loading impacts						
								Preparatory works (i.e. habitat clearance, grading and stockpiling etc) will be undertaken during the dry season to minimise impacts from erosion and suspended sediments on fauna water resources						
								Measures will be employed to stabilise exposed soil and unstable surfaces (i.e. through using terramesh or other geotextiles) where necessary						
	Impacts to fauna and their habitats from sediment-laden runoff		✓	Medium	Small	Minor	N/A	Vegetation located on the steep slopes of Mount Renci within the project area will also be preserved where possible to minimise the risk of erosion. The integrity of the road structure and associated drainage system will be maintained on a regular basis whilst the road is in operation to ensure that impacts to fauna and their habitats arising from suspended sediments and runoff continue to be minimised.			Medium	Negligible	Not Significant	
	Accidental spills of hazardous and non-hazardous substances resulting in the loss and degradation of fauna habitats and impacts to priority fauna (i.e. reduced biological fitness or mortality)	✓		Medium	Medium	Major	Adherence to a Standard Operating Procedure for Water Quality and Pollution Management.	Adherence to SOP4: Water Quality and Pollution Management to ensure the handling of diesel fuel, non-hazardous waste and hazardous compounds. This will be communicated to all relevant personnel via staff and site inductions.			Medium	Negligible	Not Significant	
								Emergency response procedures will be prepared for the Project which will include a protocol for responding to accidental spills and leakages of diesel fuel, non-hazardous waste and hazardous compounds.						
								The workforce will also be made aware of the importance of biodiversity and the priority habitats and species present in the project area to raise awareness and improve their understanding regarding the importance of conserving threatened habitats, species and natural resources for the environment and communities.						
								Staff and contractors will receive training in spill events management.						
Noise, Vibration and Airblast	Noise, vibration and airblast emissions generated by site preparation and construction works (i.e. grubbing, piling, blasting, operating plant vehicles and machinery) resulting in the disturbance and displacement of fauna from within the project area	✓		Medium	Medium	Moderate	Project construction will not be undertaken at dusk, dawn and at night to avoid disturbance to nocturnal and crepuscular fauna (i.e. bats) from increased noise and vibration.	The project will develop and adhere to a Standard Operating Procedure for noise, vibration and airblast. Machinery will be regularly maintained.	N/A	N/A	Medium	Medium	Moderate	
								The use of noisy machinery and vehicles will be avoided at dusk, dawn and at night to minimise disturbance to nocturnal and crepuscular fauna from increased noise and vibration.						
								Noise attenuation measures will be utilised (i.e. temporary noise enclosures or barriers) to minimise noise disturbance near biodiversity sensitive areas.						
								Piling/drilling methods will be used which have the lowest noise and vibration impact (i.e. lowering drop heights or impact levels for piling hammers, and using piling shrouds or temporary barriers or hoardings) to minimise impacts to fauna.						
								Machinery (i.e. concrete batching facility, workers facilities, generators, plant equipment etc) which are sources of noise emissions will be situated away sensitive habitats where possible (the coastal lagoon, wetlands, coastal habitats and protected areas). Natural noise buffers (dense vegetation, rocky outcrops and mounds) will be retained to attenuate noise emissions.						
	Noise and vibration emissions generated by vehicle traffic resulting in the disturbance and displacement of fauna from within the project area		✓	Medium	Small	Minor		Speed restrictions within the Buna River Protected Landscape. Use of natural and artificial sound barriers near biodiversity sensitive habitats. Ongoing monitoring.			Medium	Negligible	Not Significant	
Artificial lighting	Light-spill arising from artificial lighting resulting in adverse impacts to fauna (i.e. disturbance to fauna, reduced biological fitness and displacement)	✓		Medium	Small	Minor	Night working will not be permitted to avoid impacts to priority nocturnal, crepuscular fauna. Project vehicles	Artificial lighting will be used at the site offices and storage areas (i.e. for tools, machinery and material). Impacts to fauna caused by disturbance from artificial lighting will be minimised through the use of capped and directional lighting from ecologically sensitive habitats (i.e. the coastal habitats and wetlands of the Buna River Protected Landscape) and the use of office blinds / curtains.	N/A	N/A	Medium	Negligible	Not Significant	
	Light-spill arising from artificial lighting resulting in adverse impacts to fauna (i.e. disturbance to fauna, reduced biological fitness and displacement)		✓	Medium	Small	Minor	will not be used at night within project area.	Impacts to fauna caused by disturbance from artificial lighting will be minimised through the use of capped and directional lighting from ecologically sensitive habitats (i.e. the coastal habitats and wetlands of the Buna River Protected Landscape). Retention of natural barriers to minimise light spill artificial light, particularly near the Buna River Protected Landscape (i.e. woodland canopy, earth bund etc.).			Medium	Negligible	Not Significant	
Vehicle / Machinery Collisions	Accidental vehicle / machinery collisions with fauna (i.e. nesting birds, badgers, roosting bats, golden jackals and great Capricorn beetles) resulting in injury or mortality.	✓		Medium	Medium	Moderate	Vehicle operation will be restricted to daylight hours. Pre-clearance checks for trees suitable for bats, nesting birds and badger setts and establishment of a 'no-go' area around any potential active nesting sites.	The risk of accidental injury and mortality to fauna from vehicle collisions will be minimised by enforcing reduced speed limits within the construction site and drivers will be expected to adhere to the Highway Code at all times. This will be communicated to all relevant personnel through staff and site inductions. Driving training will be provided for key staff members. Access to project roads will be restricted to authorised people only.	N/A	Reporting of vehicle/machinery collisions.	Medium	Small	Minor	
								Habitats clearance will be undertaken in a progressive and sensitive manner to minimise the risk of collisions and to enable fauna to move away from the area of works, disperse into surrounding habitats and to avoid fauna from being isolated in fragmented areas of habitat.						
								Slow moving fauna will be translocated to designated receptor sites (as identified by an ecologist) during the clearance works.						
								Where possible, habitat clearance will be undertaken outside of the breeding bird season. Where this is not possible, pre-clearances checks will be undertaken to identify active nesting sites. These will be retained until the young have fledged.						
								An Injured Wildlife Protocol be also developed for the project by an experienced ecologist which will be followed by staff and contractors in the event of an incident. This will include a mandatory reporting system which will enable an assessment of the incident to be undertaken and the requirements for any further actions or mitigation measures to be determined. Reports should include encounters of wildlife and observation of natural resource collection, illegal hunting and wildlife trade. The protocol will also include procedures for the safe management of injured and dead wildlife.						

		Accidental vehicle / machinery collisions with fauna (i.e. badgers, roosting bats and golden jackals) resulting in injury or mortality.		✓	Medium	Medium	Moderate		Reduced speed limits will be signposted during operation to minimise the risk of accidental injury and mortality to fauna arising form vehicle collisions. Rumble strips or speedbumps will also be installed on the approach to Rrjolli to slow vehicle traffic near sensitive fauna habitats in the Buna River Protected Landscape. Driving training will be provided for key staff members. The establishment of a wildlife crossing point for golden jackals (and other fauna) to facilitate access to habitats	N/A	Monitoring the efficacy of the wildlife crossing point by experienced ecologists	Medium	Negligible	Not Significant	Assuming successful
	Induced Access and Project-related In-migration	Adverse impacts to priority fauna and their habitat arising from facilitated	✓		Medium	Medium	Moderate		Project staff and contractors will be banned from hunting and collecting natural resources within the project area and River Buna Protected Landscape to minimise impacts to fauna and their habitats. This	N/A	N/A	Medium	Negligible	Not Significant	
		Adverse impacts to priority fauna and their habitat arising from facilitated access and project related in-migration e.g. fauna habitat loss and degradation, disturbance to fauna and injury or harm to fauna within the Buna River Protected Landscape and surrounding environs.		✓	High	Large	Major (high)		Development and implementation of the Sustainability / Eco-tourism Programme	N/A	N/A	High	Negligible	Not Significant	Depending on the success
Aquatic Habitats and Species															
Aquatic habitats and Species	Hydrology and Water Quality	Adverse impacts to priority aquatic species and habitats arising from suspended sediment loading (i.e. habitat degradation, habitat loss and reduced biological fitness mortality to species)	✓		High	Large	Major (high)	N/A	Adherence to SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control. This will include, but is not limited to, the following mitigation measures: Surface water management infrastructure (e.g. cut-off / diversion drains, velocity dissipation devices, culverts) will be constructed in appropriate locations to minimise and control surface water flow over disturbed areas. Sediment control dams and traps will be installed in suitable locations, particularly along higher elevations above ecologically sensitive areas, to further minimise the risk of sediment loading impacts Preparatory works (i.e. habitat clearance, grading and stockpiling etc) will be undertaken during the dry season to minimise impacts from erosion and suspended sediments on fauna water resources Measures will be employed to stabilise exposed soil and unstable surfaces (i.e. through using terramesh or other geotextiles) where necessary	N/A	N/A	High	Small	Minor	
				✓	High	Small	Minor	N/A	Vegetation located on the steep slopes of Mount Renci within the project area will also be preserved where possible to minimise the risk of erosion. Surface water management infrastructure - use and maintenance of an effective draining system to minimise the risk of suspended sediment loading and runoff.	N/A	N/A	High	Negligible	Not Significant	
		Accidental spills of hazardous and non-hazardous substances resulting in the loss and degradation of aquatic habitats and impacts to priority aquatic species (i.e. reduced biological fitness or mortality)	✓		High	Large	Major (high)	Adherence to SOP4: Water Quality and Pollution Management	Adherence to SOP4: Water Quality and Pollution Management. Emergency response procedures will be developed for the Project to effectively manage any accidental spills and leakages of non-hazardous waste and hazardous compounds. Staff and contractors will receive training in spill events management. This will include the development of a spill, incident, accident and response and management plan by the contractor. The workforce will also be made aware of the importance of biodiversity and the priority habitats and species present in the project area to raise awareness and improve their understanding regarding the importance of conserving threatened habitats, species and natural resources for the environment and communities.			High	Negligible	Not Significant	
				✓	High	Small	Minor		Use and maintenance of appropriate drainage facilities.			High	Negligible	Not Significant	
	Habitat Loss and Degradation	Culverting 10 ephemeral creaks	✓		Low	Small	Minor	N/A	Adherence to a Standard Operating Procedure (SOP) 1: Habitat/ Land Clearance, Accidental Vehicle and Machinery Collisions with Fauna, Stockpiling and Alien Invasive Species Control; SOP2: Emission and Dust Control, Erosion and Suspended Sediment Control and SOP4: Water Quality and Pollution Management.	N/A	N/A	Low	Negligible	Not Significant	
	Noise, Vibration and airblast	Vibration and airblast emissions are not predicted to impact aquatic species	✓	✓	High	Negligible	Not Significant		N/A			High	Negligible	Not Significant	
	Induced Access and Project-related In-migration	Adverse impacts to priority aquatic species and their habitat arising from facilitated access and project related in-migration	✓		High	Small	Moderate		Project staff and contractors will be banned from fishing and collecting aquatic natural resources (e.g. shellfish, macrophytes) within the project area and River Buna Protected Landscape to minimise impacts to fauna and their habitats. This will be communicated to staff and contractors through staff inductions. Development and implementation of the Sustainability / Eco-tourism Programme	N/A	N/A	High	Negligible	Not Significant	
		Adverse impacts to priority aquatic species and their habitat arising from facilitated access and project related in-migration		✓	High	Large	Major (high)		Development and implementation of the Sustainability / Eco-tourism Programme	N/A	N/A	High	Negligible	Not Significant	