Financed under a specific grant agreement no 2018/402-850 from EU IPA II Multi-Beneficiary Programme for Albania, Bosnia and Herzegovina, North Macedonia, Kosovo*, Montenegro and Serbia

Western Balkans Investment Framework Infrastructure Project Facility Technical Assistance 8 (IPF 8)

TA2018148R0 IPA

Mediterranean Corridor, Bosnia and Herzegovina - Croatia CVc Road Interconnection, Subsection: Konjic (Ovcari) - Prenj Tunnel - Mostar North

Gap Analysis & ESIA Disclosure Pack

WB20-BiH-TRA-02 Component 1

Volume 1: Environmental and Social Impact Assessment Report

Chapter 15 Waste and Materials

October 2023

COWI | IPF

Western Balkans Investment Framework (WBIF)

Infrastructure Project Facility Technical Assistance 8 (IPF 8)

Infrastructures: Energy, Environment, Social, Transport and Digital Economy

TA2018148 R0 IPA

Volume 1: Environmental and Social Impact Assessment Report

Chapter 15 Waste and Materials Management

October 2023

The Infrastructure Project Facility (IPF) is a technical assistance instrument of the Western Balkans Investment Framework (WBIF) which is a joint initiative of the European Union, International Financial Institutions, bilateral donors and the governments of the Western Balkans which supports socio-economic development and EU accession across the Western Balkans through the provision of finance and technical assistance for strategic infrastructure investments. This technical assistance operation is financed with EU funds.

Disclaimer: *The authors take full responsibility for the contents of this report. The opinions expressed do not necessarily reflect the view of the European Union or the European Investment Bank.*

PROJECT NO.	DOCUMENT NO.
WB20-BiH-TRA-02	

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	25/09/2021	ESIA Report	Team of experts	Irem Silajdžić Konstantin Siderovski	Richard Thadani
2	21/11/2022	ESIA Report – Chapter 15 Waste and Materials Management	Team of experts	Irem Silajdžić	Richard Thadani
3	03/03/2023	ESIA Report – Chapter 15 Waste and Materials Management	Team of experts	Irem Silajdžić	Richard Thadani
4	10/10/2023	ESIA Report – Chapter 15 Waste and Materials Management	Team of experts	Irem Silajdžić	Richard Thadani

CONTENTS

List of figures

List of tables

15 Waste and Materials Management

15.1 Introduction

This chapter reports the findings of the assessment of the potential impact caused by inappropriate management of waste and materials during the construction and operational phases.

The baseline data for material resources and waste generation has been collected from Bill of Quantities (BoQ) and Preliminary Designs for subsection Konjic (Ovcari) – Prenj Tunnel, subsection Prenj Tunnel – Mostar North, and Prenj Tunnel. Having in mind the nature of activities that will be performed on the construction site, the significance of potential effects is assessed and the measures that will be employed to minimise them proposed.

This Chapter should be read in conjunction with the following Chapters:

Chapter 1 Introduction
Chapter 2 About the Project description
Chapter 3 Detailed Project description
Chapter 4 Policy, legislative and institutional context
Chapter 5 Assessment methodology
Chapter 6 Biodiversity
Chapter 7 Geology and groundwater
Chapter 8 Surface water
Chapter 13 Soil
Chapter 17 Cumulative impacts
Chapter 19 Residual impacts
Chapter 20 ESMMP.

15.2 Baseline Conditions

15.2.1 Waste Generation in the Construction Phase

The classification of waste generated in the construction phase of the Project is done line with the *Rulebook on categories of waste with lists*[1]. Table 15-1 provides the overview of the expected waste categories.

Table 15-1: Classification of waste generated during the motorway construction

Code	Waste
02 00 00	Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing
08 00 00	Wastes from the manufacture, formulation, supply, and use (MFSU) of coatings (paints, varnishes, and vitreous enamels), sealants and printing inks
13 00 00	Oil wastes and wastes of liquid fuels (except edible oils, 05 and 12)

[1] Official Gazette of FBiH, No. 9/05

Code	Waste
15 00 00	Waste packaging: absorbents, wiping cloths, filter materials and protective clothing not otherwise specified
16 00 00	Wastes not otherwise specified in the list
17 00 00	Construction and demolition wastes (including excavated soil from contaminated sites)
20 00 00	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions

The main types of waste that will be generated are:

- earth, sand, gravel, clay, loam, stone as a result of earthworks and excavation,
- bitumen (asphalt) or cement-bound material, sand, gravel, crushed stone as a result of construction of civil engineering structures,
- concrete, bricks, mortar, gypsum, aerated concrete, natural stone as a result of the construction of buildings and demolition of expropriated assets, and
- wood, plastic, paper, cardboard, metal, cables, paint, varnish, and other mixed waste on the construction site as a result of other construction operations.

Indicative expected composition of the construction waste is as follows:

- excavation material 90% (including non-inert organic waste 5%),
- asphalt and concrete 5%,
- demolition and construction waste 5%,

95% of the construction waste is inert (earth and stones from excavation, plaster, broken concrete, iron, steel, metals, etc.) and can be used as a fill which is suitable for land reclamation and site formation. When properly sorted, materials such as concrete, asphalt, metals etc. can be recycled for use in construction. In some cases, this type of waste may be hazardous, for example, asphalt binder or waste containing asbestos from demolished expropriated houses on the alignment, which requires special control and treatment. The remaining 5% of the waste is non-inert organic waste usually being wood, timber, vegetation, mixed municipal waste, packaging waste, etc.

The list of waste with codes, the composition, quantity, place of origin and collection, types of shipment to the disposal sites, as well as the place of final disposal of all categories of waste generated during the construction of the motorway is given in Table 15-2. This list does not include demolition waste from expropriated houses and other facilities.

Table 15-2: Estimated types and quantities of waste in the construction of the motorway with guidelines for the management of individual types of waste

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
02			**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**						
02	01		Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing						
02	01	07	Waste from forestry	Wood and plant waste from surface, humus, etc.	180,000 m^2 (On the area to be cleared)	Shrubs, bushes on the planned route, due to cleaning and preparation of the route	Temporary disposal next to the route	Transport vehicle	Firewood, composting, incineration and/or the competent (local) forestry authorities
08			**WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS**						
08	01		Wastes from MFSU and removal of paint and varnish						
08	01	11*	Waste paint and varnish containing organic solvents or other dangerous substances	Paints and varnishes	approx. 200 l	When painting along the route and protecting metal structures	Temporary storage of hazardous waste	Transport vehicle	Authorised company
08	01	21*	Wastes from MFSU and removal of paint and varnish	Thinners for paints and varnishes	approx. 150 l	When painting along the route and protecting metal structures	Temporary storage of hazardous waste	Transport vehicle	Authorised company
13			**OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)**						
13	01		Waste hydraulic oils						
13	01	10*	Mineral-based non-chlorinated hydraulic oils	Hydraulic oils	(Calculated on the basis of the table of standards for	Complete planned route	Storage of hazardous waste	Transport vehicle	Authorised company

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
					construction machinery and the number of working hours) approx. 500 l				
13	01	11*	Synthetic hydraulic oils	Hydraulic oils	(Calculated on the basis of the table of rate of yield for construction machinery) approx. 350 l	Complete planned route	Storage of hazardous waste	Transport vehicle	Authorised company
13	02		Waste engine, gear and lubricating oils						
13	02	06*	Synthetic engine, gear and lubricating oils	Engine oils, lubricants, lubricating materials	(Calculated on the basis of the table of rate of yield for construction machinery) approx. 800 l	Construction machinery, equipment installation, entire route	Temporary storage of hazardous waste	Transport vehicle	Authorised company
13	02	07*	Readily biodegradable engine, gear and lubricating oils	Engine oils, lubricants, lubricating materials	(Calculated on the basis of the table of rate of yield for construction machinery) approx. 500 l	Construction machinery, equipment installation, entire route	Temporary storage of hazardous waste	Transport vehicle	Authorised company
13	07		Wastes of liquid fuels						

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
13	07	01*	Fuel oil and diesel	Motor fuels	Calculated on the basis of the table of rate of yield for consumption and working hours, waste of 1%) approx. 500 l	Construction machinery, equipment installation, entire route	Temporary storage of hazardous waste	Transport vehicle	Authorised company
13	07	02*	Petrol	Motor fuels	Calculated on the basis of the table of rate of yield for consumption and working hours, waste of 1%) approx. 210 l	Construction machinery, equipment installation, entire route	Temporary storage of hazardous waste	Transport vehicle	Authorised company
13	08		Oil wastes not otherwise specified						
13	08	99*	Wastes not otherwise specified	Oily cloths, clothes, oily materials	approx. 200 kg	Construction machinery, equipment installation, entire route	Temporary storage of hazardous waste	Transport vehicle	Authorised company
15			**WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**						
15	01		Packaging (including separately collected municipal packaging waste)						
15	01	10*	Packaging containing residues of or contaminated	Packaging of paints and varnishes,	approx. 300 kg	The entire route of the section, and the ancillary facilities,	Temporary storage of hazardous waste	Transport vehicle	Authorised company

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
			by dangerous substances			protection of metal structures			
15	02		Absorbents, filter materials, wiping cloths and protective clothing						
15	02	02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	Filters, absorbent fillers	approx. 400 kg	Construction machinery and means of transport, installation of equipment, ancillary facilities,	Temporary storage of hazardous waste	Transport vehicle	Authorised company
16			**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**						
16	01		End-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)						
16	01	03	End-of-life tyres	Residues of worn tires	approx. 30 pieces	Due to the operation of construction machinery	Temporary waste storage	Transport vehicle	Authorised company
16	01	11*	Brake pads containing asbestos	Asbestos-containing pads	approx. 500 kg	Construction machinery and means of transport that are distributed along the entire route	Temporary storage of hazardous waste	Transport vehicle	Authorised company
16	01	12	Brake pads other than those mentioned in	Pads	approx. 500 kg	Construction machinery and means of transport	Temporary storage	Transport vehicles	Authorised company

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
			16 01 11			that are distributed along the entire route			
16	06		Batteries and accumulators						
16	06	05	Other batteries and accumulators	Batteries and accumulators	approx. 600 kg	Occurring on the construction site due to the failure of construction machinery	Temporary storage	Transport vehicles	Authorised company
17			**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**						
17	02		Wood, glass, and plastic						
17	02	01	Wood	Wooden boards, poles, wooden scaffolding, wooden pads	Demolition: approx. 150 m^3 and during construction approx. 40 m^3	Demolition of buildings, installation of equipment, concrete works, works on the route, construction of all structures	Temporary landfill	Transport vehicles	Authorised company and/or handover to third parties
17	02	02	Glass	Window and door glazing - demolition of buildings	approx. 200 kg	Demolition of existing structures	Selective waste containers	Transport vehicles	Authorised companies
17	02	03	Plastic	Thermal contraction branch, insulation from pre-insulated	Demolition: approx. 200, and during construction approx. 400 kg	Demolition of buildings, construction of structures and routes	Selective waste containers	Transport vehicles	Authorised companies

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
				pipes, PVC bags, warning tapes, foils, PVC pipes, cables					
17	02	04*	Glass, plastic, and wood containing or contaminated with dangerous substances	Mixtures of mentioned materials	approx. 500 kg	Demolition of buildings, installation of equipment, concrete works, works on the route, construction of all structures	Temporary storage of hazardous waste	Transport vehicles	Authorised company
17	03		Bituminous mixtures, coal tar and tarred products						
17	03	01*	Bituminous mixtures, coal tar and tarred products	Plastic anti-corrosion tapes, waste asphalt	approx. 1,000 m^2	Route construction, existing road barriers, structures	Temporary storage of hazardous waste	Transport vehicles	Authorised companies
17	03	02	Bituminous mixtures containing other than those mentioned in 17 03 01*	Mixtures based on bitumen, cardboard	approx. 300 m^2	Route construction, existing road barriers, structures	Selective waste containers	Transport vehicles	Authorised companies
17	04		Metals (including their alloys)						
17	04	05	Iron and steel	Mounting accessories, damaged steel and iron parts,	Demolition: approx. 130 kg and during	Construction of buildings, installation of equipment on the	Selective waste containers	Transport vehicle	Authorised companies

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
				wire, marking poles, barriers, sheet metal, grounding strip	construction approx. 70 kg	route, disassembly of old wire on barriers, preparation of poles, road crossings,			
17	04	07	Mixed metals	Electronic equipment, residue of welding electrodes, cables	Demolition: approx. 80 kg and during construction approx. 30 kg	Installation of equipment in ancillary structures including electronic equipment	Selective waste containers	Transport vehicle	Authorised companies
17	05		Soil (including excavated soil from contaminated sites), stones and dredging spoil						
17	05	04	Soil and stones other than those mentioned in 17 05 03*	Dredge spoil, stones, sand, lime sand, gravel	approx. 3.5 million m^3	Excavation works along the route, mining works, preparation works along the route, sand filling on the route, macadam roads, road crossings, tunnels and structures	Disposal sites which comply with good international practice	Transport vehicle	Construction waste disposal site (surplus that will not be used as construction material)
17	05	06	Dredging spoil other than those mentioned 17 05 05*	Dredge spoil, humus resulting from preparation works in a	approx. 50.000 m^3	Excavation works along the route, drilling works, preparation works along the route,	Temporary disposal sites	Transport vehicle	Construction waste disposal site

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
				layer of thickness d= 20 cm		road crossings, structures			
17	06		Insulation materials and asbestos-containing construction materials						
17	06	01*	Insulation materials containing asbestos	Insulation materials	Demolition: approx. 100 kg	Construction of all structures and demolition of residential buildings	Temporary storage of hazardous waste	Transport vehicles	Authorised companies
17	09		Other construction and demolition waste						
17	09	03*	Other construction and demolition wastes (including mixed wastes) containing dangerous substances	Mixed construction hazardous waste	approx. 500 kg	During demolition of existing structures on the entire planned route	Temporary storage of hazardous waste	Transport vehicles	Authorised companies
17	09	04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	Mixed construction waste	approx. 1.000 m^3	During demolition of existing structures on the entire planned route	Temporary disposal sites	Transport vehicle	Construction waste disposal site
20			**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**						
20	01		Separately collected fractions (except 15 01)						
20	01	01	Paper and cardboard	Cardboard boxes, paper packaging	approx. 1 t	Warehouse for construction materials,	Selective waste containers	Transport vehicle	Authorised companies

1[1]	2[1]	3[1]	Waste Name	Composition of waste	Estimated quantity during construction	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
						installation of equipment, workers, entire route			
20	03		Other municipal wastes						
20	03	01	Mixed municipal waste	Food products, packaging, etc.	approx. 2 t	Entire construction site	Municipal waste containers	Transport vehicle	PUC transport to the municipal waste landfill

*1[1] - activity from which the waste originates, 2[1] - the process in which the waste was generated, 3[1] - the process from which the waste originates; * -hazardous waste*

15.2.2 Waste Generation in the Operational Phase

During the operational phase of the motorway, the Investor is obliged, pursuant to Article 19 of the *Law on Environmental Protection*[2] and Article 19 of the *Law on Waste Management*[3], to implement waste management actions aimed at prevention of waste generation, recycling, treatment for re-use and safe disposal.

Considering that this section entails construction of toll stations and rest areas, it is envisaged that the municipal waste will be generated at these locations. This is usually non-hazardous waste consisting of packaging or biodegradable food waste, but some other types of waste such as used tyres or hazardous packaging from lubricants and other liquids used in car maintenance are possible to find. This category of waste should be managed by the motorway maintenance entity in cooperation with local communal enterprise for waste management.

The Preliminary Design call for the installation of oil and grease separators for treatment of surface-run off and SBR units for treatment of wastewater from toll stations. These types of treatment facilities produce wastewater sludge that must be pumped out and safely disposed by a licenced operators for management of (oily) sewage sludge. It is planned to connect rest areas to local water supply and sewage system where available or construct the collection and treatment system using biological treatment units. In case the rest areas will have portable toilet use, maintenance will be performed by the authorised company.

The waste will also be generated in the motorway maintenance activities, and in case of accident situations involving material spill.

The motorway maintenance works require the use of some types of materials that belong to the group of toxic and dangerous substances. The most used products are:

- diesel - fuel used for equipment in most transport vehicles,
- petrol,
- lubricants (oils, petroleum jelly),
- paints and varnishes, thinners - used for maintenance, protection and marking.

The classification of waste expected during the operation of the motorway is given in the following table. Since it is not possible to predict what type of accidents may occur at the motorway involving spill of material, the spill waste is not included.

[2] Official Gazette of FBiH, No. 15/21
[3] Official Gazette of FBiH, No. 33/03, 72/09 and 92/17

Table 15-3: Classification of waste generated during the motorway operation

Code	Waste
08 00 00	Wastes from the manufacture, formulation, supply, and use (MFSU) of coatings (paints, varnishes, and vitreous enamels), sealants and printing inks
13 00 00	Oil wastes and wastes of liquid fuels (except edible oils, 05 and 12)
15 00 00	Waste packaging: absorbents, wiping cloths, filter materials and protective clothing not otherwise specified
19 00 00	Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use
20 00 00	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions

The list of waste with codes, the composition, quantity, place of origin and collection, types of shipment to the disposal sites, as well as the place of final disposal of all categories of waste generated during the operation of the motorway is given is shown in Table 15-4. The quantities of waste are estimated for a period of one year.

Table 15-4: List of waste that will be generated during operation of the motorway with codes

1[1]	2[1]	3[1]	Waste	Composition of waste	Quantity per year	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
08			**Wastes from the manufacture, formulation, supply, and use (MFSU) of coatings (paints, varnishes, and vitreous enamels), sealants and printing inks**						
08	01		Waste engine, gear, and lubricating oils						
08	01	11*	Waste paint and varnish containing organic solvents or other dangerous substances	Paints and varnishes	approx. 100 l	The whole route due to painting and marking	Storage of hazardous waste	Transport vehicle and special containers for hazardous waste	Authorised company
13			**Oil wastes and wastes of liquid fuels (except edible oils, 05 and 19)**						
13	02		Waste engine, gear, and lubricating oils						
13	02	05*	Mineral-based non-chlorinated engine, gear, and lubricating oils	Motor oils	approx. 80 l	Ancillary facilities, transport vehicles, maintenance route	Storage of hazardous waste	Transport vehicle	Authorised company
13	02	06*	Synthetic engine, gear and lubricating oils	Motor oils	approx. 80 l	Ancillary facilities, transport vehicles, maintenance route	Storage of hazardous waste	Transport vehicle	Authorised company
13	08		Oil wastes not otherwise specified						
13	08	99*	Oil wastes not otherwise specified	Cloths, containers clothes...	approx. 200 kg	Ancillary facilities, transport vehicles, maintenance route	Storage of hazardous waste	Transport vehicle	Authorised company
15			**WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**						
15	01		Packaging (including separately collected municipal packaging waste)						

1[1]	2[1]	3[1]	Waste	Composition of waste	Quantity per year	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
15	01	01	Paper and cardboard packaging	Cardboard and paper boxes,	approx. 450 kg	Ancillary facilities, transport vehicles, maintenance route	Selective waste containers	Transport vehicle	Authorised company
15	01	02	Plastic packaging	Plastic packaging, boxes, bottles	approx. 150 kg	Ancillary facilities, transport vehicles, maintenance route	Selective waste containers	Transport vehicle	Authorised company
15	01	04	Metal packaging	Metal	approx. 200 kg	Ancillary facilities, transport vehicles, maintenance route	Selective waste containers	Transport vehicle	Authorised company
19			**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTEWATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**						
19	08		Wastes from wastewater treatment plants not otherwise specified						
19	08	05	Sludges from treatment of urban wastewater	Sludges from treatment	approx. 1 m^3/year.	Location of SBR device at the site of toll station	SBR sludge chamber	Transport vehicles	Authorised company with which a third party engaged in maintenance will sign a contract for waste disposal (sludge)
19	08	10*	Grease and oil mixture from oil/water separation other than those mentioned in 19 08 09	Grease and oil, mixtures of oil waste	approx. 800 l	Grease and oil separators on the planned route	Storage of hazardous waste	Transport vehicle and special containers for hazardous waste	Authorised companies
20			**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**						
20	01		Separately collected fractions (except 15 01)						

1[1]	2[1]	3[1]	Waste	Composition of waste	Quantity per year	Place of origin	Place of collection	Type of shipment to place of temporary and final disposal	Place of final disposal, authorised company, producer
20	01	01	Paper and cardboard	Paper	approx. 80 kg	Ancillary facilities, transport vehicles, maintenance route	Selective waste containers	Transport vehicle	Authorised companies
20	01	39	Plastic	Plastic equipment and parts	approx. 150 kg	Ancillary facilities, transport vehicles, maintenance route	Selective waste containers	Transport vehicle	Authorised company
20	03		Other municipal wastes						
20	03	01	Mixed municipal waste	Waste resulting from food for workers, cleaning...	approx. 4.5 t	Entire site	Containers per locations	Transport vehicle	PUC transport to the municipal waste landfill

15.3 Assessment of Impacts

In the **construction phase**, there are a range of impacts which can occur from the mismanagement of waste and inappropriate sourcing of materials. The potential adverse impacts of the Project in the construction and operation phases are:

- use of potentially finite and/or scarce resources,
- ineffective spoil/excavated material handling, storage and disposal causing contamination of the environment or sedimentation of water resources,
- contamination of environments (particularly watercourses, groundwater, and the ground) due to leakage and spillage of wastes associated with poor waste handling and storage arrangements,
- fugitive emissions, such as dust, associated with the handling and storage of some waste streams,
- visual amenity impacts associated with poor storage of waste,
- the transportation of construction waste to disposal sites can lead to increased traffic and congestion, which can be a safety hazard and increase emissions from vehicles and
- environmental damage caused by sourcing the material from illegal borrow pits.

The clean-up and preparation works will include cutting shrubs and trees of all sizes, removing branches, cutting them to lengths suitable for transport, removing roots, etc. The total quantity of removed green waste is calculated per square meter of cleared overgrown area. Cut trees and stumps should be disposed of along the route in places accessible for the trees to be removed by the competent authorities and where it will not disturb the works. The Contractor will temporarily place this waste at a sufficient distance from the watercourse. These activities will be performed by the competent (local) forestry authority.

The motorway construction requires ground excavation and removal of extra quantities of excavated soil and removal of bad quality soil from the construction site (marl soil, soil containing high percent of biodegradable material). Granular materials - broken stone, crushed stone and sand will be used as fill and lining for road laying. Cement, concrete, steel are materials that will be most frequently used in the structure construction.

According to the Preliminary Bill of Quantities (BoQ) prepared in the framework of Preliminary Designs[4] for this motorway subsection, the total quantity of excavated materials will be around **6.9 million m^3** (Table 15-5).

[4] Preliminary Design of the alignment, Ovcari Interchange-Prenj Tunnel, AIK Inzenjering Banovici, 2023; Preliminary Design of the alignment, Exit from Prenj Tunnel-Mostar North Interchange, IPSA Institut Sarajevo, 2023; Corridor Vc – Ovcari – Tunnel Prenj – Mostar North Development of Preliminary and Main Design for Preparatory Works, Design QC, Sarajevo, August 2022

Table 15-5: Estimated quantities of excavated materials that will be generated during construction of the route Konjic (Ovcari) - Prenj Tunnel - Mostar North

Subsection	The amount of excavation (m^3)
Konjic (Ovcari) - Prenj Tunnel	1,731,500
Prenj Tunnel	2,980,00
Prenj Tunnel - Mostar North	2,184,000
Total	**6,895,500**

The BoQ for construction of the access roads to Prenj Tunnel[5] estimates that the total amount of excavated materials from the northern access road will be **150,000 m^3**, and for the southern access road **80,000 m^3**.

The BoQ also estimates that the total amount of material required for construction of embankments along the route is around **3.4 million m^3**. Since the excavated spoil can be used for construction of the embankments, the final disposal will be required for **3.5 million m^3** of spoil that will be generated in excavation activities. Part of the spoil material will be disposed on the disposal sites which will be designed and used for this purpose, and part will be used for landscaping activities as specified in the table below.

Table 15-6: Disposal areas or landscaped areas for the spoil

Disposal/landscaping area	Project components	Quantity for the disposal/reuse (m^3)
Konjic (Ovcari) - Prenj Tunnel + Konjic Bypass + ½ of the Prenj Tunnel		
Konjic Municipal Solid Waste Landfill	Konjic Bypass	160,000
Landscaping	Motorway route	242,480
	½ of the Prenj Tunnel tube	170,600
	Northern Access Road	150,000
Prenj Tunnel - Mostar North + ½ of the Prenj Tunnel		
Humilisani disposal site	Motorway route	1,230,800
	½ of the Prenj Tunnel tube	1,520,000
	Southern Access Road	80,000

The proposed disposal site locations are Municipal Solid Waste Landfill in Konjic and Humilisani in Mostar, while significant amount of material will be reutilised in landscaping the terrain around the 20 meters high motorway embankments in the area of northern portal of the Tunnel Prenj on the Konjic side.

The Konjic Municipal Solid Waste Landfill is situated in the Project area and is not within any potential protection zones. The plan is to dispose of 160,000 m^3 of spoil

[5] Tunnel Prenj T3, Preliminary design, Divel d.o.o. Sarajevo, 2016

from the Konjic Bypass at this location. The Konjic Bypass is situated north of the Neretva River, and the City of Konjic prohibits the transportation of trucks carrying excavated material through its urban area. To address this issue, appropriate mitigation measures are outlined in 15.4.1, ESMP and ESAP to effectively manage this impact.

Figure 15-1: Location of the Konjic Municipal Solid Waste Landfill

The excess material on the northern side, from the motorway route from Ovcari Interchange to the entrance to the Tunnel Prenj and from one half of the Tunnel Prenj, will be used for landscaping the part of the route with the aim to fit in with the surrounding environment. The parts of the route that are planned for landscaping are situated at the following sections:

- Section 1: km 7+480.00 to km 7+920.00; capacity – 24,656.00 m^3,
- Section 2: km 8+080.00 to km 8+540.00; capacity – 4,838.00 m^3,
- Section 3: km 9+380.00 to km 10+140.00; capacity – 203,330.00 m^3,
- Landscaping in the relocation zone of the regional road; capacity – 32,500.00 m^3.

By reshaping the left side of the motorway route, the embankment's height will be less visible and will better blend in with the surrounding environment. A total of 265,324.00 m^3 of excavation material will be utilized for the landscaping activities. The rest will be used as an embankment for the motorway. The remaining excess cut material of approx. 150,000 m^3 will be required for sub-base and crushed aggregate bases of the pavement.

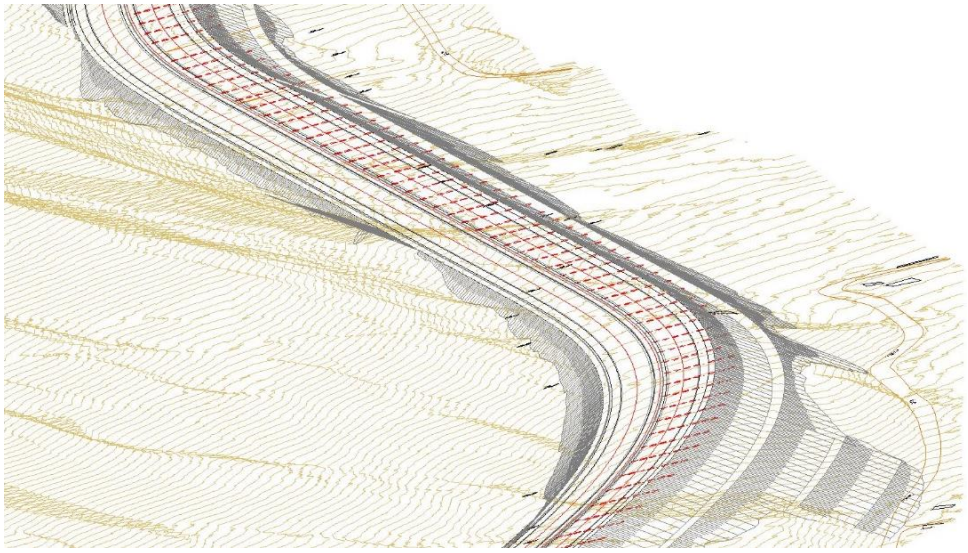

Figure 15-2: 3D model of the Sections 1 and 2

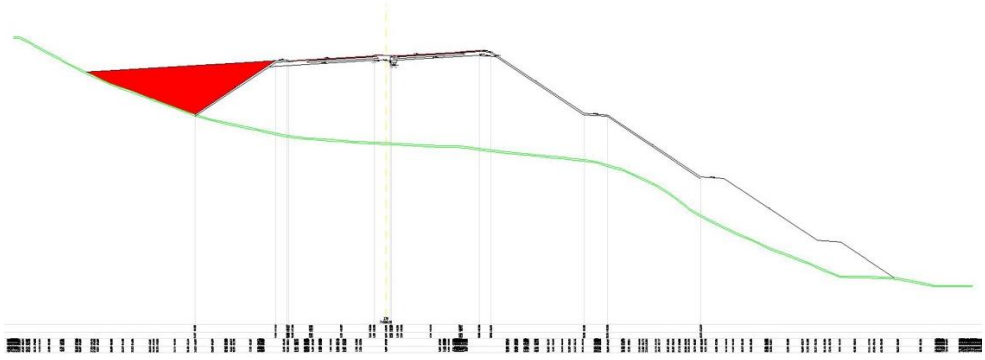

Figure 15-3: Embankment profile on Section 1 and 2

Figure 15-4: 3D model of Section 3

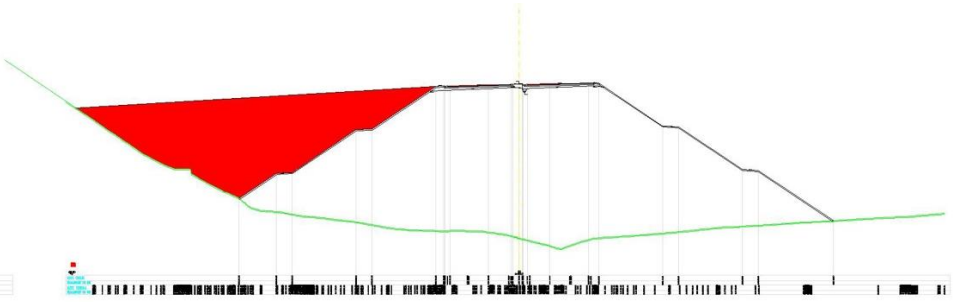

Figure 15-5: Embankment profile on Section 3

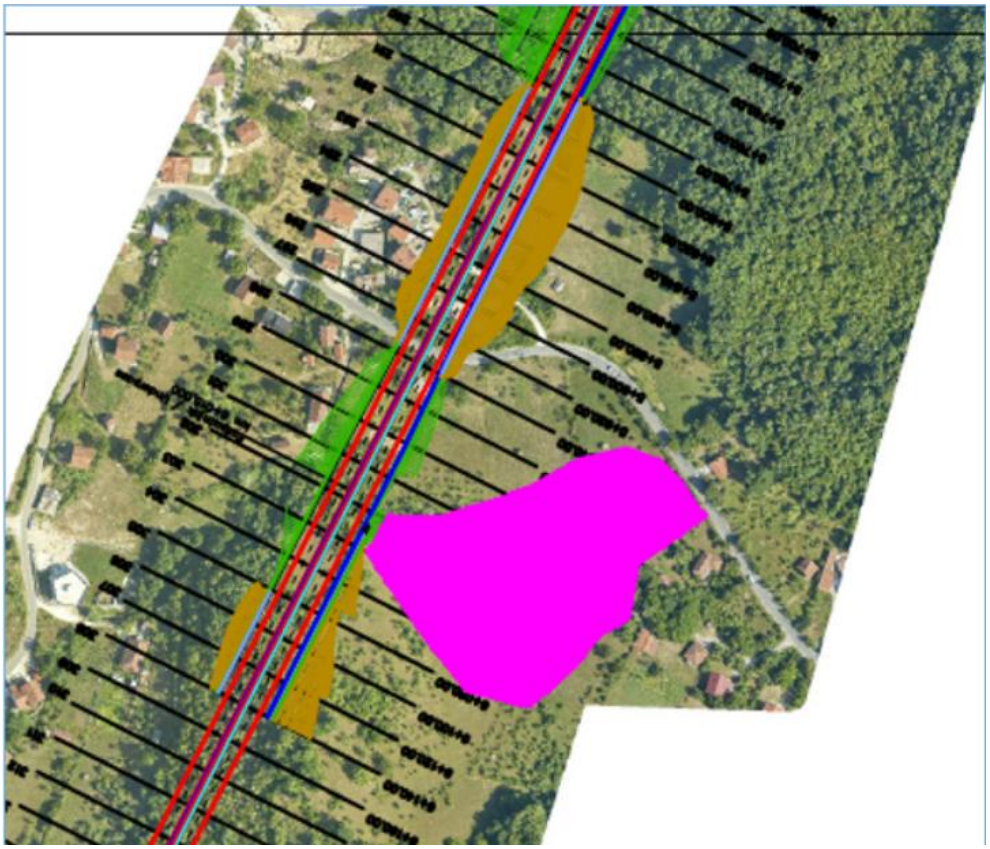

Figure 15-6: Landscaping area between regional road diversion and motorway

The Humilisani site is capable of accommodating 2,800,000 m^3 of waste generated from the construction of the second section of Tunnel Prenj, the motorway segment running from Tunnel Prenj to Mostar North, and the southern access road. The landfill location is situated on the left side of the motorway, adjacent to the regional road R435a, and is outside the water protection zone boundaries as well as potential Natura 2000 and Emerald protected areas.

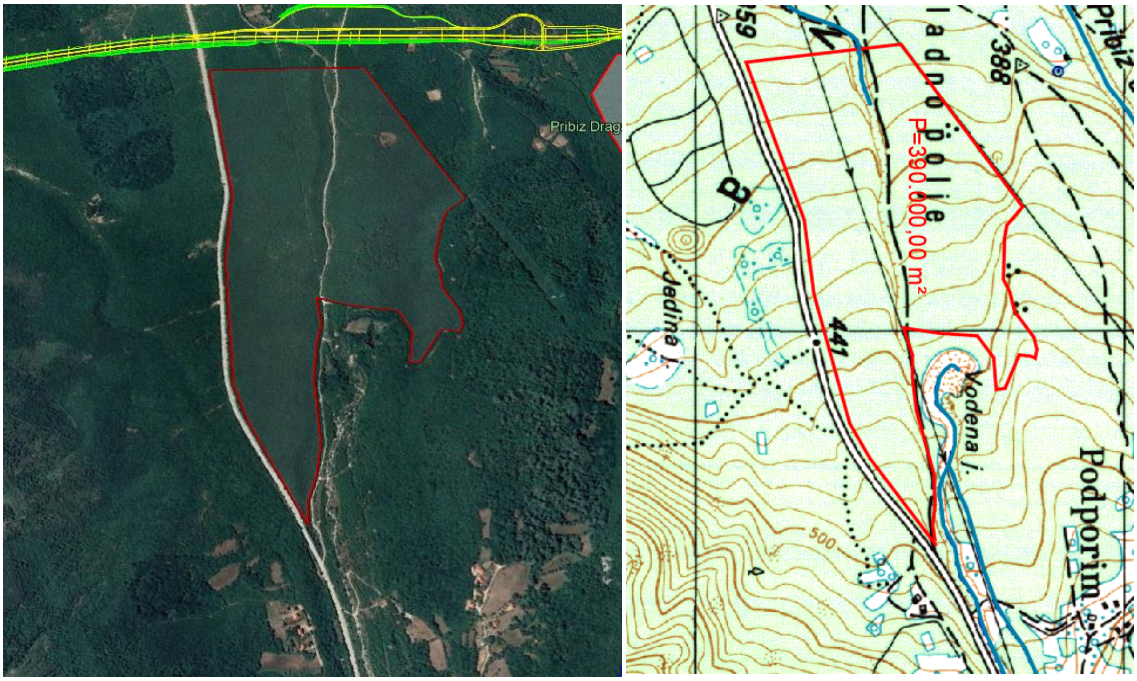

Figure 15-7: Location of the Humilisani disposal site

More information about the spoil disposal and reuse is given in Chapter 3.2.9. Spoil Disposal Sites.

It has been assumed that the Prenj Mountain constitutes a physical barrier to any material being transported from the south side (where there is an excess) to the north side in case there is a need. The two subsections (each incorporating half of Prenj Tunnel material) are therefore considered as separate from a mass haul point of view.

The transfer of material between the north and south sections should not be accepted for the following reasons:

- Any temporary access road over or around the mountain itself is environmentally undesirable, costly and will be subject to the limitations of winter conditions.
- Using the existing M17 to transport such material over a distance of approximately of 50 km is costly and should not be accepted given that lorries will need to cross existing agglomerations such a Jablanica.
- The deterioration of the existing infrastructure and issues of road safety are also important negative factors.

An alternative may be to transport such material through a constructed tube of Prenj Tunnel itself. However, this is not consistent with the procurement strategy of the Beneficiary who intends to commence tendering of the works for all sections early 2023. On the basis of 3 m of progress per day, (one sequential cycle being installations, explosives, excavation, support), the opening of 1/2 single tube of Prenj Tunnel may take up to 5 years to complete before transport through the tube may be considered. Such transportation may then hinder the continuation of construction of Prenj Tunnel itself.

Besides the excavated spoil, the most significant materials that are expected to be used as part of the construction phase are the various grades of concrete, shotcrete, and cement/grout. This will require production of concrete on site and installation of concrete batching plant that must be appropriately managed to minimise environmental impacts associated with elevated dust levels and CO_2 emissions.

Other impacts associated with material use will be the use of finite materials and the material storage including storage of chemicals and hazardous materials. If not appropriately stored and contained, materials could result in contamination of the environment.

Waste and materials handling is primarily about identifying waste streams and adopting an appropriate approach in line with Good International Industry Practice (GIIP) and federal waste management regulation, which seeks to avoid the generation of waste in the first instance, rather than mitigating potential impacts to a defined baseline environment. Waste will be generated across the entire Project area and if properly managed, the impacted area will not go beyond the Project site limits. However, if any hazardous substances or spoil/excavated materials require special disposal treatment offsite or are not handled and stored properly, there is potential that groundwater and/or the aquatic environment could become contaminated outside the Project area.

The Preliminary Construction Waste Management Plan (PCWMP) is prepared for this Project, and it describes roles, rules, and methods of waste management during construction. PCWMP prescribes temporary storage of waste separately at the location of works until the moment of final disposal, separation of construction waste from other types of waste and adequate transport to the nearest construction waste disposal site, prevention of uncontrolled disposal of construction waste on municipal solid waste landfills, taking care that maximum quantities of construction waste are recycled. The PCWMP is given in Volume 2: Book of Technical Annexes.

During construction of the motorway, there might be a need to use additional construction materials such as soil, gravel, and stone. The Contractor can obtain such materials from borrow pits or buy them on the market from licensed operators. In case the Contractor choose to open their own borrow pit, they are legally obliged to obtain valid operational licenses, Urban Permit, Construction Permit, and Water Permits, which will guarantee that their work complies with construction and water regulations and is subject to the inspection. The Contractor will be required to develop a **Borrow Management Plan** as per specifications given in Chapter 15.4. In case the Contractor will buy the material on the market, the material supply has to come from an authorized source, that is, the licensed quarries and borrow pits with a valid Construction and Water Permits, as defined in the ESMP and ESAP. Any illegal sourcing of material will be forbidden as it can cause permanent damage to environment.

The Contractor will also be required to develop **Material Management Plan** as per specifications given in Chapter 15.4. to meet best practices for material management in construction. The Plan that details how all construction phase materials will be managed, will be developed, and implemented by the appointed

contractor. This will ensure optimal use of natural and man-made resources during the motorway construction through efficient use of roadway materials aimed to reduce waste and cause negligible damage to the environment.

In the **operational phase**, the expected waste types include municipal waste from the toll station and rest areas but also the waste sludge, green waste, and possibly hazardous wastes from maintenance-related activities. Operational waste volumes will be significantly less than those generated during the construction phase. This impact is considered as moderate thus the waste segregation at source and handing over the waste to the licenced waste management operators will be employed.

Table 15-7 below provides a summary of impacts and assessment of their significance.

Table 15-7: Summary of potential impacts of waste and materials management and assessment of their significance before mitigation

Phase	Type of potential impact	Adverse/ Beneficial	Magnitude	Sensitivity	Impact evaluation	Significance (before mitigation)
Waste						
Pre- construction	No impacts	-	-	-	**-**	**-**
Construction	Contamination of environment due to inappropriate management of spoil and other types of waste generated during construction	Adverse	Major	High	Major	Significant
	Environmental damage caused by improper materials/ chemicals management	Adverse	Major	Medium	Major	Significant
	Environmental damage caused by opening of borrow pits	Adverse	Major	Medium	Major	Significant
	Environmental damage caused by inadequate management of disposal sites	Adverse	Major	Medium	Major	Significant
Operation	Contamination of environment due to inappropriate waste storage and handling arrangements	Adverse	Minor	Medium	Moderate	Significant

15.4 Mitigation and Enhancement Measures

15.4.1 Construction Phase

Waste management

Mitigation measures required to minimise the effects of waste generation and disposal are outlined below:

- Aim to maximise the reuse or recovery of waste on-site. This may involve creating hard material from excavated foundations, reusing earthworks, and recycling other removed or demolished features.
- Separate materials and substances, including construction material products that are not waste (e.g. excess material at construction or separated substance or materials that are being removed), if they can be used without processing for the same purpose in which they were produced.
- If the excavated material is not contaminated with hazardous substances to the extent that it is classified as hazardous construction waste, the Contractor must reuse it on the construction site.
- Avoid mixing certain types of dangerous construction waste with other waste or substances and materials that are not waste.
- Prevent the release of asbestos fibers into the air from asbestos waste and spills of liquid waste that may contain asbestos when asbestos waste is present in construction.
- Reprocessing asbestos into recycled materials is not allowed, as it is not permitted to use it again as a raw material or substance.
- The Contractor must provide information on the quantity and composition of excavated materials from the construction site, as well as details about excavation methods and testing procedures, in accordance with waste management regulations, EPRD PRs, and EIB standards. This data must be recorded in mandatory documentation at the construction site and utilized in the preparation of a report on construction waste and waste management. The report should be kept for at least three years after obtaining authorization for use and made available to competent inspectors upon request.
- Cut trees and stumps should be disposed of along the route in places accessible for the trees to be removed by the competent authorities and where it will not disturb the works. The Contractor will temporarily place this waste at a sufficient distance from the watercourse. These activities will be performed by the competent (local) forestry authority.
- The Contractor will be required to develop and implement a **Detailed Construction Waste Management Plan** (DCWMP) based on the Preliminary Construction Waste Management Plan (Volume 2: Book of Technical Annexes). The DCWMP is to be developed prior to construction in accordance with the principles from *Law on Waste Management*[6],

[6] Official Gazette of FBiH, No. 33/03, 72/09

EBRD PRs, and EIB standards, with special emphasis on management of hazardous waste and demolition waste from expropriated facilities. The DCWMP should be developed taking in consideration procedures related to waste management. The DCWMP should include measures for:

- on-site separation and selection of different types of waste,
- proper temporary storage of waste (adequate storage of different types of both hazardous and non-hazardous waste),
- site selection and site management of temporary storage of waste must be carried out in accordance with the EBRD PRs and EIB standards,
- final disposal of hazardous waste should be conducted by engagement of authorized third parties,
- special emphasis is placed on adequate treatment and disposal of asbestos waste,
- the authorized company is obliged to keep a proper record of the generated asbestos waste, and waste streams, and to keep and provide record of how and where the waste has been disposed.

- The DCWMP should be implemented in conjunction with a **Topsoil Management Plan** and a **Biodiversity Management Plan** (BMP).
- Where on-site reuse (or other forms of recovery) cannot be achieved, the arisings should be sent to licenced off-site reuse, recycling, or recovery facilities. If it is not possible to use the materials off site, then they should be temporarily stored on site, in locations approved by the relevant authorities and in line with provisions of EBRD PRs and EIB standards.
- JPAC is obligated to engage authorised companies for waste management, and to verify the validity of their permits. Additionally, JPAC must conduct a thorough review to ensure that their practices align with international best practices, EBRD PRs and EIB standards.
- Ensure appropriate number of containers and bins in all areas of the construction site.
- Educating workers and employees about the waste generated and its management in accordance with the adopted procedures at the site.
- The contractor will be required to define the disposal and generation of waste.
- Introduce the principle of waste reduction and recycling.
- Daily collection and temporary storage of hazardous and non-hazardous waste.
- Municipal waste shall be collected by a local utility company.
- Hazardous waste shall be collected and treated by a licensed waste operator.
- Hazardous waste before it is handed over to an authorized person must be packaged and stored in such a way as to prevent any contact of waste with the environment.
- Segregate waste streams to prevent cross contamination and maximise recovery.
- If waste for which the contents are unknown is stored, measures should be taken that include testing and analysis to examine the characteristics

of the waste. Until its characteristics are determined, this waste is considered hazardous.

- Liquid waste and wastewater must not be discharged into drains or sewers.
- Avoid blowing, spilling, or dropping waste outside the construction site into the environment.
- Prevent the outflow of rainwater that has come into contact with hazardous waste on the ground, in water, and underground water.
- Prevent liquid waste from flowing onto the ground, into water, and underground water.

Materials management

The following shall be implemented in order to minimise impacts from using construction and other materials:

- It is necessary to arrange and to plan the transport and unloading of different materials, such as:
  - Materials will be brought by dump trucks or tippers.
  - Machines for spreading, planning and compaction of imported excavated material should be provided at the sites.
  - Material compaction will be done in layers with vibro rollers.
  - Filling of the material should be done up to the projected slopes, while respecting the projected slopes which will ensure the drainage of the landfill surfaces.
  - When excavation works are done, the sites will be flattened and closed.
  - During transport, trucks should be covered with a tarpaulin, and the wheels should be washed before using the main road.
- To minimise the effect of construction traffic on the City of Konjic, Viaducts No. 3 and No. 4 shall be prioritised in the tender documentation to be built first.
- Tunnels T1 and T2 north of the Neretva River shall also be prioritised in the tender documentation for construction to aid in the transportation of surplus material.
- Contractor must avoid traffic of the trucks with construction material crossing Konjic. Particular constrains are to be arranged between JPAC, Constructor and the City of Konjic.
- Programming/procurement of the construction works for Prenj Tunnel needs to be considered in a way to allow for complete reuse of the excavated material from the tunnel in the embankments for the northern motorway subsection. JPAC has to define the scope of activities in the tender documentation for the construction of Prenj Tunnel.
- Ensure that the specification of recycled and secondary content in imported materials (such as earthwork, stone and aggregate, cement, and asphalt), is set out during detailed design.
- A **Materials Management Plan** shall be developed by the appointed contractor and will include details on how the site construction materials would be managed. The Plan shall include planning and controlling of all materials and equipment in advance, procuring them at a reasonable cost, storing them adequately and making them available as needed.

The Plan shall be based on best practices and all the requirements of this ESIA such as:

- Capturing project requirements early in the process, including a written scope of requirements that identifies deliverables, equipment and materials needed.
- Involving construction team early in the process for effective material management in construction, especially during the design phase.
- Evaluating proposals from suppliers or vendors based on their performances on past and present projects.
- Adequate storage planning where each material requisition is planned with a level of storage and preservation based on the equipment type and manufacturers' preservation requirements. Specific storage measures should be planned for chemicals/ hazardous materials.
- Materials on-site quality assurance and quality control.
- Keeping the records of: (i) licenses and permits of suppliers or vendors, (ii) material resources tracking, treatment, disposal, and delivery notes records, and (iii) records of any contingency arrangement for material resources and waste arisings that had to be implemented will also be detailed.

Borrow pits

In case the Contractor opts for the borrow pits instead of material purchase, the following measures shall be implemented:

- Develop and implement a **Borrow Management Plan**, which shall include location of proposed extraction sites, plan for access, dust management on access roads, stockpile locations and management, and plan for rehabilitation of sites, commitments to obtain all regulatory approvals following approval from JPAC.
- Materials shall not be borrowed from the Neretva River. The Contractor is not permitted to open new extraction pits within this river basin.
- Borrow pits may not be opened in protected areas in line with the national and EBRD and EIB requirements.
- Before putting in operation a borrow pit, all necessary water related, and construction related permits must be obtained in line with the Federal regulations.
- If Contractor decides to purchase construction materials from the market, it is allowed to subcontract only licenced material providers that have valid environmental, water and working permits.
- Constraints concerning eventual itineraries through the City of Konjic must be discussed and agreed between JPAC, Contractor and the City of Konjic.

Disposal sites

The following are the necessary mitigation measures to undertake in order to minimise the negative impacts from spoil disposal sites:

- Excavated material that will not be used in construction activities must be deposited outside the water pollution risk zones, as stipulated in the Preliminary Water Consent.

- The disposal of excavation material must not be carried out along the banks of watercourses, in sanitary protection zones, or in water resources, as specified in the Preliminary Water Consent.
- After the formation of the disposal areas, it is necessary to carry out humification in a layer of 20 cm. To carry out this process, the humus that has been removed from the site will be utilized together with fresh humus, if needed.
- Peripheral ditches shall be constructed along the perimeter of the disposal sites to collect rainwater from external sources and the closed section of the sites, directing it towards the nearest recipient. On the opposite side, the planned ditch runs alongside the sites and connects to the existing road's drainage ditch, leading to the recipient. In areas where the ditch's slope exceeds 4%, concrete elements must be used to line the ditch.
- Areas of the landfill closing plateau have to be projected horizontally. The slope of the scarp between the two layers shall be given in a slope of 1:2 so that the scarp of each subsequent surface is pulled by 2.00 m towards the middle of the landfill.
- Specific studies shall be undertaken to ensure integration within the surrounding environment.

15.4.2 Operational Phase

During the operation of the motorway, mitigation measures required to minimise the effects of waste generation and disposal are as follows:

- waste bins for separate waste collection at rest areas and toll stations will be provided,
- waste will be transferred to licenced operators for waste management for final treatment/disposal.

During the road maintenance activities, the Contractors shall apply the same measures as under the construction phase, as applicable.