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Rural Economic Transformation Project — Additional Financing (RETRAP-AF; P175263 / P181083)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

FOR THE REHABILITATION OF THE IVORY COAST BORDER – TOE TOWN – ZWEDRU ROAD (85 KM)

GRAND GEDEH COUNTY, LIBERIA

FINAL REPORT — REVISED AND UPDATED EDITION

Incorporating the Biodiversity Field Survey and Biodiversity Management Plan, the Contractor's design and contract particulars, and the 2026 baseline and consultation update

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EXECUTIVE SUMMARY

Introduction

This report is the Government of Liberia's Environmental and Social Impact Assessment (ESIA) for the rehabilitation of the Ivory Coast Border – Toe Town – Zwedru Road (85 km), Grand Gedeh County, Liberia ("the Project"), financed under the Liberia Rural Economic Transformation Project (RETRAP, P175263) Additional Financing (RETRAP-AF, P181083). The Ministry of Public Works (MPW), acting through the Infrastructure Implementation Unit (IIU), is the proponent of the Project and the party that discloses this assessment. This is the revised and updated edition (October 2026) of the Final ESIA of June 2024: it incorporates the findings of the subsequently completed Biodiversity Field Survey (BFS, 2026) and its Biodiversity Management Plan (BMP); it presents the Contractor's design and the current contract particulars; and it brings the environmental and social baseline and the consultation record up to date with the 2026 field campaign. The June 2024 assessment remains the foundation of this report: its material is retained, referenced and updated — not annulled — and where maps or figures of the 2024 ESIA are reproduced, they are credited to Earthtime Inc. Authorship, licensing and the revision history are recorded on the Document Control, Authorship and Revision History page.

Project Description

The Project rehabilitates the 85 km corridor (GPS-measured centreline 83.75 km) from B'hai Jorzon at the Liberia–Côte d'Ivoire border through Toe Town to Zwedru, to paved standard within the existing government right-of-way (150 ft rural / 100 ft urban). The design — produced by the design-and-build Contractor, the ICCO/CET Joint Venture, under its Design Proposal and Methodology Statement (June 2025) — provides a 59 cm pavement structure (65 mm asphalt-concrete wearing course, 75 mm asphalt base, 150 mm crushed aggregate base and 300 mm gravel sub-base), two 3.75 m lanes with 1.5 m shoulders, design speeds of 80 km/h rural and 60 km/h urban, retention and widening of the five existing bridges, and a drainage system of 42 reinforced-concrete box culverts and 40 pipe culverts of 1,000 mm diameter designed for 10/50/100-year floods — building on the existing inventory of 82 identified structures (five bridges, 69 pipe culverts, eight box culverts), with the final scope of additional or modified structures determined at the approval of the detailed design. Ancillary facilities comprise sixteen registered borrow pits (BP1–BP17, no BP10), the Suaken and Ziah Town quarries, the Suaken batching/asphalt/crusher complex, a candidate crusher site (RC2), the Zuoyou Town construction camp and the Zuoyou/Zahi mechanical site — all registered with coordinates, screened against biodiversity geofences, and subject to site-specific EPA permits. Retaining-wall schedules for the hilly reaches are not yet produced by the design; Section 3.14 sets the binding framework — including measurable design limits — under which they will be designed, screened and approved before the works that need them.

The works contract is a Design and Build contract on the FIDIC Plant and Design-Build Conditions (Second Edition, 2017): Letter of Acceptance 18 March 2026, Contract Agreement 5 May 2026, commencement 24 August 2026, time for completion 1,095 days (36 months) with a 12-month defects liability period, and an original contract amount of US$ 63,392,345.04. The Contractor's design obligation covers the entire 85 km corridor; the rehabilitation works presently programmed comprise approximately 75 km, with the remaining 10 km subject to Government of Liberia funding — this ESIA assesses and covers the full 85 km in either case (Section 3.16). The Monitoring Consultant (the Engineer), LEA Associates South Asia Pvt. Ltd., commenced services on 3 August 2026 and is mobilised for design review and supervision, including of the Contractor's environmental, social, health and safety obligations. Status at the date of this edition: mobilisation, surveys and design are under way — detailed design has been completed for the approximately first 10 km from Zwedru and is progressing westward, with the ancillary-site screening, the wildlife signage and the crossing provisions of the BMP carried into it (Section 3.16) — and civil works have not yet commenced; early works at the Zwedru end will begin only after the Contractor's Environmental and Social Management Plan (C-ESMP) is approved and the applicable conditions precedent of this ESIA are verified.

Legal and Institutional Framework

The assessment is prepared under the Environment Protection and Management Law (2002, published 2003) and the EPA ESIA Procedural Guidelines (2022), the other applicable Liberian statutes, and the World Bank Environmental and Social Framework — ESS1, 2, 3, 4, 5, 6, 8 and 10 are relevant; ESS7 (no Indigenous Peoples as defined by the standard are present) and ESS9 (no financial intermediaries) are not relevant. The project-level instruments of RETRAP (the ESCP, ESMF, SEP and LMP under P175263, and the Resettlement Action Plan, Final V2 of 23 July 2025, under P181083) apply throughout. ESS6 is the applicable biodiversity standard; IFC Guidance Note 6 (2019) is used only as a technical reference for the quantitative Critical Habitat screening thresholds. Five EPA permits are required (road works; construction camp; quarry; crusher/asphalt plant; concrete batch plant), together with FDA, water-abstraction and materials licences. Chapter 2 includes the gap analysis between national requirements and the ESSs, with gap-filling measures, and the register of the buffers and setbacks the Project adopts.

Public Participation

The consultation record now spans three campaigns: the 2023–24 programme of the original ESIA (Notice of Intent of November 2023; nine community meetings with 219 attendees; women's and ecosystem focus groups); the RAP census and consultations (December 2024); the BFS engagement (21 community consultations, 464 participants, 46% women); and the 2026 update programme — 17 Notice-of-Intent postings, 14 community meetings with 471 participants (246 men, 225 women), two government engagements, five key-informant interviews and six women's focus group discussions. The issues communities raised — local and youth employment, speed control, dust and water management, compensation for trees and graves, re-occupation of the right-of-way, and road safety at schools and markets — together with newly recorded social concerns around workforce influx, adolescent-girl exploitation risk, access severance during works and the timing of compensation, are carried into the assessment and the ESMP. The Project adopts the established RETRAP grievance redress mechanism (community, county and project tiers), supplemented by a confidential SEA/SH channel; it does not create new structures.

Baseline Conditions

The physical baseline was refreshed by the August 2026 field campaign: 20 air-quality and 20 co-located noise stations, five groundwater and three surface-water stations and twelve soil stations, analysed by the University of Liberia laboratory (certificate UL LAB/ICC/002A/2026). The 2023 sampling of the original ESIA is referenced as the historical record; its results tables are superseded by the 2026 dataset, with the 2023 manganese and mercury exceedances carried as verification commitments because they were not re-tested in 2026. The biological baseline is transformed by the Biodiversity Field Survey (two seasons, 2025–26): ESS6 Critical Habitat is triggered under Criterion **1** for the White-bellied Pangolin (Endangered; the primary trigger) and, precautionarily, the Western Chimpanzee (Critically Endangered; one verified camera detection at approximately km 19). A 3.14 km² Chimpanzee Sensitivity Zone with a 0.78 km² no-go core is delineated near Sennehwein Town, superseding the km 64–72 zone assumed in 2024; three Critical Habitat polygons total 22.6 km², with six Priority Biodiversity Features. The socio-economic baseline retains the 2023 household survey as the quantitative base and adds the 2026 qualitative refresh, the cultural-heritage register (six sacred sites, grave sites in the right-of-way) and the gender and GBV context.

Impacts and Mitigation

The assessment finds the Project's benefits substantial — connectivity, market access, incomes, services — and its adverse impacts manageable with the measures of this report: construction-phase impacts on soils, water, air, noise, biodiversity and communities, operation-phase and induced impacts including access-driven hunting and land-use change, and the unplanned-event risks of a works programme of this scale. For biodiversity, the full BFS mitigation hierarchy is adopted: nine avoidance measures, eleven minimisation measures and six restoration programmes (≈284.5 ha of restoration, 15 km of riparian re-vegetation and ≈170 km of right-of-way planting), delivering an 81% reduction of the aggregate threat score

and a measurable **net-gain** trajectory verified over ten years. No impact remains in an unacceptable residual class; residual moderate impacts (induced land-use change, cumulative forest loss) are carried under adaptive management, and community traffic risk is managed to as-low-as-reasonably-practicable with a documented programme (the consolidated risk register is at Appendix X).

Environmental and Social Management Plan

Chapter 11 carries the updated ESMP: institutional arrangements centred on the IIU as Employer, the design-and-build Contractor's CESMP obligations, the Supervising Engineer's verification role, monitoring across the physical, biological and social domains, capacity building, and an indicative budget, with the detailed standalone ESMP issued and disclosed as part of this submission package. The Biodiversity Management Plan is reproduced in full at Appendix T and is binding on the works; its six binding conditions — funding, plan approvals, the contractor biodiversity compliance plan, governance, community conservation agreements and the ranger programme — are conditions precedent to works in the sensitive segments. Resettlement is governed by the RAP (2025): no civil works commence on any front before compensation is complete, Bank-cleared and notice has run. MPW-IIU will ensure that all mitigation and monitoring measures are included in the bidding and contract documents, are costed in the Bills of Quantities or through provisional sums, and are reflected in the Contractor's C-ESMPs.

Conclusion

With the BFS and BMP incorporated, the Contractor's design and contract particulars presented, and the baseline and consultation record updated to 2026, MPW-IIU adopts the conclusion of this assessment that the Project can be implemented in compliance with Liberian law and the World Bank ESF, provided the ESMP, the BMP's binding conditions and the RAP conditions precedent are enforced as set out in this report. MPW-IIU commits to that enforcement — through the bidding and contract documents, the Bills of Quantities and the Contractor's C-ESMPs — and submits this assessment for the EPA of Liberia's permitting process and the financier's No Objection.

1 INTRODUCTION

This report is the Environmental and Social Impact Assessment (ESIA) Report for the rehabilitation of the Ivory Coast Border – Toe Town – Zwedru Road (85 kilometres (km)), located in Grand Gedeh County, Liberia ("the Project").

1.1 Overview

The Government of the Republic of Liberia (GOL) has applied for Additional Financing (AF) from the World Bank for the Rural Economic Transformation Project (RETRAP), a project that aims to increase the income of rural poor households in Liberia through sustainable agricultural livelihood enhancements, improved rural access and agricultural marketing infrastructure services. RETRAP has four components, as follows:

- Component 1: Improving the enabling environment for agribusiness development.
- Component 2: Enhancing competitiveness and market access through productive alliances.
- Component 3: Agro-logistics and infrastructure investments.
- Component 4: Project coordination and management and contingency emergency response.

Under Component 3, sub-component 3.1: Roads, the GOL, through the Ministry of Public Works (MPW) and its Infrastructure Implementation Unit (IIU), is seeking to rehabilitate the 85 km road stretch between the Ivory Coast Border, Toe Town and Zwedru ("the Project"), in the east of Liberia, due to the agricultural potential of the Tappita–Zwedru corridor. The Project is located in Grand Gedeh County, in the east of Liberia, and is designed for a period of 20 years. It covers 10 km between Toe Town and the Ivory Coast Border, and 75 km between Toe Town and Zwedru.

The Project will be undertaken in compliance with the relevant Liberian laws, the World Bank's Environmental and Social Framework (ESF), and Good International Industry Practice (GIIP). One of the first steps towards environmental and social compliance is the production of an ESIA and an Environmental and Social Management Plan (ESMP). This document presents the ESIA for the rehabilitation of the Ivory Coast Border – Toe Town – Zwedru Road, and includes an ESMP which is designed to be immediately usable as a self-standing safeguards manual for the design and construction works of the road.

1.2 Historical Background

The GOL, through the MPW and its IIU, has been working to improve the Ganta – Tappita – Zwedru Road Corridor (approximately 225 km) from unpaved to paved road standard. Two sections of the corridor have already been financed:

- The Ganta to Tappita section (100 km), under the South-Eastern Corridor Road Assets Management Project (SECRAMP), for which an ESIA was prepared and disclosed in 2018.
- The Tappita to Toe Town section (40 km), the first section under the Rural Economic Transformation Project (RETRAP), for which an ESIA was prepared and disclosed in 2021.

The current Project is therefore an extension of these two road sections, commencing from where the Tappita – Toe Town road section ended. It will complement the planned road works mentioned above.

1.3 Purpose and Need for the Project

The proposed road rehabilitation is an important component in the revitalisation of Liberia, a country rebuilding its infrastructure, rehabilitating its economy, attracting investment, and improving the livelihoods of its citizens following years of civil unrest and conflict. The Liberian government is developing strategies and policies to promote sustainable development and sound environmental management. The infrastructure constraints are the major impediments to economic recovery and growth in Liberia. One of the main challenges faced by the country is the limited road transport connectivity.

Adopting a sustainable road asset management strategy for creating durable transportation networks and ensuring their preservation is central to the sustainable development that the GOL is endeavouring to promote and develop. Improvements made in the road and in the transportation sector will be instrumental in:

- Improving inland connectivity to the inaccessible and deprived rural areas.
- Reducing transport and material costs by improving accessibility.
- Improving health and sanitation.
- Improving access to services.
- Enabling farmers to sell their goods and gain better prices, raising incomes.
- Reducing poverty and hunger.
- Establishing employment, training, human resource development, and technology transfer opportunities.
- Increasing the earning potential.
- Enabling industrial and commercial growth.
- Encouraging community and rural development.

This corridor is vital to the nation's reconstruction effort and the improvement of regional cross-border traffic, which will enhance Liberia's trade and interconnection with its neighbours: Ivory Coast, Guinea, and Sierra Leone. The road has the potential to open up the south-east of Liberia and assist in the delivery of government services such as health and education. It will also link the south-eastern counties to Nimba County.

1.4 Objectives of the ESIA

The ESIA Report has been prepared in accordance with the following regulations and guidelines (see Chapter 2 for further detail):

- The Environmental Protection Agency (EPA) of Liberia's regulations and standards, specifically: Sections 13 and 14 of the Liberian Environmental Protection and Management Law (EPML) of 2003; the ESIA Procedural Guidelines of 2022; and the Approved Parameters of Concern (POCs) for Different Environmental Projects.
- World Bank Environmental and Social Framework (ESF), including the World Bank Environmental and Social Standards (ESS), particularly ESS1, ESS2, ESS3, ESS4, ESS5, ESS6, ESS8 and ESS10.
- IFC Environmental, Health and Safety (EHS) Guidelines.
- Good International Industry Practice (GIIP).

The ESIA's main objective is to ensure that the potential environmental and social risks and impacts associated with Project activities from the different implementation phases of the Project are identified, their significance is assessed, and appropriate mitigation, management and monitoring measures are proposed to eliminate or minimise such impacts during a reasonable timeframe. Recommendations of this ESIA will be mainstreamed into the final project designs, investment decisions and project implementation processes to ensure the sustainable management of the environment and society during the duration of the Project.

1.5 Scope of the ESIA

The ESIA covers the rehabilitation of the Ivory Coast – Toe Town – Zwedru Road (85 km) to bitumen standard, and the ancillary facilities associated with the Project (see Chapter 3 for further detail).

1.6 ESIA Methodology and Approach

The preparation of the ESIA involved desktop and literature review, field surveys to collect data on the physical, biological, and socio-economic environments, laboratory analysis, and expert consultation. Public consultations were conducted with stakeholders, communities of the project area, and relevant Government agencies.The methodology was extended by the two-season Biodiversity Field Survey (2025–26), the August 2026 environmental sampling and social engagement campaign, and the review of the design-and-build Contractor's design documentation (Section 1.8).

1.7 Structure of the ESIA Report

The ESIA Report is organised in twelve chapters covering all the items listed in the Liberia ESIA Procedural Guidelines (EPA, 2022), as well as the pertinent World Bank requirements: the Executive Summary; Introduction (Chapter 1); Legal and Institutional Framework (Chapter 2); Project Description (Chapter 3); Analysis of Alternatives (Chapter 4); Public Participation and Stakeholder Engagement (Chapter 5); Baseline Conditions — the Physical Environment (Chapter 6), the Biological Environment (Chapter 7) and the Socio-economic Environment (Chapter 8); Environmental and Social Assessment of Impacts (Chapter 9); Environmental and Social Mitigation (Chapter 10); the Environmental and Social Management Plan (Chapter 11); and References (Chapter 12), followed by Appendices A to X, which form part of this single-volume report.

1.8 Basis and Scope

This ESIA has been prepared for the Ministry of Public Works — Infrastructure Implementation Unit (IIU), which is the proponent of this document. It builds upon the June 2024 Final ESIA as the foundational reference: the structure, retained text, and evidence from the 2024 assessment are preserved and will be cited throughout as (Earthtime, 2024). This updated edition introduces three key improvements:

1. **Incorporation of the BFS and the BMP.** The two-season Biodiversity Field Survey (2025–26) and its Biodiversity Management Plan are incorporated in full: the biological baseline (Chapter 7), the biodiversity impact assessment and mitigation (Sections 9.4 and 10.6), the ancillary-siting controls (Section 3.8) and the complete BMP at Appendix T.
2. **The Contractor's design and the contract particulars.** The project description is rebuilt from the design-and-build Contractor's documentation (ICCO/CET, 2025) and the Monitoring Consultant's project information (LEA Associates South Asia, 2026): the structure schedules and materials (Sections 3.5 and 3.7 and Appendix A), the framework for the pending hilly-terrain design packages (Section 3.14), the nature of the works contract (Section 3.15), and the contract particulars, implementation arrangements and programme (Section 3.16).
3. **The 2026 update of the baseline and the consultation record.** The August 2026 field campaign refreshes the physical-environment results (Chapter 6 and Appendices G–J; the 2023 sampling of the 2024 ESIA is referenced as the historical record and its result tables are superseded), and the 2026 stakeholder programme extends the public-participation record (Chapter 5 and Appendix U), including newly recorded social concerns carried into the assessment.

Lessons learned from the corridor's other road sections are carried at Appendix W and embedded throughout the management framework. Where maps and figures originated from the 2024 ESIA they are reproduced with credit to Earthtime Inc.

2 LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter describes the policy, legal and institutional framework within which the Project is prepared, permitted and implemented. It retains the framework analysis of the 2024 ESIA (Earthtime, 2024, Chapter 2) and brings it to currency: the register of national instruments is consolidated, the World Bank Environmental and Social Framework applicability is restated with the project-level instruments of RETRAP and its Additional Financing (ESCP, ESMF, SEP and LMP, P175263), and the permits register is updated to the five EPA permits and associated licences the works require.

2.1 Purpose

The purpose of this chapter is fourfold. First, it identifies the legal dispositions that make an ESIA mandatory for the Project and locates this ESIA within the statutory process administered by the Environmental Protection Agency (EPA) under the Environment Protection and Management Law (EPML, 2002/2003) and the EPA ESIA Procedural Guidelines (2022). Second, it demonstrates that the assessment, mitigation and management framework of this report satisfies both Liberian law and the World Bank ESF, in line with objectives 1 and 2 of the update (Section 1.3). Third, it defines the compliance obligations that flow to each Project party — the Infrastructure Implementation Unit of the Ministry of Public Works (IIU/MPW) as Employer, the Ministry of Agriculture Project Management Unit (MoA-PMU) as programme lead, the ICCO/CET Joint Venture as Design-and-Build Contractor, and their supervision and oversight bodies — so that the Environmental and Social Management Plan (ESMP, Chapter 11 and standalone volume), the Contractor's ESMP (CESMP) and the Biodiversity Management Plan (BMP) can allocate responsibilities on a sound legal footing. Fourth, it consolidates the permits and approvals register for the road works and all ancillary facilities. The hierarchy rule applied throughout the package is stated once here: national law and the World Bank ESF are floors, not ceilings; wherever the two regimes diverge, the Project commits to the more stringent standard, consistent with the approach adopted in the Resettlement Action Plan (RAP, 2025) and the parent-project instruments (ESMF, 2021; ESCP, P175263).

2.2 National Policy Framework

2.2.1 Constitution of the Republic of Liberia (1986)

The 1986 Constitution is the supreme law and frames the rights engaged by the Project. Article 22 protects the right of every person to own property, and Article 24 conditions any expropriation of private property for public purposes on the giving of reasons, the prompt payment of just compensation, and an unimpeded right of challenge before the courts, with a right of first refusal to the former owner should the public purpose lapse. Although the Project is confined to the existing government right-of-way (RoW) and no private land acquisition is anticipated (RAP, 2025), Article 24 remains the constitutional benchmark for the compensation of structures, crops and livelihood assets within the RoW. The Constitution also commits the State to managing the national economy and natural resources in a manner that secures the maximum feasible participation of Liberian citizens and advances the general welfare — the constitutional root of Liberia's environmental management regime. Further provisions relevant to the Project include Article 8 (just and humane conditions of work, and protection of safety, health and welfare in employment), Article 18 (equal opportunity and equal pay for equal work), Article 15(c) (the right of access to information, operationalised by the Freedom of Information Act, 2010), Article 17 (freedom of assembly and consultation) and Article 65 (recognition of customary law), which together underpin the labour, disclosure, consultation and customary-tenure dimensions of this ESIA. Liberia operates a dual statutory and customary legal system, and both strands are engaged along the corridor, particularly in respect of land, sacred sites and community governance.

2.2.2 National Environmental Policy (2003) and Related Sector Policies

The National Environmental Policy (2003) establishes sustainable development as the organising objective of environmental management in Liberia, adopts environmental impact assessment as the principal preventive instrument, and endorses public participation, inter-sectoral coordination and the polluter-pays principle. It is given legal effect through the EPML and the EPA Act (Section 2.3). The National

Environmental Action Plan that elaborated the Policy covered the period 2019–2023 and has lapsed; the Policy itself remains the operative national framework pending its successor. Sector policies of direct relevance include the National Biodiversity Strategy and Action Plan (2017–2025), which carries Liberia's commitments under the Convention on Biological Diversity into national planning and is directly pertinent to the Critical Habitat findings of the Biodiversity Field Survey (BFS, 2026); the National Forestry Policy (2006) and the REDD+ National Strategy (2016), which frame forest conservation and climate-related forest management; and the Mineral Policy (2010), which governs extraction of construction materials.

2.2.3 Gender Policy and Gender-Based Violence Frameworks

Liberia's gender architecture is led by the Revised National Gender Policy (2018–2022), which pursues gender equality and women's empowerment across all sectors, and by the National Action Plan on Gender-Based Violence (NAP-GBV, first adopted for 2011–2015 and carried forward through successor programming, including the Joint Government of Liberia–United Nations Programme on Sexual and Gender-Based Violence, 2016). These are complemented by the National Action Plan on United Nations Security Council Resolution 1325 on Women, Peace and Security (2009; Phase II 2019–2023) and by the institutional machinery of the Ministry of Gender, Children and Social Protection (including its Sexual and Gender-Based Violence Unit) and the Ministry of Justice SGBV Crimes Unit, which prosecutes through the dedicated Criminal Court "E" (Earthtime, 2024). The formal periods of several of these instruments have lapsed and their revisions were pending at the time of writing; they nonetheless remain the operative national reference frameworks. For this Project their significance is practical: the county GBV context described in Chapters 6–8, the sexual exploitation and abuse / sexual harassment (SEA/SH) risks assessed in Section 9.8, and the survivor-centred grievance and referral arrangements described in Section 5.6 are all designed to satisfy both these national frameworks and the more detailed preventive requirements of the World Bank instruments (Section 2.6), with the more stringent requirement governing.

2.2.4 Climate Policy and the Nationally Determined Contribution

Liberia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 2002 and the Paris Agreement in 2018, and articulates its response through the National Policy and Response Strategy on Climate Change (2018) and the Revised Nationally Determined Contribution (NDC, 2021), which targets a 64 per cent reduction in greenhouse-gas emissions below business-as-usual by 2030 (Earthtime, 2024). The Project engages this framework in two ways: the climate-resilient design of the road — drainage structures dimensioned for 10-, 50- and 100-year flood events against a mean annual rainfall of 2,500–3,000 mm (ICCO/CET, 2025) — supports the adaptation agenda, while construction-phase greenhouse-gas sources and mitigation are addressed in Chapters 8 to 10 (Sections 9.4 and 10.7).

2.3 National Legal Framework

The national statutes and regulations of principal relevance to the Project are summarised in Table 2.1. The list follows the legal register applied by the 2024 ESIA (Earthtime, 2024, Ch. 2), updated and re-verified for this report; the full legal register is provided in Appendix C.

Table 2.1: National legal framework applicable to the Project

Instrument	Key provisions	Relevance to the Project
Environment Protection and Management Law (EPML), enacted 2002, published 2003	Framework environmental law: ESIA licence/permit for prescribed activities (Section 6; Annex I mandatory list, incl. No. 13 "Building and Civil Engineering Industries"); environmental review and environmental impact study procedures (Sections 13–14); compliance monitoring and audits (Sections 24–25); annual licences for effluent discharge (s.58), solid/hazardous waste disposal (s.64) and pollution emissions (s.71); protection of watercourses and wetlands (ss.74–75); wildlife protected areas and biodiversity conservation (ss.80, 83–85); restoration orders (s.91)	The road is a mandatory-ESIA activity under Annex I No. 13; this ESIA discharges that obligation and supports the five EPA environmental permits (Section 2.9). The operational licences apply to the camp and plants; monitoring, audit and restoration powers frame EPA oversight of construction
Environmental Protection Agency Act (EPA Act), 2002/2003	Establishes the EPA as the principal authority for environmental management, standard-setting, licensing and enforcement; registration of proposed projects through the County Environmental Officer (Section 36); county environmental officers and inspectors	Defines the permitting authority and the entry point of the statutory ESIA process; the EPA Grand Gedeh county office and inspectors monitor Project compliance
EPA ESIA Procedural Guidelines (2022)	Codify the current administrative ESIA procedure: registration, Notice of Intent, screening, scoping/ToR approval, EIS preparation, review, public hearing and permit decision, with notice periods and disclosure duties	Governing procedure for this ESIA; the steps and the Project's position within them are described after this table
National Wildlife Conservation and Protected Areas Management Law (2016)	Conservation and sustainable management of wildlife; protection of listed species; regulation of hunting, possession and trade (including bushmeat); protected-area establishment and management	Protects the species for which Critical Habitat is triggered — the White-bellied Pangolin (EN; primary trigger) and the Western Chimpanzee (CR; managed precautionarily through the Chimpanzee Sensitivity Zone) (BFS, 2026); underpins the workforce hunting and bushmeat prohibition (BMP action A5), the Chimpanzee Sensitivity Zone prescriptions and the BMP. No protected area is

Instrument	Key provisions	Relevance to the Project
		crossed; the Zwedru (Forest) KBA/IBA lies about 0.7 km from the corridor at its nearest point
National Forestry Reform Law (2006)	Vests forest-resource management in the Forestry Development Authority (FDA); regulates felling, timber and chainsaw operations; requires authorisation for tree removal	FDA authorisation required for felling within the RoW and at ancillary sites, supported by a tree inventory; tree replacement at four for one under the ESMF and, for FDA Class A stems, five for one under BMP (rev.3) action A4; where both apply, the higher ratio governs
Forestry Development Authority Regulation No. 113-08 (2008)	Lists the protected Class A tree species (felling restricted) and the regulated Class B species (felling only with approved salvage), with the conditions and replacement requirements for any authorised felling	Twenty-eight Class A and B species were recorded in the corridor by the BFS; the regulation is the basis of the FDA Class A stem protocol and the five-for-one replacement rule carried by BMP action A4, and of the FDA referral in the BMP stop-work triggers
Community Rights Law with respect to Forest Lands (2009)	Recognises community rights over forest lands and resources; requires consultation and benefit-sharing on community forest resource use	Requires meaningful engagement with corridor communities on forest resources, sacred groves and community-managed areas (Chapters 6 and 7)
Land Rights Act (2018)	Defines Public, Government, Customary and Private land (Protected Areas cross-cutting); customary land protected equally with private land; community land governance procedures (incl. Article 49)	The RoW is Government land and works are confined to it; contractor-procured ancillary sites on customary or private land require documented voluntary agreements/MOUs verified with the Liberia Land Authority, or a RAP addendum (RAP, 2025); protects title-less and customary landholders, including women
Land Acquisition Act (1929)	Historic procedures for acquiring land for public purposes, with consent/certification requirements and nominal statutory compensation rates	Historic basis of government land acquisition; its minimal compensation standards are displaced for this Project by the more stringent ESS5 full-replacement-cost standard applied in the RAP

Instrument	Key provisions	Relevance to the Project
Public Health Law (Title 33), Revised 2017	Sanitation, safe drinking water, waste and nuisance abatement, communicable disease prevention, occupational hygiene	Public-health baseline for the camp, worksites and plants: sanitation, potable water, vector control (incl. water-filled borrow pits), disease prevention (HIV/AIDS, COVID-19), protection of community water sources
Decent Work Act (2015)	Consolidated labour code: prohibits forced labour and worst forms of child labour; general minimum full-time employment age 15 (light work 13; hazardous work prohibited for children); non-discrimination, equal remuneration, freedom of association; prohibition of sexual harassment; employer OHS duties; hours, wages, contracts, termination	Governs all Project labour, implemented through the Labor Management Procedures (LMP, P175263) and the CESMP; the Project applies a minimum employment age of 18, more stringent than the statute, given the hazardous works; Ministry of Labour inspection applies
Minerals and Mining Law (2000)	Vests mineral resources in the State; licensing of prospecting, mining and quarrying by the Ministry of Mines and Energy (MME); regulation of explosives	Materials licences required for the quarry(ies) and 16 borrow pits, and blasting/explosives authorisation for quarry operations, before extraction (Section 2.9)
Local Government Act (2018)	Decentralised governance: county, district, chiefdom and clan structures; county service centres and clearance functions	Basis for county/district clearances, coordination with the Grand Gedeh County Administration and local-authority participation in grievance redress committees
Water Resources Management Regulations — Wetlands, Rivers, Lakes, Groundwater and Sea Shore (2009)	Protection of wetlands, rivers, lakes and groundwater; regulation of works affecting water bodies	Engaged by the 9 creek crossings and 31 inland wetlands within the 150-ft RoW (RE-GROUP, 2026), the five bridge sites and all culvert works; frames CESMP sediment and pollution controls
Water Quality Regulations of Liberia (2018)	Ambient and use-class water-quality standards and discharge controls; water abstraction licensing	Compliance benchmark for the water-quality monitoring programme (Chapters 6–8); abstraction licences required for construction and camp supply
Freedom of Information Act (2010)	Public access to government-held information	Supports disclosure of this ESIA, the RAP and associated instruments, and the transparency

Instrument	Key provisions	Relevance to the Project
		commitments of the Stakeholder Engagement Plan (SEP, P175263)

2.3.1 The ESIA Process under the EPA ESIA Procedural Guidelines (2022)

The statutory process begins with registration of the proposed undertaking with the EPA through the County Environmental Officer, pursuant to Section 36 of the EPA Act. The proponent then publishes a Notice of Intent (NOI) announcing the proposed project and inviting public reaction, and submits a Project Brief to the EPA and the relevant line ministry. On the basis of the Brief, the EPA screens the undertaking and determines the assessment track: an environmental review, a full Environmental Impact Study for prescribed activities, or a finding of no significant impact. Because road construction and rehabilitation fall within Annex I of the EPML (No. 13, Building and Civil Engineering Industries), a full study is mandatory for this Project and screening confirms the category rather than deciding it. Figure 2.1 summarises the statutory sequence.

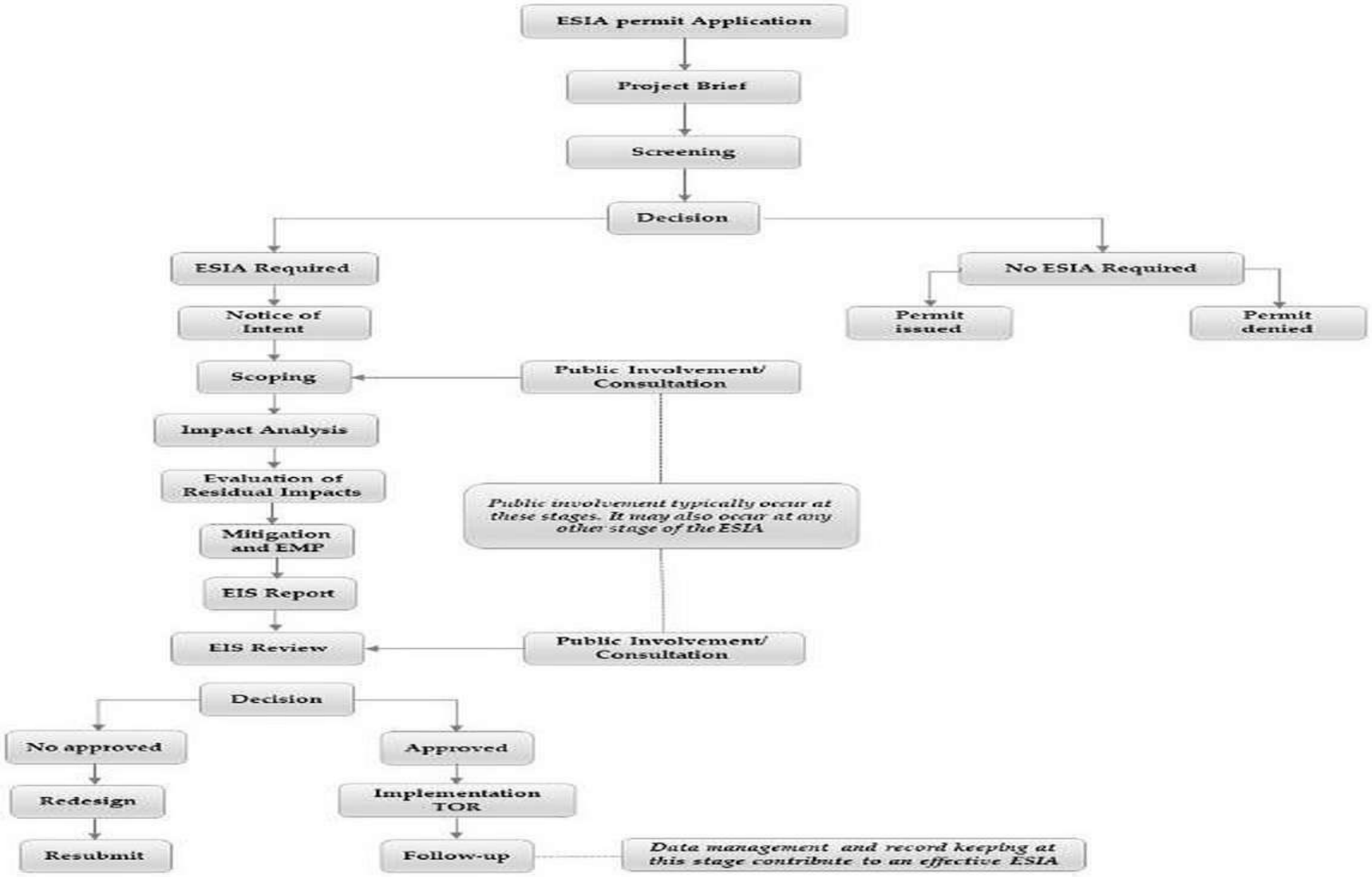


Figure 2.1: EPA of Liberia ESIA process (adopted from the 2024 ESIA (Earthtime, 2024, Ch. 2); reproduced for this ESIA).

The proponent next undertakes scoping, supported by stakeholder consultation, and submits a scoping report with draft Terms of Reference (ToR) for EPA approval; under the parallel World Bank track applied to RETRAP road works, the ToR is also submitted to the World Bank for review and clearance (ESMF, 2021). The Environmental Impact Statement (EIS) — the ESIA report — is then prepared covering baseline conditions, impact analysis and significance, mitigation and a management plan, and is submitted to the EPA for review. The EPA publishes a notice inviting public comments, to be received within 30 days of publication, and decides whether to convene a public hearing in the project area. The process concludes with the permit decision: the EPA may approve the EIS unconditionally or subject to conditions, refer it back for further work, or reject it. Approval is given effect through the environmental permit(s), and the approved instruments are disclosed in-country and, for Bank-financed operations, on the World Bank's external website following Bank clearance.

The Project's position in this process is as follows. The original NOI was published in three national newspapers over three days in November 2023, and the 2024 ESIA (Earthtime, 2024) was prepared and submitted under EPA project code EP2023042. For the present update, the NOI was submitted to the EPA on 1 August 2026 and posted at 17 locations along the corridor and in Monrovia, with radio announcements (Section 1.5), a corridor-wide re-consultation programme was undertaken (14 community meetings with 471 participants, 3–6 August 2026; Section 1.8 and Appendices M–N), and this Updated ESIA — which updates, and does not annul, the 2024 ESIA — has been prepared to support the EPA's review and the issue of the five environmental permits listed in Section 2.9, as well as World Bank clearance. Public consultation requirements of the Guidelines (NOI, scoping consultation, review-stage consultation and any public hearing) are addressed in Chapter 5.

2.4 International Conventions Ratified by Liberia

Liberia is party to a body of multilateral environmental and social agreements that inform the standards applied in this ESIA. Ratification of an international convention engages the Republic's duty to give effect to it in national decision-making, including through the EIA process. The instruments most relevant to the Project are set out in Table 2.2, with ratification or accession dates as recorded in the 2024 ESIA legal register (Earthtime, 2024, Ch. 2).

Table 2.2: Principal international conventions and agreements applicable to the Project

Convention / agreement	Liberia status	Relevance to the Project
Convention on Biological Diversity (CBD)	Ratified 8 November 2000	Duty to conserve biodiversity and use biological resources sustainably; implemented through the NBSAP. Directly engaged by the ESS6 Critical Habitat determination, the 26 threatened species (7 mammals, 6 birds and 13 trees) recorded by the BFS in the AoI and surveyed buffer (BFS, 2026) and the construction-phase actions of the BMP (rev.3)
Convention on International Trade in Endangered Species (CITES)	Ratified 9 June 1981	Prohibits and regulates trade in listed species; species recorded in the Project area, including Western Chimpanzee and pangolins, are CITES-listed. Underpins the Project prohibition on wildlife purchase, trade and transport by the workforce and the stop-work trigger for verified hunting, capture or bushmeat by Project personnel (BMP rev.3, Table 5.2)
Convention on the Conservation of Migratory Species (CMS, Bonn Convention)	Ratified 2 September 2004	Protection of migratory species and their habitats; relevant to the migratory species among the 206 bird species recorded (BFS, 2026) and to maintaining habitat connectivity across the corridor (crossings at documented hotspots only, BMP action A6; Section 3.5)
Ramsar Convention on Wetlands	Contracting Party; five Wetlands of International Importance designated (95,879 ha)	No Ramsar site lies on or near the corridor; the Convention's wise-use principle nonetheless informs management of the 31 inland wetlands and 9 creeks within the RoW (RE-GROUP, 2026) and the drainage and crossing designs
UN Framework Convention on Climate Change; Kyoto Protocol; Paris Agreement	UNFCCC and Kyoto ratified 5 November 2002; Paris Agreement ratified 27 August 2018	Frame Liberia's climate commitments (Revised NDC, 2021: 64 per cent below business-as-usual by 2030); engaged through climate-resilient drainage design, construction GHG management and the climate risk screening in Section 9.8
Stockholm Convention on Persistent Organic Pollutants	Ratified 23 May 2002	Prohibits/restricts persistent organic pollutants; engaged by the prohibition of on-site waste burning, controls on bitumen and chemical handling and the hazardous-materials provisions of the CESMP
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes	Party	Governs transboundary movement of hazardous wastes — pertinent given the border location at B'hai Jorzon; Project hazardous wastes are managed in-country through EPA-certified handlers, and no transboundary movement is permitted without the Convention's procedures
ILO fundamental conventions	25 ILO Conventions ratified, including six of the eight fundamental conventions (among them C29 Forced Labour, C138 Minimum Age and C182 Worst Forms of Child Labour)	Foundation of the labour standards applied through the Decent Work Act and the LMP: prohibition of forced and child labour, non-discrimination and freedom of association; reflected in the Project minimum working age of 18 and age-verification procedures
African Charter on Human and Peoples' Rights (ACHPR)	Ratified 1982	Recognises peoples' rights to a generally satisfactory environment and to participation; supports the consultation, disclosure and grievance-redress arrangements of Chapter 7
CEDAW; Convention on the Rights of the Child; Maputo Protocol	CEDAW ratified 1984; CRC ratified 1990 (with Optional Protocols); Maputo Protocol ratified 2007	Gender equality, protection of women's rights and child protection; underpin the Project's SEA/SH prevention framework, the prohibition of sexual activity with persons under 18 in the Code of Conduct, and child-labour controls
Revised African Convention on the Conservation of Nature and Natural Resources (Maputo, 2003)	Ratified 23 February 2014	Regional obligations on conservation of habitats, species and natural resources; reinforces the avoidance and mitigation hierarchy applied to natural habitat and Critical Habitat along the corridor

2.5 World Bank Environmental and Social Framework

The Project is financed by the International Development Association under RETRAP (P175263) and its Additional Financing (RETRAP-AF, P181083), and the World Bank ESF therefore applies: ESSs 1–6, 8 and 10 are relevant to the Project, while ESS7 (no Indigenous Peoples as defined by the standard are present) and ESS9 (no financial intermediaries) are not relevant. Under the ESF, the Borrower's obligations are carried through the Financing Agreement and the Environmental and Social Commitment Plan (ESCP), and are elaborated in the ten Environmental and Social Standards. The parent project's environmental and social risk classification is Substantial (ESMF, 2021). The relevance of each ESS to the 85 km road was determined through the parent ESMF screening framework and the 2024 ESIA, and has been re-examined and confirmed by this update: ESS1, ESS2, ESS3, ESS4, ESS5, ESS6, ESS8 and ESS10 are relevant; ESS7 and ESS9 are not relevant. Table 2.3 records, for each standard, the applicability determination, the reasons for it, and where in this ESIA package the standard's requirements are addressed.

Table 2.3: ESS applicability and conformance matrix

ESS	Relevant?	Why	Where addressed in this ESIA package
ESS1 Assessment and Management of Environmental and Social Risks and Impacts	Yes	Rehabilitation of 85 km of road with 16 borrow pits, two quarries, a crusher/asphalt and batching plant complex and a construction camp generates significant E&S risks and impacts requiring integrated assessment and management across all phases, including operation, maintenance and decommissioning (ESCP item 1.2)	This entire Updated ESIA; methodology (Section 1.8 and Appendices M–N); impacts (Chapters 8–9); risks (Section 9.8); Chapter 11, standalone ESMP and CESMP; commitments register (Table 2.4)
ESS2 Labour and Working Conditions	Yes	Direct, contracted and primary-supply workers (2024 planning estimate of about 100 international and 680 national staff, pending the CESMP; target of at least 30 per cent women); substantial OHS risks; child- and forced-labour controls and a workers' grievance mechanism required	Chapter 3 (workforce); Chapters 8–10; LMP (P175263) applied in full; CESMP labour and OHS plans; workers' GRM (Section 1.8 and Appendices M–N)
ESS3 Resource Efficiency and Pollution Prevention	Yes	Materials extraction, water abstraction, asphalt/concrete production, fuels and hazardous materials, dust and emissions, wastewater and solid/hazardous wastes	Chapter 3 (materials, water, wastes); Chapters 6–8 (baselines vs standards); Chapters 8–9; spill risks (Section 9.8); CESMP waste, water and hazardous-materials plans; WBG EHS Guidelines benchmarks
ESS4 Community Health and Safety	Yes	Construction traffic through fifteen project-affected communities, road safety near schools/markets, labour influx, communicable disease, SEA/SH risk, quarry blasting, open excavations, use of security personnel	Chapters 9 and 10; CESMP Traffic Management Plan, Emergency Preparedness and Response Plan (EPRP), security management, SEA/SH prevention; GRM SEA/SH channel (Section 1.8 and Appendices M–N)
ESS5 Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Yes	Works are confined to the existing government RoW and no private land is acquired, but 860 project-affected persons with 1,084 affected assets across 24 settlements experience physical and economic displacement; compensation precedes works	RAP (Final V2, 23 July 2025), the authoritative instrument; Chapters 6–8 (socio-economic baseline); Chapter 9 (displacement impacts); RAP–ESIA reconciliation (Appendix N); ancillary-site agreements/RAP addendum (Chapters 3 and 11)
ESS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	Yes	Critical Habitat triggered under Criterion 1: White-bellied Pangolin (EN) as the primary trigger (CH-West 8.7 km², km 38–44; CH-East 10.8 km², km 46–50); Western Chimpanzee (CR) managed precautionarily in the Chimpanzee Sensitivity Zone (3.14 km², km 18–20); total Critical Habitat footprint 22.6 km²;	Chapters 6–8 (BFS-based baseline and CH determination); Chapter 4 (avoidance-driven alternatives); Chapters 8–9; BMP rev.3 (November 2026; annexed to this ESIA), with Contractor obligations in the CESMP and

ESS	Relevant?	Why	Where addressed in this ESIA package
		Criteria 2–5 not triggered; six Priority Biodiversity Features (14.2 km²); natural habitats, 31 RoW wetlands and 27 threatened species (BFS, 2026)	works contract and compliance checks by the Supervising Engineer under the ESMP
ESS7 Indigenous Peoples / Sub-Saharan African Historically Underserved Traditional Local Communities	No	Project screening under the ESMF identified no groups meeting the ESS7 criteria; the ESCP records ESS7 as not currently relevant. Corridor communities are predominantly Krahn, with Mossi and Fulani migrant residents, part of mainstream Liberian society; the 2026 field campaign and BFS consultations identified no distinct IP/SSAHUTLC communities	Determination recorded in this chapter (Section 2.5); ethnic composition documented in Chapter 6
ESS8 Cultural Heritage	Yes	The 2026 register records 6 sacred sites, 12 grave sites and unmarked graves in 5 communities, with five of the six sacred features adjoining or crossed by the RoW and the Central Poro Bush of Gbarzon at Goyeazon; 15 graves to be relocated under the RAP; chance-find risk in earthworks	Chapters 6–8 (cultural heritage register); Chapter 9 (avoidance and custodial consultation); Section 9.8 (chance finds); Chance-Find Procedure (this report the Chance-Find Procedure; CESMP); RAP grave provisions
ESS9 Financial Intermediaries	No	The road is delivered as a public civil-works contract; no financial intermediaries participate	Determination recorded in this chapter (Section 2.5)
ESS10 Stakeholder Engagement and Information Disclosure	Yes	Fifteen principal affected communities and a wider county population require meaningful consultation, disclosure and a functioning grievance mechanism throughout the Project life	Chapter 5 (2023–2026 engagement record, disclosure plan, adopted Project GRM); SEP (P175263); records in this report Appendix U

2.5.1 Application of the More Stringent Standard

Where Liberian law and the ESSs address the same subject to different depths, the Project applies the more stringent requirement. This commitment is made expressly in the RAP, whose gap analysis compares Liberian land law with ESS5 theme by theme and adopts bridging measures wherever national law falls short (RAP, 2025). Two examples illustrate the operation of the rule. First, on compensation: Liberian law requires "just compensation" for expropriation but does not define its basis or timing, and the Land Acquisition Act's historic rates are nominal; under ESS5 the RAP applies full replacement cost — materials at current market prices plus transport, labour and transaction costs, without depreciation — and requires that compensation be paid before displacement and before commencement of civil works. Second, on persons without formal title: national law confers no resettlement rights on tenants, squatters or occupants without documented tenure, whereas under the RAP all persons occupying the RoW before the cut-off date of 15 December 2024 are compensated for structures and assets and receive resettlement and livelihood assistance regardless of tenure status (though never for the government land itself); the RAP records expressly that "the Bank's ESS5 requirements shall prevail". The same rule operates in the labour and social domains: the Decent Work Act permits full-time employment from age 15, but the Project sets a minimum working age of 18 with documented age verification, and while the Act prohibits sexual harassment, the Project superimposes the ESF's fuller SEA/SH regime — signed codes of conduct, a confidential survivor-centred grievance channel, notification by the Contractor to the Employer within 24 hours, and by the Employer to the World Bank and the EPA within 48 hours, and referral to service providers (Section 2.6).

2.6 Project-Level Instruments: ESCP, ESMF, SEP and LMP (P175263, including Additional Financing)

Four binding project-level instruments were prepared for RETRAP in April 2021 and disclosed by the Government of Liberia: the Environmental and Social Commitment Plan (ESCP), the Environmental and Social Management Framework (ESMF), the Stakeholder Engagement Plan (SEP) and the Labor Management Procedures (LMP). The SEP itself anchors the present corridor in the parent project, identifying the "gap of about 85 km" between Toe Town and the Côte d'Ivoire border corridor works then under discussion for financing; that gap is now delivered under the Additional Financing (the RAP is issued under P181083, while the framework instruments carry P175263). The 85 km road is accordingly implemented inside the parent ESMF screening-and-instrument system and inherits every ESCP commitment applicable to road rehabilitation works. This Updated ESIA itself discharges a specific ESCP obligation: item 1.2 requires the Government to "update the ESIA and ESMP prepared for the road rehabilitation works to incorporate an assessment of operational, maintenance and decommissioning phases of the road works and a study of biodiversity in the road area including an assessment of potential project E&S risks and impacts on critically endangered chimpanzees and other biodiversity of conservation concerns" — requirements met by this report, the BFS (2026) and the BMP, which applies to detailed design, construction and the defects-liability period.

The ESMF supplies the screening procedure, instrument menu and contractor management requirements reflected in Section 2.3.1 and in the CESMP; its Chance Finds Procedure (Annex 5) and Environmental Rules for Contractors (Annex 6, including fifteen worker-behaviour prohibitions) are carried into the CESMP as contract provisions. The SEP defines the stakeholder engagement programme and the Project grievance mechanism, which this ESIA adopts without restructuring (Section 1.8 and Appendices M–N). The LMP governs all categories of Project workers and prescribes the workers' grievance mechanism, terms and conditions consistent with the Decent Work Act, occupational health and safety management to the WBG EHS Guidelines, the minimum working age of 18, and the Code of Conduct signed by every worker before commencement of works. The ESCP commitments most material to this ESIA and its implementation are consolidated in Table 2.4; the full commitment set is tracked in the ESMP.

Table 2.4: Binding ESCP commitments most material to this Updated ESIA

Commitment	ESCP reference	Responsible	Timing
Update and disclose the ESIA/ESMP for the road works, covering operation, maintenance and decommissioning phases and incorporating the biodiversity/chimpanzee study	1.2	MoA-PMU and IIU/MPW	Before finalisation of the road design and before disbursements for road construction (discharged by this Updated ESIA, October 2026, upon disclosure)
Conduct the biodiversity survey and prepare the Biodiversity Management Plan (BMP)	6.1	MoA-PMU and IIU/MPW	Survey before design finalisation (BFS, September 2026); BMP, disclosed with this ESIA; BMP gates accepted before any front enters segment S3 or S6
Implement the RAP: designated account funded; all compensation and resettlement assistance paid; payment-completion report cleared by the Bank; site handover after eviction-notice expiry	1.2 / 5.1	MoA-PMU and IIU/MPW	RAP account funded six months before civil works; no civil works until compensation is fully paid and the completion report is Bank-cleared; handover to the Contractor no earlier than three months after compensation
Secure all permits, consents and authorisations and comply with their conditions	1.5	IIU/MPW (proponent permits); ICCO/CET (operator permits)	Before commencing the relevant Project activity (register at Table 2.6)
Maintain qualified environmental and social staffing: one Environmental Specialist and one Social Development Specialist in each of MoA-PMU and IIU/MPW, plus county E&S focal points; maintain the environmental and social management information and reporting system	1.1	MoA and MPW	Specialists in place from effectiveness and maintained throughout implementation
Adopt and implement emergency preparedness and response measures, with regular worker and contractor training and drills	2.4	ICCO/CET, with IIU/MPW oversight	Plans adopted before initiation of construction activities; training within two weeks of plan adoption and repeated regularly
Incorporate ESHS specifications, the LMP, worker Code of Conduct and E&S plans into contracts; Contractor to prepare CESMP (including OHS plan) and Contractor Labour Management Plan for approval	1.4 / 2.3	IIU/MPW; ICCO/CET	ESHS specifications before bidding; CESMP and Contractor LMP approved before mobilisation (mobilisation followed the kick-off meeting of 2 August 2026, so the requirement is applied through the contractual eight-week CESMP window, with no works on a front before the applicable CESMP parts are approved — Table 11.5, item 6); OHS measures adopted before construction
Establish and operate the workers' grievance mechanism per the LMP	2.2	ICCO/CET (with IIU/MPW oversight)	Before engaging Project workers; maintained throughout
Implement SEA/SH prevention and mitigation: Code of Conduct signed by all employees, GBV-sensitive grievance channel, worker and community awareness-raising	4.3	MoA-PMU, IIU/MPW and ICCO/CET	In place before commencement of works; enforced throughout
Notify the World Bank of any serious incident or accident, including SEA/SH-GBV incidents, with subsequent root-cause analysis and corrective actions	B	MoA-PMU and IIU/MPW	Within 48 hours of learning of the incident (Contractor notifies the PIU of SEA/SH complaints within 24 hours per the LMP)

Commitment	ESCP reference	Responsible	Timing
Contractor and Supervising Engineer environmental and social progress reports	C / 1.4	ICCO/CET and Supervising Engineer, to MoA-PMU/IIU	Monthly throughout the works
Regular ESHS monitoring reports to the World Bank, covering ESCP implementation, E&S documents, engagement and grievance-mechanism functioning	A (with 5.3 for RAP monitoring)	MoA-PMU and IIU/MPW	Quarterly throughout implementation; RAP monitoring reported quarterly
Deliver ESHS training to all Project actors on the prescribed topic list (project GRM, E&S screening, OHS, emergency preparedness, SEA/SH risk mitigation, disability inclusion, biodiversity conservation, among others)	C1	MoA-PMU and IIU/MPW, with the World Bank E&S team	Training completed before commencement of civil works and repeated periodically

2.7 WBG EHS Guidelines and IFC Performance Standard 6

The World Bank Group General EHS Guidelines — covering Environmental; Occupational Health and Safety; Community Health and Safety; and Construction and Decommissioning — are the technical reference for all site-specific instruments under the parent project (ESMF, 2021) and are applied throughout this ESIA, the ESMP and the CESMP as the benchmark of Good International Industry Practice for emissions, effluent, noise, waste, hazardous materials, traffic and worksite management. The sector EHS Guidelines for Toll Roads are used as the road-sector reference, and the World Bank Good Practice Notes on Road Safety, on Addressing SEA/SH in Civil Works and on Labor Influx inform the corresponding assessments in Chapters 8 and 10. Where a national standard and an EHS Guideline value differ, the more stringent applies unless a project-specific alternative is justified and agreed with the EPA and the Bank.

ESS6 is the applicable biodiversity standard for the Project and establishes its Critical Habitat obligations. IFC Guidance Note 6 (2019) is used only as a technical reference: the BFS (2026) applied its quantitative screening thresholds in making the ESS6 determination. On that basis, Critical Habitat is triggered under Criterion 1 (critically endangered and endangered species), with the White-bellied Pangolin as the primary trigger and the Western Chimpanzee, known from a single verified record, managed precautionarily through the Chimpanzee Sensitivity Zone; Criteria 2–5 are not triggered, and the avoidance and minimisation provisions of the BMP (rev.3) follow the PS6/GN6 practice standard for such determinations. The full determination, polygons and prescriptions are presented in Chapters 6–8 and the BMP.

2.8 Institutional Framework

Environmental and social governance of the Project engages national regulators, the implementing ministries, county and local government, the Contractor's own environmental, social, health and safety (ESHS) organisation and independent oversight functions. The EPA is the principal environmental authority: it reviews and approves the ESIA, issues and conditions the environmental permits, sets standards, and monitors and audits compliance through its Grand Gedeh county office and environmental inspectors. The EPML also provides for a specialised environmental judiciary (an Environmental Administrative Court and an Environmental Appeals Court), which had not been formally established at the time of writing; EPA administrative enforcement and the ordinary courts therefore remain the operative channels (Earthtime, 2024). The IIU of the MPW is the Employer and proponent: it implements all civil works, administers the Design-and-Build contract with ICCO/CET, houses dedicated Environmental and Social Specialists, leads RAP implementation and chairs the final administrative tier of the Project grievance mechanism. The MoA-PMU (RETRAP PIU) provides programme-level coordination, fiduciary management through the Project Financial Management Unit, custody of the ESMF/SEP/LMP/ESCP, and reporting to the World Bank; its Social Development Specialist is the confidential handler of SEA/SH complaints. An inter-ministerial Project Steering Committee chaired by the MoA provides strategic oversight, meeting at least twice a year (ESMF, 2021). Figure 2.2 reproduces the institutional chart for implementation of the civil works, showing the reporting and supervision lines among these parties.

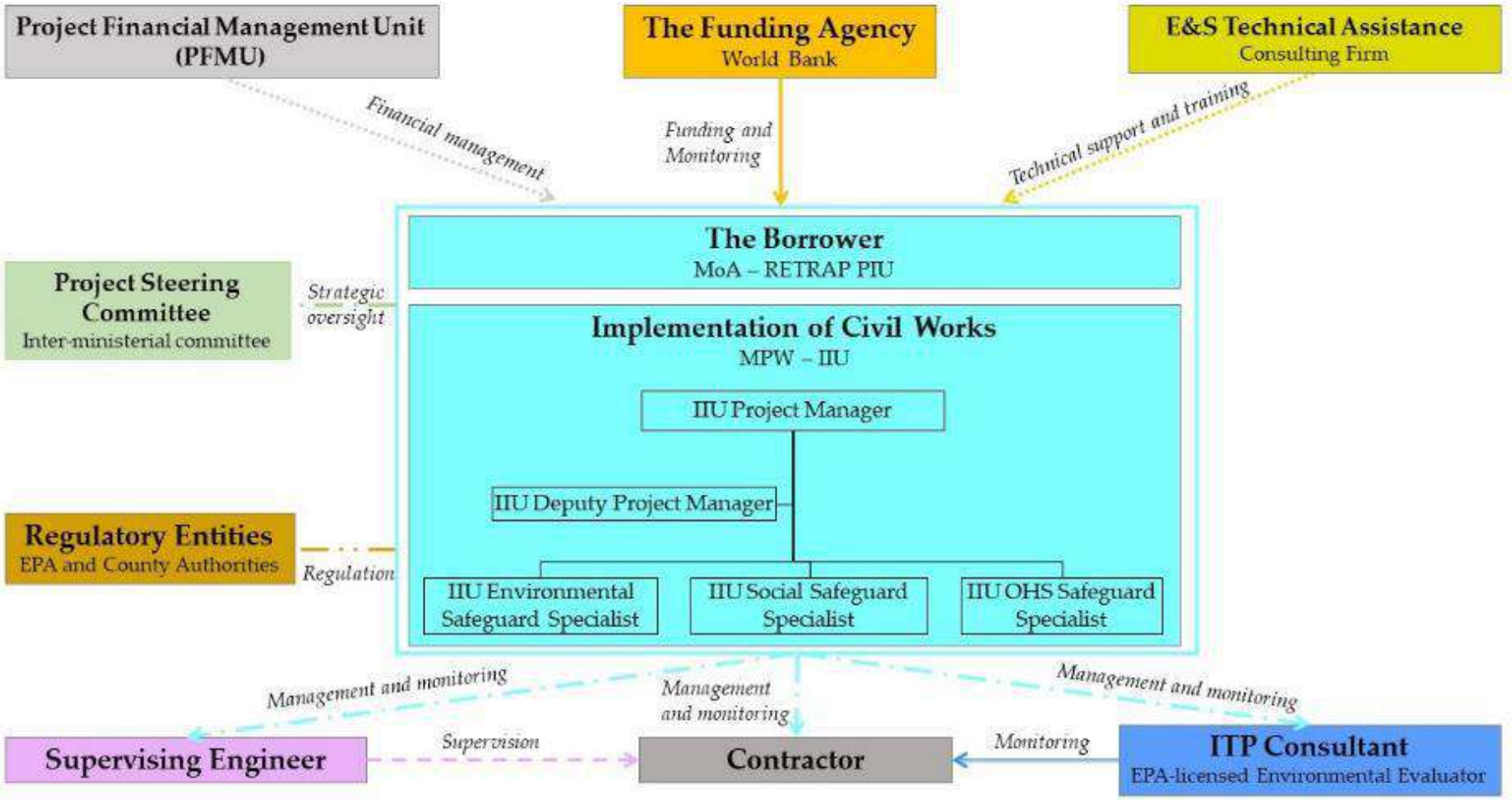


Figure 2.2: Implementation of civil works — institutional chart (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this Updated ESIA).

At community level, the Project operates the established RETRAP grievance redress mechanism, which this ESIA adopts: eight Community Grievance Redress Committees constituted along the corridor (resolution within 5 days, with 24-hour written acknowledgement), escalating to the County GRC (15 days) and the Project GRC at IIU/MPW (15 days, final administrative tier), with the courts as last resort and the separate workers' GRM operating in parallel under the LMP; the mechanism, its SEA/SH-sensitive channel and the World Bank Grievance Redress Service are described in Chapter 5. Institutional roles are summarised in Table 2.5.

Table 2.5: Institutional roles and responsibilities

Institution	Key roles and responsibilities in the Project
Environmental Protection Agency (EPA)	Statutory ESIA review and permit decisions; issue and conditioning of the five environmental permits and operational licences; receipt of quarterly E&S reports and of serious-incident notifications within 48 hours; standards (Parameters of Concern); compliance monitoring, inspection and audit through county environmental officers/inspectors; enforcement, including restoration orders
Ministry of Public Works — Infrastructure Implementation Unit (MPW/IIU)	Employer and proponent; implementation of all civil works and administration of the Design-and-Build contract; in-house Environmental and Social Specialists; approval of the CESMP before mobilisation; refusal of any ancillary site that fails BMP action A3; taking-over withheld until action A8 is met; notification of serious incidents to the World Bank and the EPA within 48 hours; RAP implementation, including compensation before works in the affected sections; chairs the Project-level GRC; monthly/quarterly E&S reporting with the PMU
Ministry of Agriculture — Project Management Unit (MoA-PMU / RETRAP PIU)	Programme lead agency; coordination across RETRAP components; fiduciary management (PFMU); custodian of the ESMF, SEP, LMP and ESCP; Environmental Specialist and Social Development Specialist (confidential SEA/SH handling); quarterly reporting to the World Bank; secretariat of the Project Steering Committee
Forestry Development Authority (FDA)	Regulation of forests, wildlife and protected areas; tree-felling authorisation for RoW and ancillary-site clearance; enforcement of wildlife and bushmeat law; receives Class A stem and wildlife-law referrals during the works, and quarterly and serious-incident notices as national procedure requires (BMP rev.3, Table 9.1)
Liberia Land Authority (LLA)	Land governance, deed and title registry; validation of titles and of voluntary agreements/MOUs for contractor-procured ancillary sites; support to resolution of land-related grievances

Institution	Key roles and responsibilities in the Project
Ministry of Mines and Energy (MME)	Licensing of quarry and borrow-pit materials extraction; explosives and blasting authorisation; hydrological services relevant to water abstraction
Ministry of Labour	Labour standards and inspection, including wage records and working conditions; final administrative tier of the workers' grievance mechanism; the Liberia Labour Commission for individual and collective labour disputes
Ministry of Gender, Children and Social Protection	Gender equality policy; coordination of GBV survivor services and referral pathways (with the Ministry of Justice SGBV Crimes Unit and Criminal Court "E"); interface for the Project SEA/SH framework
Ministry of Health	Public-health standards for camps, worksites and communities; disease surveillance and outbreak response interface
Ministry of Information, Cultural Affairs and Tourism	National authority for cultural heritage; decision-making on chance finds under the Chance-Find Procedure, with local authorities
Grand Gedeh County and District authorities	County Superintendent, District Commissioners, chiefdom and clan structures; county/district clearances; community mobilisation; statutory participation in grievance redress committees; county development coordination under the Local Government Act
Community, County and Project Grievance Redress Committees (GRCs)	Adopted RETRAP GRM: 8 community GRCs (5-day resolution; 24-hour acknowledgement), County GRC (15 days), Project GRC at IIU/MPW (15 days, final administrative tier); registers/logbooks at each tier; composition includes chief/elders, religious representative, women's, youth and PWD representatives
Contractor — ICCO/CET Joint Venture	Design and execution of the works; ESHS organisation with qualified environmental, social and OHS experts and community liaison function; preparation and implementation of the CESMP, Contractor Labour Management Plan, OHS, traffic, waste and emergency plans; Code of Conduct administration; workers' grievance committee; camp and ancillary-site management, permits compliance and site restoration; monthly E&S reports
Supervising Engineer	Day-to-day supervision of the Contractor's ESHS performance, including daily oversight of labour and working conditions written into its contract; verification of BMP actions A1–A10 (weekly while a front is in segment S3 or S6 or working in-stream at the Towah swamp, monthly

Institution	Key roles and responsibilities in the Project
	elsewhere, with weekly camp check); same-day stop-work instructions under BMP Table 5.2; monthly biodiversity verification form (BMP Annex B); no certification of a section that fails action A8; corrective-action instructions; advice to IIU on non-compliance, contractual sanctions and reliefs; monthly monitoring reports including accidents
RE-GROUP (Environmental and Social Consultant)	EPA-licensed consultant to the Contractor; preparation of this Updated ESIA, ESMP, CESMP and BMP package; 2026 field campaign; support to EPA process, consultation and disclosure
World Bank (IDA)	Financier; review and clearance of ToR, ESIA/ESMP, BMP and RAP completion reports; implementation support and supervision against the ESCP; recipient of quarterly reports and 48-hour incident notifications; Grievance Redress Service and Inspection Panel available to affected parties

2.9 Permits and Approvals Register

Under ESCP item 1.5, all permits, consents and authorisations must be obtained before the relevant Project activity commences, and their conditions complied with throughout implementation. The EPA permit set for this Project comprises five environmental permits: for the road works; the construction camp; the quarry; the crusher/asphalt plant; and the concrete batch plant. Each ancillary facility requires its permit before that facility is established or operated, and facility siting remains subject to BMP (rev.3) action A3 — no new quarry, borrow pit, crusher, batching plant, camp or laydown inside the Chimpanzee Sensitivity Zone or a pangolin Critical Habitat polygon, confirmed by the design-review overlay of every site — and to the exclusion of sacred groves, with pre-clearance screening required for BP3 (secondary forest), BP2 (wetland IW-007 overlap) and the sites flagged in Table 3.6. Beyond the EPA permits, the register includes FDA felling authorisation, water abstraction licensing, MME materials and blasting authorisations, EPML operational licences and county/community-level clearances and agreements. Contractor-procured ancillary sites lie outside the RAP scope and require documented voluntary agreements or MOUs (or a RAP addendum cleared by the Bank); the MOU for the Suaken quarry site remained outstanding at the time of writing. The permits and approvals register is set out in Table 2.6 and is maintained live in the ESMP; the RAP compensation condition precedent (Table 2.4) applies in parallel, so that neither permits nor compensation alone authorise commencement.

Table 2.6: Permits and approvals register

Permit / approval (authority)	Trigger	Holder	Timing	Status (October 2026)
Environmental permit — road works (EPA)	Rehabilitation of the 85 km road within the RoW: mandatory-ESIA activity under EPML Annex I No. 13	IIU/MPW (proponent)	Before commencement of civil works	Application supported by this Updated ESIA; EPA review and decision pending
Environmental permit — construction camp (EPA)	Establishment and operation of the construction camp and mechanical yard (Zuoyou Town area)	ICCO/CET (operator), under IIU/MPW	Before camp establishment and operation	Pending; supported by this Updated ESIA and the CESMP
Environmental permit — quarry (EPA)	Development and operation of the quarry (Suaken; Ziah Town site if operated), including blasting	ICCO/CET (operator)	Before quarry development and operation	Pending; Suaken host-community MOU outstanding; siting subject to the BMP action A3 siting rule
Environmental permit — crusher / asphalt plant (EPA)	Operation of the crushing and asphalt hot-mix plant (Suaken complex)	ICCO/CET (operator)	Before plant operation	Pending; application follows confirmation of siting screening
Environmental permit — concrete batch plant (EPA)	Operation of the concrete batching plant	ICCO/CET (operator)	Before plant operation	Pending
EPML operational licences: effluent discharge; solid and hazardous waste disposal; pollution emission (EPA)	Discharges, waste management and emissions at the camp and plants (annual, renewable licences)	ICCO/CET (operator)	Before the licensed activity commences; renewed annually	To be applied for with the facility permits
Tree-felling authorisation (FDA)	Felling of trees within the RoW and at ancillary sites during clearance	ICCO/CET, through IIU/MPW	Before vegetation clearance	To be obtained; tree inventory to accompany the application
Water abstraction licence(s) (EPA/MME hydrological services, per the Water Quality Regulations 2018)	Abstraction of surface water or groundwater for construction and camp supply	ICCO/CET	Before abstraction begins	To be obtained; sources and volumes per the CESMP water-management plan

Permit / approval (authority)	Trigger	Holder	Timing	Status (October 2026)
Materials extraction licences and explosives/blasting authorisation (MME)	Extraction of quarry rock and borrow materials (16 borrow pits); use of explosives at the quarry	ICCO/CET	Before extraction and before any blasting	To be obtained
County/district clearances and community agreements (Grand Gedeh County Administration; districts; host communities)	Mobilisation, ancillary-site access and local operations, including voluntary agreements/MOUs for contractor-procured sites	ICCO/CET, with IIU/MPW	Before mobilisation to the respective sites	In progress; Suaken quarry MOU outstanding; BP2, BP3, BP6, BP8, BP9, BP11, BP12, Quarry 2 and RC2 subject to pre-clearance screening and the BMP A3 overlay
BMP ancillary-site overlay and segment gates G1–G6 (IIU/MPW as Employer, with the Supervising Engineer)	Every proposed or existing ancillary site (BMP action A3 overlay); any front entering segment S3 (km 18–20) or segment S6 (km 38–50)	ICCO/CET, accepted by IIU/MPW	Detailed-design review; before a front enters S3 or S6	Pending (BMP rev.3, Section 3.3 and Table 9.2)

The permits in Table 2.6 are conditions precedent in the sequence of Project execution: no facility may operate, and no works may commence, before the corresponding permit or authorisation is in hand, before the RAP compensation condition is discharged and the payment-completion report cleared by the World Bank, and — for biodiversity-sensitive activities — before the BMP (rev.3) is disclosed and the BMP gates for segments S3 and S6 are met (BMP rev.3, Table 8.2). Compliance with this register is monitored by the EPA and reported monthly by the Contractor and quarterly to the World Bank as set out in Chapter 11 and the ESMP.

2.10 Gap Analysis: National Requirements and the World Bank ESSs

The RAP carries the land-acquisition gap analysis (national expropriation practice against ESS5) and the LMP the labour gap analysis (Decent Work Act against ESS2); the ESMF presents the framework-level analysis for RETRAP as a whole. Table 2.7 consolidates, for this Project, the remaining topics where national requirements and the ESSs differ materially, and states the gap-filling measure this ESIA adopts in each case. Where the two systems differ, the more stringent requirement governs (Section 2.5.1).

Table 2.7: Gaps between national requirements and the relevant ESSs, and the gap-filling measures of this ESIA

Topic	National provision	ESS / EHS requirement	Gap and gap-filling measure
Land acquisition and livelihoods	Constitution and Land Rights Act (2018); expropriation practice compensates titled interests; limited provision for informal users	ESS5 — compensation at full replacement cost for all displaced persons regardless of tenure; livelihood restoration; cut-off census	Gap closed by the RAP (2025): new census (860 PAPs; 1,084 assets), entitlement matrix at replacement cost including informal users, cut-off date, grievance route; compensation a condition precedent to works (Table 11.5, item 1)
Labour and working conditions	Decent Work Act (2015) — core standards, minimum age 15 (light work)	ESS2 — LMP, workers' GRM, codes of conduct, OHS management system; project minimum working age 18	LMP applied; minimum working age 18 with age verification; workers' GRM and signed codes of conduct (including SEA/SH) before engagement (Table 11.5, item 6)
Biodiversity and critical habitat	Wildlife Conservation and Protected Area Management Law (2016) protects listed species and protected areas; no critical-habitat test or no-net-loss requirement outside them	ESS6 — critical-habitat determination, mitigation hierarchy, no net loss / net gain, biodiversity management planning	Gap closed by the BFS critical-habitat determination (Section 7.5) and the binding BMP (Appendix T) with measurable net-gain trajectory; ESS6 conditions precedent at Table 11.5, item 2
Wetlands and riparian buffers	No general statutory buffer widths for streams, rivers or wetlands	ESS6/ESS3 and WBG EHS good practice — defined working buffers and water-protection zones	Project-adopted buffers of Table 2.8 (30 m riparian; wetland buffer; crossing-corridor rule), binding through the CESMP and the biodiversity geofences
Ambient air, noise and effluent standards	EPA Approved Parameters of Concern; ambient standards incomplete for some parameters	WBG General EHS Guidelines values; WHO guidelines	For each parameter the more stringent available standard is applied in Chapter 6 and the monitoring programme (Section 11.4); where no national value exists, the WHO/WBG EHS value governs

Topic	National provision	ESS / EHS requirement	Gap and gap-filling measure
			(Appendices G–J state the standards used)
Hazardous materials and waste	EPML licensing of discharges and waste disposal; limited hazardous-waste infrastructure in-country	ESS3 and EHS Guidelines — cradle-to-grave management, bunding, licensed handling	EPML operational licences before the relevant operation (Table 11.5, item 3); 110% bunded storage, manifests and EPA-certified handlers; no transboundary movement without Basel procedures (Appendix R)
Climate resilience	NDC commitments; no codified design-standard requirement for climate adaptation	ESS1/ESS4 — climate risk screening and resilient design	Climate risk screened (Section 9.8); 10/50/100-year drainage standard with freeboard adopted as the design allowance (Appendix X, Section X.5)
Cultural heritage	National heritage protections; customary protections for sacred sites and graves	ESS8 — chance-find procedure, mapped heritage register, custodial consultation	Cultural-heritage register (Section 8.6); 1 km sacred-grove buffers (Table 2.8); Chance-Find Procedure in every works package; grave relocation only under the RAP protocol
SEA/SH	National Gender Policy and NAP-GBV; criminal law	World Bank Good Practice Note (SEA/SH) — prevention, codes of conduct, survivor-centred response	SEA/SH risk assessed; confidential channel in the adopted GRM; codes of conduct covering SEA/SH; mapped service providers; monitoring of channel functionality (Chapter 11)

2.11 Adopted Buffers, Setbacks and Standoffs

The Project operates to a defined set of numerical buffers and setbacks. Table 2.8 states, for each, the requirement of Liberian law (or that none exists), the ESS or WBG EHS reference, and the distance the Project adopts as a design requirement — showing where the Project goes beyond the legal minimum. The distances bind through the CESMP, the biodiversity geofences loaded into the Contractor's setting-out systems, and the per-site EPA permit conditions.

Table 2.8: Buffers, setbacks and standoffs adopted by the Project

Protection	Liberian legal requirement	ESS / EHS reference	Adopted distance	Application and basis
Riparian buffer — streams and creeks	None of general application	ESS6; EHS good practice	**30 m** each side, measured from the top of the bank	No ancillary facility, spoil, fuelling or plant parking within the buffer. At the designed crossings, the buffer applies outside the minimised working corridor, which is reinstated and re-vegetated on completion
Larger rivers and bridge waterways	None of general application	ESS6; EHS good practice	**50 m** each side from the top of the bank	Same rule as above, applied to the five bridge waterways; in-stream works only under the method statements and (for the nine fish-bearing creeks) after the ichthyological survey of Section 6.3.2
Wetlands (the 31 inland wetlands)	None	ESS6	**30 m** beyond the seasonal wetland edge	No new facility or spoil within the buffer; the Towah swamp works window and low-flow method apply (BMP action A7)
Fuelling and maintenance standoff	None	EHS Guidelines	**50 m** from any watercourse or drain	Fuelling on sealed/bunded areas only; spill kits at point of use
Quarry, crusher, asphalt and batching plants	EPA permit conditions set case-by-case	EHS Guidelines (air, noise)	**500 m** from dwellings, schools and health facilities	Site-specific permits; dust and noise controls; the Suaken complex layout respects the setback to Suaken Town’s receptors

Protection	Liberian legal requirement	ESS / EHS reference	Adopted distance	Application and basis
Construction camp	EPA permit conditions	ESS2/ESS4	**250 m** from schools and health facilities; sited at the edge of, not inside, settlements	Zuoyou Town camp conforms; camp rules and codes of conduct apply
Chimpanzee Sensitivity Zone no-go core	None	ESS6 (precautionary)	**0.78 km² demarcated core** (≈500 m radius of the verified detection)	Physically demarcated before any clearance in segment S3 (BMP gate G2); no works entry at any time
Sacred groves	Customary protection; recognised under the Land Rights Act	ESS8	**1 km** facility exclusion; works within the right-of-way past a grove only under the agreed custodial protocol	Register at Section 8.6; a newly declared grove is logged in the GRM and verified before any affected drawing proceeds
White-necked Rockfowl outcrop	None	ESS6	**1 km** facility exclusion	BMP geofence; no blasting within the exclusion
Schools and health facilities (traffic)	None	ESS4	School-zone treatments and **20 km/h** works-traffic limit at frontages	Traffic Management Plan from the first haul movement; crossing control at school hours

Where any detailed-design element cannot meet an adopted distance, the change-management procedure of the ESMP applies before execution: the Contractor must demonstrate an equivalent level of protection, and the Supervising Engineer and IIU must accept it in writing, with EPA notification where a permit condition is affected.

3 PROJECT DESCRIPTION

This chapter describes the Project as designed by the design-and-build Contractor — the location and corridor, the design standards and geometry, the pavement, the drainage structures, the construction methodology and programme, the materials demand and sourcing, the ancillary facilities and their siting controls, utilities and workforce, waste streams, and decommissioning — updating the 2024 project description (Earthtime, 2024, Chapter 3) with the Contractor's Design Proposal and Methodology Statement (ICCO/CET, June 2025) and presenting the detailed project-specific information of the current design (Sections 3.5, 3.7, 3.14 and 3.15; Appendix A).

3.1 Overview and Location

The Project is the rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road, a nominally 85 km gravel/laterite corridor in Grand Gedeh County, south-eastern Liberia, financed under the Additional Financing of the Rural Economic Transformation Project (RETRAP-AF, P181083, IDA). The Employer is the Infrastructure Implementation Unit (IIU) of the Ministry of Public Works (MPW); the works are being delivered by the ICCO/CET Joint Venture under a Design-and-Build contract (RFP No. LR-IIU-404122-CW-RFP). The corridor forms Lot 2 of the 125 km Tappita–Zwedru road and is the final link of the approximately 225 km Ganta–Tappita–Zwedru corridor, whose earlier sections were or are being delivered under SECRAMP (Ganta–Tappita, 100 km) and RETRAP (Tappita–Toe Town, 40 km) (Earthtime, 2024).

The canonical chainage convention adopted throughout this ESIA places km 0 at B'hai Jorzon, at the Liberia–Côte d'Ivoire border (approximately 6.47027° N, 8.50256° W), from where the road runs south to Toe Town (approximately km 10–12) and then south-east through the roadside settlements of Sennehwein, Duogee, Tian Town, Zleh City, Pouh Town, Ziah Town, Zai Town, Zaiyee Town and Gboleyville to terminate at the end of the existing pavement in Zwedru City (approximately km 83.7; approximately 6.06026° N, 8.13964° W), the county capital (RAP, 2025). The nominal length is **85 km**; the GPS-measured centreline is **83.75 km**. Where 2026 field documents used a Zwedru-origin (reversed) chainage, values have been converted to the canonical B'hai-origin chainage. The corridor traverses the B'hai, Gbao, Cavalla and Tchien administrative districts, with the Gbarzon Statutory District met at Goyeazon; fifteen principal project-affected communities lie on the corridor, within a county population of 216,692 (LISGIS, 2022). Figure 3.1 shows the elevation profile of the corridor across its gently rolling terrain, with the principal settlements and biodiversity hotspots located along the chainage.

For biodiversity management the BMP (rev.3) divides the corridor into seven segments, which are used throughout this report: S1 km 0–12 (sacred groves at the western end); S2 km 12–18 (Towah swamp); S3 km 18–20 (Chimpanzee Sensitivity Zone); S4 km 20–28 (threatened-flora hotspot); S5 km 28–38; S6 km 38–50 (pangolin Critical Habitat polygons); and S7 km 50–85 (eastern farm-bush and settlements). Supervision intensity follows this segmentation: the Supervising Engineer checks weekly while a works front is in S3 or S6 (and in each in-stream week at the Towah swamp) and monthly elsewhere, alongside the corridor-wide CESMP checks (BMP rev.3, Tables 3.3 and 7.1).

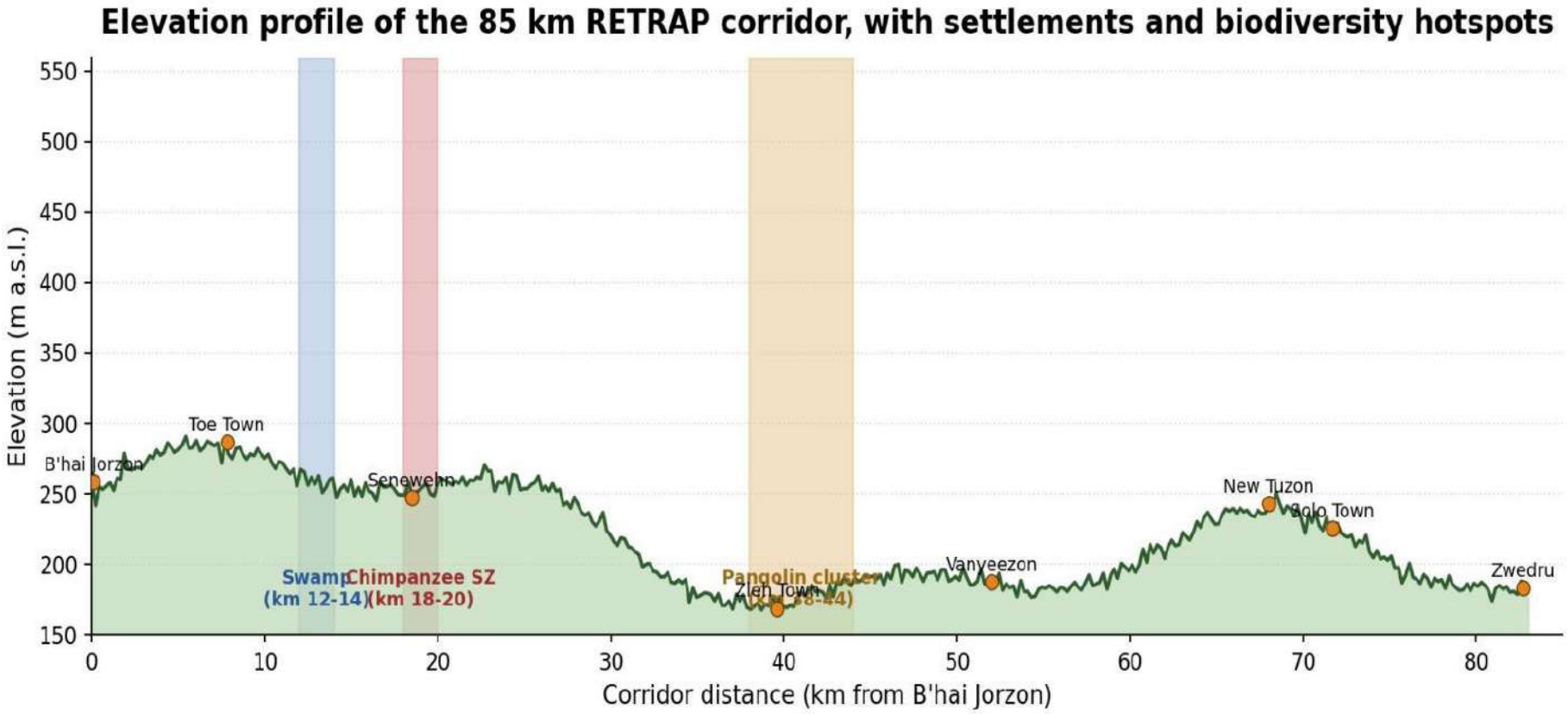


Figure 3.1: Elevation profile of the 85 km corridor with settlements and biodiversity hotspots (BFS, 2026, Figure 1.6; reproduced for this ESIA).

The Contractor's design is stationed as two roads, and this two-road stationing appears on all design drawings and schedules (ICCO/CET, 2025). Road 1 is the border link from the B'hai Jorzon area to the Toe Town junction, 10.345 km long (stations 0+000 to 10+345, with an urban section over approximately its final 1.24 km). Road 2 is the main road from Toe Town to Zwedru, stationed to approximately 73+456. Corridor chainage is obtained for structures and other Road-2 features by adding 10.345 km to the Road-2 station (corridor km = Road-2 station + 10.345). Both stationing systems are cross-referenced in this report so that design schedules, the RAP settlement inventory and the biodiversity chainages of the BFS can be read against a single corridor kilometrage.

The existing road is a single gravel carriageway generally 7.0–8.0 m wide, bordered largely by shrub regrowth with settlement frontages and only minor stretches of farmland immediately adjacent (ICCO/CET, 2025). Its condition is poor: rutting, erosion gullies, ponding where grading has cut below natural ground, silted or collapsed culverts, and wet-season impassability, particularly on the 10 km border leg (Earthtime, 2024; RE-GROUP, 2026). Baseline traffic on the corridor was low — 310 vehicles/day on the border–Toe Town leg and 922 vehicles/day on Toe Town–Zwedru in the 2017 base year, all classes including motorcycles (Earthtime, 2024) — but motorcycles now dominate passenger and goods movement and small commercial vehicles are increasing (RE-GROUP, 2026). Plate 3.1 shows the typical existing condition, Plate 3.2 the corresponding wet-season condition recorded by the 2024 ESIA in 2023, and Figure 3.2 the corridor with the ancillary-facility network described in Section 3.8.



Plate 3.1: Existing condition of the unpaved corridor — rutted and eroded laterite carriageway typical of the alignment prior to rehabilitation — project corridor, Grand Gedeh County, August 2026 (RE-GROUP field survey)



Plate 3.2: Existing road condition in the wet season (2023) (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this ESIA).

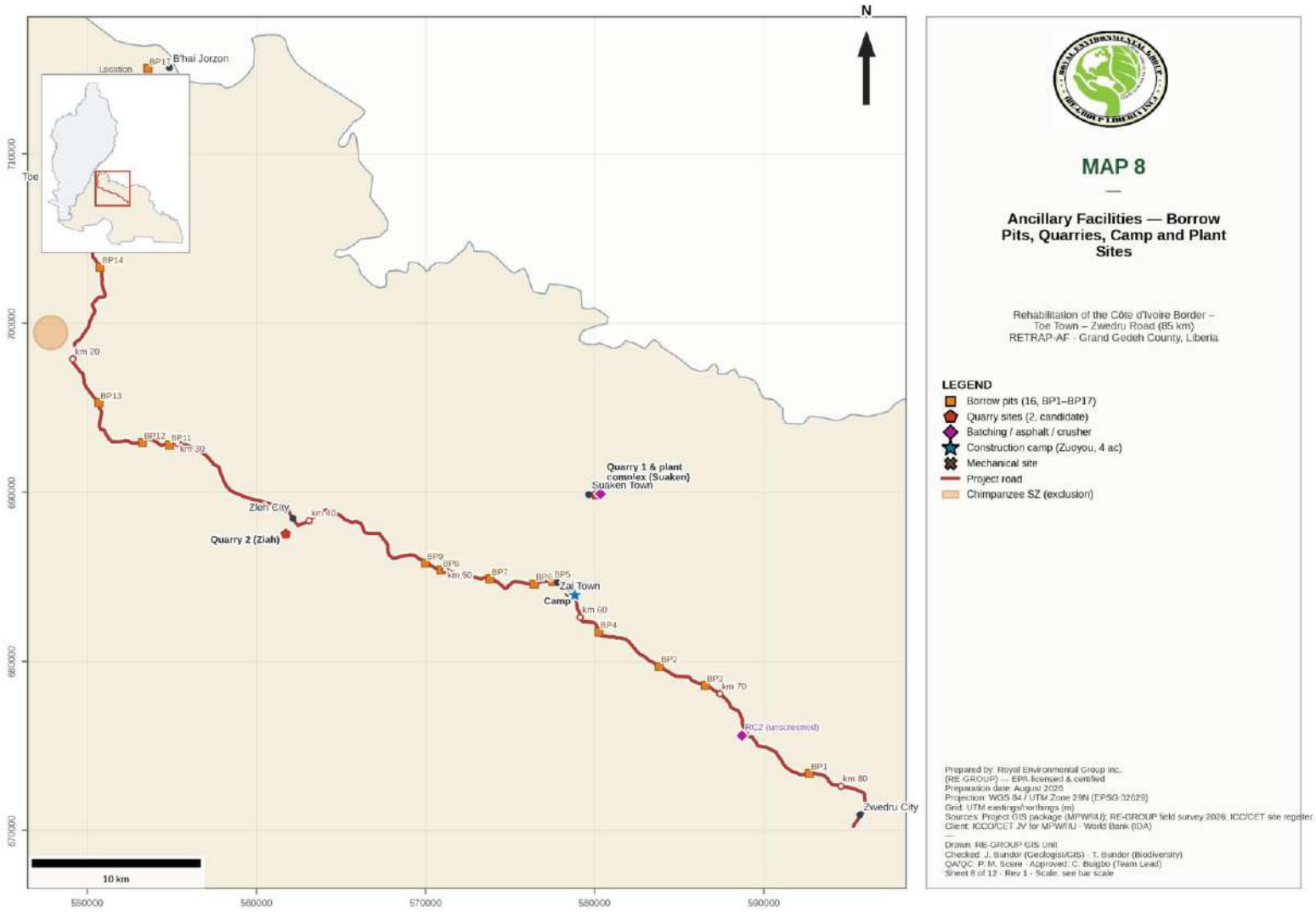


Figure 3.2: Project corridor and ancillary facilities — borrow pits BP1–BP17 (16 sites; no BP10), quarries, batching/asphalt/crusher complex, construction camp and mechanical site (UTM Zone 29N; ICCO/CET register; RE-GROUP, 2026)

3.2 Design Standards and Geometry

The design is prepared to the Ministry of Public Works (Liberia) 2017 geometric and pavement design standards, with the AASHTO 1993 Guide for Design of Pavement Structures for pavement structural design, AASHTO LRFD specifications for bridge design, AASHTO materials and testing standards with ASTM references, and the Asphalt Institute Superpave performance-graded binder specifications (SP-1) for bituminous materials (ICCO/CET, 2025). FIDIC conditions, ISO 9001 quality management and World Bank ESF/IFC requirements frame contract administration and environmental and social performance.

Two design classes are applied along the corridor — rural (design speed 80 km/h) and urban (60 km/h) through the town sections. The controlling geometric criteria adopted by the Contractor are summarised in Table 3.1.

Table 3.1: Principal geometric design parameters (ICCO/CET, 2025)

Parameter	Unit	Rural	Urban
Design speed	km/h	80	60
Stopping sight distance	m	130	85
Lane width (2 lanes)	m	3.75	3.75
Shoulder width	m	1.50	1.50
Carriageway crossfall	%	2.0	2.0
Maximum superelevation	%	6.0	4.0
Minimum horizontal radius	m	252	135
Minimum radius not requiring superelevation	m	2,360	1,310
Maximum longitudinal gradient	%	6.0	6.0
Minimum gradient in cuttings	%	0.5	0.5
Minimum K-value, crest vertical curve	K	26	11
Minimum K-value, sag vertical curve	K	30	18

The maximum gradient of 6 per cent is compatible with the corridor's gently rolling terrain (elevations of about 150–320 m above sea level). Junction geometry, including the Road 1/Road 2 junction at Toe Town, and the final signing and marking plans are detailed-design deliverables.

3.3 Cross-Sections and Right-of-Way

Three typical cross-sections are applied (ICCO/CET, 2025). The **rural section** provides a 7.50 m carriageway (2 × 3.75 m lanes) with 1.50 m hard shoulders each side — a paved formation of approximately 10.5 m — with 2 per cent crossfall from the crown, lined ditches on the cut side, fill slopes of 1V:1.5H, safety barriers (guardrails) on high-fill sections and 1.0 m benching on high cut slopes. The **urban section** is symmetrical between building lines and provides, in each direction from the carriageway edge: a 1.50 m covered drain, a 1.50 m sidewalk and a 3.00 m minimum clear zone — a minimum of 19.5 m between building lines. Urban side drains are rectangular reinforced-concrete channels with cover slabs, so that the drain doubles as a walking/frontage edge; rural drains are trapezoidal open ditches with hardened linings where erosion protection is required.

The works are confined to the existing government right-of-way (RoW): 150 ft (45.72 m) in rural areas (75 ft/22.86 m either side of the existing centreline) and 100 ft (30.48 m) in urban areas (50 ft/15.24 m either side) (RAP, 2025). The RoW is government reserved land; no private land acquisition is anticipated, and the RAP records that no person lost land as a result of the Project — displacement is limited to structures,

trees, businesses and graves within the RoW (the RAP and Section 9.7 set out the entitlement framework). The carriageway is widened from the existing 6.5–7.4 m gravel running surface to the 10.5 m paved formation within this reserve. Any localised geometric correction that would extend works beyond the RoW would trigger supplementary resettlement planning and an updated cut-off date under the RAP protocol (Section 10.7).

Urban (town) sections total approximately 9 km of the corridor, comprising the Road-1 urban section at the Toe Town junction end (9+103 to 10+345) and, on Road 2, the tabulated urban bands at 0+000–1+150 (Toe Town), 11+041–11+588, 19+948–21+118, 30+524–31+970 and 48+844–50+000, plus the terminal town section from about 71+154 to the Zwedru end at about 73+456 (corridor about km 81.5–83.75) (ICCO/CET, 2025). The kerbed, covered-drain-and-sidewalk urban cross-section, with the 60 km/h design speed, applies in these bands; the definitive assignment of each intermediate band to its settlement will be confirmed in the detailed design and reconciled with the RAP settlement register.

3.4 Pavement

The surfacing is hot-mix asphalt concrete (AC) — not gravel wearing course and not surface dressing. The pavement structure proposed by the Contractor is a 590 mm build-up, shown in Table 3.2.

Table 3.2: Proposed pavement structure (ICCO/CET, 2025)

Layer (top to bottom)	Thickness	Material and requirement
Surface (wearing) course	65 mm	Asphalt concrete
Tack coat	—	Between asphalt layers
Asphalt base (binder) course	75 mm	Asphalt concrete
Prime coat	—	On granular base
Base course	150 mm	Crushed aggregate, CBR at least 80%, 100% MDD
Sub-base	300 mm	Natural gravel, CBR at least 30%, two layers, 100% MDD
Total pavement	590 mm	

The structural design follows the AASHTO 1993 method for a design traffic loading of **6.0 million equivalent standard axle loads (ESALs) over a 20-year design life** (80 kN standard axle), on a design subgrade of CBR 5–7 per cent (subgrade class S3). The binder is 60–70 penetration-grade bitumen selected for the local mean annual temperature of 26 °C. Localised treatments — thicker sub-base or geosynthetics in weak or expansive soil zones, and additional drainage layers where groundwater or runoff risk exists — are provided for, and swampy or soft-subsoil zones identified along the alignment will be excavated and replaced with granular fill (ICCO/CET, 2025).

3.5 Drainage and Structures

Existing structures (condition survey). The condition survey of the existing road identified 82 structures: five bridges, 69 pipe culverts and eight box culverts (Earthtime, 2024; carried forward at the 2026 update). This existing inventory is the baseline on which the Contractor’s drainage design builds: the design schedules of this section and Appendix A provide 42 box culverts and 40 pipe culverts (82 cross-drainage structures) — replacing, upgrading or consolidating the existing culverts and retaining the five bridges — together with lined longitudinal drainage. The final scope and requirement for additional or modified structures will be determined upon the finalisation of the detailed design phase (Section 3.16). The hydraulic design adopts the 10/50/100-year flood standards as a climate-change adaptation measure for the corridor’s numerous creek, river and swamp crossings, consistent with the climate-resilient drainage commitments carried in this report.

Bridges. Five existing bridges carry the road over the principal watercourses; all have concrete girder-and-deck superstructures on reinforced-concrete abutments and piers, all were assessed in good condition, and the design strategy is to retain, rehabilitate and widen them rather than replace them — no new bridge is proposed at the five existing bridge sites (ICCO/CET, 2025). At the Towah swamp (km 12–14), BMP (rev.3) action A7 requires a span or a large box culvert rather than culvert-and-fill, to be designed and costed by the Contractor's design engineer within the works contract and accepted at design review; the structure type and station are to be confirmed in the culvert and bridge schedules. Table 3.3 presents the inventory on both the Road-2 design stationing and the corridor chainage. (The 2024 ESIA recorded the same five structures against the Tappita-origin stationing of the earlier feasibility design; the values below supersede that convention).

Table 3.3: Existing bridges to be rehabilitated and widened (ICCO/CET, 2025)

No.	Road-2 station	Corridor chainage (approximate km)	Spans	Length (m)	Deck width (m)	Condition
1	32+160	42.5	1	16.0	7.3	Good
2	38+040	48.4	1	15.0	7.3	Good
3	46+957	57.3	1	15.0	7.3	Good
4	57+034	67.4	2	37.8	7.3	Good
5	71+256	81.6	2	30.8	7.4	Good

Two widening options were evaluated — integrated deck widening (new concrete/steel structurally integrated with the existing deck, abutments and piers) and cantilever widening on steel braces — with integrated widening preferred for structural uniformity. Bridge works include guardrail repair, the **addition of pedestrian walkways**, deck-level adjustment where clearance requires it, and full replacement only where deterioration is found to warrant it. Hydraulic design considers backwater, freeboard, scour and floodplain effects for the **10-, 50- and 100-year floods**, which govern vertical clearance and foundation depth (ICCO/CET, 2025).

Culverts. The existing corridor has only 34 cross-drainage structures (5 box, 9 pipe and 20 corrugated-zinc culverts), most of them shallow, under-sized, silted or eroded. The proposed design provides **42 reinforced-concrete box culverts** (1 to 7 cells; cell sizes 1.5 × 1.0 m to 3.0 × 2.5 m; the largest structures being a 7-cell 3.0 × 2.5 m battery at station 10+164 and multi-cell boxes at 13+882, 32+970, 52+173 and 65+790 marking the larger stream crossings) and **40 pipe culverts of Ø1,000 mm**, at stations from 0+321 to 72+573 — 82 new or reconstructed cross-drainage structures, roughly one per kilometre (ICCO/CET, 2025). One section of the design proposal cites 62 pipe culverts (40 replacements plus 22 additions); the appendix schedule lists 40, and the final count will be confirmed in the detailed design and bill of quantities. Structural concrete is grade C30 (C15 for blinding/foundations). Retained culverts receive desilting, inlet/outlet clearing, crack sealing and reconstruction of eroded wing walls.

Side drains and erosion protection. Longitudinal drainage comprises covered rectangular concrete channels in urban sections and lined trapezoidal ditches in rural cuts, with earth and berm-lined ditches elsewhere, mitre drains, and inlet/outlet headwalls, wing walls and riprap aprons at all culverts. Slope protection is by grouted riprap with weep holes, supplemented by a vegetative ("green infrastructure") slope philosophy of grassed embankments established in the rainy season. Energy-dissipation elements are provided at outfalls to prevent scour and sedimentation.

Hydrology and climate resilience. Hydraulic design uses the Rational Method for catchments below 0.5 km² and the SCS Curve Number method for larger basins, with catchments delineated from 30 m digital elevation models, HY-8 for culvert hydraulics and HEC-RAS/SWMM for stormwater modelling, against a mean annual rainfall of 2,500–3,000 mm (ICCO/CET, 2025). Climate-resilient features embedded in the design include raised road profiles or supplementary drainage in identified flood-prone reaches, freeboard and scour protection at bridges for events up to the 100-year flood, systematic upsizing of culverts relative to the under-sized existing crossings, dual drainage on slopes (surface diversion plus deep drainage), erosion-resistant linings and energy dissipation. The 2026 update survey inventoried 31 inland wetlands (IW-001–IW-031) and 9 named creeks within the 150 ft RoW (RE-GROUP, 2026); drainage design at these features is required to maintain flows and aquatic connectivity, avoid direct wetland fill, and respect the riparian buffers of at least 30 m and the span or large box culvert (rather than culvert-and-fill) required at the Towah swamp crossing (km 12–14) by BMP rev.3 action A7 (BFS, 2026). Culvert and bridge design also carries the wildlife safe-passage provisions required under the parent ESMF and specified by the BFS — oversized or dual-purpose dry-cell culverts and maintained under-bridge passage, provided only at the BFS-documented movement hotspots to the design engineer's accepted drawings (BMP rev.3, action A6; Section 9.6) — so that cross-corridor connectivity for fauna is preserved through the drainage works (ESMF, 2021; BFS, 2026). Figure 3.3 shows the crossings, wetlands and structures along the corridor.

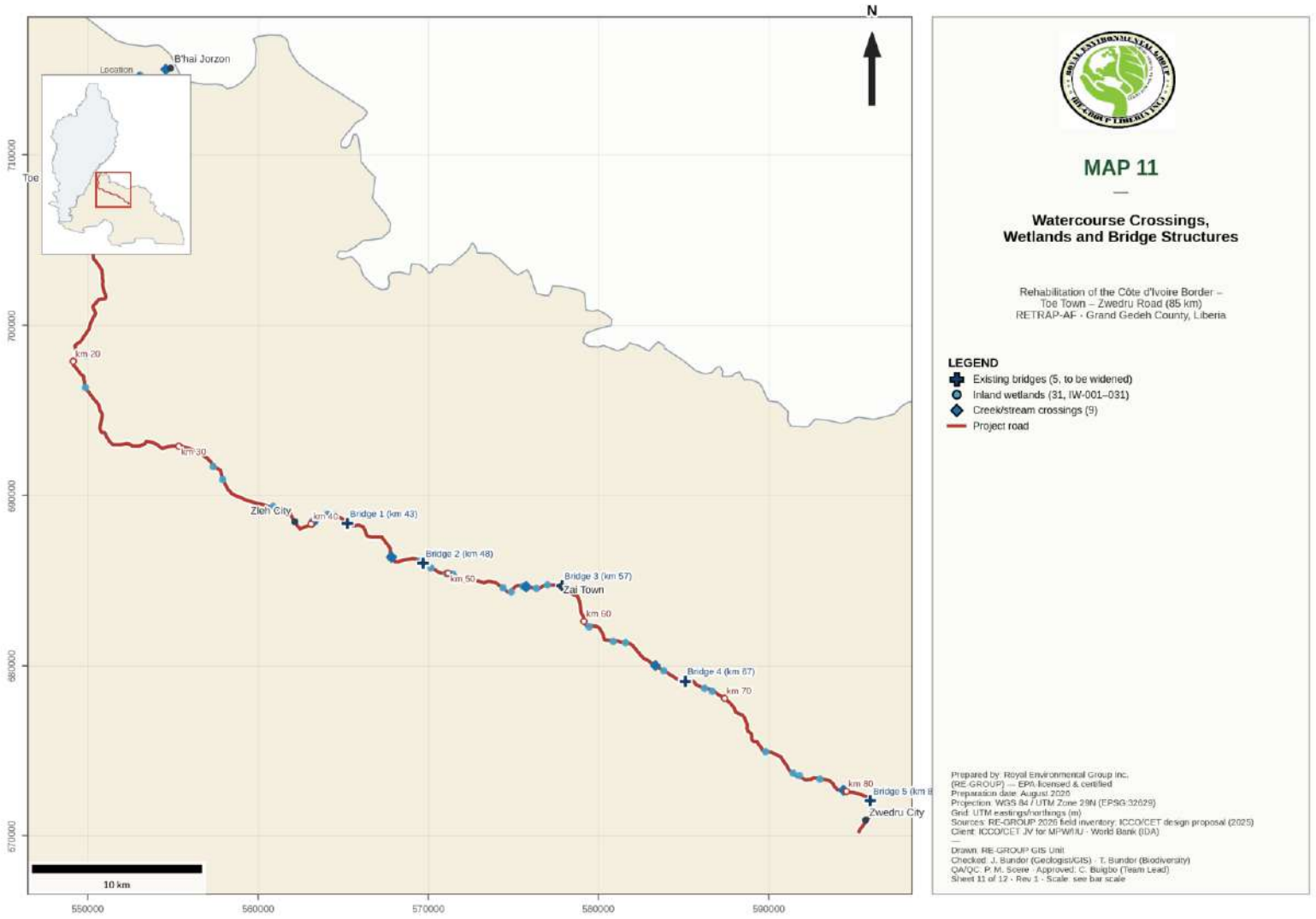


Figure 3.3: Watercourse crossings, inland wetlands and drainage structures along the corridor, with bridge and multi-cell culvert locations

3.6 Construction Methodology and Programme

The Contractor mobilised in mid-2026 and is undertaking the road survey and design data collection; civil works begin at the Zwedru end, where the existing asphalt pavement meets the laterite road, and proceed towards the border (Contractor's kick-off meeting, Zwedru project site, 2 August 2026). In Zwedru City the early works include removal of the existing dilapidated concrete/asphalt surface and relocation of aged utility lines, particularly electricity/light poles, in coordination with the utility operators. Commencement is subject to the RAP condition precedent: no civil works may start in an affected section until compensation and resettlement assistance have been paid in full to the eligible project-affected persons there and the payment-completion report has been cleared by the World Bank, with site handover no less than three months after compensation (RAP, 2025), and to the permits and approvals in Section 2.9 (Table 2.6) and, before a front enters segment S3 or S6, to the BMP gates (BMP rev.3, Table 8.2).

The Design-and-Build sequence runs from data collection (approximately 56 days of mobilisation and surveys — topographic about 28 days, geotechnical about 23 days, hydrological about 11 days, partly overlapping) through concept and schematic design to detailed design (about 181 days) and design review (about 25 days), with key design personnel deployed for 36 months — consistent with a 36-month contract period (ICCO/CET, 2025). Figure 3.4 reproduces the Contractor's design-stage programme. The 2024 planning assumption of roughly four years including a one-year defects-liability period remains a reasonable envelope (Earthtime, 2024). The works programme itself (phasing, work-front sequencing, resource histograms) is a Contractor deliverable not yet issued; it will be appended to the CESMP.

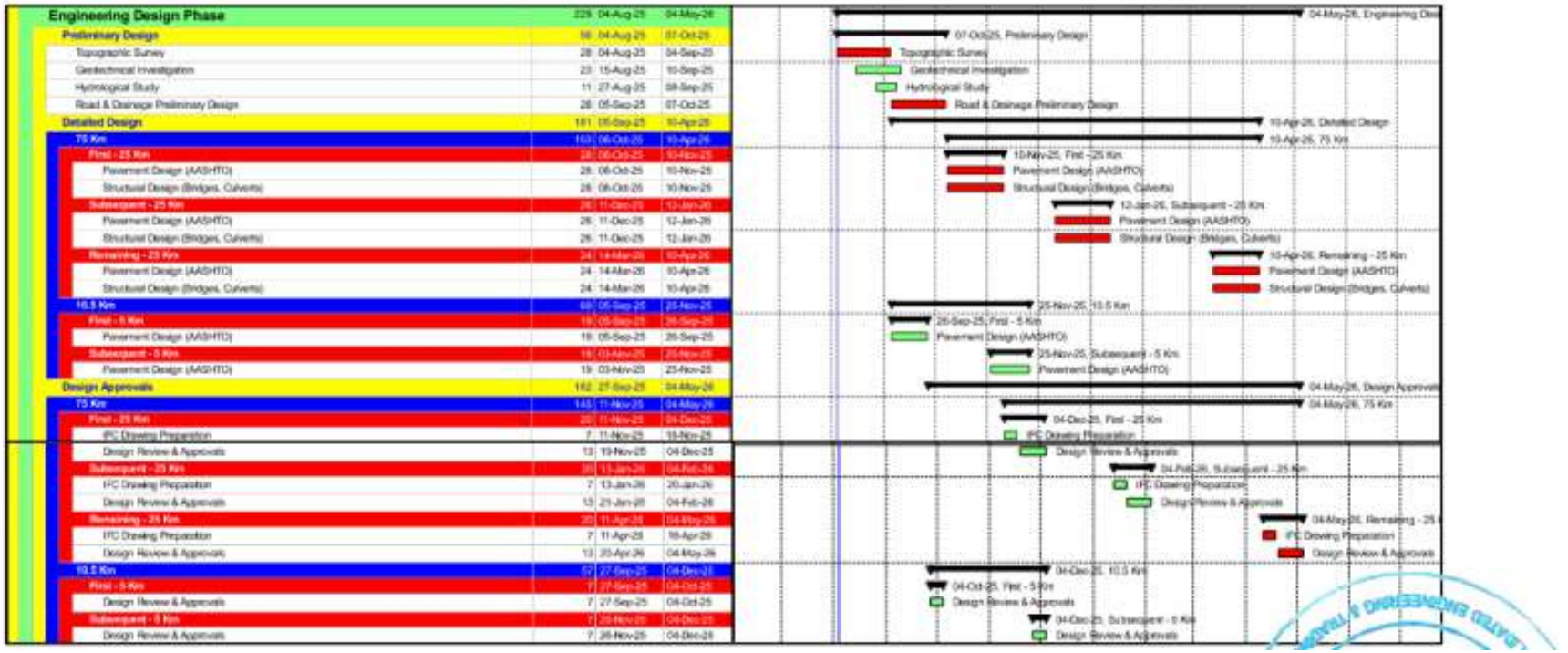


Figure 3.4: Design-stage programme (Gantt) (adopted from the Contractor's Design Proposal (ICCO/CET, 2025, Fig. 2); reproduced for this ESIA; cropped from the proposal page).

The principal construction operations are, in broad sequence per work front: clearing and grubbing strictly within the pegged RoW — in segment S3 preceded by demarcation of the no-go core (BMP action A1), and everywhere by the pre-clearance walkover and, in segment S4 and the Critical Habitat segments, by the FDA Class A stem protocol (action A4) — with topsoil stripped and stockpiled for reuse; earthworks in cut and fill (standard slopes 1V:1.5H fill, 1:1 soil cut, 1:0.25 rock cut), including full removal and replacement of unsuitable material with granular fill in the identified swampy/soft-ground zones; installation of culverts and side drains; bridge rehabilitation and widening; placing and compaction of sub-base and crushed base; priming and laying of the asphalt binder and wearing courses; urban drains, sidewalks and kerbs; and finishing works (signage, markings, guardrails, slope grassing). Materials production at the quarry, crusher, asphalt and batching plants (Section 3.8) proceeds in parallel.

Seasonal constraints. With 2,500–3,000 mm of rainfall a year concentrated in May–October, earthworks, culvert construction and works in swamp crossings are programmed for the dry season (approximately November–April). While a front is in the Chimpanzee Sensitivity Zone (km 18–20, segment S3) or the pangolin Critical Habitat polygons (km 38–44 and km 46–50, segment S6), working hours are 08:00–16:00 with no night work or blasting (BMP rev.3, action A2). Adjacent to the Towah swamp (segment S2, km 12–14) the working window is 07:00–17:00 (BFS, 2026, Figure 5.6), and in-stream work there uses a low-flow method with silt control (action A7). Slope grassing is undertaken in the rainy season. The decision to open works at the Zwedru end also defers the sensitive mid-corridor reaches until the BMP gates for those segments have been accepted (BMP rev.3, Table 8.2).

Traffic management during works. The Contractor's traffic management commitments (ICCO/CET, 2025) include: advance public notice of temporary closures; signed and mapped detour routes with maintained emergency-vehicle access at all times; lane reductions controlled by barriers, traffic marshals and flaggers; temporary speed limits with enforcement; advance warning signage and reflective temporary markings; variable message signs in high-volume areas; temporary pedestrian walkways physically separated from work zones, and cyclist detours; a public information campaign using local radio, TV and flyers; traffic-flow monitoring and periodic external safety audits. Community access continuity — paths to schools, markets, water points and health facilities — is an explicit design and construction requirement, reinforced by the community consultations of August 2026 which sought advance notice, speed control near schools and end-of-day reinstatement of access (RE-GROUP, 2026). These commitments are carried into the CESMP traffic-management plan. In segments S3 and S6 and at documented hotspots, a 20 km/h limit and node warning signs apply (BMP action A9), and communities are notified before a front enters S3 or S6 (action A10).

3.7 Materials and Material Balance

The pavement of Section 3.4 implies a large materials demand over the 83.75 km centreline: indicatively about 0.9 million m² of paved formation, of which the granular base and sub-base courses represent on the order of 0.4 million m³ of crushed and natural gravel materials and the two asphalt courses on the order of 0.12 million m³ of hot-mix asphalt, together with structural concrete for 82 culverts, bridge widenings and lined drains, and earthworks fill including replacement of soft ground. These are indicative planning estimates prepared by the ESIA team for assessment purposes only: the Design Proposal contains no cut/fill balance, mass-haul diagram or borrow/spoil volumes, and definitive quantities await the detailed design and bill of quantities (ICCO/CET, 2025). The CESMP will incorporate the final earthworks balance when issued.

The sourcing strategy emphasises local materials: rock for crushed aggregate and concrete from the identified quarry sites (granite/gneiss outcrops at Suaken and Ziah Town — Section 3.8); natural gravel for sub-base and fill from the sixteen registered borrow pits distributed along the corridor (Table 3.4); optimal reuse of excavated material; sand from approved local sources; and imported bitumen (60–70 pen) and cement. Aggregate crushing, hot-mix asphalt production and concrete batching will be undertaken at the Suaken plant complex (Section 3.8); the 2024 ESIA's planning assumption of minimum plant capacities — asphalt plant 250 t/h, crushing and screening 200 t/h, concrete batching 50 m³/h — remains the working estimate pending the Contractor's plant schedule (Earthtime, 2024). Materials extraction is subject to the

Minerals and Mining Law (2000) and MME requirements, tree felling within the RoW to FDA approval, and each pit and plant to the EPA permitting summarised in Section 3.8.

3.8 Ancillary Facilities — Canonical Register

The 2024 ESIA could describe ancillary infrastructure only generically, as siting was deferred to the contractor (Earthtime, 2024). The Contractor has now earmarked its sites, shared GPS coordinates (Contractor's kick-off meeting, Zwedru project site, 2 August 2026), and the ESIA team field-verified the principal sites in August 2026 (RE-GROUP, 2026). This section constitutes the **canonical register** for this ESIA, the CESMP and the EPA permit applications; the coordinate list of the Contractor's register is authoritative where minor GPS scatter exists between records, and the quarry numbering below is canonical (the UL laboratory certificate transposes the two quarry numbers). Site locations are shown in Figure 3.2.

Borrow pits. Sixteen borrow pits are registered, numbered BP1–BP17 with no BP10 (an omission to be confirmed with the Contractor). Five have August 2026 land-cover records: three were field-verified as low sensitivity (BP1, BP4, BP17) and two were flagged (BP2, BP3); soil-quality baselines were sampled at eight (SS-05 to SS-12 of the 2026 laboratory campaign); the remainder are recorded by coordinates only, with screening outstanding. Table 3.4 presents the register with screening notes.

Table 3.4: Borrow-pit register BP1–BP17 (UTM Zone 29N; ICCO/CET register with RE-GROUP 2026 verification)

ID	Easting	Northing	Corridor reach (indicative)	Land cover (Aug 2026)	Screening note
BP1	592687	673385	Zwedru end, near Gboleyville	Agriculturally degraded land	Field-verified; low sensitivity; soil baseline SS-05
BP2	583820	679728	Zaiyee Town–Zwedru reach	Young bush	Coordinates coincide with inland wetland **IW-007** — footprint shift and wetland screening required before use
BP3	586518	678582	Between Zaiyee Town and Zwedru	**Secondary forest**	Natural-habitat flag; FDA/EPA pre-clearance screening; alternative site or reduced footprint to be sought (Section 4.5); soil baseline SS-08
BP4	580235	681752	Zaiyee/Zuoyou reach	Young bush	Field-verified; low sensitivity
BP5	577488	684733	Near Zai Town	Not yet recorded	Coordinates only; soil baseline SS-09; screening outstanding
BP6	576417	684579	Zai Town reach	Not yet recorded	Coordinates only; soil baseline SS-10; screening outstanding
BP7	573793	684871	Zai–Pouh reach	Not yet recorded	Coordinates only; screening outstanding
BP8	570903	685378	Zai–Pouh reach	Not yet recorded	Coordinates only; screening outstanding
BP9	569967	685801	Pouh Town reach	Not yet recorded	Coordinates only; screening outstanding
BP11	554842	692813	Tian–Duogee reach; indicative GIS chainage about km 29 (segment S5); see Table 3.6	Not yet recorded	About 3 km from pangolin station T16 (Table 3.6); A3 overlay and pre-clearance walkover required before opening; soil baseline SS-06

ID	Easting	Northing	Corridor reach (indicative)	Land cover (Aug 2026)	Screening note
BP12	553249	692939	Tian–Duogee reach; indicative GIS chainage about km 27 (segment S4); see Table 3.6	Not yet recorded	Desktop check places the site about 0.9 km from pangolin detection station T16 (Table 3.6) — A3 overlay and pre-clearance walkover required; relocation if the overlay places it inside a pangolin polygon (Section 4.5)
BP13	550682	695304	Duogee–Sennehwein reach	Not yet recorded	Coordinates only; screening outstanding
BP14	550764	703310	Sennehwein–Toe Town reach	Not yet recorded	Coordinates only; outside the CSZ on desktop check (BMP A3 overlay to confirm); formal screening outstanding
BP15	549733	709253	North of Toe Town	Not yet recorded	Coordinates only; soil baseline SS-11; screening outstanding
BP16	551294	712671	Border segment (Goyeazon–Nicko reach)	Not yet recorded	Coordinates only; soil baseline SS-12; screening outstanding
BP17	553578	715065	Nicko Town area, border segment	Young bush	Field-verified; low sensitivity; soil baseline SS-07

Additional sites in the BFS ancillary package. BMP rev.3 (Table 3.2) also tests, from the BFS ancillary package, worker camps proposed at about km 12 (C-1, adjacent to the Towah swamp: screen before approval), km 45 (C-2, inside the pangolin reach: rejected under action A3; to be relocated west of km 38 or east of km 50 onto already-disturbed farm-bush) and km 73 (C-3, accept if the overlay is clear); three further quarries not individually chained (Q-3 to Q-5, screen before approval; two sites in the package require additional EPA permitting, to be named on the overlay sheet); four laydown areas (L-1 to L-4, part of the 18 ha ancillary package); and about 18 km of dry-season detours (D-1, each bypass in S3 or S6 screened and reinstated under action A8). None of these is in the Contractor's register of Tables 3.4 and 3.5; they are not approved sites, and any of them that the Contractor proposes to use enters the register only through the A3 overlay, the screening of Section 5.4.3 and the permits of Section 2.9.

Quarries, plants, camp and workshop. The other ancillary facilities are registered in Table 3.5. Suaken (also rendered Swaken/Suehken) Town, the quarry host community, lies off-corridor, approximately 6.5 km from Zuoyou Town, which is on the corridor.

Table 3.5: Quarries, plant sites, construction camp and mechanical site (UTM Zone 29N)

Facility	Host community	Easting	Northing	Description and status (Aug 2026)	Agreements and permits required
Quarry 1	Suaken Town (off-corridor)	580067	689841	Granite/gneiss rock pavement, about 6.5 km off-corridor and about 431 m **from the nearest dwellings**; young bush and agriculturally degraded land; two Contractor–community meetings held; **no MOU yet signed**; community willing subject to honoured commitments and equitable benefits; blasting-vibration concern for older fragile homes	Community lease/MOU; EPA quarry permit; MME explosives/blasting permit; vibration limits and pre-blast condition surveys
Quarry 2	Ziah Town	561723	687540	Rock outcrop on the outskirts of Ziah Town; alternative/supplementary source; screening and negotiations at an earlier stage	Community agreement; EPA quarry permit; MME blasting permit if used
Batching plant, asphalt plant and rock crusher (combined complex)	Suaken Town	580324	689901	Single plant complex about 700 m from Suaken Town, within young bush associated with a cocoa farm	Land agreement incl. crop compensation; EPA crusher/asphalt-plant permit and EPA concrete batch-plant permit; emissions and dust controls
RC2 candidate crusher site	Between Zaiyee Town and Zwedru	588703	675616	Candidate crushing site on the Contractor's list; **unscreened** — no field verification or baseline	Full ancillary-site screening before any use; land agreement; EPA permit
Construction camp	Zuoyou Town	578827	683905	About 4 acres (about 1.6 ha) within young bush; main accommodation and offices	Documented voluntary land agreement; EPA construction-camp permit; camp standards per the LMP
Mechanical (workshop) site	Zuoyou Town	578546	684165	Equipment maintenance yard within the settlement area, beside the corridor	Land agreement; inclusion under camp/works permits; hydrocarbon management controls

Ancillary sites are **outside the scope of the RAP**: land access is at the Contractor's expense through documented voluntary lease agreements or MOUs with landowning communities, failing which a RAP addendum must be prepared, reviewed by the IIU and cleared by the World Bank (RAP, 2025). The Suaken quarry MOU is the outstanding priority case. Each facility additionally requires its EPA environmental permit before operation — the Project's permit register comprises five EPA permits (road works; construction camp; quarry; crusher/asphalt plant; concrete batch plant) plus FDA, water-abstraction, MME and county clearances (Chapter 2).

Biodiversity siting rule. All ancillary siting is subject to BMP (rev.3) action A3: no new quarry, borrow pit, crusher, batching plant, camp or laydown may be opened inside the Chimpanzee Sensitivity Zone (km 18–20) or either pangolin Critical Habitat polygon (CH-West, km 38–44; CH-East, km 46–50). At detailed-design review the Contractor overlays every proposed or existing site on the BMP map and the Employer rejects any site that falls inside those areas (the siting freeze; BMP rev.3, Section 3.3 and Table 3.2). The rule is absolute for the zones the BFS records as sensitive, with particular caution at km 19 (a key chimpanzee crossing point). In addition, no facility may be sited within the Barteh Jam sacred grove or its agreed no-blasting buffer, the White-necked Picathartes outcrop buffer, or any sacred grove or sacred site (RE-GROUP 2026 cultural-heritage register SS-001–SS-006), and sites within 1 km of the CSZ boundary or of a pangolin detection station are flagged for the overlay. Table 3.6 gives the indicative corridor chainage of every registered site, computed in October 2026 by projecting the register coordinates onto the road centreline (national road layer, WGS 84 / UTM 29N); the values are indicative to about 1 km and do not replace the design-review overlay on the BMP polygon layer held by the IIU. On that basis Quarry 2, BP8 and BP9 lie in or at the edge of the pangolin reach by chainage, and BP12 and BP6 lie within about 1 km of a pangolin detection station (BP11 about 3 km from one); the camp proposed at about km 45 in the BFS ancillary package has been rejected outright (BMP rev.3, Table 3.2, row C-2). The screening of the registered sites against these rules, and the alternatives considered where conflicts arise (BP2, BP3, BP6, BP8, BP9, BP11, BP12, Quarry 2, RC2 and the km 45 camp), are presented in Section 4.6. Plates 3.3 to 3.5 illustrate the quarry site, borrow-pit verification and the Suaken host community.

Table 3.6: Indicative corridor chainage and BMP action A3 screening flags for the registered ancillary sites (RE-GROUP GIS check, October 2026; register coordinates of Tables 3.4 and 3.5 projected onto the road centreline; chainage indicative to about 1 km; pangolin station chainages from the BFS camera coordinates — the pangolin polygons are defined by chainage in BMP rev.3 Table 2.1, and the overlay on the IIU polygon layer is the deciding test)

Site	Indicative corridor chainage (km)	Segment (BMP rev.3)	Distance from centreline (km)	Nearest pangolin station (indicative chainage)	A3 overlay flag
BP17	0 (border; Nicko Town)	S1	0.9	—	No flag
BP16	2.4	S1	0.04	—	No flag; sacred-grove check (Barteh Jam km 3–4)
BP15	6.3	S1	0.1	—	No flag
BP14	13.2	S2 (Towah swamp)	0.01	—	Towah swamp PBF adjacency: no fill or spoil in the swamp
BP13	22.5	S4 (flora hotspot)	0.0	—	A4 walkover and Class A protocol before any cut
BP12	27.0	S4	0.03	T16 (about km 28), about 0.9 km	Flag — A3 overlay and A4 walkover; relocate if inside a polygon
BP11	29.1	S5	0.06	T16 (about km 28), about 3 km	Flag — A3 overlay and A4 walkover
Quarry 2 (Ziah Town)	38.8	S6 (CH-West boundary)	0.9	T21 (about km 41), about 2 km	Flag — A3 overlay; A2 hours if used while a front is in S6
BP9	48.9	S6 (CH-East by chainage)	0.1	T27 (about km 50), about 1.5 km	Flag — rejected under A3 if the overlay places it inside CH-East
BP8	50.0	S6/S7 boundary	0.03	T27 (about km 50), about 0.9 km	Flag — A3 overlay
BP7	53.2	S7	0.01	T27, about 3 km	No flag on chainage; overlay to confirm

BP6	56.1	S7	0.04	T30 (about km 56), about 0.6 km	Flag — station proximity; overlay to confirm (polygons end at km 50 by chainage)
BP5	57.2	S7	0.06	T30, about 1.3 km	Overlay to confirm
Quarry 1 and plant complex (Suaken)	57.6 (off-corridor)	S7	5.5–5.7	—	No flag; blasting controls (NV-02); Suaken MOU
Mechanical site (Zuoyou Town)	58.5	S7	0.0	—	No flag
Construction camp (Zuoyou Town)	58.9	S7	0.02	—	No flag; camp standards (SE-01)
BP4	62.0	S7	0.01	—	No flag
BP2	66.8	S7	0.05	—	Wetland IW-007 overlap — footprint shift
BP3	70.0	S7	0.04	—	Secondary forest — A4 walkover; alternative or reduced footprint
RC2 candidate crusher	73.8	S7	0.5	—	Unscreened — not in the permit basis
BP1	79.0	S7	0.07	—	No flag

Note to Table 3.6: the chainages projected for the pangolin camera stations (T16 about km 28, T21 about km 41, T27 about km 50 and T30 about km 56) do not coincide with the BFS assignment of the four White-bellied Pangolin events (stations T16, T18, T27 and T30) to the km 38–50 polygons (BFS, 2026, Table 4.7; BMP rev.3, Table 2.1). The difference arises from projecting the camera coordinates onto the reconstructed national road layer and is not resolved in this issue. It does not change any obligation: every site near a station on either basis (Quarry 2, BP6, BP8, BP9, BP11 and BP12) is flagged, and the deciding test is the overlay of each site on the BMP polygon layer held by the IIU at design review (action A3, gate G3). The IIU is to reconcile the station coordinates with the BFS consultant before that overlay is signed.



Plate 3.3: Aerial view of the proposed Quarry 1 site, an exposed granite/gneiss pavement approximately 431 m from the nearest dwellings — Suaken Town environs, August 2026 (RE-GROUP field survey)



Plate 3.4: Ancillary-site verification — ESIA team site assessment at a proposed borrow pit on cleared laterite ground — project corridor, August 2026 (RE-GROUP field survey)



Plate 3.5: Aerial view of Suaken Town, the nearest settlement and host community for the proposed quarry and plant complex; no MOU had been concluded at the time of survey — Suaken Town, August 2026 (RE-GROUP field survey)

3.9 Water Supply, Power and Workforce Accommodation

Water. Construction and domestic water will be drawn from surface water (the perennial rivers and creeks near the corridor) and from groundwater wells/boreholes to be established by the Contractor, the area having ample groundwater reserves (ICCO/CET, 2025). Volumetric demand has not yet been declared and will be quantified in the CESMP; every abstraction requires a water-abstraction licence under the Water Quality Regulations. Abstraction and construction runoff must not compromise community sources: the 2026 baseline shows community groundwater compliant but with suspended solids already at 69–80 per cent of the Class I limit, so wells and hand pumps require positive protection from construction sediment, and community commitments were recorded to repair or replace any damaged water points (RE-GROUP, 2026).

Power. Major corridor towns are connected to the national grid via the regional CLSG interconnection, but construction power at the camp, plants and work fronts is expected to come principally from Contractor generators; the arrangement, including fuel storage (bunded tanks) and refuelling controls, is to be specified in the CESMP. Relocation and reinstatement of the existing electricity poles and lines within the RoW — present along the whole route and aged in Zwedru City — will be coordinated with the utility and is budgeted through the RAP/contingency framework (RAP, 2025).

Accommodation. The workforce will be accommodated at the Zuoyou Town camp (Table 3.5), for which the Design Proposal provides prefabricated single-storey typologies: residential buildings of 70–140 m² (three-bedroom, dormitory and intermediate layouts) and a consultant office block with meeting and server/archive rooms (ICCO/CET, 2025). Camp layout, capacity and services (potable water, sanitation, wastewater treatment, waste management, security) are to be detailed in the Camp Management Plan of the CESMP and must meet the standards of the Project LMP, including separate secure sanitation for women, no worker occupation of community facilities, and the worker Code of Conduct. No workforce accommodation may be located inside the Chimpanzee Sensitivity Zone or a pangolin Critical Habitat polygon (BMP rev.3, action A3; Section 3.8).

3.10 Workforce and Equipment

The Contractor has not yet declared its construction workforce. Pending the CESMP, this ESIA carries forward the 2024 planning estimate of approximately 100 international and 680 national staff (of the national workforce, roughly 200 skilled, 180 semi-skilled and 300 unskilled), with the contractual requirement that local labour be prioritised and at least 30 per cent of employment opportunities be afforded to women (Earthtime, 2024) — figures to be read as estimates, and broadly corroborated by the RAP's planning assumption of about 750 workers over a three-year construction period (RAP, 2025). Recruitment will be channelled transparently through community structures, as requested in all 14 community consultations of August 2026; no person under 18 is employed — a minimum working age more stringent than the Decent Work Act (2015), which permits full-time employment from age 15 (Section 2.5.1); all workers sign the Code of Conduct, which prohibits sexual exploitation, abuse and harassment; and the workers' grievance mechanism operates separately from the community GRM (Chapters 2 and 7). Key supervisory staff include dedicated Environmental, OHS and Social Officers and a Community Liaison Officer for the Contractor, mirrored by specialists in the supervision team. The Contractor's suggested design organisation chart (Figure 3.5) already embeds an Environmental Department alongside the engineering disciplines; the construction-phase ESHS organisation to be set out in the CESMP is required to mirror this arrangement.

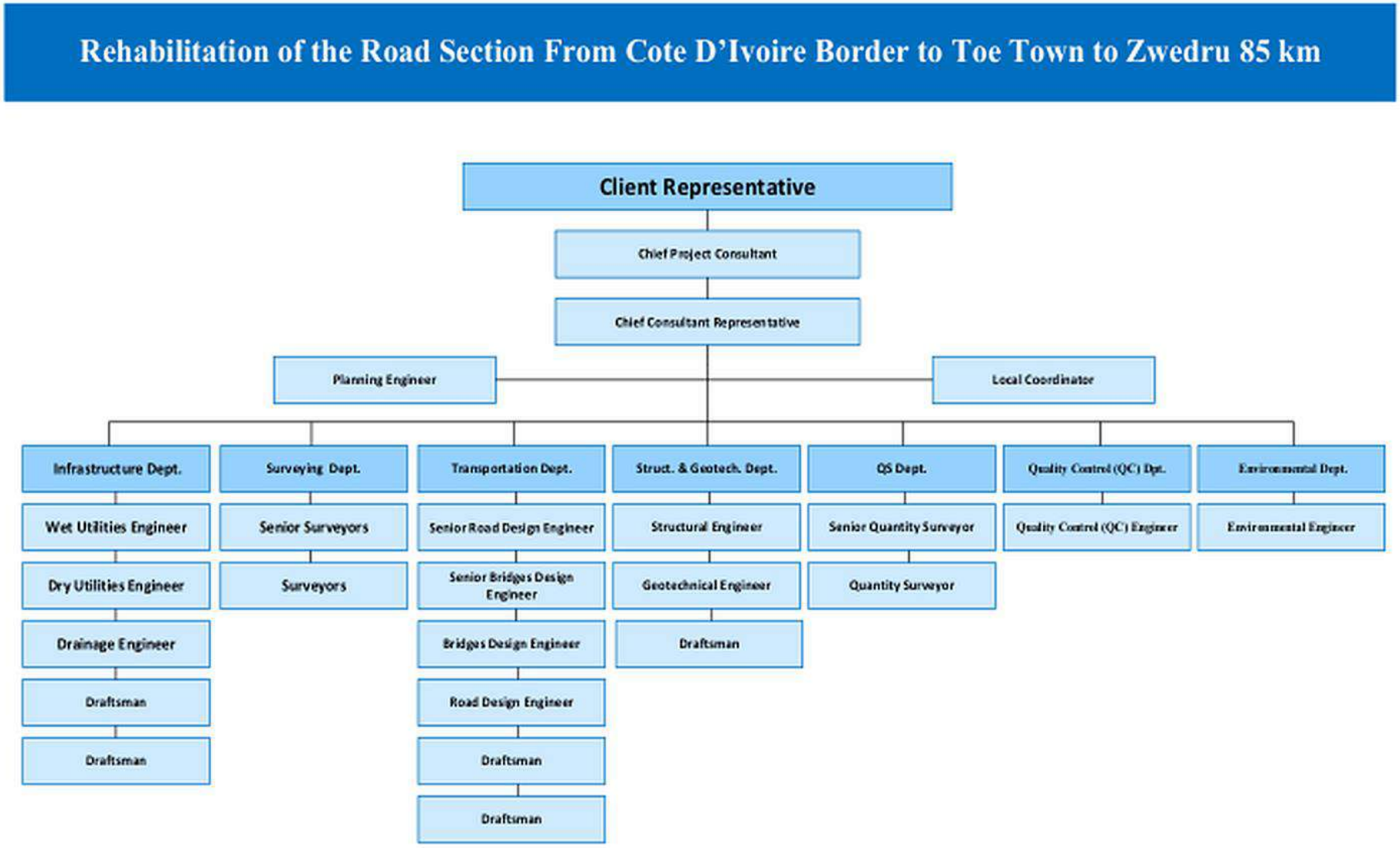


Figure 3.5: Contractor's suggested design organisation chart (adopted from the Contractor's Design Proposal (ICCO/CET, 2025, Fig. 4); reproduced for this ESIA; cropped from the proposal page).

The construction fleet has likewise not been declared. The 2024 planning minimum — asphalt paver, six compaction rollers, front-end loaders, motor graders, excavators, bulldozers, pug mills, a crane of at least 20 t, sixteen dump trucks/tippers, mobile workshop, tow truck and ambulance, together with crushing, asphalt and batching plant and laboratory equipment — remains the working assumption for the assessment of noise, emissions and traffic (Earthtime, 2024). The definitive fleet, with plant emissions and noise data, is a CESMP input.

3.11 Waste Streams and Emissions Sources

Construction will generate the following principal waste streams, with management destinations as indicated; quantities are 2024 planning estimates to be refined in the CESMP waste-management plan (Earthtime, 2024):

- Municipal solid waste from camp and offices: about 280 kg/day (about 165 kg biodegradable, about 115 kg non-biodegradable) — segregated at source, removed by an EPA-certified waste collector; no burning and no burial on site.
- Sewage and sludge: about 30 m³/day of wastewater (order-of-magnitude planning figure; to be confirmed in the CESMP) — septic systems at the camp, emptied by a certified service provider.
- Spoil, unsuitable/swamp excavation material and stripped topsoil — topsoil stockpiled for reinstatement; surplus spoil placed only at approved, screened disposal sites away from wetlands and watercourses; drainage desilting arisings tested before disposal.
- Bituminous wastes (cut-back, spillage, plant residues) and empty bitumen containers — cleaned and consigned to authorised dealers/recyclers.
- Hazardous wastes (used oils and filters, hydraulic fluids, batteries, paints, contaminated soils) — stored on bunded, covered hardstanding and consigned under the EPA hazardous-waste requirements to licensed handlers.
- Construction and demolition waste, including the demolished Zwedru pavement, and scrap metal — reused as fill where suitable or consigned to authorised recyclers/dealers.

The principal emissions sources are: fugitive dust (PM10/PM2.5) from earthworks, unpaved haul routes, borrow pits, crushing and material handling — the dominant community concern given the very low measured baseline (PM2.5 5.8–7.3 µg/m³ at the 18 stations reported in the 2026 campaign; Section 6.5); combustion emissions from the asphalt plant, batching plant, generators and vehicle fleet (NOx, SO_2, CO, VOCs); noise from plant, haulage and the crusher (baseline 46–55 dB(A) at the 20 co-located stations); blasting noise and ground vibration at Quarry 1, subject to permit conditions and to the prohibition of blasting in the CSZ and the pangolin polygons (BMP rev.3, action A2); night-lighting spill, with no night work in those areas and lighting at camps and security positions in or adjoining segments S3 and S6 directed downward and kept off the no-go core (BMP rev.3, Section 5.2); and wastewater/sediment-laden runoff from work fronts, plants and washdown areas, controlled by silt fences, sediment traps and retention ponds (ICCO/CET, 2025). Greenhouse-gas sources (materials production, plant and haulage fuel, land-use change) are identified qualitatively, as in the 2024 ESIA; an order-of-magnitude construction-phase estimate is presented in Section 10.7, to be recomputed from the CESMP quantities. Discharges and emissions are additionally subject to the EPML effluent-discharge, solid and hazardous waste and pollution-emission licences (Chapter 2).

3.12 Decommissioning and Reinstatement of Ancillary Sites

All ancillary sites are temporary facilities to be decommissioned at works completion and reinstated before the end of the defects-liability period. The Contractor's design methodology already commits to reconditioning borrow and spoil pits for agricultural reuse or ecological restoration, with integrated drainage and erosion control (ICCO/CET, 2025); the 2024 ESIA requires restoration of all sites to pre-construction condition or better, with revegetation and post-construction monitoring (Earthtime, 2024). For this ESIA the reinstatement scope comprises: dismantling and removal of the camp, plants and workshop; a contamination survey of fuel, bitumen and maintenance areas with remediation of any hydrocarbon-

affected soils; regrading of pits to stable, free-draining profiles (no standing water attractive to disease vectors unless a community water use is formally agreed with safety measures); battering and making safe of quarry faces; replacement of stockpiled topsoil; and revegetation of the opened footprint with native species from the BFS planting palette to the standard of BMP (rev.3) action A8: at least 70 per cent cover by the end of the first rainy season after planting and at least 60 per cent survival of planted stems, failing which replanting at five for one at the Contractor's cost, with taking-over of the section withheld until the standard is met. Handback of each site follows the terms of its lease/MOU, with community sign-off, and closure is verified against the conditions of the relevant EPA permit through a joint EPA/IIU inspection. Detailed site-by-site reinstatement plans are a required element of the CESMP and of each permit application.

3.13 Project Activities Summary by Phase

Table 3.7 summarises Project activities by phase. This activity register is the screening basis for the identification of impacts (Chapters 8 and 9, covering predictable changes from these planned activities) and risks (Section 9.8, covering unplanned events).

Table 3.7: Summary of Project activities by phase

Phase	Principal activities
Pre-construction (design and mobilisation)	Topographic, geotechnical, hydrological and traffic surveys; detailed design and design review; RAP implementation — compensation completed and cleared before works; ancillary-site screening, land agreements/MOUs and RAP addendum where required; EPA, FDA, MME, water-abstraction and blasting permits; camp and plant establishment; utility survey and relocation agreements; recruitment and worker induction (Code of Conduct, biodiversity and SEA/SH modules); baseline verification monitoring; BMP siting overlay of every ancillary site at detailed-design review (action A3); demarcation materials and method statement for the no-go core (A1); CESMP to contain the BMP zone rules, supervision checks and stop-work triggers before a front enters S3 or S6 (BMP rev.3, Table 8.2)
Construction	Clearing and grubbing within the RoW; topsoil stripping and stockpiling; earthworks (cut/fill; soft-ground replacement); borrow-pit and quarry operation, including controlled blasting outside the Chimpanzee Sensitivity Zone and the pangolin Critical Habitat polygons; crushing, asphalt and concrete production; materials haulage; culvert and drain construction; bridge rehabilitation and widening with pedestrian walkways; pavement laying; urban covered drains, sidewalks and kerbs; road furniture, signage and markings; traffic management, detours and temporary access; dust suppression and sediment control; progressive slope grassing and reinstatement

Phase	Principal activities
Operation and maintenance	Public traffic at design speeds (80/60 km/h); routine maintenance (drain and culvert cleaning, vegetation control, pothole/surface repairs, signage and marking renewal); periodic resurfacing; bridge and structure inspections; axle-load management; emergency repairs after storm events
Decommissioning of ancillary facilities (construction close-out)	Plant and camp dismantling and demobilisation; contamination survey and remediation; regrading, topsoil replacement and revegetation of pits, quarry and plant sites; community handback under lease/MOU terms; EPA permit-closure inspections; post-construction monitoring through the defects-liability period

The operation-phase activities are undertaken by MPW (or a maintenance contractor) following handover; the environmental and social obligations attaching to each phase are carried in the standalone ESMP, the CESMP and the BMP (rev.3).

3.14 Retaining Structures and Works in Hilly Terrain

The corridor traverses rolling terrain between approximately 150 m and 320 m above sea level, with the more pronounced relief — incised stream valleys, side-long ground and cut-prone slopes — concentrated in the central reaches, including the erosion-susceptible belt at approximately km 30–45 and the approaches to the larger stream crossings. The Contractor's Methodology Statement — Design (ICCO/CET, June 2025) covers the pavement, alignment and drainage design, including the full culvert schedules reproduced at Appendix A; **it does not yet include a retaining-wall schedule or slope-stabilisation designs for the hilly sections**. Under the design-and-build contract these elements are produced progressively at detailed design, and this ESIA therefore fixes the framework under which they will be designed, screened and approved rather than leaving them unaddressed:

1. **Design provisions already fixed.** The geometric design caps gradients at 6%, and the drainage design (10/50/100-year flood standards, lined drains, riprap protection at outfalls) is dimensioned to protect the formation and adjacent land. Embankment and cut slopes follow the design standards of Section 3.2, with benching, topsoiling and re-vegetation of exposed faces under the erosion-control measures of Chapter 10.
2. **Retaining-wall and slope-stabilisation schedule — a committed design deliverable.** For every section in hilly terrain, the Contractor's design engineer shall identify, before works in that section, the locations requiring retaining structures (gravity, gabion or reinforced-concrete walls), slope treatment (benching, drainage, bioengineering) or protection works, and shall issue a section-by-section schedule with typical details for Supervising Engineer review and IIU acceptance. The schedule and designs are reviewed against this ESIA: footprints must remain within the right-of-way, respect the biodiversity geofences (Section 3.8; Appendix T) and the cultural-heritage register (Section 8.6), and carry section-specific erosion-control and spoil-management method statements.
3. **Assessment coverage in the interim.** The impact assessment (Chapter 9) and the ESMP (Chapter 11) treat cut-and-fill slopes, side-long ground and wall construction generically but bindingly — slope-failure and erosion risk, spoil generation and disposal, drainage concentration, worker safety in excavations, and visual effects — so that the later schedule changes no conclusion of this report; if detailed design identifies a wall or stabilisation measure whose footprint or method falls outside what this chapter describes, the change-management procedure of the ESMP (Chapter 11) applies before execution.

4. **Measurable design limits for schedule review.** Each hilly-terrain schedule is tested against fixed limits as well as the right-of-way, biodiversity-geofence and heritage-register checks: a maximum unsupported cut height of **6 m** and a maximum single-tier wall height of **4 m** (greater heights only with a specialist geotechnical justification and tiered, benched design); a total disturbed width at any chainage not exceeding the right-of-way and, in the sensitive stretches, not exceeding **25 m**; and no new clearing outside the pegged working width. In the stretches that coincide with the flora hotspot and the pangolin Critical Habitat — km 18–28, km 30–45 and km 38–50 — each schedule additionally requires the Biodiversity Specialist's written sign-off before acceptance, and the limit tests extend to wetlands, stream banks and the riparian buffers of Table 2.8. No works start in a section until its schedule is accepted. A schedule that fails or exceeds the limits is returned for redesign; where a compliant design is not practicable and the change is material to this assessment, an ESIA addendum is prepared through the change-management procedure before that section proceeds. Under the works contract, the tasks are priced as lump-sum activities and sub-activities outlined in the Schedule of Priced Activities (Section 3.16, Table 3.9). There is no measured Bill of Quantities for the cross-drainage, culvert, retaining wall, and slope stabilization works at this stage. The itemized quantities and rates for these elements will be provided with the design-schedule packages during the detailed design phase. These quantities are included within the lump sums for site works and concrete works of Activity 3, as well as the design services of Activity 1. Their acceptance is confirmed by the Engineer for each package..

The position is stated plainly: the schedules are a pending detailed-design output of the design-and-build contract, and the ESIA's role — discharged here — is to bind their production, screening and approval to defined standards and gates. This is consistent with the Monitoring Consultant's status reporting that the number and extent of hydraulic and cross-drainage structures, retaining walls, cut-and-fill quantities and material requirements will be determined and confirmed following the finalisation and approval of the detailed design (Section 3.16).

3.15 Nature of the Works Contract: Design and Build

For the avoidance of doubt, the works contract is a design-and-build contract. The ICCO/CET Joint Venture (International Consolidated Contractors Offshore S.A.L. and Consolidated Engineering and Trading Co. S.A.L.) was engaged by the IIU/MPW under RFP No. LR-IIU-404122-CW-RFP to both design and construct the works; its Design Proposal and Methodology Statement — Design (June 2025) is the design basis described in this chapter, and detailed design proceeds in parallel with early works under Employer review.

The road project is procured under a Design and Build Contract: the Contractor is responsible for the design, engineering and construction of the Works, including all associated studies, investigations and approvals required for completion of the Project. The contract is let on the FIDIC Conditions of Contract for Plant and Design-Build (Second Edition, 2017) (LEA Associates South Asia, 2026). The principal components of the Project include:

- detailed engineering design for the entire 85 km of Project corridor;
- rehabilitation of approximately 75 km of roadway under the current implementation programme;
- provision for rehabilitation of an additional 10 km section, subject to funding availability;
- construction related to bridges and associated structures in accordance with the Contract, and rehabilitation and construction of drainage structures;
- pavement rehabilitation;
- road safety improvements;
- traffic management measures;
- environmental and social mitigation measures;
- utility coordination where required; and

- all ancillary works necessary for successful completion of the Contract.

The Contractor is also required to provide facilities, offices, laboratories, accommodation, vehicles and other resources for use by the Employer and the Monitoring Consultant in accordance with the Works Contract specifications.

Three consequences for environmental and social management follow from this contract form, and this report is built around them. First, design detail matures progressively: elements such as the retaining-wall schedules (Section 3.14), the final earthworks balance (Section 3.7) and the ancillary-facility layouts are completed during implementation, so this ESIA fixes binding envelopes, siting controls and approval gates rather than frozen quantities, and the change-management procedure of the ESMP governs anything that moves outside them. Second, the Contractor carries the delivery of the environmental and social design features — the 82-culvert drainage system, the wildlife crossings and canopy bridges of the BMP, borrow-pit reconditioning for agreed after-uses, and community access works — priced and finalised through the normal mechanisms of the works contract and verified by the Supervising Engineer before acceptance. Third, the Contractor's ESHS obligations are contractual: the CESMP and its constituent plans, the biodiversity compliance plan required by the BMP (Appendix T), the codes of conduct, and the penalty and performance-security provisions operate inside the contract, with the IIU as Employer and the World Bank exercising review and No Objection at the gates fixed in the ESCP.

3.16 Project and Contract Particulars, Implementation Arrangements and Programme

This section consolidates the initial project information and the current contract particulars, drawing on the Monitoring Consultant's project information (LEA Associates South Asia, 2026) and the Contractor's design documentation (ICCO/CET, 2025).

The Contract is of a Design and Build nature. The Contractor is therefore responsible for the preparation, updating and implementation of all road design details based on current site conditions, engineering investigations and contract requirements. The updated project information and road design details form the basis for the execution of the Works and shall comply with the Employer's Requirements. Design submissions are reviewed by the Monitoring Consultant on behalf of the Employer, and — under the procedures fixed by this ESIA — each submission is also checked against this report, the ESMP and the BMP before approval (Sections 3.14 and 3.15).

Table 3.8: Project and contract particulars (LEA Associates South Asia, 2026; ICCO/CET, 2025)

Item	Description
Project title	Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (85 km)
Country / location	Republic of Liberia — Toe Town – Zwedru corridor, Grand Gedeh County
Sector / financing	Transport / road infrastructure — World Bank (RETRAP-AF; P175263 / P181083)
Employer	Infrastructure Implementation Unit (IIU), Ministry of Public Works
Engineer (Monitoring Consultant)	LEA Associates South Asia Pvt. Ltd. — monitoring and supervision consultancy services; commencement 3 August 2026; duration 36 months plus 12 months defects liability; mobilised
Contractor	International Consolidated Contractors Offshore S.A.L. (ICCO) / Consolidated Engineering & Trading Co. S.A.L. (CET) — Joint Venture

Item	Description
Contract type	Design and Build — FIDIC Conditions of Contract for Plant and Design-Build, Second Edition (2017)
Procurement reference	LR-IIU-404122-CW-RFP
Letter of Acceptance	18 March 2026
Contract Agreement	5 May 2026
Commencement date	24 August 2026
Time for completion	1,095 calendar days (36 months)
Original contract amount	US$ 63,392,345.04
Defects liability period	12 months
Current status	Mobilisation, survey and design stage; detailed design completed for approximately the first 10 km from Zwedru (km 85 to about km 75) and progressing westward; civil works not yet commenced — early works at the Zwedru end subject to C-ESMP approval and the conditions precedent
Currency	United States Dollar (USD)

Status at the date of this edition. The Project is in the mobilisation and pre-construction phase, and **civil works have not yet commenced**. Completed: the Contractor's site kick-off at Zwedru (2 August 2026), the Engineer's mobilisation (3 August 2026) and the contractual commencement (24 August 2026). Ongoing: mobilisation of personnel, equipment and engineering resources; topographic, geotechnical and hydrological surveys; and design data collection. Planned: detailed-design submissions through the Engineer's review; approval of the Contractor's Environmental and Social Management Plan (C-ESMP); and thereafter early works at the Zwedru end — **which will not start until the C-ESMP is approved** and the applicable conditions precedent of Table 11.5 (permits in hand for the activity, RAP clearance for the affected sections, and the BMP gates for any sensitive segment) are verified in writing. The number and extent of hydraulic and cross-drainage structures, retaining walls, cut-and-fill quantities and material requirements will be determined and confirmed following the finalisation and approval of the detailed design (LEA Associates South Asia, 2026); the design-stage schedules presented in Sections 3.5 and 3.7 and Appendix A are the current record (building on the condition survey's 82 existing structures: five bridges, 69 pipe culverts and eight box culverts — Section 3.5), and changes at detailed design pass through the design-review and change-management gates of Sections 3.14 and 3.15 and the ESMP. At the Zwedru end specifically, the activities carried out since the kick-off of 2 August 2026 are: the site kick-off meeting and establishment of the Contractor's project office at Zwedru; topographic, geotechnical, hydrological and traffic surveys and design data collection along the corridor; identification and GPS referencing of candidate ancillary sites (no site opened); and community consultations and Notice-of-Intent posting for this ESIA (August 2026). These are survey, design and engagement activities: under the EPML and the EPA's ESIA Procedural Guidelines they require no construction permit, and they were carried out under the works contract and the Engineer's supervision with the landowners' and communities' consent recorded in the consultation record (Chapter 5). No vegetation clearing, earthworks or other civil works have been executed at the Zwedru end or elsewhere. The conditions before works (Table 11.5) accordingly remain live for every section including Zwedru: the EPA permit follows this ESIA; the C-ESMP (with the CBCP) must be approved, RAP compensation completed, Bank-cleared and notice run on the affected front, and the Section 3.8/3.14 design gates passed, before any civil works — including early works at the Zwedru end — commence.

Design progress and the integration of environmental and biodiversity considerations (status at 13 November 2026). Alongside the surveys, the Contractor has commenced the detailed engineering design and is progressing it from the Zwedru terminus (km 85+000) westward toward Toe Town. Detailed design has been completed for approximately the first 10 km from Zwedru (about km 85 to km 75), and the remaining sections follow in design-schedule packages as the survey data are consolidated. The completed and ongoing design work comprises the geometric design and alignment refinement within the existing road reserve; the pavement design; the hydraulic and drainage design, including the sizing of the pipe and reinforced-concrete box culverts and the assessment of the existing bridges; the slope-stabilisation and erosion-control measures of the cut-and-fill sections; and the road-safety features (signage, markings and traffic calming at settlements). Each package passes through the Engineer's design review and the environmental and social gates of Sections 3.8 and 3.14 before it is accepted.

Auxiliary facilities. The planning of the quarries, borrow pits, spoil-disposal areas, storage and stockpile areas, workers' camps and equipment yards proceeds with the design. Each candidate location is identified, GPS-referenced and screened against the sensitivity mapping of Chapter 7 — the Chimpanzee Sensitivity Zone, the pangolin Critical Habitat polygons, the Priority Biodiversity Features, the sacred sites and the wetland inventory — through the BMP action A3 overlay (Section 3.8; Tables 3.4 to 3.6), so that no facility is sited in or beside a sensitive area and the Critical Habitat polygons are excluded from every support footprint. No site has been opened, and none will be opened before its screening, its permits and the Supervising Engineer's signed overlay are in place.

Biodiversity and wildlife measures carried into the design. The design incorporates the wildlife-related measures of Chapter 10 and the BMP. The wildlife-sensitive areas and movement corridors documented by the BFS are avoided by the ancillary footprint and the alignment does not leave the existing road reserve, so that cross-corridor connectivity is retained; wildlife-crossing warning signs and environmental awareness signage are carried in the road-furniture design at the approaches to segments S3 and S6 and at the other documented hotspots (BMP action A9; Section 10.6); the drainage and crossing structures are designed, where the BFS documents a movement hotspot, so as to facilitate wildlife movement — oversized or dry-bench culverts and canopy connections to the design engineer's drawings (action A6) and the span or large box culvert at the Towah swamp (action A7); speed management applies in the areas of elevated crossing risk (the 20 km/h limit for Project vehicles and plant in the nodes during the works, and the posted limits of the permanent design); and the construction-phase environmental controls of the standalone ESMP are written into the method statements that accompany each package.

Conclusion. The design is therefore advancing on a programme that integrates the engineering, environmental and biodiversity requirements of this ESIA from the outset: the measures of Chapter 10, the BMP actions and the design gates of Sections 3.8 and 3.14 are applied as the design is produced rather than retrofitted, and the Supervising Engineer's review of each package — with the written sign-off of its environmental specialist in the sensitive stretches — is the control that confirms them before any works.

Design scope and the implementation programme. The Contractor is contractually required to undertake the detailed engineering design for the **entire 85 km Project corridor**. The rehabilitation works presently included within the implementation programme comprise approximately **75 km**, while the rehabilitation of the remaining **10 km** is subject to the availability of Government of Liberia funding, as clarified during the pre-contract discussions; the Contractor's design obligation extends to the full 85 km irrespective of the implementation status of that section (LEA Associates South Asia, 2026). For environmental and social purposes the position is correspondingly clear: **this ESIA assesses and covers the full 85 km corridor**, so the deferred section remains fully assessed, its baseline, impacts and mitigation are established in this report, and — if and when its rehabilitation is funded — works there proceed under this ESIA, the ESMP and the BMP, with the CESMP extended to the additional section through the change-management procedure rather than by a new assessment, unless the design then departs from the envelopes fixed in this report.

Contractual framework. Implementation is governed by two principal contracts: the Consultancy Contract between the Employer and the Monitoring Consultant, and the Design and Build Works Contract between the Employer and the Contractor. These establish the responsibilities of the Employer, the Monitoring Consultant and the Contractor, and define the procedures governing contract administration, design

review, quality assurance, programme management, environmental and social management, payment, testing, completion and defects notification. The Monitoring Consultant administers the Contract within the authority delegated by the Employer — reviewing the Contractor's designs and submissions, monitoring compliance with contractual obligations (the ESHS obligations among them), and advising the Employer throughout the execution of the Works. Its mobilisation materially answers the supervision-capacity lesson of the Ganta–Tappita corridor recorded at Appendix W (Table W.1, lesson 7): employer-side supervision is in place from the design stage, before the main works fronts open.

Contract price structure and the Bill of Quantities. The contract price of US$63,392,345.04 is built up in the Price Schedules of the Contract (printed pages 239 to 259) as lump-sum activities and sub-activities rather than as a measured Bill of Quantities (Table 3.9): design services (Activity 1), mobilisation and site establishment (Activity 2), construction of the 75 km road (Activity 3 — site works, bituminous construction, concrete works and incidental works), environmental and social management (Activity 4) and health and safety management (Activity 5), with a daywork schedule, specified provisional sums (including US$100,000 for specific environmental and social outcomes) and a provisional sum of US$4,000,000 for contingency allowance — every provisional sum being expended only at the direction of the Engineer under Sub-Clauses 13.4 and 13.5 of the General Conditions. The 10.5 km Toe Town – Côte d'Ivoire border section is priced separately as optional works. Measured quantities and rates for the cross-drainage structures, culverts, retaining walls and slope-stabilisation works are therefore produced with the design-schedule packages (Section 3.14) and the Bill of Quantities that the Contractor itemises at design finalisation; the environmental and social allowances of the standalone ESMP (ESMP Section 8) are reconciled with the contract's priced activities and, line by line, with the itemised Bill of Quantities within 30 days of each accepted package (ESMP Section 1.5).

Table 3.9: Works-contract price structure — Schedule of Priced Activities and Grand Summary (ICCO/CET Joint Venture; Contract Agreement 5 May 2026; US$)

Activity / item	Sub-activities (US$)	Amount (US$)	Environmental and social content
Activity 1 — Design services for the 75 km and the 10.5 km sections	Geotechnical investigation 350,000.00; inception design 200,000.00; detailed design 550,000.00; as-built drawings 100,000.00	1,200,000.00	Design-schedule packages of Section 3.14 (retaining walls, slopes, cross-drainage, culverts); BMP action A3 overlay and A6/A7 drawings as design tasks
Activity 2 — Mobilization and site establishment	Mobilization of the Contractor's personnel and equipment and site establishment 5,100,440.27; offices, accommodation, laboratory and transportation for the Engineer 4,327,839.37	9,428,279.63	Camp establishment and camp controls (ESMP Section 3.8); Contractor ESHS staffing, plans and systems (ESMP Table 8.3, preliminary-and-general items)
Activity 3 — Construction of the 75 km road	Site works 9,915,849.44; bituminous construction 26,830,604.21; concrete works 8,623,476.95; incidental works 1,061,183.73	46,431,114.33	Works-embedded mitigation of the ESMP sub-plans (ESMP Table 8.3); BMP actions A1, A4, A7 (structure), A8 and A9; the cross-drainage, culvert, retaining-wall and slope works whose quantities follow the design-schedule packages
Activity 4 — Environmental and social management	Environmental and social impact assessment 45,000.00; stakeholder engagement 20,000.00; environmental and social monitoring and mitigation 430,000.00; grievance redress mechanism 25,000.00	520,000.00	The contract's explicit environmental and social line: Contractor E&S monitoring and reporting, engagement, GRM; E&S-specific BMP items (A1, A5, A10) as the C-ESMP costing allocates
Activity 5 — Health and safety management	Health and safety risk assessment 45,000.00; stakeholder engagement 20,000.00; health and safety monitoring and mitigation 420,000.00; grievance redress mechanism 25,000.00; security and guards 30,000.00	540,000.00	OHS and welfare, emergency preparedness, community safety and security management (ESMP Sections 3.10, 3.11 and 3.16)

Total of priced activities (A)	—	58,119,393.96	—
Daywork — provisional sum (B)	Daywork schedule (labour, materials, equipment)	22,951.08	Dayworks as instructed by the Engineer
Total of activities and daywork (C = A + B)	—	58,142,345.04	—
Provisional sum for contingency allowance (D)	—	4,000,000.00	Source of BMP Table 7.2 corrective work and other instructed environmental and social corrective work; expended only at the direction of the Engineer (Sub-Clauses 13.4 and 13.5)
Sub-total (E = C + D)	—	62,142,345.04	—
Specified provisional sums (I)	Employer's portion of DAAB costs 150,000.00; provisional sums for any specific environmental and social outcomes 100,000.00; provisional sum to be determined by the Employer 1,000,000.00	1,250,000.00	The US$100,000 environmental and social provisional sum: source of the A6 evidence-led structures (BMP Table 9.1; ESMP Table 8.3) and of other specific E&S outcomes instructed by the Engineer
Contract price (J = E + I)	—	63,392,345.04	Against which the Contractor-borne environmental and social allowances of the standalone ESMP (ESMP Section 8) are itemised at design finalisation and reconciled under ESMP Section 1.5
Optional works (outside the contract price)	Construction of the 10.5 km Toe Town – Côte d'Ivoire border section	8,582,116.83	The deferred 10 km section of Section 3.16; assessed in full by this ESIA; ESMP allowances scale with its quantities if it proceeds

Source: Design and Build Contract, Rehabilitation of the Road Section from Côte d'Ivoire Border to Toe Town to Zwedru (85 km), RFP LR-IIU-404122-CW-RFP — Price Schedules (Schedule of Priced Activities, printed page 241; Schedule of Priced Sub-Activities, pages 242–243; Daywork, pages 244–255; Specified Provisional Sums, page 257; Grand Summary, page 259). Amounts in United States dollars as contracted; the environmental and social content column is this ESIA's reading of where the measures of Chapter 10, the BMP and the standalone ESMP are carried, confirmed in the C-ESMP costing (ESMP Section 1.5).

Programme. From the commencement date of 24 August 2026, the 36-month time for completion runs to August 2029, followed by the 12-month defects notification period to August 2030; the ESMP, the BMP and the monitoring programme of Chapter 11 apply across both periods. Upon the expiry of the defects notification period, responsibility for the operation and maintenance of the road passes to the MPW as the road authority — which may engage maintenance contractors for that phase — and the operation-phase commitments of this ESIA attach to the road authority accordingly (Section 11.9). The objectives the Project serves — year-round accessibility, a safe all-weather road, reduced vehicle operating costs and travel times, improved access to social services and markets, regional trade, road safety and sustainable socio-economic development — are the benefit case assessed at Chapter 9, and the Works are implemented in accordance with the applicable World Bank Environmental and Social Framework as set out in Chapter 2.

4 ANALYSIS OF ALTERNATIVES

This chapter presents and discusses the various alternatives for the rehabilitation of the Ivory Coast Border – Toe Town – Zwedru Road (85 km). The analysis of alternatives discusses alternative routes, construction approaches, the “Do Nothing” alternative, and — added in this revision — the siting alternatives for the ancillary facilities.

4.1 Basic Rationale

The Ivory Coast Border – Toe Town – Zwedru Road has deteriorated to an extremely poor condition. As one of the nation’s main strategic linkages, it represents a serious bottleneck on development. Given that the road already exists, and parts deteriorate to a very bad condition every wet season, there can hardly be a serious case to be made against its being upgraded. The main benefits of the Project are expected to be in the form of reduced vehicle operating costs and time savings for existing and generated traffic, leading to improved access of farmers along the road to markets, reduced agricultural input and marketing costs, and improved access to social service facilities. These are expected to improve rural agricultural and non-agricultural productivity and development.

In addition to the economic benefits from a better road, environmental benefits will include a marginal net reduction in the total vehicle emissions in the short term because of improved travel conditions. Due to the sealing of the highway, there will be much less polluted runoff from the road surface during the wet season, and lower dust levels in the dry season.

4.2 Alternative Routes

Overall, the route from the Ivory Coast Border to Toe Town and Zwedru is relatively direct, intercepting 21 settlements, including 2 relatively large towns (Toe Town and Zwedru), and 19 other smaller towns, villages and hamlets. However, it has few straight sections because of the undulating terrain and the need to cross the numerous stream lines at advantageous points. The road was never properly engineered initially, but developed as an earth track along the naturally best alignment. If a completely new road were to be constructed, it would follow a straighter alignment with broader curvature. As it is, the road will need some of the twists and bends to be removed in order to make the higher design speed safer and more comfortable. However, it is not intended to realign more than short sections, and to utilise the existing alignment to the greatest extent possible. By this means, the Project will avoid the need for significant additional land take and further impacts on habitats (flora and fauna). The micro-alignment adjustments adopted since the 2024 ESIA — most notably the 35 m lateral shift at approximately km 53 to avoid a verified pangolin camera-trap microsite and its forest fragment — apply this same principle at the scale of individual sensitive features (see Chapter 7 and Appendix T).

4.3 Alternative Construction Approaches

The existing road and the proposed new design are both summarised in Chapter 3. The existing road is mostly an earth surface, generally at the same level as the surrounding ground. Some parts may have had embankments in the past, but they have been eroded away. Most of the unbound gravel surfacing that may have been applied in the past has also been eroded away. This does not allow a road to be kept serviceable during the wet season, because the ground simply saturates and is washed out by passing traffic. The proposed design will construct a laterite embankment, topped with selected materials that meet engineering strength qualities and sealed with bitumen-based asphalt. By raising the road above the surrounding land, the whole formation is kept dry and therefore retains its strength. This is the key to ensuring both maintainability and longevity.

The constraint of the proposed approach is that it requires considerable volumes of the various materials. In turn, this leads to the need for significant areas of borrow pits to provide the laterite fill for the embankment, and quarries to provide the hard stone aggregates for the granular road base and chippings for the asphalt. Winning these materials involves considerable additional land take and permanent disturbance of the land surface. However, there is no realistic alternative to the standard design of an embankment road across the highly weathered residual soils of the Liberian hinterland, under the very

humid climate. This is a tried and tested approach used throughout the world and is straightforward to construct. In environmental terms, the local sourcing of materials at least means that the impacts of the Project are restricted to the immediate vicinity.

Alternative surfacing materials could be considered in place of bituminous asphalt. The main alternatives are gravel or a cement-based material. Gravel is traditionally used on low-traffic roads, but it is frequently difficult to obtain a reasonable quality of material. Many gravels are derived from riverine or alluvial sources, with the result that particles tend to be rounded and lack both the sharp edges required to achieve a good interlock and the fine material needed for binding. Laterite-based gravels often contain too high a proportion of clay, making them weak and cohesionless when wet. For these reasons, gravels tend to require very high maintenance regimes. Also, they do not have the same surface smoothness and friction coefficients as asphalt, making them considerably less safe for higher traffic speeds. Concrete aggregate surfacing based on Portland cement (rather than bitumen, which is the binder used in asphalt) has been used widely in some parts of the world. It can form a durable surface, but is slower and more costly to construct than an asphalt surface. For significant road lengths, such as the 85 km Ivory Coast Border – Toe Town – Zwedru Road, the additional cost would be significant. By limiting the construction cost, the MPW can ensure that additional studies needed, such as a biodiversity field survey for the Ganta–Zwedru Highway, can be completed under the RETRAP project — a study that has, since the 2024 ESIA, in fact been completed and is incorporated in this revision (Chapter 7 and Appendix T).

4.4 “Do Nothing” Alternative

In the event that the Project was not to occur (“do nothing”), the existing road will continue to generate significant impacts, harming the environment and society (water quality, air quality, significant risk to public safety, etc.) and indirectly depressing the local economies. It is hard to find any argument as to why such an important linkage should not be improved. The proposed Project will transform it dramatically, since it will change a traditional earth road with very limited engineered formation or drainage, into a well-constructed, all-weather, sealed highway. Continuing with the current standard of road can only hold back the local, regional and national economies, since it is a key strategic link between the centre of Liberia, the south-east and Ivory Coast. It is not possible to maintain the existing road because the weak materials and almost absent drainage mean that it cannot carry traffic with any degree of reliability once it has been subject to even moderate levels of rainfall. The “do nothing” alternative is therefore not a supportable proposition.

4.5 Ancillary-Facility Siting Alternatives

This section summarises the siting alternatives considered for the ancillary facilities — the element of the Project with the greatest discretionary footprint ties expressly to critical habitat management. The governing rule, applied to every site in the canonical register of Section 3.8, is a siting hierarchy: (i) absolute exclusions — no facility of any kind (quarry, borrow pit, crusher, plant, laydown, camp, spoil or storage site) within the Chimpanzee Sensitivity Zone and its 1 km buffer, within any Critical Habitat polygon or Priority Biodiversity Feature, within a sacred site or grove, or within an inventoried wetland (Appendix T, spatial regime); (ii) preference for degraded land — already-cleared, farm-bush or previously disturbed ground over secondary forest, and sites inside or immediately adjacent to the existing right-of-way over new penetrations; (iii) distance screening against dwellings, watercourses, wells and community-use areas, with site-specific EPA permits and, where applicable, documented voluntary land agreements before occupation.

Applying that hierarchy produced the register of Section 3.8 and the following dispositions: the Suaken quarry was retained over closer alternatives because the rock resource, access and separation from the Critical Habitat polygons outweigh its ~6.5 km off-corridor haul, subject to the community MOU and the plant complex’s consolidated controls; the Ziah Town quarry provides the western-section alternative, limiting haul distances and night movements; borrow pits follow the approximately one-per-10 km concept of the design, each screened individually — with BP3 flagged for re-siting or reduced footprint because its concept location falls on secondary forest with a natural-habitat flag, and BP2 adjusted off the wetland IW-007 overlap; the RC2 candidate crusher site remains unapproved pending full screening; and the camp and mechanical site at **Zuoyou** were preferred to in-town alternatives to control worker–community

interfaces while remaining on previously disturbed ground with documented community agreement. Where screening finds a conflict that adjustment cannot cure, the facility is re-sited: proximity to the works is never accepted as a justification for entering an excluded area. The no-facility geofences, the screening workflow and the verification responsibilities are binding through the BMP (Appendix T) and the ESMP (Chapter 11).

5 PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

This chapter presents the Project's public participation and stakeholder engagement record and the grievance arrangements. It retains the 2023–24 engagement of the 2024 ESIA as the historical record (Earthtime, 2024, Chapter 5 and its appendices, referenced), adds the consultation undertaken for the Resettlement Action Plan (2024) and the Biodiversity Field Survey (2025–26), and presents in full the 2026 update programme — including the new social concerns communities raised, which this revision carries into the impact assessment and the ESMP. The scanned attendance registries and meeting records of the 2026 programme are at Appendix U.

5.1 Framework and Objectives

Engagement for the Project is governed by three converging requirements. First, World Bank ESS10 (Stakeholder Engagement and Information Disclosure) requires engagement proportionate to project risks across the whole project life-cycle: early identification of affected and interested parties, meaningful consultation free of manipulation or intimidation, particular measures for disadvantaged and vulnerable groups, timely disclosure in accessible languages and formats, and an accessible grievance mechanism. Second, the parent-project Stakeholder Engagement Plan (SEP, P175263, April 2021) and the Environmental and Social Commitment Plan bind the Project to implement the SEP throughout, to operate the project grievance mechanism as described in the SEP, ESMF and RPF, and to disclose the updated ESIA/ESMP before design finalisation and before disbursements for civil works (ESCP, P175263); the 85 km road, delivered under the RETRAP Additional Financing, inherits these commitments in full. Third, national law: the EPML (2002, published 2003) and the EPA ESIA Procedural Guidelines (2022) require public participation at defined stages — publication of a Notice of Intent, consultation during scoping and baseline studies, public review of the submitted ESIA with a 30-day comment window, and a public hearing where the EPA so determines — supported by the constitutional right to information and the Freedom of Information Act 2010.

Within this framework, the objectives of the engagement programme are to: (i) provide accurate, timely and understandable information about the Project to all affected communities and institutions; (ii) obtain and document local knowledge, concerns and preferences so that they demonstrably inform design, impact assessment and mitigation; (iii) give women, youth, migrants, persons with disabilities and other disadvantaged groups distinct, safe channels of participation; (iv) agree and publicise accessible grievance uptake with predictable timelines; and (v) sustain engagement — not as a one-off study exercise but continuously through mobilisation, construction and operation.

5.2 Stakeholder Identification

Stakeholder identification for this update built on the SEP's affected-party/interested-party framework and the 2024 ESIA's mapping, refreshed through the August 2026 fieldwork. Table 5.1 presents the consolidated stakeholder map.

Table 5.1: Stakeholder map for the 85 km Côte d'Ivoire Border–Toe Town–Zwedru road

Category	Key stakeholders	Interest in the Project	Engagement approach
National government	MPW/IIU (Employer); MoA RETRAP PMU/PIU; EPA; FDA; Ministry of Gender, Children and Social Protection; Ministry of Labour; Liberia Land Authority; Ministry of Mines and Energy; Ministry of Health; Ministry of Information, Cultural Affairs and Tourism	Implementation, permitting, compliance oversight, tree-felling and materials licensing, gender/GBV response, labour standards, chance-find custody	Formal correspondence, technical meetings, permit applications, quarterly reporting
Financier	World Bank (IDA)	ESF compliance, clearance of instruments, disbursement conditions	Technical meetings (30 July 2026); World Bank review of the BFS (28 September 2026) and of BMP (30 September 2026); quarterly ESHS reports; incident notification
County level	Grand Gedeh County Superintendent and Administration; County Development Officer; EPA county office; MPW County Resident Engineer; county line offices; Liberia National Police; Liberia Immigration Service (B'hai border post)	County development priorities, coordination, security, border management; Immigration office lies within the corridor	Briefings and consultation meetings, NOI posting at the County Administrative Building, membership of the County GRC
District and community	Commissioners of B'hai, Gbao, Cavalla and Tchien Administrative Districts and Gbarzon Statutory District; city mayors (Zwedru, Toe Town); paramount, clan and town chiefs; elders; women's and youth leaders; Poro/Sande custodians; the fifteen principal PACs (Table 8.1) and all 24 RAP settlements; PAPs	Directly affected population; custodians of land, culture and local order	Community meetings in every PAC, KIIs, NOI postings, community GRCs, custodial consultation for sacred sites
Vulnerable groups	Female-headed households; widows; the elderly; persons with disabilities;	Heightened exposure to displacement, exclusion, unsafe mobility and SEA/SH	Women-only FGDs, targeted small-group discussions, migrant

Category	Key stakeholders	Interest in the Project	Engagement approach
	adolescent girls; tenants and informal roadside users; title-less women; Mossi and Fulani migrant communities; 116 vulnerable PAPs		representatives, accessible grievance channels without cost, literacy or title requirements
NGOs/CSOs	SCNL, WCF, Fauna & Flora and Solimar International (BFS partners); Conservation International (CI); Liberia Chimpanzee Rescue and Protection (LCRP); ELRECO; GBV service providers; community forest bodies	Biodiversity conservation, monitoring, survivor services, community advocacy	Technical consultation, BFS partnership, referral-pathway agreements, disclosure
Private sector	ICCO/CET Joint Venture (Contractor); transport and motorcycle unions; traders and marketeers; cocoa buyers; quarry and ancillary-site host communities (Suaken Town, Zuoyou, Ziah Town); suppliers	Works delivery; transport livelihoods; market operations; land access for ancillary sites	Contractor coordination (kick-off 2 August 2026), host-community negotiation and MOUs, trader consultation on traffic and market management
Media	Community radio (Zwedru-based); national newspapers; social media	Public information and disclosure reach	NOI publication, radio announcements in local languages, disclosure notices

5.3 Engagement History 2023–2026

The corridor has been consulted through four successive programmes, each documented and each feeding this update; the 2023–24 programme is documented in full in the 2024 ESIA (Earthtime, 2024, Ch. 5). Table 5.2 summarises the record; Figure 5.1 maps its geographic coverage. Cumulatively, more than 1,400 recorded participants have engaged with the Project since November 2023, with women constituting between 39 per cent and 58 per cent of participants across programmes.

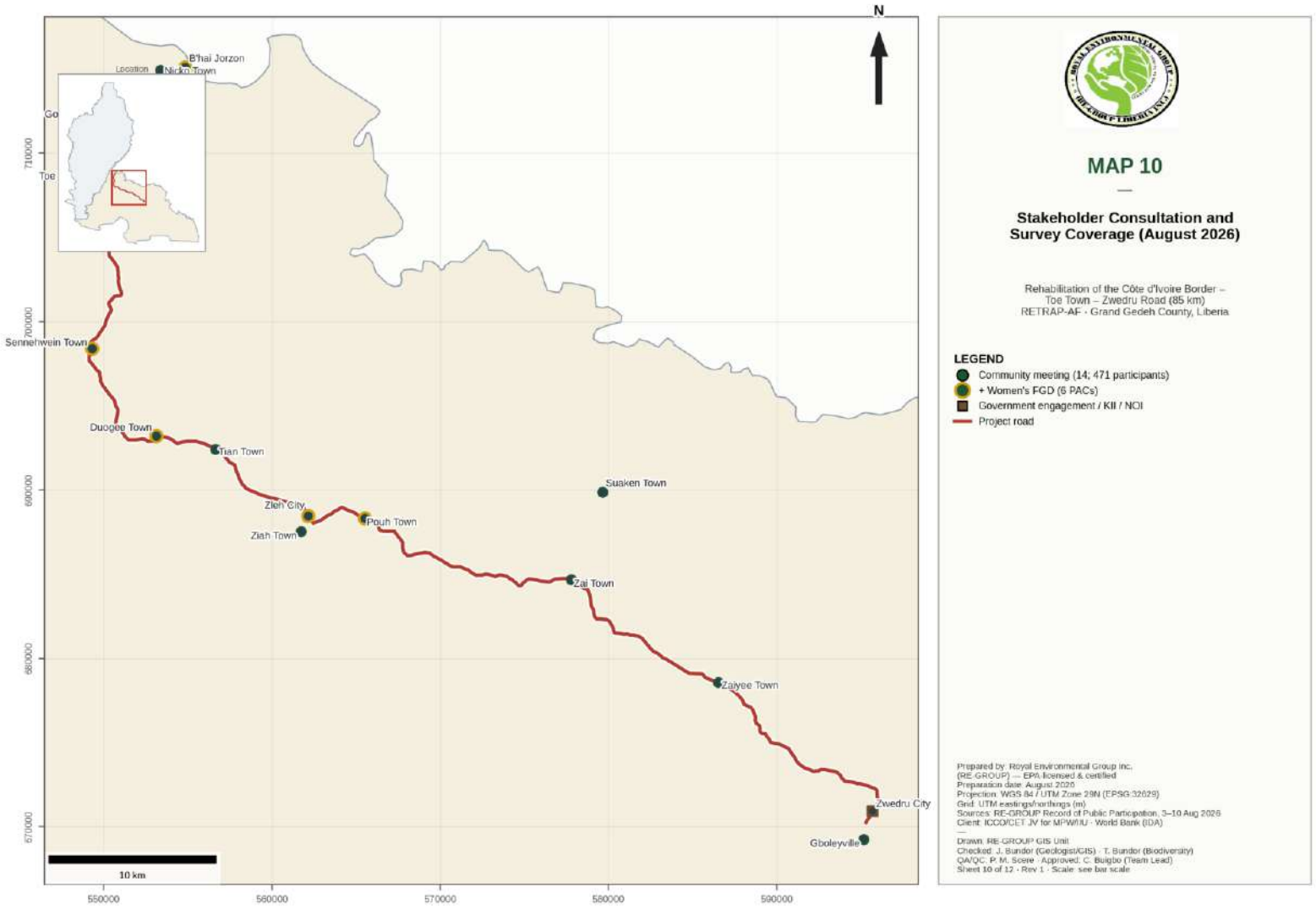


Figure 5.1: Coverage of the 2023–2026 consultation programmes along the project corridor

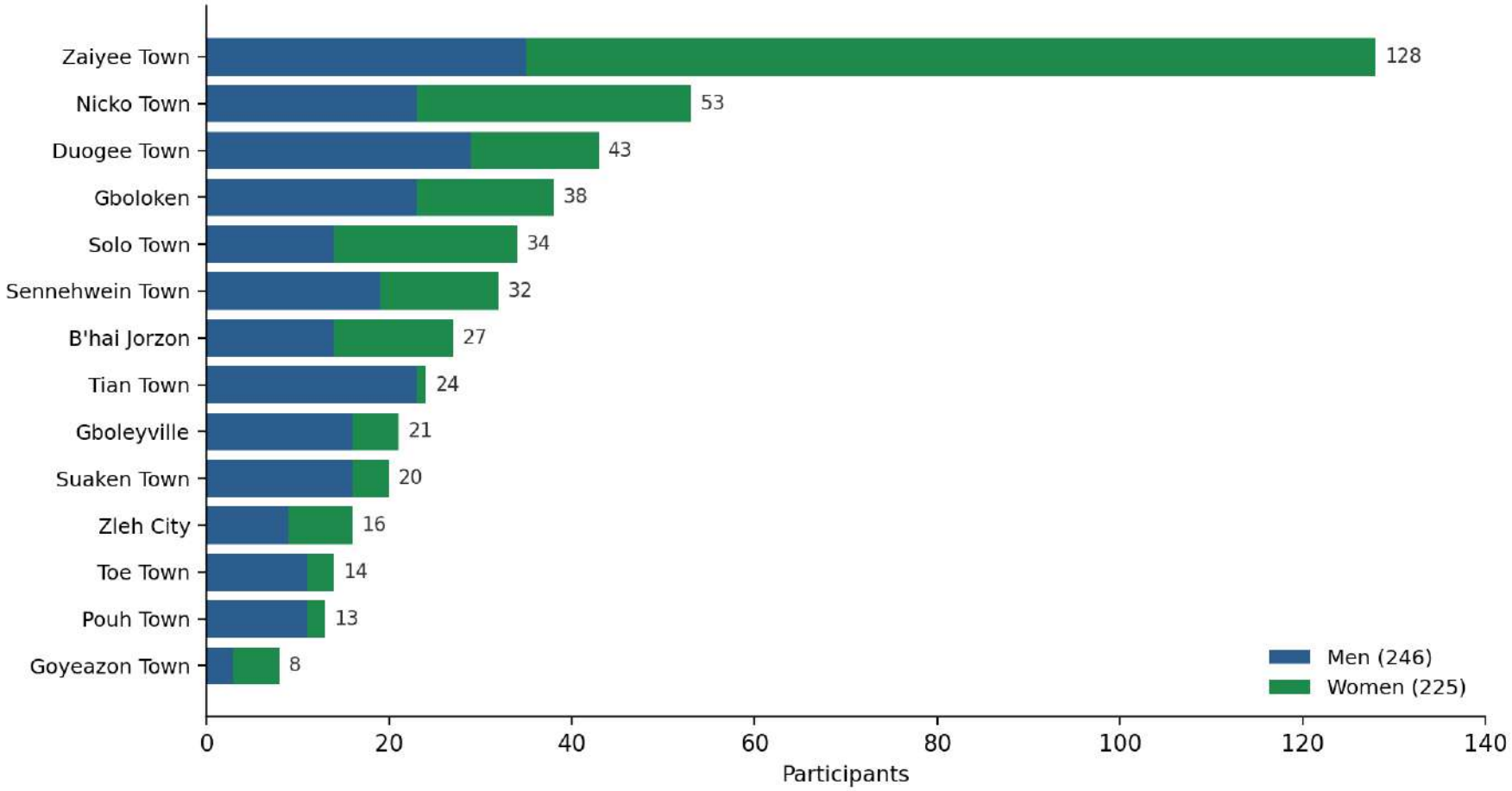
Table 5.2: Chronology of stakeholder engagement, 2023–2026

Period	Programme (lead)	Activities	Participation	Key outputs
November 2023	Notice of Intent (Earthtime for MPW/IIU)	NOI published in three newspapers — Oracle, The New Republic, Hot Pepper — on three days each, 7–10 November 2023	Public notice; no written objections received	Statutory notification under the EPA ESIA process (EP2023042)
November–December 2023	2024 ESIA consultation programme (Earthtime)	9 community meetings (18–24 November 2023); 35 KIIs in corridor towns; high-level stakeholder consultation, Monrovia, 1 December 2023	219 community attendees (93 M / 126 F, 58% female); 59 named key informants; government and NGO participants	Community concerns register (graves, safety, employment, town rules); agency technical directions
November 2023	FGD programme (Earthtime)	7 women's FGDs; 15 ecosystem-services FGDs with hunters, honey gatherers, zoes and craft makers	77 women; 57 resource users	Gender and ecosystem-services baselines of the 2024 ESIA
December 2024	RAP census and consultations (IIU/MPW with RETRAP/MoA)	Census 6–17 December 2024; public consultation meetings at 7 tabulated locations; cut-off date (15 December 2024) publicised by public notice and community radio	276 attendees (167 M / 109 F, 39% female)	PAP register (860 PAPs); entitlement disclosure; 8 community GRCs constituted; PAP rights communicated
October 2025–February 2026	Biodiversity Field Survey (SCNL-led with WCF, Fauna & Flora and Solimar International)	21 community consultations across the survey area alongside two-season field survey; traditional ecological knowledge elicitation; sacred-grove documentation	464 participants, 46% women	Community validation of species records; four sacred groves registered; conservation attitudes baseline (BFS, 2026)

Period	Programme (lead)	Activities	Participation	Key outputs
30 July 2026	World Bank technical meeting (WB Country Office, Monrovia)	Coordination among WB, MPW/IIU, Contractor and RE-GROUP	Institutional	Directions: BFS integration into the updated ESIA and CESMP; no ancillary facilities in sensitive ecological zones (caution at km 19); the update adopts the existing GRM — no new structures
2 August 2026	Contractor kick-off/scoping meeting (ICCO/CET JV, Zwedru project site)	Briefing on mobilisation, survey status and ancillary-site earmarking; coordinates shared	Institutional	Confirmation that works begin at the Zwedru end; ancillary-site register for screening (Chapter 3)
3–10 August 2026	2026 update consultation programme (RE-GROUP)	NOI republished with 17 postings; 14 community meetings; 2 government engagements; 5 KIIs; 6 women's FGDs	471 community-meeting participants (246 M / 225 F, 48% female) plus government and KII participants	The record at Section 7.4; issues-and-responses matrix (Table 5.4); FGD findings (Section 7.5)

5.4 The 2026 Update Consultations — the Record

Between 3 and 6 August 2026 the RE-GROUP ESIA team held fourteen community consultation meetings covering every principal settlement cluster from Gboleyville to Goyeazon Town, together with two government engagements (the Grand Gedeh County Administration and the Zwedru City Government, both on 3 August 2026) and five key informant interviews (the Commissioners of Gbao and B'hai Administrative Districts, the Gbarzon Statutory District authority, the Toe Town City Mayor and the Toe Town Local Land Administrator). The republished Notice of Intent was posted at seventeen locations: the fourteen consultation communities, the Grand Gedeh County Administrative Building, and the offices of the Gbao and B'hai District Commissioners. Meetings were convened through community leadership, held in palava huts, town halls, churches, schoolrooms and open-air venues, facilitated in simple English and local language, and recorded with attendance sheets disaggregated by sex. Community attendance totalled 471 participants (246 men, 225 women; 47.8 per cent female), the largest gathering being Zaiyee Town with 128 participants, 73 per cent of them women. Supplementary engagements — with the ICCO/CET Project Manager, a Zwedru quarter chairman, residents of the Sinoe Road Community in Zwedru, the County Development Officer, and the leaderships of Gwein Town and Karr Town — are recorded, with their minutes, in Appendix H. Figure 5.2 charts the attendance by settlement, and Table 5.3 presents the meeting-by-meeting record.



Fourteen community meetings, 3–6 August 2026: 471 participants (246 men, 225 women; 47.8 per cent women). Source: Table 7.3; Volume II, Annex H.

Figure 5.2: Community consultation attendance by settlement — fourteen meetings, 3–6 August 2026, 471 participants (246 men, 225 women) (RE-GROUP, 2026; Table 5.3).

Table 5.3: Record of the August 2026 community and government consultations

Date (2026)	Community/institution	M	F	Total	Principal issues raised
3 August	Gboleyville	16	5	21	Compensation for landowners without structures; whether rebuilding in the corridor is allowed after compensation; unmarked structures near the RoW; dust, noise and surface-water mitigation; project dimensions
3 August	Solo Town	14	20	34	Local versus external labour; air and water pollution; respectful removal of graves; replacement of NGO-installed water pumps if damaged; GRC training
3 August	Pouh Town	11	2	13	Roadside trading disruption; speeding risk to school children and pedestrian crossings; RoW re-occupation after compensation; clarity of GRM procedures; dust near homes and health facilities; economic-tree compensation
3 August	Grand Gedeh County Authority	6	1	7	Full support pledged; ensure full community participation through free, prior and informed consultation; use local electronic media; Contractor to liaise with MME, Local Government and communities
3 August	Zwedru City Government	1	1	2	Fate of marked structures to be demolished; clarification of the RoW
4 August	Gboloken	23	15	38	Timing of works and compensation; noise/vibration effects on the elderly; equal and safe employment for women; worker–community disease management; structures cracked by vibration but outside the RAP; detours for vehicles and pedestrians

Date (2026)	Community/institution	M	F	Total	Principal issues raised
5 August	Zaiyee Town	35	93	128	Start date; graves without headstones along the corridor; compensation for life trees; protection of electricity infrastructure; relocation of the football field if taken
5 August	Zleh City	9	7	16	Interval between compensation and demolition; identification and protection of headstone-less graves; Contractor awareness of biodiversity assessments; cash or cheque payment; treatment of community and government structures within the 150 ft corridor; livelihood impacts; use of local contractors; RoW re-occupation; warning signs and speed control
5 August	Duogee Town	29	14	43	Roadside trading loss; RoW re-occupation; speed breakers near crossings; local employment priority; live/economic-tree compensation; communicable-disease risk from worker influx
5 August	Tian Town	23	1	24	Worker-influx disease risk; crop compensation; local leaders in recruitment; fate of affected structures; regular town halls; daily water trucks for dust; grave restoration; relocation of the football field within the 150 ft zone; Contractor assistance to renovate the community borehole
6 August	Suaken Town	16	4	20	Quarry host community: willingness to lease the site; blasting vibration and fragile older homes; no MOU yet signed

Date (2026)	Community/institution	M	F	Total	Principal issues raised
					despite two prior meetings with the Contractor; equitable environmental and social benefits; openness to resettlement should the need arise
6 August	Sennehwein Town	19	13	32	Roadside trading loss; speed breakers near crossings; local employment; live/economic-tree compensation
6 August	Toe Town	11	3	14	Overwhelming welcome; start date; employment frameworks; protection of water sources; roadside crop protection; RoW re-occupation; speed breakers; worker-influx disease
6 August	Nicko Town	23	30	53	Overwhelming welcome; start date; RoW re-occupation after compensation; live/economic-tree compensation
6 August	B'hai Jorzon	14	13	27	RoW re-occupation; tree compensation; valuation of structures repaired after marking; procedures where an owner is deceased or travelling; advance notice to the Immigration Service, whose office lies within the corridor; maintenance of access roads; women's safety in relation to external workers; proper culverts for existing drainage problems; limited working hours for noise
6 August	Goyeazon Town	3	5	8	Cultural protocols governing conduct in the town (dress and behaviour rules; restricted sacred tree; food taboos); requirement that the Contractor work through traditional leadership

Date (2026)	Community/institution	M	F	Total	Principal issues raised
Total — community meetings (14)		246	225	471	

Community sentiment was strongly supportive — several towns recorded an "overwhelming welcome" — but support is conditional on fair treatment, timely information, transparent employment, nuisance control and continuous engagement. The 2026 record captures issues and recommendations as minuted; the Project's consolidated responses, and where each issue is addressed in this ESIA, are presented in Table 5.4 and carried through Chapters 8 to 10 into the ESMP.



Plate 5.1: Stakeholder consultation with the Grand Gedeh County Administration — Zwedru, 3 August 2026 (RE-GROUP field survey)



Plate 5.2: Community consultation meeting in the community palava hut — Solo Town, 3 August 2026 (RE-GROUP field survey)



Plate 5.3: Community consultation meeting — Duogee Town, 5 August 2026 (RE-GROUP field survey)

Table 5.4: Issues raised in 2026 and the Project's responses

Issue	Raised by	Project response and commitment	Where addressed
Local and youth employment; transparent recruitment	All 14 communities	Local-hire preference with unskilled recruitment from corridor communities; published criteria and wage rates; recruitment routed through community structures, not gatekeepers; at least 30% women target (planning estimate pending the CESMP); sex-disaggregated monitoring	Chapter 10; LMP; CESMP labour provisions
Speed control and pedestrian safety (speed breakers at settlements)	12 communities	Engineered traffic calming at settlement gateways, school-zone controls, signage, crossings and trained flaggers, installed before the road opens to fast traffic	Chapters 9 and 10; Traffic Management Plan (CESMP); design (Chapter 3)
Dust and protection of water sources	All communities	Watering/water trucks on active fronts, covered loads, buffer and spill controls at wells, pumps and creeks; verified damage to water points repaired or replaced	Chapter 10 (air and water mitigation); ESMP monitoring
Compensation for economic/life trees and crops	8+ communities	RAP entitlements: 2,185 trees on six farms compensated at MoA rates at full replacement value; harvest window for annual crops; additional affected trees processed through the GRM	Chapter 9; RAP (2025)
Graves, including graves without headstones	Zaiyee, Zleh, Duogee, Tian, Solo Town	Avoidance first; 15 census graves compensated for relocation with family and traditional rites; pre-construction walkovers with communities; chance-find procedure; unmarked graves registrable through the GRC for capture and compensation	Section 8.6; Chapter 9; Chance-Find Procedure (ESMP)

Issue	Raised by	Project response and commitment	Where addressed
RoW re-occupation after compensation or completion	7+ communities	The 150 ft/100 ft RoW is government reserved land; compensated structures must be removed and re-establishment within the works corridor will not be permitted; an authoritative restatement will accompany RAP disclosure, with encroachment monitoring thereafter	Chapter 9; RAP disclosure programme
Road safety near schools and markets	Majority of communities	School-zone gateways and crossings, market-frontage traffic management, driver management and community road-safety education throughout construction and before opening	Chapters 9 and 10; CESMP Traffic and Road-Safety Plan
Women's issues: safety near workforces, jobs, direct information	Women's FGDs; B'hai Jorzon	Worker code of conduct with sanctions; SEA/SH prevention, confidential reporting and survivor-centred referral; women-targeted recruitment and information through women's networks; continuing women-only consultations	Sections 8.5, 7.5, 7.6; Chapter 10; LMP/SEP
Quarry blasting, fragile homes and benefit sharing	Suaken Town	Signed MOU with the host community as a precondition to quarry operation; pre-blast condition surveys; vibration limits and monitoring; advertised blasting times; equitable community benefits; EPA quarry permit	Chapters 3 and 9; CESMP Blasting Plan; permits register
Worker influx and communicable disease	Several communities	Camp management and worker health programme; HIV/STI and disease awareness for workers and communities; influx management; local hiring to reduce influx	Chapters 9 and 10; LMP; CESMP
Protection of electricity infrastructure and utilities	Zaiyee, Zleh, Duogee, Toe Town	Joint utility survey and relocation schedule before excavation (especially	Chapter 10; CESMP; RAP utility provisions

Issue	Raised by	Project response and commitment	Where addressed
		Zwedru); advance shutdown notices; safe temporary supply	

5.5 Women's Focus Group Discussions

Six women-only focus group discussions were held during the August 2026 campaign in Pouh Town, Zleh City, Duogee Town, Sennehwein Town, Toe Town and B'hai Jorzon, facilitated by female team members using a structured guide covering access and mobility; economic opportunity; safety, security and GBV/SEA/SH; health, water and sanitation; and participation and vulnerability. Findings were triangulated with the 2023 programme of seven women's FGDs (77 participants) and with household observation. The attendance sheets and dates of the six sessions are held with the Women's FGD Report in Appendix H.

Across all six PACs women proposed a common mitigation package: maintained pedestrian, household, farm and water-point access throughout the works with temporary crossings; advance notice of closures in accessible local languages; settlement speed calming and school-zone controls with trained flaggers and guarded excavations; transparent local recruitment with published criteria, equal pay, women-suitable PPE and separate secure sanitation; worker codes of conduct with GBV/SEA/SH training, sanctions and confidential, female-staffed grievance channels; dust watering and protection of wells and streams; women-only consultations at convenient times; and grievance channels usable without fees, literacy, land title or fear of retaliation. Distinct community findings included: seasonal isolation and requests for information direct to women rather than only through male leaders (Pouh Town); difficult emergency obstetric travel, risks to adolescent girls from labour influx, and the need to consult tenants and informal users separately from owners (Zleh City); the burden of head-loading, interest in flagging, vegetation-management, catering and clerical jobs, and care-responsive shift arrangements (Duogee Town); expensive maternal-emergency travel, concern about unfamiliar workers interacting with girls, and a requested women's role in monitoring the Contractor's conduct (Sennehwein Town); anticipated displacement of kiosks and stalls, parking and loading conflicts, and acceptance of diverse forms of evidence for impact verification (Toe Town); and screening of impacts by actual use and vulnerability rather than title, confirmation of access points with women before earthworks, and a child-protection protocol (B'hai Jorzon).

These findings have directly shaped this ESIA: emergency (especially obstetric) access maintenance and clinic coordination are construction-phase commitments; access continuity and daily reinstatement of crossings respond to head-loading and mobility burdens; the SEA/SH programme — codes of conduct, prohibition of sexual activity with minors, confidential female-staffed uptake, survivor-centred "warm referral" and the notification protocol in Section 5.6 — responds to the adolescent-exploitation risk; Toe Town's town-specific traffic and market-management plan and the RAP's recognition of non-structure businesses respond to kiosk displacement; and vulnerability screening based on use rather than title protects title-less women, widows and tenants. Women representatives will sit in the Project's liaison and monitoring structures, and women-only sessions continue through construction (Section 5.8).



Plate 5.4: Women's focus group discussion — Pouh Town, August 2026 (RE-GROUP field survey)

5.6 The Adopted Grievance Redress Mechanism

The Project operates the established RETRAP grievance redress mechanism, built on the SEP/ESMF chiefdom-based approach (SEP, P175263) and operationalised for this corridor by the RAP (RAP, 2025, §9). This ESIA adopts that existing mechanism in full and proposes no new grievance structures; it supplements the adopted mechanism only with the SEA/SH-sensitive channel and World Bank corporate avenues described below, neither of which alters the mechanism's tiers, composition or timelines. The mechanism is free of charge, open to oral and written complaints without retaliation, and its committees were constituted with community participation — eight Community Grievance Redress Committees (CGRCs) are already established and functioning along the 85 km corridor, formed during the RAP census and consultations of December 2024, with member names and telephone contacts held in the RAP's annexes (RAP, 2025).

The structure is a three-tier committee system with the courts as the constitutional last resort (Table 5.5). Grievances are lodged with any committee member, the community liaison officer, or local authorities, and are entered in the grievance register book kept at each committee — recording case reference number, complainant name, dates received and resolved, and remarks — with a written acknowledgement issued within 24 hours stating the review date and venue. The register books are publicly accessible. Community-tier committees are chaired by the town chief or city mayor and include elders, a religious representative, women's and youth representatives, a representative of persons with disabilities/vulnerable groups, and male and female PAP representatives, supported by the RAP monitoring consultant and the Contractor; they aim to resolve every case at first instance within five days. Unresolved cases escalate to the County GRC, chaired by the County Superintendent with district, judicial, land, MPW and EPA membership (15 days), and thence to the Project GRC at the IIU/MPW, chaired by the Deputy Minister for Administration with IIU, RETRAP/PIU, legal, valuation, audit and PAP membership, whose decision within 15 days is the final administrative determination. Resolution is verified by site visit or contact with the complainant, and a Grievance Redress Form confirming resolution is issued. Any aggrieved person retains the constitutional right to the courts at any time. Figure 5.3 shows the adopted mechanism's tiers, timelines and parallel channels.

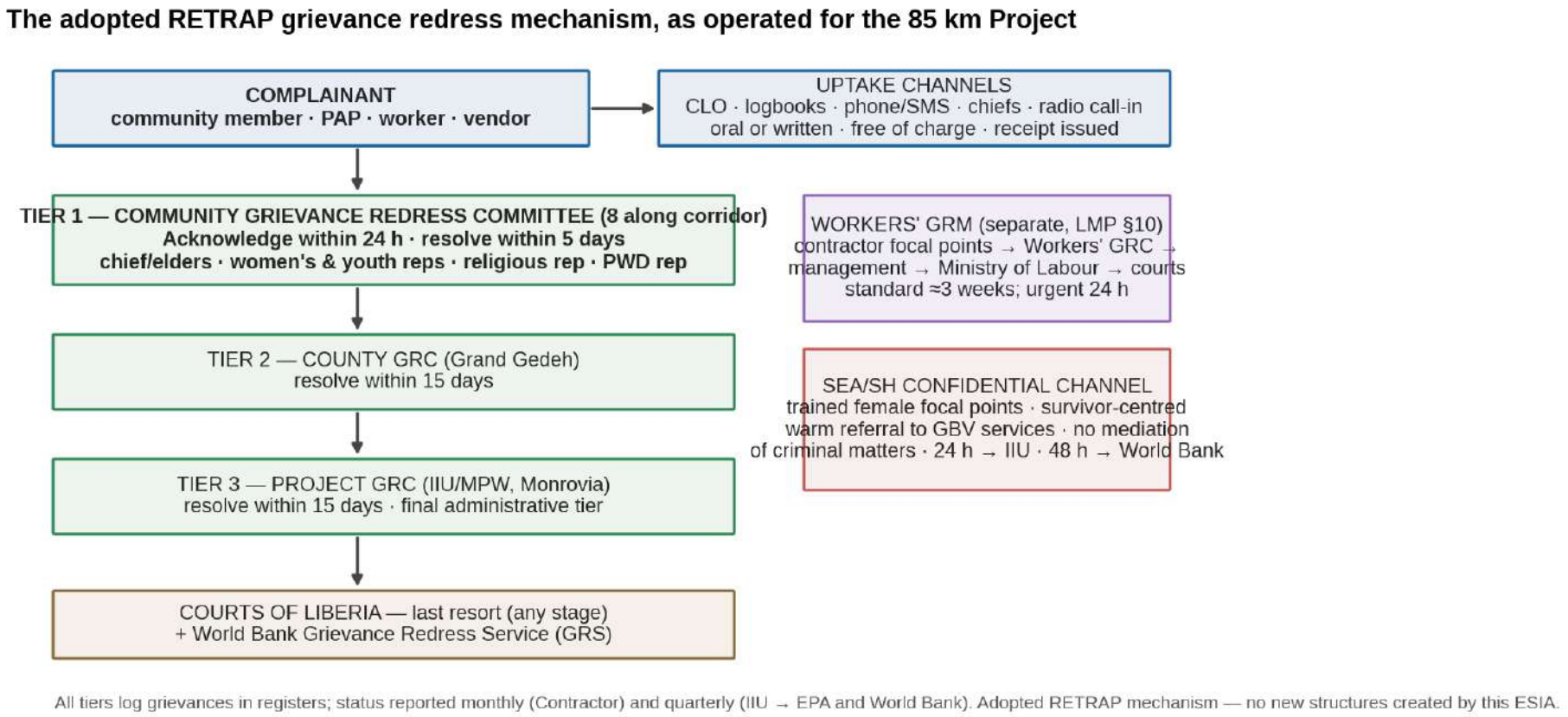


Figure 5.3: The adopted RETRAP grievance redress mechanism (RE-GROUP, 2026).

Table 5.5: Tiers and timelines of the adopted grievance redress mechanism

Tier	Composition and uptake	Timeline	Records and output
Uptake and registration (all tiers)	Any CGRC member, community leadership, CLO or IIU social team; oral or written, with assistance for non-literate complainants; no cost	Written acknowledgement within 24 hours, stating review date and venue	Entry in the grievance register book; publicly accessible
Tier 1 — Community GRC (8 committees along the corridor)	Chair: Town Chief/City Mayor; elders, religious representative, women's and youth representatives, vulnerable-group/PWD representative, male and female PAP representatives; RAP monitoring consultant and the Contractor in support	Resolution or decision within 5 days of receipt	Written decision to the complainant; register book
Tier 2 — County GRC	Chair: County Superintendent; District Commissioner (vice), District Magistrate, City Mayor, Clan Chief, Land Commissioner representative, MIA County Inspector, MPW County Resident Engineer, EPA representative	Resolution within 15 days of transfer	Written decision; records kept
Tier 3 — Project GRC at IIU/MPW	Chair: Deputy Minister for Administration (MPW); IIU Program Manager (vice), IIU Social Safeguards Officer (secretary), RETRAP/PIU, MPW ESAFE and Legal, Property Valuator, Internal Audit, male and female PAP representatives	Resolution within 15 days of transfer; final administrative decision	Written decision; Grievance Redress Form on verified resolution
Courts	Constitutional right of any aggrieved person	Available at any time; normally used after the administrative tiers	Judicial record
Workers' GRM (separate, per LMP)	Contractor focal points; Workplace GRC including E&S specialists; anonymous complaints accepted; dedicated telephone and e-mail	Standard resolution within 3 weeks; urgent matters 24 hours–15 days; escalation to the Contractor's management, then Ministry of Labour (final tier), then courts	Workers' complaints registry; signage, brochures and SMS publicity
SEA/SH-sensitive channel (supplement)	Confidential uptake through trained female focal points and the Social Development Specialist; not mediated by community committees	Contractor to the Employer (IIU/MPW) within 24 hours; Employer to the World Bank within 48 hours;	Separate confidential log with informed consent; warm referral records

Tier	Composition and uptake	Timeline	Records and output
		survivor-timed resolution	

Two parallel provisions complete the system. First, the workers' grievance mechanism is separate from the community mechanism and is operated by the Contractor under the Labor Management Procedures: designated focal points receive complaints, a Workplace Grievance Redress Committee including the environmental and social specialists addresses them within a three-week standard (24 hours to 15 days for urgent matters), and unresolved cases escalate to the Contractor's management, then to the Ministry of Labour as the final administrative tier, with the courts thereafter; anonymous complaints are accepted and dedicated telephone and e-mail channels, site signage and SMS publicity are required (LMP, P175263). Second, the SEA/SH-sensitive channel: the RAP's grievance chapter contains no explicit SEA/SH pathway, and this ESIA therefore supplements the adopted mechanism — without replacing any part of it — with the SEP/LMP provisions: confidential uptake through trained female focal points and the Social Development Specialist; no mediation of SEA/SH cases by ordinary community committees; survivor-centred support and "warm referral" to GBV service providers; referral of criminal cases (assault, rape) to the police for prosecution; and incident notification from the Contractor to the Employer (IIU/MPW) within 24 hours and from the Employer to the World Bank within 48 hours. A GBV service-provider directory for Grand Gedeh is being compiled by the Contractor's SEA/SH focal point with the IIU Social Development Specialist and must be completed before works fronts open near settlements. Finally, communities and workers retain access to the World Bank's corporate channels: complaints may be submitted at any time to the Bank's Grievance Redress Service and, after Bank Management has had the opportunity to respond, to the independent Inspection Panel.

5.7 Disclosure Plan

Disclosure of this updated ESIA follows the EPA ESIA Procedural Guidelines (2022) and the ESCP. The report will be submitted to the EPA with the Project's permit applications; the EPA will publish notice inviting public comments within its 30-day window and may convene a public hearing in Grand Gedeh, and, under the Guidelines, the EPA takes its permit decision only after the comment window has closed and comments have been addressed. In parallel with, and in advance of, the statutory process, IIU/MPW will disclose the full report (with the annexed BMP rev.3) and a non-technical executive summary at accessible in-country locations: the EPA in Monrovia and its Grand Gedeh county office; the IIU/MPW in Monrovia; the Grand Gedeh County Administration in Zwedru; the district commissioners' offices of B'hai, Gbao and Cavalla Administrative Districts and Gbarzon Statutory District; and PAC noticeboards and palava huts in the consultation communities along the corridor, where the republished NOI was posted in August 2026 (Plate 5.5). Consistent with the SEP, disclosure will be announced in at least two national daily newspapers and on community radio; and consistent with the ESCP, the World Bank will disclose the cleared instruments on its external website, with the updated ESIA/ESMP disclosed before design finalization and before disbursements for civil works. Given corridor literacy levels, written disclosure will be paired with oral and visual formats: local-language (Krahn) radio discussion, community read-outs, and poster/leaflet summaries of key entitlements, timelines and grievance contacts. Comments received during the feedback window will be logged, responded to, and annexed to the final submission; disclosure of individual compensation details to PAPs proceeds separately under the RAP. Appendix T bound with this ESIA is the Biodiversity Management Plan cited in Section 7.5.6 and in Table 11.5. No earlier biodiversity management plan is an instrument of this submission.



Plate 5.5: Posting of the republished Notice of Intent — Pouh Town, 3 August 2026 (RE-GROUP field survey)

5.8 Ongoing Engagement During Construction

Engagement does not end with disclosure. The Contractor will field community liaison officer (CLO) capacity and the IIU social team will maintain its community liaison assistants along the corridor, providing a continuous, named, local point of contact for every PAC. Quarterly community meetings will be held in each settlement cluster throughout construction, supplemented by targeted engagement before mobilisation, at the opening of each sensitive work front (including the community notice required before a front enters segment S3 or S6 under BMP rev.3, action A10), ahead of major traffic changes or closures, and before the road opens to fast traffic — the four engagement triggers requested by the women's FGDs — with feedback returned to each community on how its issues were addressed. Women-only sessions will continue at convenient times and venues, migrant representatives (Mossi and Fulani) will be included in liaison arrangements, and recruitment procedures, work schedules and closure notices will be publicised in advance through community structures and radio. The grievance mechanism will be actively publicised — committee contacts, register locations and timelines posted in every PAC, broadcast on radio and printed on leaflets — and GRC members will receive refresher training, as requested at Solo Town. Engagement performance (meetings held, participation by sex and community, migrant participation, grievance uptake and closure within disclosed timelines) is a monitored ESMP indicator reported monthly by the Contractor and quarterly to the World Bank, and consultations will continue through construction under IIU leadership in accordance with the RAP's forward commitments and the SEP.

6 BASELINE CONDITIONS: THE PHYSICAL ENVIRONMENT

This chapter presents the physical-environment baseline: climate, topography and soils, hydrology, water quality, air quality and noise. Consistent with the update instruction for this revision, the narrative setting of the 2024 ESIA is retained and updated, while the 2023 sampling results of the 2024 ESIA are **referenced as the historical record and superseded in the tables by the August 2026 campaign** (60 stations; University of Liberia laboratory certificate UL LAB/ICC/002A/2026; Appendices G–J). Where a 2023 result exceeded a standard and was not re-tested in 2026 (manganese; mercury), the matter is carried explicitly as a pre-construction verification commitment rather than silently dropped.

6.1 Climate and Climate-Change Trends

The Project corridor in Grand Gedeh County lies within the tropical wet-and-dry (Köppen Aw) climate zone of south-eastern Liberia, within the Upper Guinean forest belt. Annual rainfall in the corridor region is high, in the approximate range of 2,100–3,000 mm per year: the BFS climate characterisation for the Zwedru area indicates roughly 2,100 mm per year with a bimodal wet-season distribution (BFS, 2026), while the Contractor's design documentation adopts 2,500–3,000 mm per year as the hydrological design basis (ICCO/CET, 2025). There is no long-term meteorological station on the corridor itself. The 2024 ESIA relied on two proxy automatic weather stations — one near Fish Town approximately 100 km to the south-east and one near Karnplay approximately 90 km to the north-west — which recorded annual totals of 1,461 mm (2019) and about 2,300 mm (2022) respectively (Earthtime, 2024). The spread of these figures illustrates both real spatial and inter-annual variability and the scarcity of observational climate data for the south-east, and all rainfall statements in this chapter should be read with that caveat. The long-term monthly rainfall and temperature regime characterised for Zwedru is summarised in the climate diagram at Figure 6.1.

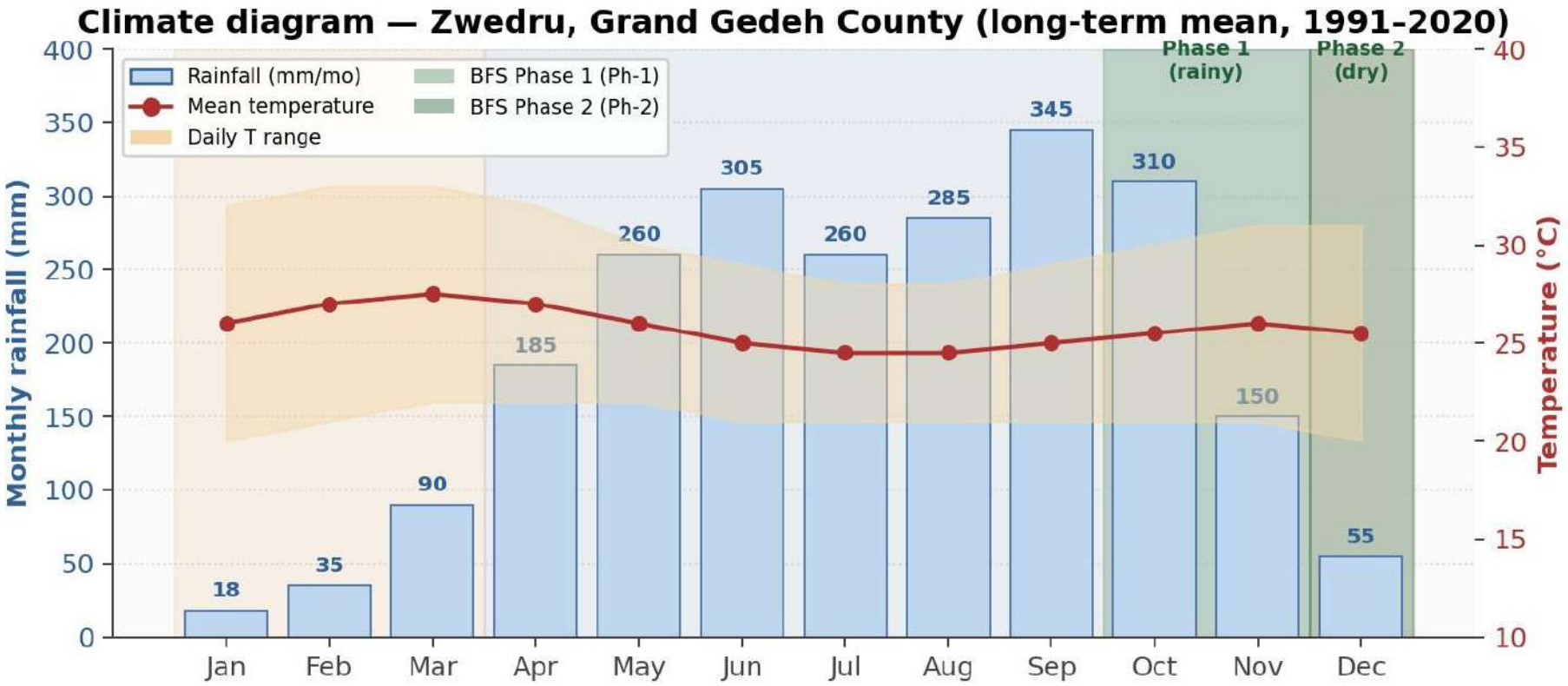


Figure 6.1: Climate diagram, Zwedru (long-term means) (BFS, 2026, Figure 1.7; reproduced for this ESIA).

The seasonal regime is strongly defined. The wet season extends broadly from May to October, with the heaviest rainfall between June and September; the dry season runs from November to April, with the driest conditions from December to March (Earthtime, 2024; BFS, 2026). Between December and April the corridor experiences episodes of the Harmattan — a dry, dust-laden north-easterly airflow from the Sahara — which seasonally elevates coarse particulate concentrations, reduces visibility and lowers humidity (RE-GROUP, 2026). Mean annual temperature is approximately 26 °C, the value also adopted for bitumen-grade selection in the pavement design (BFS, 2026; ICCO/CET, 2025). At the proxy stations, monthly mean temperatures ranged from about 23.6 °C to 26.9 °C, with recorded extremes from roughly 13.6 °C (dry-season night minimum) to 35.8 °C (Earthtime, 2024). Relative humidity is generally high, averaging 80–90 per cent and approaching saturation in the wet season, but falling as low as about 30 per cent during dry-season Harmattan spells. Winds are light (station means of roughly 0.2–1.2 m/s, with isolated gusts above 18 m/s), predominantly from westerly to south-south-westerly directions, backing north-easterly during the Harmattan period (Earthtime, 2024). The locations of the two proxy weather stations relative to the corridor are shown in Figure 6.2.

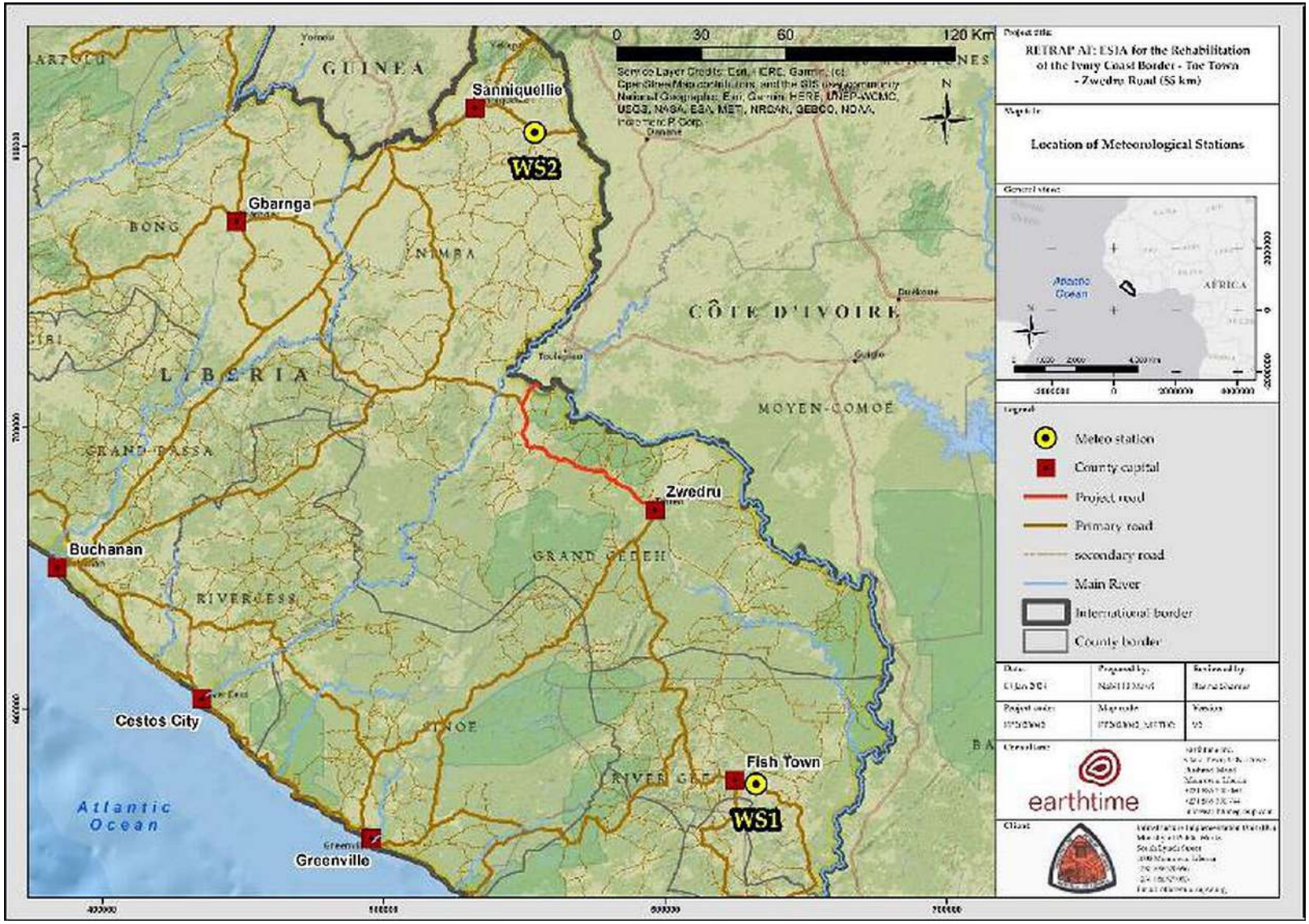


Figure 6.2: Meteorological stations relevant to the corridor (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this Updated ESIA).

With respect to climate-change trends, the evidence base for south-eastern Liberia is qualitative and must be treated with caution: station records are short, discontinuous and spatially sparse, and neither the 2024 ESIA nor the Contractor's design proposal contains a downscaled climate projection or an explicit climate uplift on design flood events — the latter is recorded here as a data gap. Subject to that caveat, national and regional assessments underpinning Liberia's National Policy and Response Strategy on Climate Change (2018) and the Revised Nationally Determined Contribution (2021) consistently indicate: (i) an observed warming trend over recent decades, expected to continue through the Project design life; (ii) an observed and projected intensification of heavy-rainfall events — rainfall arriving in fewer, more intense storms — even where trends in total annual rainfall remain uncertain in direction; (iii) greater variability in wet-season onset and duration; and (iv) more pronounced dry spells within and between seasons. These directions of change are consistent with community reports along the corridor of increasingly erratic rains and damaging storm events, although no corridor-specific trend series exists to quantify them.

The implications for the works and the asset are material. For construction, wet-season rainfall of this magnitude constrains earthworks, borrow-pit operation and compaction, generates high erosion and sedimentation potential on any exposed surface, and makes drainage-first sequencing and pre-rain stabilisation of cut and fill faces essential; the Contractor's kick-off meeting was held at the Zwedru project site on 2 August 2026 and works are proceeding from the Zwedru end, i.e. within the wet season. High heat and humidity also create occupational heat-stress risk for the workforce, while Harmattan conditions add a seasonal dust burden that will compound construction dust if uncontrolled. For the asset, the intensification of extreme rainfall places a premium on the resilience features already embedded in the design — cross-drainage sized for 10-, 50- and 100-year flood events with freeboard and scour allowance, upsized multi-cell box culverts at major crossings, raised profiles or additional drainage in identified flood-prone reaches, lined side drains, energy dissipation and grouted riprap protection (ICCO/CET, 2025) — and argues for a conservative reading of hydraulic capacity at detailed design, given the absence of a formal climate uplift analysis. Climate resilience of the drainage system is therefore carried forward as a design-verification action in the ESMP.

6.2 Topography, Geology and Soils

6.2.1 Topography

The corridor traverses gently undulating terrain at elevations of approximately 150–320 m above sea level, with a mean of about 235 m (BFS, 2026). The landscape is predominantly flat to gently sloping, punctuated by occasional isolated hillocks typically rising less than 50 m above their surroundings, and by shallow low-lying depressions that become seasonally waterlogged and form the inland wetlands and swamp fringes documented along the alignment (RE-GROUP, 2026). The 2024 ESIA described the same terrain as a zone of broken, formerly forested hills with flat, swampy, agricultural and settled interludes (Earthtime, 2024). The gentle topography reduces construction complexity — earthwork volumes and high cuts are limited — but it also means the road repeatedly crosses ground that is naturally susceptible to waterlogging, requiring careful drainage design and sediment control (Section 6.3). The alignment follows the existing laterite road within the established government right-of-way of 150 ft (45.7 m) in rural sections and 100 ft (30.5 m) in urban sections.

6.2.2 Geology, Seismicity and Landslides

The corridor is underlain by Precambrian crystalline metamorphic basement of the Guinea Shield. The principal unit is a quartz-diorite gneiss, poorly exposed except along river channels; mica schist underlies the low-relief areas, while amphibolitic schist with banded iron formation and quartzite forms the higher-relief ground. Residual soil cover reaches up to 20 m in thickness. Structurally, the corridor lies between the Cestos shear zone to the west and the Juazohn shear zone to the east, close to the boundary between the Liberian and Eburnean age provinces (Earthtime, 2024). Seismic hazard is very low — there is less than a 2 per cent chance of a potentially damaging earthquake within 50 years, and the most recent recorded inland event (2007, magnitude 4.5) occurred far to the north-west — and landslide potential in Grand Gedeh is likewise assessed as low, with the caveat that climate-driven increases in extreme rainfall

could locally raise slope-failure susceptibility on saturated cut faces (Earthtime, 2024). The regional geological setting of the corridor is shown in Figure 6.3.

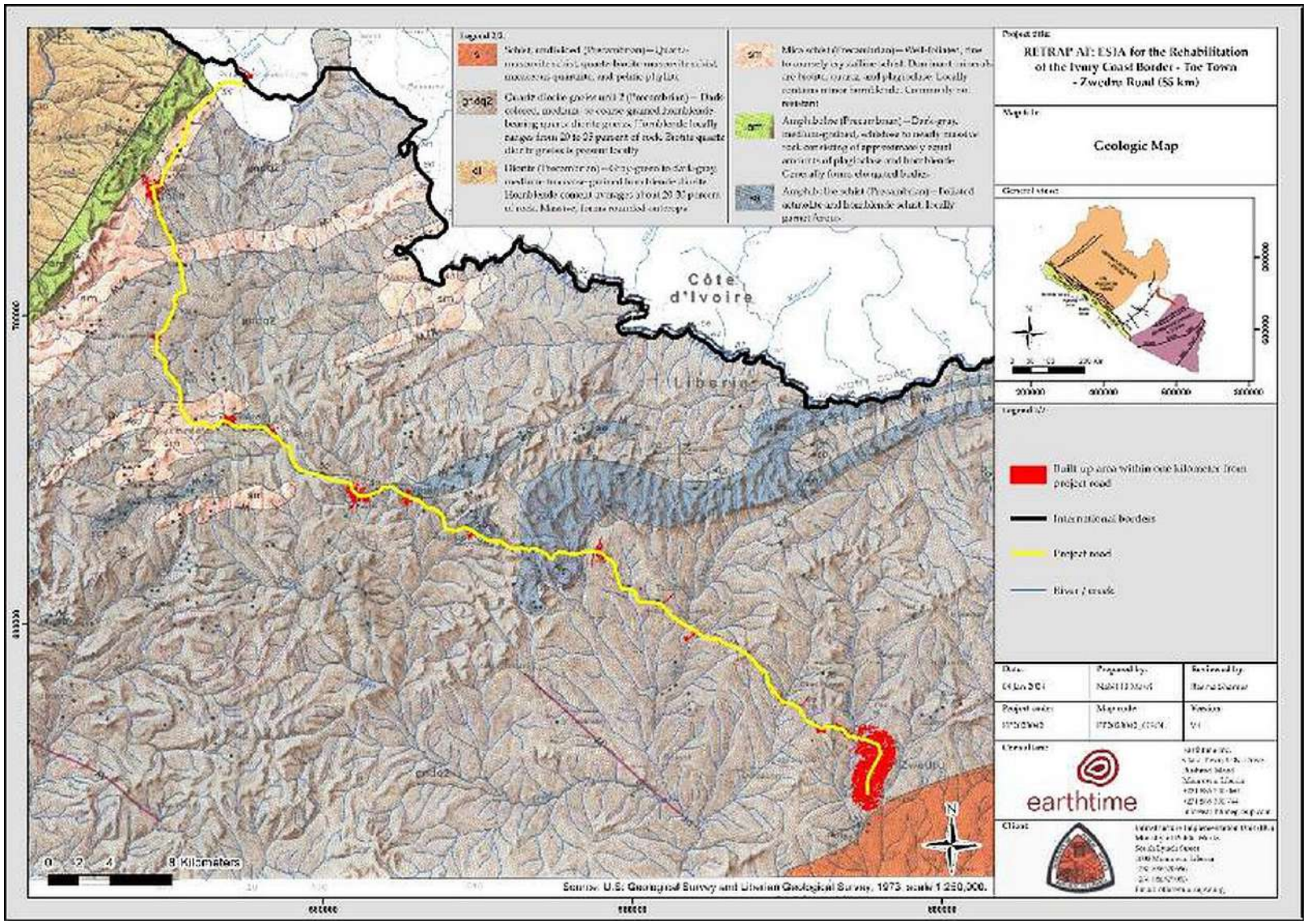


Figure 6.3: Geology of the project region (adopted from the 2024 ESIA (Earthtime, 2024, Ch. 6); reproduced for this ESIA).

6.2.3 Soils and the 2026 Soil Quality Results

Deep in-situ chemical weathering of the crystalline basement has produced the lateritic soil profiles typical of the region — ferralsols and ferralic cambisols on the uplands, leptosols on hilltops, and gleysols and fluvisols in the valley bottoms and floodplains. These soils are iron-rich, acidic and inherently infertile: the 2023 sampling (seven stations) returned pH 4.78–5.54 (with a single wetland site at 7.55), very low nitrogen, phosphorus and potassium, and low cation-exchange capacities of 2.7–7.1 meq/100 g. Iron concentrations naturally exceed generic screening levels — up to 237,000 mg/kg — reflecting the iron-rich parent rock rather than contamination, and the only anthropogenic pollution signal found in 2023 was extractable petroleum hydrocarbons (187 mg/kg) at a motorbike-washing site; asbestos was not detected anywhere (Earthtime, 2024). For engineering purposes, the design subgrade is characterised at CBR 5–7 per cent (S3 class), with crushed aggregate base (CBR at least 80) and natural gravel sub-base (CBR at least 30) to be won from quarries and borrow pits (ICCO/CET, 2025).

The 2026 campaign re-baselined soils specifically at the ancillary facilities — the sites where soil disturbance, hydrocarbon handling and plant operation will concentrate. Twelve stations (SS-01–SS-12) were sampled between 3 and 6 August 2026 at the mechanical site, the Suaken quarry site (Quarry 1), the batching/asphalt/crusher complex, the construction camp site and eight borrow pits (Plate 6.1). Results are summarised in Table 6.1.



Plate 6.1: Soil sampling at a proposed borrow pit along the corridor, August 2026 (RE-GROUP field survey)

Table 6.1: 2026 soil sampling summary, stations SS-01–SS-12 (UL LAB/ICC/002A/2026)

Station	Sampled site	pH	Organic matter (%)	Organic carbon (%)	Lead	Zinc (unit not stated)
SS-01	Mechanical site, Zuoyou Town	5.65	52.00	53.16	<0.001	0.042
SS-02	Quarry 1 site, Suaken	6.57	51.05	50.84	<0.001	0.064
SS-03	Batching/asphalt/crusher complex, Suaken	6.49	49.00	47.70	<0.001	0.063
SS-04	Construction camp site, Zuoyou Town	5.69	47.80	51.99	<0.001	0.080
SS-05	Borrow pit BP1	6.65	49.45	51.76	<0.001	0.074
SS-06	Borrow pit BP12 (see note)	5.99	50.00	52.00	<0.001	0.066
SS-07	Borrow pit BP17, Nicko Town	6.00	48.07	50.89	<0.001	0.050
SS-08	Borrow pit BP3	5.99	46.09	54.00	<0.001	0.057
SS-09	Borrow pit BP5	6.03	49.50	53.66	<0.001	0.065
SS-10	Borrow pit BP6	5.87	52.31	52.80	<0.001	0.069
SS-11	Borrow pit BP15	6.44	51.60	49.99	<0.001	0.070
SS-12	Borrow pit BP16	5.77	49.76	50.77	<0.001	0.058

Across the twelve stations, the certificate additionally reports iron at 0.55–0.79, nitrate at 0.42–0.61, cation-exchange capacity at 49.00–57.70 and sulphate below 0.001 at every station; the units for soil nitrate, iron, zinc, lead and CEC are not stated on the certificate, no soil reference standard is cited, and sampling depths were not recorded. The station labelled BP-12 (SS-06) has coordinates that plot at borrow pit BP11 — a labelling discrepancy to be reconciled with the laboratory. It is also noted that the Ziah Town quarry site (Quarry 2) and the candidate crusher site RC2 were not soil-sampled in 2026.

Two findings stand out. First, on contamination: lead is below detection at all twelve stations, zinc is present only at trace levels (0.042–0.080; unit not stated on the certificate), and sulphate is below detection throughout — there is no soil contamination signal at any ancillary site, and the 2026 results are therefore consistent with the 2023 conclusion that corridor soils are effectively uncontaminated prior to construction. Soil pH of 5.65–6.65 indicates moderately to slightly acidic conditions typical of lateritic profiles, although less acidic than the 4.78–5.54 measured in 2023; the difference is included in the laboratory query. Secondly, on data quality: the reported organic matter (46.09–52.31 per cent) and organic carbon (47.70–54.00 per cent) values are agronomically implausible for mineral lateritic soils, for which values of roughly 1–10 per cent would be expected; moreover organic carbon exceeds organic matter in nine of the twelve samples (all except SS-02, SS-03 and SS-11), which is internally inconsistent since organic carbon is a fraction of organic matter. The reported CEC values (49.00–57.70, units unstated) are similarly high relative to the 2.7–7.1 meq/100 g measured in 2023. A method and unit clarification, and where necessary re-analysis, has been requested from the laboratory. Pending that clarification, the fertility parameters in Table 6.1 (organic matter, organic carbon, nitrate, CEC) are treated as indicative only and are not relied upon in the impact assessment; the contamination-screening parameters (lead, zinc, sulphate, pH) are not affected by this caveat. This is carried as an explicit data-quality gap.

6.2.4 Erosion Susceptibility

Lateritic soils and their underlying saprolite are highly erodible once vegetation and the indurated surface crust are stripped, and the corridor's rainfall erosivity is high. Erosion susceptibility is greatest on cut slopes and embankment faces, at borrow pits and spoil areas, on the approaches to watercourse crossings, and wherever the existing road has been graded below natural ground level, concentrating runoff. Uncontrolled erosion would deliver sediment directly to the nine creek crossings and 31 right-of-way wetlands described in Section 6.3, and to the community water points described in Section 6.4. The design responds with fill slopes of 1V:1.5H, benched high cuts, lined ditches, grouted riprap aprons and slope protection, and a stated preference for vegetative ("green infrastructure") slope stabilisation established during the rains (ICCO/CET, 2025); the ESMP carries the corresponding construction-phase erosion and sediment-control requirements, including progressive re-vegetation and borrow-pit restoration.

6.3 Hydrology and Drainage

6.3.1 Drainage Setting

The corridor drains towards two Atlantic river systems. East of approximately km 55, drainage is tributary to the Cavalla River basin — the Cavalla forms Liberia's eastern border with Côte d'Ivoire — while west of approximately km 55 the creeks form headwaters of the Cestos River system (BFS, 2026). The 2024 ESIA identified the receiving waters in more detail: creeks in the border section drain via the Tabi (Wala) Creek towards the Cestos, while creeks in the central and eastern corridor drain via the Dube River, roughly 15 km south of the road, to the Cavalla (Earthtime, 2024). More than 30 creeks and streams cross the alignment in total, but no major river intersects it; named watercourses recorded at crossings in 2023 include the Tahi (Wala) Creek, Tah Creek, Gillee Creek, Senneh River, Baha Water (Duogee), Gbekai Creek, Dunee River, Seh River, Degbor and the Gunie River at the entrance to Zwedru, with the Tani River lying at the Côte d'Ivoire border itself (Earthtime, 2024). The existing crossings comprise five bridges — retained and widened in the design, at corridor km about 42.5, 48.4, 57.3, 67.4 and 81.6 — and 34 culverts, to be replaced and augmented by 42 box culverts and 40 pipe culverts under the concept design (ICCO/CET, 2025).

6.3.2 Creek and Stream Crossings within the Right-of-Way

The July 2026 field survey identified and documented nine significant creeks and streams within the 150-ft right-of-way, varying in width from 7 m to 16 m, with flows running predominantly east–west or west–east in response to the local topographic gradient; five are perennial and four intermittent (RE-GROUP, 2026). These are listed in Table 6.2; their locations, together with the wetland inventory and the drainage structures, are mapped in Chapter 3 (Figure 3.3), which is not repeated here. Table 6.2 records the significant named or field-verified creeks and is not the complete inventory of cross-drainage points, which is given by the design culvert schedule.

Table 6.2: Creek and stream crossings within the 150-ft right-of-way (RE-GROUP, 2026)

Crossing	Easting (UTM 29N)	Northing	Width (m)	Flow direction	Permanence	Corridor reach (indicative)
Unknown Creek 1	0594360	0672683	13	West to East	Perennial	Zwedru–Gboleyville
Unknown Creek 2	0583322	0680013	15	East to West	Intermittent	Solo Town area (near BP2/IW-007)
Unknown Creek 3	0575746	0684634	15	East to West	Perennial	Zai Town (station SW-01)
Unknown Creek 4	0575725	0684639	10	West to East	Intermittent	Zai Town
Unknown Creek 5	0567836	0686376	10	East to West	Intermittent	Pouh Town (station SW-02)
Unknown Creek 6	0567839	0686363	16	East to West	Perennial	Pouh Town
Donneh Creek	0563278	0688495	15	East to West	Perennial	Zleh City (station SW-03)
Kougae Creek	0552976	0714563	10	East to West	Perennial	Nicko Town — sacred creek (SS-004)
Unknown Stream	0554577	0715030	7	West to East	Intermittent	B'hai Jorzon — sacred creek (SS-003)

Two of the nine crossings are sacred water bodies: the Kougae Creek at Nicko Town (its water may not be taken into the town) and the B'hai Jorzon sacred creek (its fish may not be eaten). Both are registered as cultural-heritage sites (SS-004 and SS-003 respectively; Section 8.6, Table 8.2) and carry avoidance and custodial-consultation requirements in addition to water-quality protection. The perennial creeks — including the Donneh and Kougae — support fish populations used by local communities, although no formal fish survey has yet been undertaken. This carried data gap is closed by commitment: a specialist ichthyological survey of all nine fish-bearing creeks — commissioned by the IIU through the Monitoring Consultant with a BFS-consortium aquatic specialist, and funded from the Project's E&S provisional sums — will be completed before in-stream works at any of the nine crossings and in any case within six months of commencement; its results inform the crossing designs through the design-review gate and update the aquatic impact rating (Section 11.9.3). At the two sacred creeks among the nine crossings, and at the Toe Town Sacred Stream (SS-006) where the works affect it, the survey is designed with the custodians and answers the sacred-creek concern raised in consultation directly: the custodians' documented consent is obtained before any sampling; the methods are non-lethal (visual census and environmental DNA, with catch-and-release only where the custodians permit the handling of fish); no fish is removed from the B'hai Jorzon sacred creek, whose fish may not be eaten, and no water is drawn from the Kougae Creek for the survey, whose water may not be taken into the town; the findings are shared with the custodians; and the crossing design and the in-stream construction method at each sacred creek are agreed with the custodians before any in-stream work (Section 8.6, Table 8.2; Table 10.9, measure CU-01). The nine crossings are mapped on the corridor alignment sheets (Figure 3.2) and in the BMP spatial regime (Appendix T, its Figure 2.1). The border segment between B'hai Jorzon and Toe Town includes approximately three creek crossings for which no flow measurements exist — a further hydrological data gap for detailed drainage design.

6.3.3 Inland Wetlands

The 2026 survey additionally documented 31 discrete inland wetlands (IW-001–IW-031) within the 150-ft right-of-way — low-lying areas with hydric soils that remain waterlogged or muddy even in the dry season, each individually georeferenced and typically 0.3–0.8 ha in extent (aggregate approximately 13.5 ha) (RE-GROUP, 2026). Many are fringed by seasonally flooded forest, and the 2026 biodiversity assessment found all 16 amphibian species recorded on the corridor exclusively in this habitat. The wetlands perform flood attenuation, natural filtration of runoff, amphibian breeding and nursery functions, and dry-season refugia. Their distribution along the corridor, converted from the source report's Zwedru-origin stationing to the canonical B'hai-origin chainage, is:

- km 0–25 (B'hai Jorzon to Sennehwein Town): 8 wetlands (25.8 per cent);
- km 25–45 (Sennehwein Town to the Zleh City area): 10 wetlands (32.3 per cent);
- km 45–65 (Zleh City to the Zai Town area): 8 wetlands (25.8 per cent);
- km 65–85 (Zaiyee Town to Zwedru City): 5 wetlands (16.1 per cent).

The BFS records two larger wetland complexes beyond the right-of-way inventory: the Towah swamp (approximately 380 ha) crossed at km 12–14, which functions as a wildlife crossing corridor and is to be crossed by a span or a large box culvert rather than filled, using a low-flow in-stream method with silt control (BMP rev.3, action A7), and the New Tuzon swamp complex at approximately km 65–72 (BFS, 2026). One right-of-way wetland, IW-007, coincides with the coordinates of proposed borrow pit BP2; BP2 therefore requires pre-clearance screening before any approval, and no wetland may be directly filled. The management requirements carried into the ESMP are: maintenance of hydrological connectivity and flow regimes at every crossing (the 2026 assessment anticipates culvert installations at some 30–40 stream and wetland crossings, within the 82-culvert design schedule); no direct wetland fill; and strict sediment control on all works draining towards wetlands.

6.3.4 Flood-Prone Reaches

Flood susceptibility along the corridor is driven by intense wet-season rainfall, flat low-lying terrain, and an existing road that in places has been graded below natural ground level, with wet-season ponding, rutting

and impassability recorded in the 2024 ESIA (Earthtime, 2024). Reaches of elevated flood risk include the Towah swamp crossing (km 12–14) and the adjoining wetland concentration at km 15–20; the New Tuzon swamp complex (km 65–72); and the low-lying swamp-rice and wetland reaches around Zleh City and between Zai Town and Zwedru. The Contractor's site investigations likewise identified zones of soft, swampy subsoil requiring removal and replacement with granular fill (ICCO/CET, 2025). The concept design recognises the major flow concentrations through its largest structures — multi-cell box culverts at corridor km about 20.5 (seven cells of 3.0 m × 2.5 m), km about 24.2 (five cells), km about 43.3 and km about 62.5 (four cells each) and km about 76.1 (six cells) — together with the 10-, 50- and 100-year flood standards, raised profiles in flood-prone areas, and scour protection at bridges (ICCO/CET, 2025). Hydraulic verification of these provisions at detailed design, including consideration of climate-driven rainfall intensification (Section 6.1), is carried forward as an ESMP action.

6.4 Water Quality

The 2026 water-quality programme sampled three surface-water stations — SW-01 (unnamed creek, Zai Town highway), SW-02 (unnamed creek, Pouh Town highway) and SW-03 (Donneh Creek) — and five groundwater stations at community supply points: GW-01 (handpump, Zai Town), GW-02 (handpump, Zleh City), GW-03 (well, Zleh City), GW-04 (handpump, Suaken Town) and GW-05 (handpump, B'hai Jorzon); surface waters were sampled on 4 August and groundwater on 4–6 August 2026 (Plates 6.2 and 6.3). These five groundwater points double as the only georeferenced community water-point inventory currently available for the corridor. Results were assessed by the laboratory against the Liberia Water Quality Standard (LQWS) Class III for surface water and Class I for groundwater. The 2026 network is smaller than the 2023 network (14 surface-water and 6 groundwater stations) and the analyte suite narrower; the stations are not co-located with those of 2023, and the seasons differ (November 2023, early dry season, versus August 2026, wet season). The comparison in Section 6.4.3 is therefore indicative rather than station-by-station.



Plate 6.2: Groundwater sampling at a community handpump — Zai Town (station GW-01), August 2026 (RE-GROUP field survey)



Plate 6.3: Surface-water sampling at a creek near Zleh City, August 2026 (RE-GROUP field survey)

6.4.1 Surface Water Quality (2026)

Table 6.3 presents the 2026 surface-water results against LQWS Class III.

Table 6.3: 2026 surface-water quality results, SW-01–SW-03, versus LQWS Class III (UL LAB/ICC/002A/2026)

Parameter (unit)	SW-01	SW-02	SW-03 (Donneh Creek)	LQWS Class III
pH	6.90	7.48	6.34	5.5–9.0
Turbidity (NTU)	0.64	0.57	0.66	≤10.0
Electrical conductivity (µS/cm)	55.10	49.00	43.30	NS
Total dissolved solids (mg/l)	53.24	50.18	48.21	≤1,200.0
Total suspended solids (mg/l)	8.00	8.33	7.86	≤50.0
Sulphate (mg/l)	0.68	0.59	0.90	≤250.0
Chloride (mg/l)	0.55	0.77	0.65	≤450.0
Nitrate (mg/l)	0.50	0.39	0.40	≤80.0
Chromium (VI) (mg/l)	0.035	0.044	**0.39**	≤0.1
Iron (mg/l)	0.052	0.071	0.73	≤2.0
Cadmium (mg/l)	≤0.001	≤0.001	≤0.001	≤0.01

The three creeks are generally of good quality and compliant with LQWS Class III: low turbidity and suspended solids, low mineralisation, low nutrients, cadmium below detection and iron well within class limits. The single reported exceedance is hexavalent chromium at SW-03 (Donneh Creek), printed as 0.39 mg/l against the Class III limit of 0.1 mg/l — 3.9 times the limit as printed. This value is flagged for laboratory verification as a possible transcription of 0.039 mg/l: it is an order of magnitude above every other chromium result in the campaign (all seven other stations returned 0.025–0.044 mg/l), the certificate's own convention of printing exceedances in bold was not applied to it, and no chromium source is known in the Donneh catchment. The written laboratory confirmation — stating the analytical method and detection limit — will be obtained and appended to the certificate record, and the corrected result reported in the pre-construction verification record; total chromium is analysed alongside the hexavalent determination, and the pre-construction re-testing extends to manganese, mercury, arsenic and coliforms at the stations where each applies (Sections 11.4 and 11.9.3). The value is nevertheless carried at face value pending verification, and the Project commits to (i) obtaining written confirmation or correction from the University of Liberia laboratory and (ii) re-sampling Donneh Creek for hexavalent chromium, with source investigation should the exceedance be confirmed, before commencement of civil works in the Donneh Creek catchment. SW-03 also shows the lowest pH (6.34) and the highest iron (0.73 mg/l, about ten times the SW-01 and SW-02 values) of the three stations. Both are within class limits, but the iron value shows the same order-of-magnitude pattern as the chromium result and is included in the laboratory verification query. Figure 6.4 charts each 2026 surface-water result as a percentage of its LQWS Class III limit, in which the anomalous SW-03 chromium value stands out against an otherwise fully compliant profile.

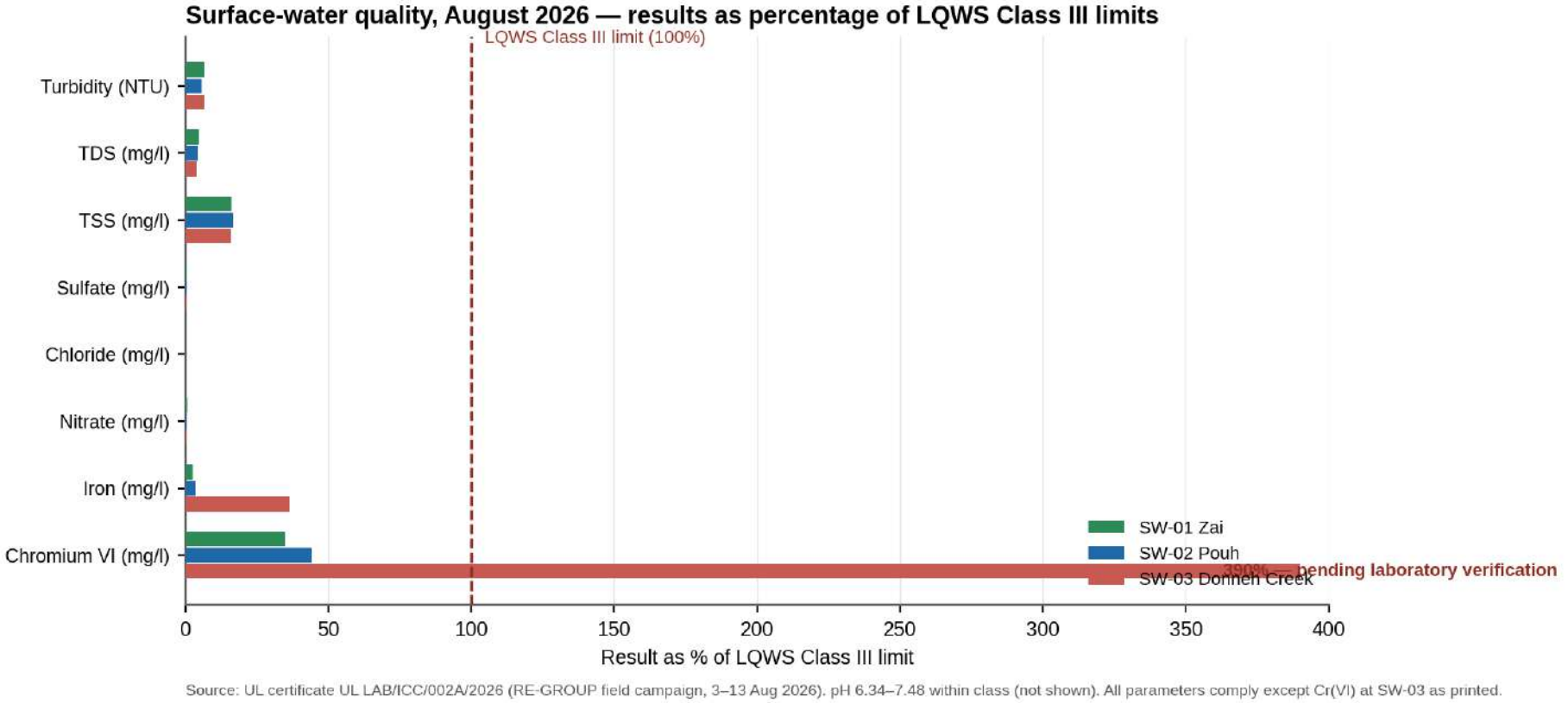


Figure 6.4: Surface-water results as a percentage of the LQWS Class III limits, August 2026 (RE-GROUP, 2026).

6.4.2 Groundwater Quality (2026)

Table 6.4 presents the 2026 groundwater results against LQWS Class I.

Table 6.4: 2026 groundwater quality results, GW-01–GW-05, versus LQWS Class I (UL LAB/ICC/002A/2026)

Parameter (unit)	GW-01	GW-02	GW-03	GW-04	GW-05	LQWS Class I
pH	6.95	7.25	7.58	6.70	6.53	6.5–8.0
Turbidity (NTU)	0.60	0.53	0.55	0.66	0.64	≤5
Electrical conductivity (µS/cm)	52.00	51.88	49.50	44.20	48.15	1,000
Total dissolved solids (mg/l)	45.21	40.01	39.28	46.21	47.00	≤500
Total suspended solids (mg/l)	8.00	6.98	7.33	7.86	6.86	≤10
Sulphate (mg/l)	0.55	0.54	0.53	0.64	0.67	≤150.0
Chloride (mg/l)	0.51	0.47	0.67	0.60	0.59	250
Nitrate (mg/l)	0.48	0.45	0.36	0.44	0.39	≤40.0
Chromium (VI) (mg/l)	0.033	0.025	0.042	0.031	0.028	≤0.05
Iron (mg/l)	0.043	0.034	0.039	0.045	0.029	≤0.1
Cadmium (mg/l)	≤0.001	≤0.001	≤0.001	≤0.001	≤0.001	ND

There are no groundwater exceedances: all five community sources comply with LQWS Class I for every analysed parameter. Two results nonetheless warrant management attention. First, pH at GW-05 (B'hai Jorzon handpump), at 6.53, sits just inside the Class I lower bound of 6.5 and should be watched in future rounds. Secondly, total suspended solids of 6.86–8.00 mg/l stand at 69–80 per cent of the strict Class I limit of 10 mg/l at all five points: the headroom between baseline condition and non-compliance is small, so any ingress of construction sediment could tip these community drinking-water sources over the limit. Wellhead protection is therefore required — physical protection zones around all pumps and wells near the works, exclusion of runoff from work areas, no spoil, fuel or wastewater handling near water points, and prompt repair of any verified damage — as also demanded by communities during the August 2026 consultations. Microbiological potability of the five sources was not tested in 2026 and remains unverified; this is a carried data gap for the pre-construction round.

6.4.3 Comparison with the 2023 Baseline

The 2023 campaign found a generally natural but locally stressed water environment: manganese above both Liberian standards at all 14 surface-water stations (0.2–0.63 mg/l, attributed to natural leaching); iron at or above 0.1 mg/l at all sites, with 1.0 mg/l at one station exceeding the 0.3 mg/l EPA/WHO value; mercury above the national "not detectable" requirement at six surface-water stations (0.0108–0.0202 µg/l, though far below EPA/WHO health limits); suspended solids above 10 mg/l at six stations; and phosphate above the national limit almost everywhere, linked to open-defecation sanitation and agricultural runoff. In groundwater, all six wells were acidic (pH 5.45–5.91), nitrate reached 68.2 mg/l at 2023 station GW02 (Toe Town, near the market) against limits of 40–50 mg/l, and lead reached 21.6 µg/l at 2023 station GW05 (Zai Town — a station distinct from the 2026 GW-05 at B'hai Jorzon), exceeding the 10 µg/l EPA/WHO value; no petroleum hydrocarbons or VOCs were detected in any water sample (Earthtime, 2024). Table 6.5 reconciles those findings with the 2026 results.

Table 6.5: Comparison of 2023 exceedances with 2026 results and carried actions

Parameter	2023 finding (Earthtime, 2024)	2026 result (RE-GROUP, 2026)	Status carried into this ESIA
Manganese	Above MoH 0.1/EPA 0.05 mg/l at all 14 surface-water stations (0.2–0.63 mg/l); also 3 wells	Not analysed in 2026	Data gap — pre-construction verification sampling committed
Mercury	Above MoH "not detectable" at 6 surface-water stations (0.0108–0.0202 µg/l) and 4 wells; below EPA/WHO limits	Not analysed in 2026	Data gap — pre-construction verification sampling committed
Phosphate	Above the MoH 0.01 mg/l limit at 13 of 14 surface-water stations (0.02–0.36 mg/l) and in all 6 wells (0.04–0.17 mg/l), linked to sanitation and agricultural runoff	Not analysed in 2026	Data gap — pre-construction verification sampling committed
Iron	At or above 0.1 mg/l at all surface-water sites; 1.0 mg/l at SW28 above EPA/WHO 0.3 mg/l	Surface water 0.052–0.73 mg/l (limit 2.0); groundwater 0.029–	Compliant in 2026

Parameter	2023 finding (Earthtime, 2024)	2026 result (RE-GROUP, 2026)	Status carried into this ESIA
		0.045 mg/l (limit 0.1) — compliant	
Total suspended solids	Above 10 mg/l at 6 surface-water stations (10.5–31.8 mg/l); 42.4 mg/l at 2023 GW05	Surface water 7.86–8.33 mg/l (limit 50); groundwater 6.86–8.00 mg/l (limit 10) — compliant	Compliant, but groundwater at 69–80% of Class I limit — wellhead protection required
Nitrate (groundwater)	68.2 mg/l at 2023 GW02, Toe Town — above MoH 40/EPA 45/WHO 50 mg/l	0.36–0.48 mg/l at the 5 stations sampled (limit 40) — compliant; the Toe Town well was not re-sampled	Localised sanitation pressure presumed; include Toe Town source in pre-construction round
Lead (groundwater)	21.6 µg/l at 2023 GW05, Zai Town — above EPA/WHO 10 µg/l	Lead not in the 2026 water suite (soil lead below detection at all sites)	Data gap — include lead in pre-construction verification sampling
pH	Acidic in all 6 wells (5.45–5.91); below 6.5 at 3 of 14 surface-water sites	Groundwater 6.53–7.58 and surface water 6.34–7.48 — all within class	Compliant; GW-05 near the Class I lower bound

In summary, suspended solids, flagged in 2023 against a 10 mg/l screening value, are now below that value at every station, and nitrate at the five 2026 stations is unremarkable. Iron complies with LQWS Class III (2.0 mg/l) and Class I (0.1 mg/l); the SW-03 result (0.73 mg/l) would, however, exceed the 0.3 mg/l EPA/WHO value against which iron was flagged in 2023, so part of the apparent improvement reflects the change of reference standard. However, manganese and mercury, the two most widespread 2023 exceedances, were not re-tested in 2026, and neither were arsenic, phosphate, BOD/COD, coliforms or oil and grease, all of which appear in the Project's own sampling toolkit suite. The closure of the 2023 flags therefore cannot be confirmed. This is carried explicitly as a data gap, with a commitment to a pre-construction verification round at representative surface-water and community groundwater stations, covering manganese, mercury, lead, arsenic, BOD/COD, phosphate, microbiological indicators and oil and grease; the round is completed by the Contractor under the CESMP and verified by the Supervising Engineer before works reach the affected reaches, and its results are reflected in the CESMP monitoring baselines.

6.5 Air Quality

Baseline air quality was measured at 20 stations (AQ-01–AQ-20) between 3 and 7 August 2026, covering the corridor settlements from Zwedru City and Gboleyville to Toe Town, Nicko Town, Goyeazon and the B'hai Jorzon border, together with the proposed quarry, batching/asphalt/crusher, camp, mechanical-site and borrow-pit locations. All reported parameters at all reported stations are within the reference values cited on the laboratory certificate (which the certificate attributes to WHO; the WBG EHS and WHO 2021 guideline values are the standards applied in Chapters 8 to 11): carbon monoxide 5.86–7.45 ppm (reference 50 ppm); volatile organic compounds below 0.001 ppm (reference 0.75 ppm); PM2.5 5.78–7.34 µg/m³ (reference 35 µg/m³); PM10 5.55–7.63 µg/m³ (reference 50 µg/m³); sulphur dioxide 0.27–0.44 µg/m³ (reference 20 µg/m³); and nitrogen dioxide 0.01 ppm at every station (reference 1.00 ppm). The particulate spot readings are also below the 24-hour PM2.5 guideline of the WHO Global Air Quality Guidelines (2021), 15 µg/m³, although spot readings are only indicative against a 24-hour averaging period. The lowest PM10 value (5.55 µg/m³) is below the lowest PM2.5 value (5.78 µg/m³), which is physically impossible at a single station because PM2.5 is a fraction of PM10; the particulate data are therefore treated as indicative until the laboratory responds to the query. Pre-construction ambient air quality along the corridor is therefore

very good, as expected for a rural, largely unindustrialised setting whose present emission sources are limited to vehicle exhaust and dust from the unpaved road, domestic cooking and charcoal production, slash-and-burn land preparation, and seasonal Harmattan dust between December and April.

Four reporting anomalies are recorded for transparency: results for stations AQ-07 (Duogee Town) and AQ-12 (Zai Town) do not appear in the certificate's results tables although both stations were sampled — the laboratory has been asked to supply or explain the missing results, and this is carried as a data gap; the sulphur dioxide cell for AQ-06 (camp site) is blank; the reported carbon dioxide concentrations (13.60–20.83 ppm) are physically implausible for ambient air (approximately 420 ppm globally) and have been queried as an instrument or unit error; and the PM2.5 row of the certificate's second results table (stations AQ-14–AQ-20) repeats the values of the first table's opening columns exactly, suggesting a copy artefact, and has likewise been queried. None of these anomalies affects the compliance conclusion for the parameters reported, all of which lie far below their reference values.

The 2026 findings are continuous with the 2023 baseline, in which spot measurements at eight stations — including forest, market, clinic, school and hospital frontages — were likewise all below the applicable Liberian and WHO limit values, with PM10 of 7–61 µg/m³ and PM2.5 of 3–19 µg/m³ (reported as 0.007–0.061 and 0.003–0.019 mg/m³) (Earthtime, 2024). Two campaigns three years apart, by different laboratories and station networks, thus concur that the corridor enters construction with clean air, and that construction dust — earthworks, unpaved haulage, crushing, asphalt and batching operations — will be the dominant future pressure, seasonally compounded by the Harmattan. The sensitive receptors are the linear roadside settlements themselves, whose houses, shops and social facilities face the carriageway, and in particular the schools, clinics and markets along the right-of-way: among others, the Zai Town clinic, the public school serving Zleh City (Gborho Central High School), the Toe Town and Zleh City markets, and, near Zwedru, the Midwifery Training School, the Grand Gedeh County referral hospital nearing completion, and Martha Tubman Memorial Hospital. Dust was raised as a priority concern in the August 2026 consultations (Table 5.3), with requests for watering and covered loads; these controls, receptor-focused monitoring at the ancillary sites, and completion of the AQ-07/AQ-12 record are carried into the ESMP.

6.6 Noise

Baseline noise was measured concurrently at the 20 stations co-located with the air-quality network (NS-01–NS-20), as single daytime spot readings. Measured levels ranged from 46.30 dB(A) (Gboleyville) to 55.00 dB(A) (B'hai Jorzon border), all below the 75 dB(A) reference cited on the certificate. Assessed instead against the more protective WBG EHS daytime residential guideline of 55 dB(A) — the screening value adopted in the Project's own sampling toolkit — the B'hai Jorzon border station sits exactly at the guideline, and the Suaken quarry-site (54.02), Zwedru City (54.00) and Zai Town (53.13) stations approach it. The pattern is consistent with the qualitative characterisation in the 2026 biodiversity assessment of rural background levels of 35–45 dB(A), village levels of 40–50 dB(A) and roadside levels of 45–55 dB(A) LAeq (RE-GROUP, 2026): the corridor is quiet by any urban standard, with the highest baseline levels at market and roadside locations where traffic — chiefly motorcycles — commerce and public activity concentrate, notably the border crossing settlement and Zwedru City. Table 6.6 summarises the 2026 results by receptor group.

Table 6.6: 2026 daytime noise summary by station group (NS-01–NS-20, UL LAB/ICC/002A/2026)

Receptor group	Stations	n	LAeq range, dB(A)	Highest station, dB(A)	Screening remark
Settlement and roadside community stations	NS-02, NS-07–NS-09, NS-12–NS-20	13	46.30–55.00	B'hai Jorzon border, 55.00	Within the certificate reference of 75 dB(A); NS-20 at, and NS-09/NS-12 near, the WBG EHS daytime residential guideline of 55 dB(A)
Proposed ancillary-facility sites (mechanical site, both quarries, batching/asphalt/crusher complex, camp)	NS-01, NS-03–NS-06	5	48.99–54.02	Suaken quarry site, 54.02	Quiet rural baseline; limited headroom for plant noise at Suaken, with dwellings about 431 m from the quarry
Borrow pits	NS-10 (BP1), NS-11 (BP3)	2	51.90–52.00	BP3, 52.00	Quiet rural baseline; BP3 adjoins secondary forest

The 2023 baseline, which used attended 30-minute LAeq measurements including night-time readings at three stations, provides the complementary picture: daytime levels of 46.1–64.4 dB(A) exceeded the applicable national (EPA 2017) category limits at about half of the daytime sites — including clinic frontages near Duogee and at Pouh Town, Martha Tubman Memorial Hospital (61.0 dB(A) against a 45–50 dB(A) category) and the Zwedru Youth Center (64.4 dB(A)) — and night-time levels of 56.5–60.8 dB(A) exceeded national night limits at all three night stations (Toe Town, the hospital and the Youth Center), driven overwhelmingly by motorcycle traffic with evening amplified music and public address (Earthtime, 2024). The corridor's sensitive noise receptors are therefore the same roadside dwellings, schools, clinics and hospitals identified for air quality, several of which already experience elevated levels from existing traffic and social activity.

The implications for construction are threefold. First, scheduling: with residential night-time guidelines of 45 dB(A) (WBG EHS) and existing night levels already elevated in the towns, construction and haulage near settlements should be confined to daytime hours, with advance notice of any unavoidable night works; communities at B'hai Jorzon explicitly requested limited working hours during the August 2026 consultations, and within the Chimpanzee Sensitivity Zone (km 18–20) and the pangolin Critical Habitat polygons (km 38–50), works are in any case restricted to 08:00–16:00, with no night work or blasting, under BMP rev.3 action A2. Secondly, receptor protection: quarry, crushing, asphalt and batching operations at the Suaken complex must manage cumulative plant noise against a baseline already at 49–54 dB(A), and blasting at the quarry raises a vibration concern for older fragile homes voiced by the Suaken host community. Thirdly, measurement: the 2026 dataset comprises single daytime spot readings without night-time measurements, LAmax/LA90 statistics, durations or meter-class metadata, and no vibration baseline exists at the Suaken quarry; an attended noise and vibration baseline at the quarry, the batching complex and the nearest settlement receptors is therefore committed and carried into the ESMP; the Contractor completes it, verified by the Supervising Engineer, before quarry operation and before the relevant works begin, together with construction-phase noise monitoring at the sensitive receptors identified above.

7 BASELINE CONDITIONS: THE BIOLOGICAL ENVIRONMENT

This chapter presents the biological-environment baseline as transformed by the Biodiversity Field Survey (BFS, 2025–26) — the two-season, consortium-delivered survey commissioned to close the biodiversity data gaps of the 2024 ESIA — supplemented by the RE-GROUP 2026 update survey. It sets out the survey methods and effort, habitats and land cover, flora, fauna, the ESS6 Critical Habitat determination with the Chimpanzee Sensitivity Zone and Critical Habitat polygons, and ecosystem services and community resource use. The 2024 ESIA's biological baseline (Earthtime, 2024, Chapter 7) is retained as the reference record; where its inferences are superseded by the BFS's field-verified findings — most materially the location of chimpanzee sensitivity, now fixed at approximately km 19 rather than km 64–72 — the BFS governs. The full survey tables are at Appendices M and N, and the management response is the Biodiversity Management Plan at Appendix T.

7.1 The BFS Methods Summary

The Biodiversity Field Survey was led by the Society for the Conservation of Nature of Liberia (SCNL) in partnership with the Wild Chimpanzee Foundation (WCF), Fauna & Flora and Solimar International, and was carried out over two seasons: Phase 1 in the rainy season (October–November 2025) and Phase 2 in the dry season (December 2025 – February 2026), giving the seasonal representativeness that the single-season 2023 baseline lacked. Surveys were structured across nested study zones: the sub-AoI, extending 500 m either side of the centreline (the direct works footprint); the Area of Influence (AoI), extending 1 km either side of the centreline (a 2 km-wide band of about 167.6 km²); and the surveyed buffer, extending to 2 km either side (about 336.1 km²). A 5 km extended buffer (about 850 km²) serves as reference landscape only. Field methods followed the SMART protocol with all records georeferenced (UTM Zone 29N, WGS 84) into a version-controlled PostGIS geodatabase (BFS, 2026, Ch. 2). Figure 5.2 summarises the survey effort by method and its balance between the AoI and the surveyed buffer and between the two phases.

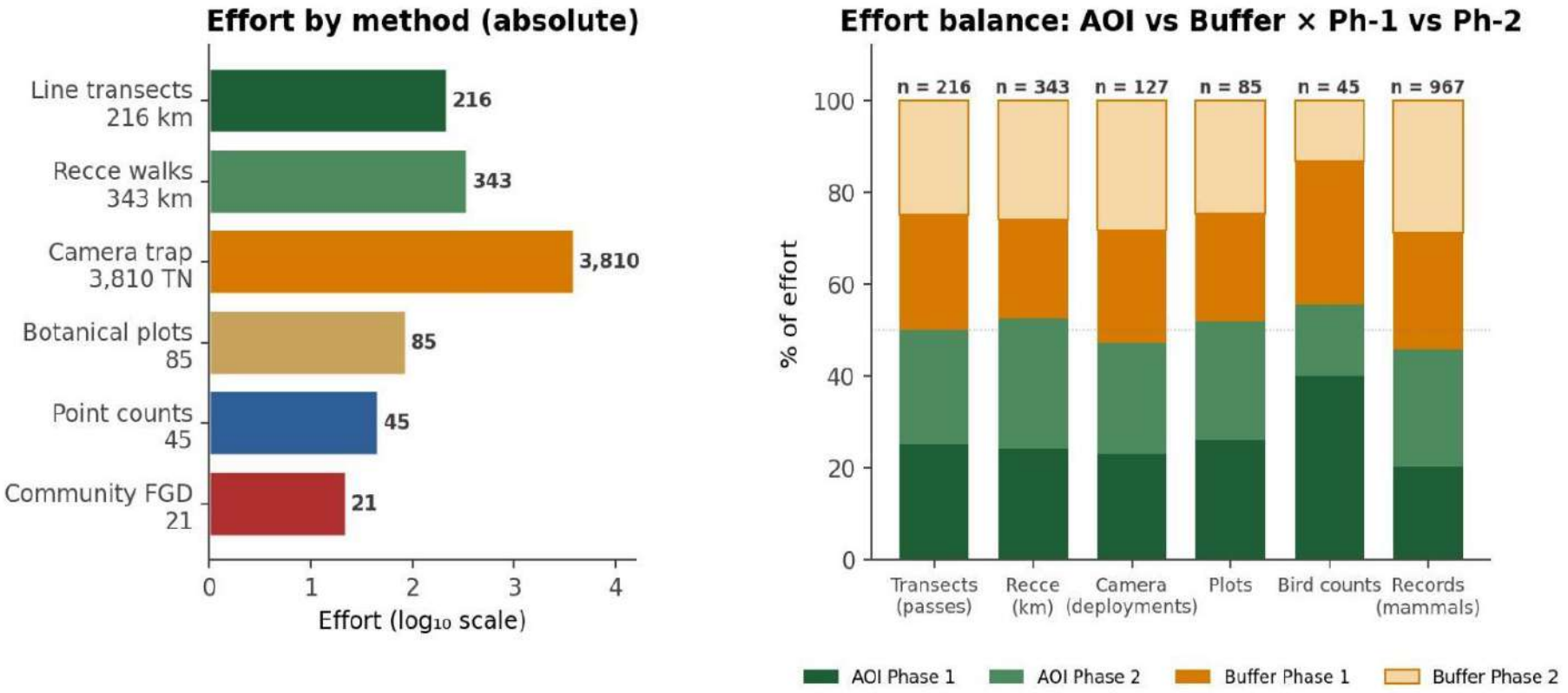


Figure 7.1: BFS survey effort by method (left; logarithmic scale) and the balance of effort between the AoI and the surveyed buffer and between Phase 1 and Phase 2 (right) (BFS, 2026, Figure 2.1; reproduced for this ESIA).

Total survey effort comprised: 216 km of line-transect walking (108 unique 1 km transects, each walked once per phase); 343 km of reconnaissance walks; 127 camera-trap units deployed, of which 97 were usable (50 in Phase 1 and 47 in Phase 2), yielding approximately 3,810 functional trap-nights; 85 vegetation plots of 25 m × 25 m (5.31 ha sampled, all stems of at least 10 cm diameter at breast height recorded, with nested sub-plots); and 45 ten-minute fixed-radius bird point counts. The programme was complemented by 21 community consultations with 464 participants (46 per cent women), integrating traditional ecological knowledge, hunter interviews and sacred-grove visits with custodian consent. Quality assurance included GPS precision of 10 m or better, mandatory photographic vouchers for threatened species, a two-specialist verification rule for camera-trap identifications, and clearance of all out-of-range data flags. Figure 7.2 shows the camera-trap station design and its array along a transect, and Figure 7.3 the distribution of effort.

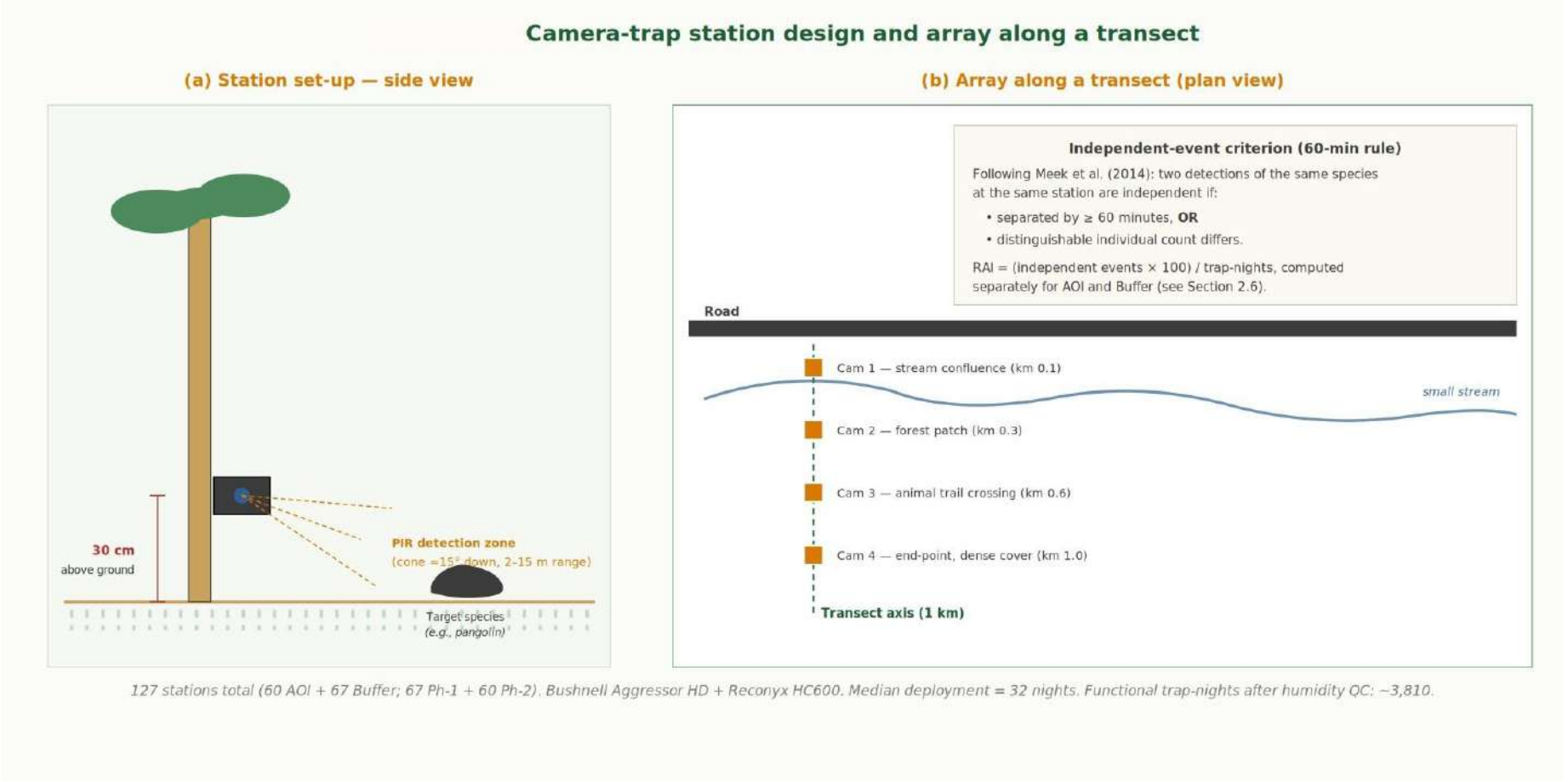
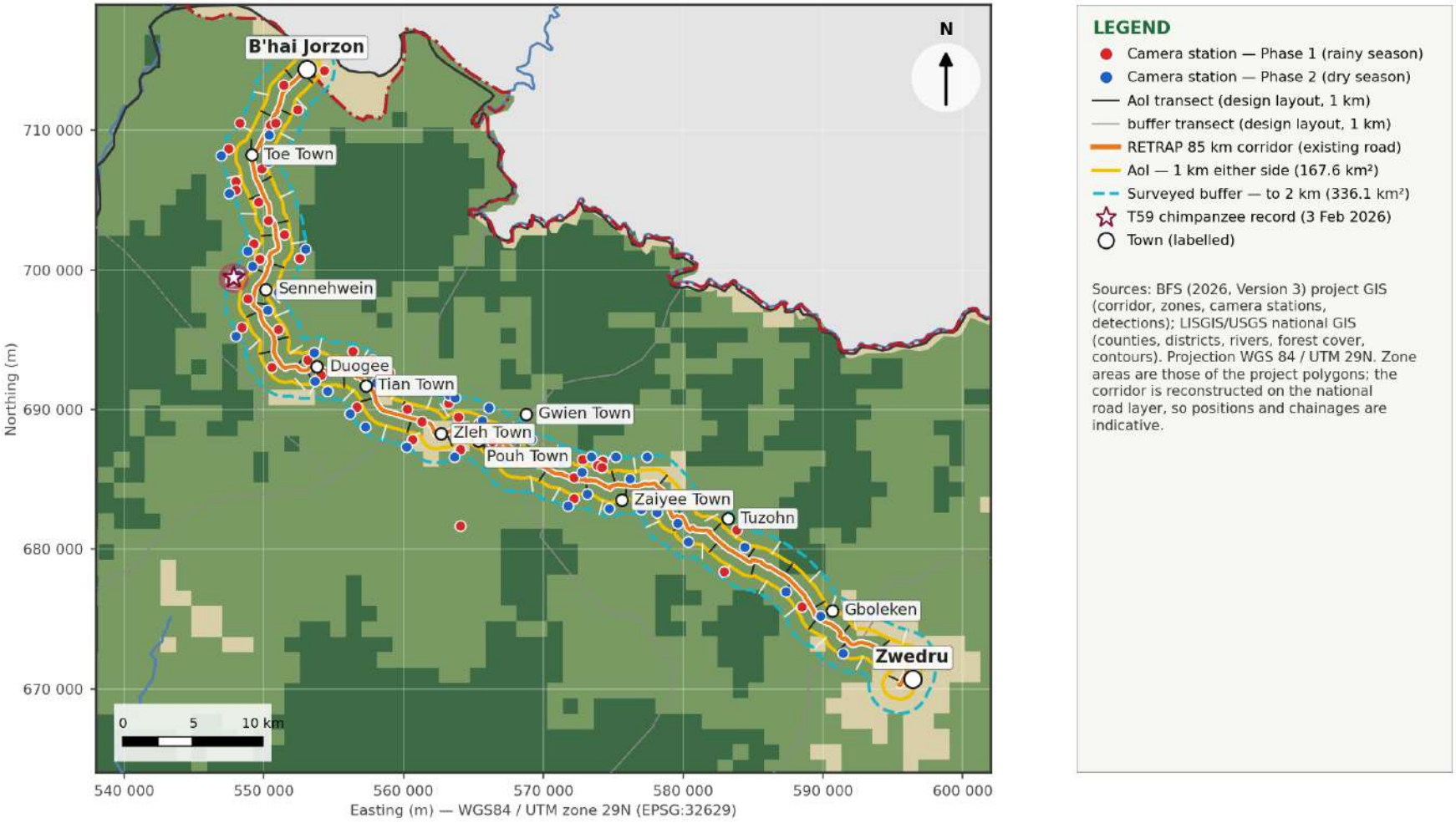


Figure 7.2: BFS camera-trap station design and array along a line transect (adopted from the Biodiversity Field Survey (BFS, 2026, Fig. 2.4); reproduced for this ESIA).



LEGEND

- Camera station — Phase 1 (rainy season)
- Camera station — Phase 2 (dry season)
- AoI transect (design layout, 1 km)
- buffer transect (design layout, 1 km)
- RETRAP 85 km corridor (existing road)
- AoI — 1 km either side (167.6 km²)
- Surveyed buffer — to 2 km (336.1 km²)
- T59 chimpanzee record (3 Feb 2026)
- Town (labelled)

Sources: BFS (2026, Version 3) project GIS (corridor, zones, camera stations, detections); LISGIS/USGS national GIS (counties, districts, rivers, forest cover, contours). Projection WGS 84 / UTM 29N. Zone areas are those of the project polygons; the corridor is reconstructed on the national road layer, so positions and chainages are indicative.

Figure 7.3: BFS survey effort across the Area of Influence and surveyed buffer — line transects, reconnaissance walks, camera-trap stations, vegetation plots and bird point counts over the two survey seasons, October 2025 to February 2026 (BFS, 2026).

The Critical Habitat assessment tested the five criteria of ESS6 paragraph 23 using the decision rules of IFC PS6 Guidance Note 6, delineating Critical Habitat polygons by a 1 km kernel around confirmed detection points with expert-judgment inclusion of contiguous suitable habitat. Chapters 6–8 presents the resulting baseline and Critical Habitat determination; Chapters 8, 9 and 11 carry the BFS threat assessment and the mitigation hierarchy into the Project's management framework. Biodiversity management is confined to detailed design, mobilisation, construction and the defects-liability period; it is set out in the BMP rev.3 (Appendix T) as ten construction-phase actions (A1–A10), with supervision checks and stop-work triggers.

Before the August 2026 campaign, RE-GROUP undertook a supplementary biodiversity verification survey (5–9 July 2026, 15 plots) covering flora, mammals, herpetofauna and birds and mapping 31 inland wetlands and nine creeks within the 150 ft RoW. Its incremental records — including a Giant Pangolin direct record — are cited in Chapters 6–8 as "recorded by the 2026 update survey, subject to verification" and do not alter the BFS Critical Habitat determination (RE-GROUP, 2026).

7.2 Habitats and Land Cover

7.2.1 Study Area and Information Base

The biological baseline presented in Sections 7.2 to 6.11 is organised around the three-tier study-area zonation established by the Biodiversity Field Survey (BFS, 2026), which the 2026 field campaign confirmed as the area of influence for this ESIA. The sub-AoI extends 500 m either side of the centreline and represents the direct works footprint, within which direct habitat loss is modelled. The Area of Influence (AoI) extends 1 km either side of the centreline — a 2 km-wide band delineated as a GIS polygon of about 167.6 km² — and is the primary study area. The surveyed buffer extends to 2 km either side (about 336.1 km²) and is the comparison landscape against which corridor conditions are assessed. A 5 km extended buffer (about 850 km²) is used as reference landscape only. All quantitative habitat, flora and fauna statistics in this chapter are reported against the AoI and surveyed-buffer polygons.

The evidential backbone of the baseline is the two-season BFS undertaken by the Society for the Conservation of Nature of Liberia (SCNL) with the Wild Chimpanzee Foundation (WCF), Fauna & Flora and Solimar International between October 2025 and February 2026, comprising 216 transect-km walked over 108 unique 1 km transects surveyed in both seasons, 343 km of reconnaissance walks, 127 camera-trap deployments of which 97 were usable (approximately 3,810 functional trap-nights), 85 botanical plots sampling 5.31 ha, 45 bird point counts and 21 community consultations with 464 participants (BFS, 2026). This is supplemented by the rapid update survey of the 2026 field campaign (15 botanical plots (about 400 m² each; 6,000 m² in total), visual-encounter and acoustic herpetofauna searches, mammal plots and ten key-informant interviews (separate from the five key informant interviews of the August campaign), 5–9 July 2026) (RE-GROUP, 2026), and by the 2023–24 baseline of the previous ESIA, which is retained and contextualised rather than replaced (Earthtime, 2024). Full survey design, effort statistics and record-level registers are documented in the BFS (BFS, 2026, Chs 3–5, Annexes 6–8); the 2023–24 biological baseline methods and results are documented in the 2024 ESIA (Earthtime, 2024, Ch. 7).

The corridor lies wholly within the Upper Guinean Moist Forest ecoregion, a WWF Global 200 priority ecoregion, part of the Guinean Forests of West Africa biodiversity hotspot and of BirdLife Endemic Bird Area 084. Liberia retains approximately 43 per cent of the remaining Upper Guinean forest, which frames the international significance of even the degraded forest mosaic that the road traverses (BFS, 2026).

7.2.2 Habitat and Land-Cover Classes

The BFS classified habitat from 2,689 georeferenced SMART observation records (1,306 in the AoI and 1,383 in the buffer) into seven habitat and land-cover classes. Their proportional composition is as follows (AoI percentage / buffer percentage of records) (BFS, 2026):

- **Farm-bush** — 39.4 per cent / 33.3 per cent: the dominant matrix; supports generalist species and indicates recent disturbance.
- **Swamp and wetland —** 21.0 per cent / 17.2 per cent: hydrologically significant; amphibian and hornbill habitat; managed as a Priority Biodiversity Feature.
- **Plantation (cocoa, oil palm, rubber)** — 14.7 per cent / 25.0 per cent: shaded cocoa retains partial habitat value.
- **Secondary forest** — 12.8 per cent / 20.5 per cent: the core habitat of the Critical Habitat-qualifying species and the avoidance priority.
- **Community and settlement land** — 11.6 per cent / 2.2 per cent: very low habitat value.
- **Abandoned farm and plantation —** 0.5 per cent / 1.5 per cent: identified by the BFS as a restoration opportunity where the works footprint touches it, addressed through progressive footprint restoration (BMP rev.3, action A8).
- **Mountain forest patches** — 0 per cent / 0.3 per cent: small, high-integrity patches associated with sacred groves.

Differences between the AoI and buffer are statistically significant for plantation, secondary forest and community land (chi-squared test, $p < 0.001$). Approximately 64 per cent of AoI records already fall in non-forest classes, meaning that avoidance of natural habitat has largely been achieved by the selection of the existing alignment. Primary forest is essentially absent: at most 0.5 per cent of the AoI, with buffer mountain-forest patches at 0.3 per cent (BFS, 2026). The corridor-scale distribution of these land-use classes, including the farm-crop mosaic, is mapped in Figure 7.4.

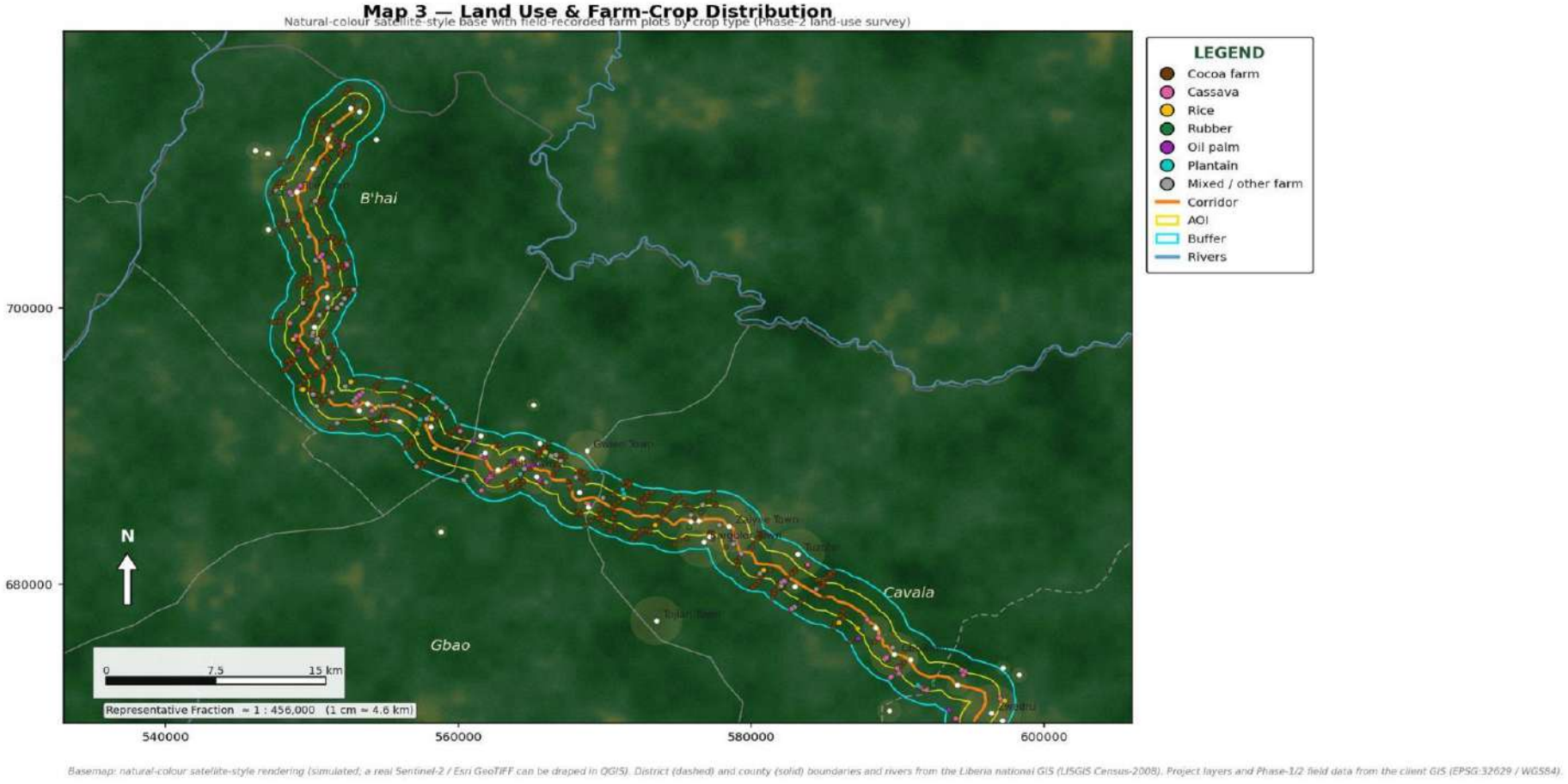


Figure 7.4: Land use and farm-crop distribution along the corridor (BFS, 2026, Figure 1.9; reproduced for this ESIA).

The longitudinal pattern is management-relevant. Wetland concentrations occur at km 15–20 (with the Towah swamp crossing at km 12–14) and at km 60–75 (the New Tuzon swamp complex at km 65–72); secondary forest peaks at km 50–65 (over 30 per cent of records, where the corridor abuts the Putu Range); and community land dominates the termini at km 0–5 and km 80–85 (BFS, 2026). This longitudinal sequence is drawn as a linear ecosystem strip-map at Figure 7.5, and Plate 7.1 illustrates the characteristic passage of the corridor through the secondary-forest and regrowth mosaic.

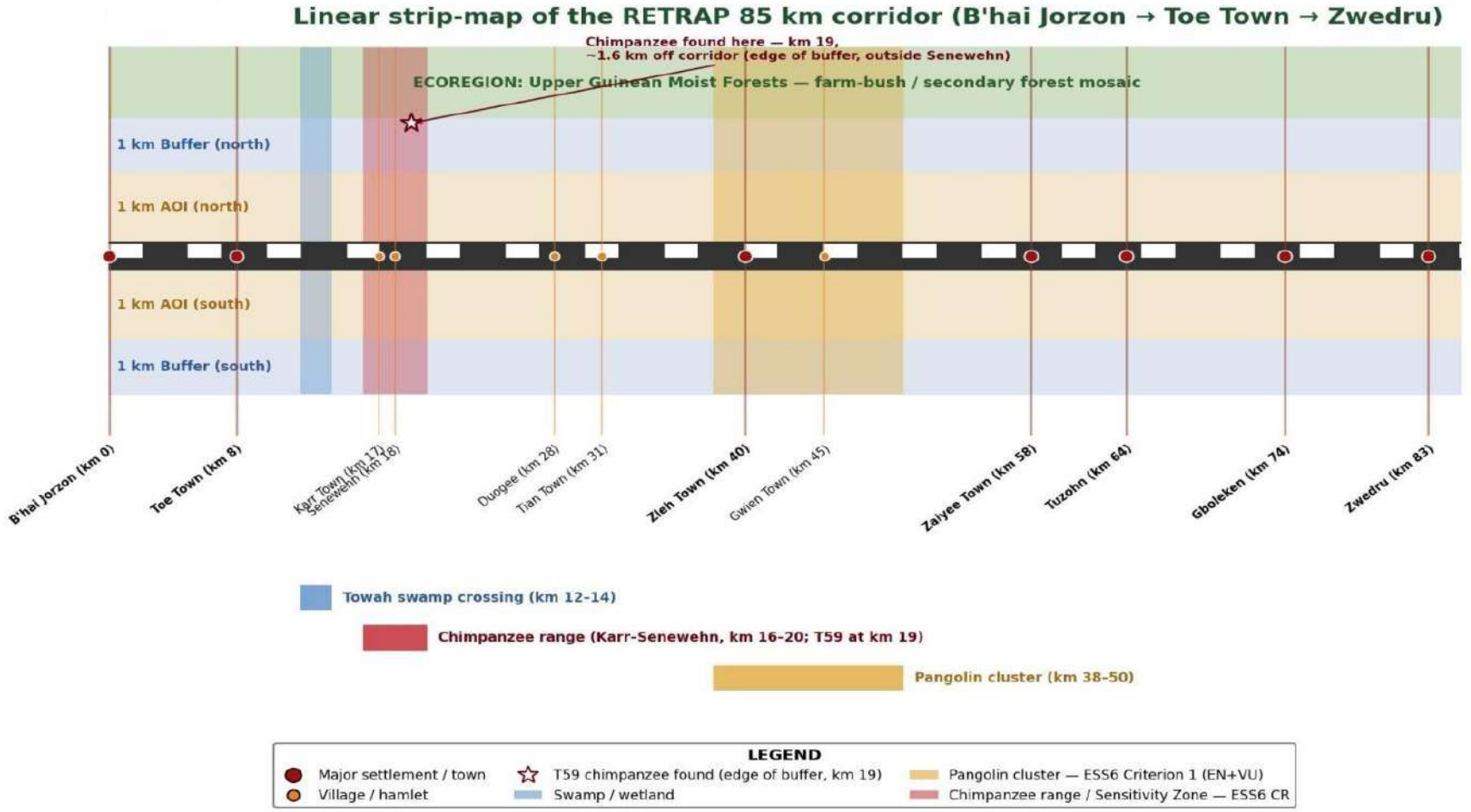


Figure 7.5: Linear ecosystem strip-map of the corridor (BFS, 2026, Figure 1.10; reproduced for this ESIA; settlement labels and chainages as in the BFS graphic — the canonical chainage is that of Section 3.1).



Plate 7.1: Aerial view of the project corridor traversing secondary forest and roadside regrowth — Grand Gedeh County, August 2026 (RE-GROUP field survey)

The 2026 update survey applied a complementary four-unit habitat classification under ESS6 and IFC Performance Standard 6 terminology: secondary forest (natural habitat, high priority), young bush (natural habitat, medium-high priority), inland wetland (modified habitat retaining significant biodiversity value, high priority) and agricultural degraded area (modified habitat, low-medium priority) (RE-GROUP, 2026). For the purposes of this ESIA the BFS seven-class scheme is the operative typology; the update survey's "young bush" and "secondary forest" map onto the BFS farm-bush regrowth and secondary-forest classes, and its wetlands — although coded "modified" in the rapid assessment — are managed as natural-value features consistent with the BFS treatment of swamp and wetland as a Priority Biodiversity Feature. The 2024 ESIA's remote-sensing land-cover assessment (which reported 57.7 per cent closed forest and 22.5 per cent open forest within a 1 km band, but could not distinguish natural forest from tree plantations) is superseded for management purposes by the ground-verified BFS record set, which explains the apparent difference in forest proportions between the two baselines (Earthtime, 2024; BFS, 2026). The habitat composition recorded by the 2026 update survey across its 15 plots is charted at Figure 7.6.

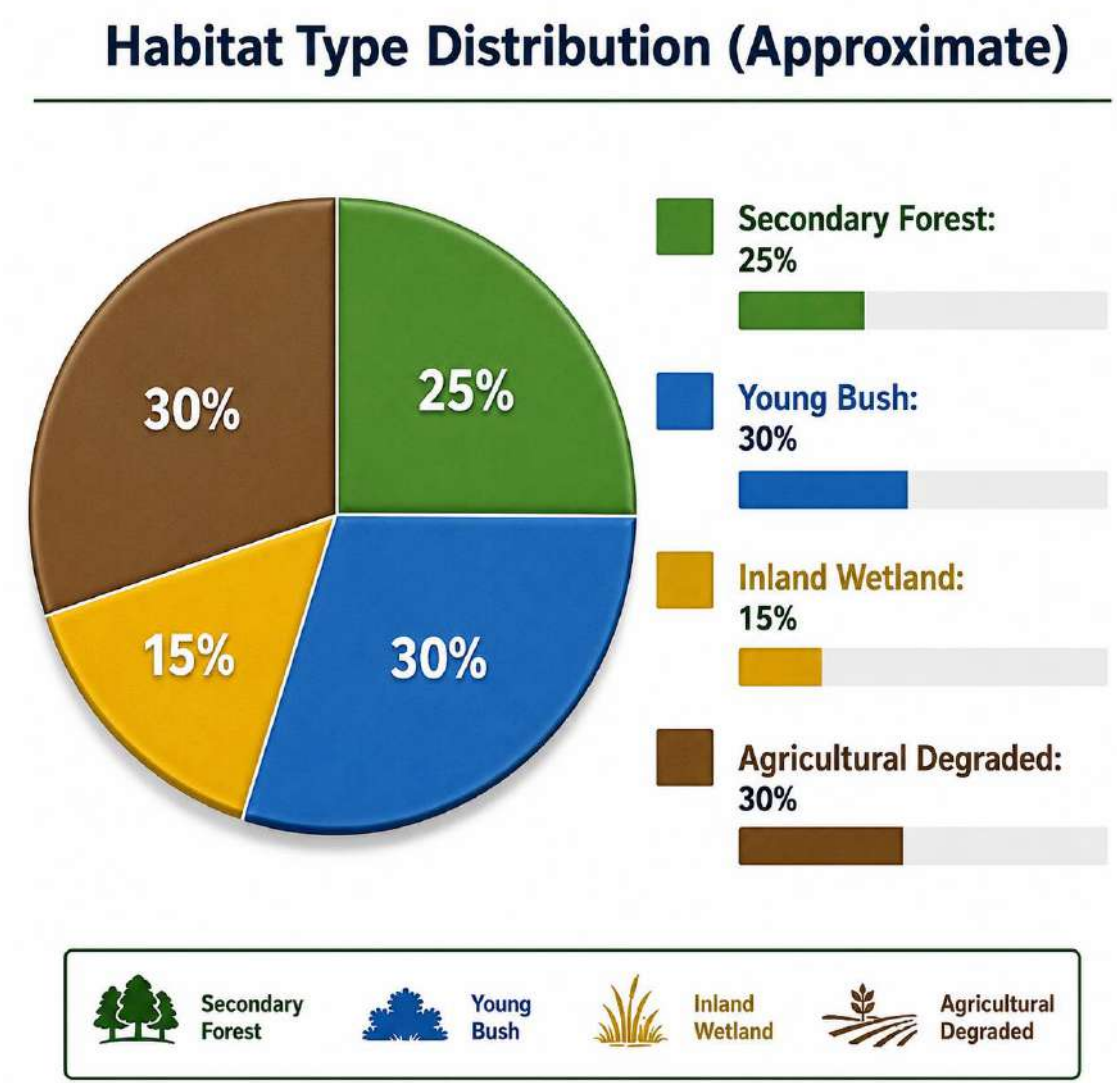


Figure 7.6: Habitat composition recorded by the 2026 update survey (adopted from the 2026 update field assessment (RE-GROUP, 2026f); reproduced for this ESIA).

7.2.3 Forest Condition and Landscape Integrity

Forest condition within the AoI is measurably poorer than in the buffer. Large trees exceeding 70 cm diameter at breast height number 25 stems in AoI plots against 60 in buffer plots — a density of 4.7 versus 11.3 stems per hectare, a 2.4-fold difference — and diversity indices are consistently lower in the AoI (Shannon H′ for flora 3.45 versus 3.72; for birds 3.92 versus 4.12; for mammals 2.04 versus 2.38) (BFS, 2026). The BFS combined these and related measures into a nine-indicator Biodiversity Condition Index, on which the AoI scores 52 out of 100 against 71 for the buffer — a 27 per cent condition gap, with the AoI trailing on seven of the nine indicators. The two exceptions are White-bellied Pangolin relative abundance and snare density. Both zones nonetheless retain reverse-J diameter distributions, indicating active regeneration where clearance pressure is relieved (BFS, 2026).

7.2.4 Deforestation Trends and Drivers

Analysis of the Hansen Global Forest Watch record for 2001–2024 shows a mean annual forest-cover loss of 3.2 per cent per year in the AoI against 0.8 per cent per year in the buffer — a four-fold higher rate along the road. Over the 23-year record the AoI lost approximately 30 percentage points of forest cover, against approximately 9 percentage points in the buffer (BFS, 2026). Loss rates by period (AoI / buffer, per cent per year) were: 2001–2010, 3.20 / 0.64 (post-conflict resettlement); 2011–2017, 3.38 / 0.81 (smallholder expansion and first cocoa replanting); 2018–2022, 4.48 / 0.86 (the cocoa price boom driving forest-to-cocoa conversion); and 2023–2024, 4.48 / 1.18 (continuing cocoa expansion, with early informal access effects). Both major loss pulses (2005–2012 and 2018–2022) predate the Project and reflect structural rural-economic drivers rather than the road upgrade; the buffer's 2023–24 acceleration is noted by the BFS as an early-warning signal of landscape change (BFS, 2026).

Cocoa is the dominant conversion driver. Of 556 georeferenced farming records, 383 plots — 68.9 per cent — were cocoa, followed by cassava (47 records, 8.5 per cent), swamp and upland rice (23, 4.1 per cent), rubber monoculture (14, 2.5 per cent), smallholder oil palm (11, 2.0 per cent) and mixed vegetables and minor crops (64, 11.5 per cent). Of 1,832 land-use records, cropland accounted for 73.3 per cent and active clearing for 9.8 per cent (180 records), the latter constituting a fresh-conversion indicator (BFS, 2026). The BFS characterises cocoa dominance as the single most important contextual fact for biodiversity management on this corridor: cocoa expansion is simultaneously the largest habitat threat and — through shade-tree enrichment of existing farms — the largest restoration lever (BFS, 2026).

7.2.5 Hunting Pressure

Hunting pressure is high by regional standards. Across 559 km of combined transect and reconnaissance effort the BFS recorded 72 spent shotgun cartridges and 69 snares or cable traps, a corridor snare density of approximately 0.31 per km against a regional benchmark of 0.08 per km on the Grebo-Krahn National Park periphery. Hunting sign concentrates in two hotspots: km 60–75 (New Tuzon–Gboloken), the most intense concentration of cartridges and snares on the corridor and its most urgent hunting risk, and km 35–50, where 12 cartridges and 15 snares over 15 km overlap the White-bellied Pangolin Critical Habitat cluster. Within the AoI the baseline snare density is 0.41 per km, against 0.18 per km in the surveyed buffer (BFS, 2026). The Chimpanzee Sensitivity Zone at km 18–20 (which supersedes the 2024 ESIA's km 64–72 zone) carries comparatively low hunting-sign density (BFS, 2026).

7.2.6 Protected Areas and Internationally Recognised Areas

No legally protected area, proposed protected area or internationally recognised area is crossed by the corridor or its ancillary facilities. The Zwedru KBA/IBA, about 0.7 km from the road at its closest, does however lie partly within the AoI, and the Putu Range Proposed Protected Area, about 1–2 km away, lies within or at the edge of the surveyed buffer. The nearest features, from the 2024 ESIA screening and the BFS protected-area context, are as follows (Earthtime, 2024; BFS, 2026), and their positions relative to the Project are shown in Figure 7.7:

- **Zwedru (Forest) Key Biodiversity Area / Important Bird Area** ("Zwedru Proposed Protected Area", approximately 15,000 ha of fragmented forest): approaches to within approximately 0.7 km

east of the road at the Pouh Town–Manyee Village and Lara Rock–Sennehwein Town sections, and lies within approximately 0.7–10 km of the corridor overall. The KBA is bounded to the north by the Cavalla River on the Côte d'Ivoire border and sits west of the Cavally and Goin-Débé Forest Reserves KBA in Côte d'Ivoire (24.4 km north-east of the road). Qualifying and associated species include Western Chimpanzee, Pygmy Hippopotamus, forest elephant, King Colobus, Western Red Colobus, Diana Monkey, Jentink's Duiker, Zebra Duiker, Liberian Mongoose, Timneh Grey Parrot, Gola Malimbe and White-breasted Guineafowl, with more than 160 key bird species including nine hornbills.

- **Krahn-Bassa Proposed Protected Area** (Gbi/Krahn-Bassa, part of the Grebo–Taï forest complex): 9.9 km from the road at its closest point between Solo Town and Zwedru. It supports Liberia's second-largest Western Chimpanzee population, substantial forest elephant numbers and extensive Pygmy Hippopotamus habitat.
- **Grebo-Krahn National Park** (approximately 970 km², gazetted 2016): approximately 25 km south of the corridor at km 55, the principal formally protected area in the county context and the source of the regional hunting and hornbill benchmarks used in this chapter.
- **Sapo National Park** (approximately 1,804 km²): approximately 60 km south-west of km 60.
- **Putu Range Proposed Protected Area**: approximately 1–2 km east of the corridor at km 50–60, where the secondary-forest peak abuts the range.
- **Neezonie Active Community Forest**: 5.4 km from Duogee Town.

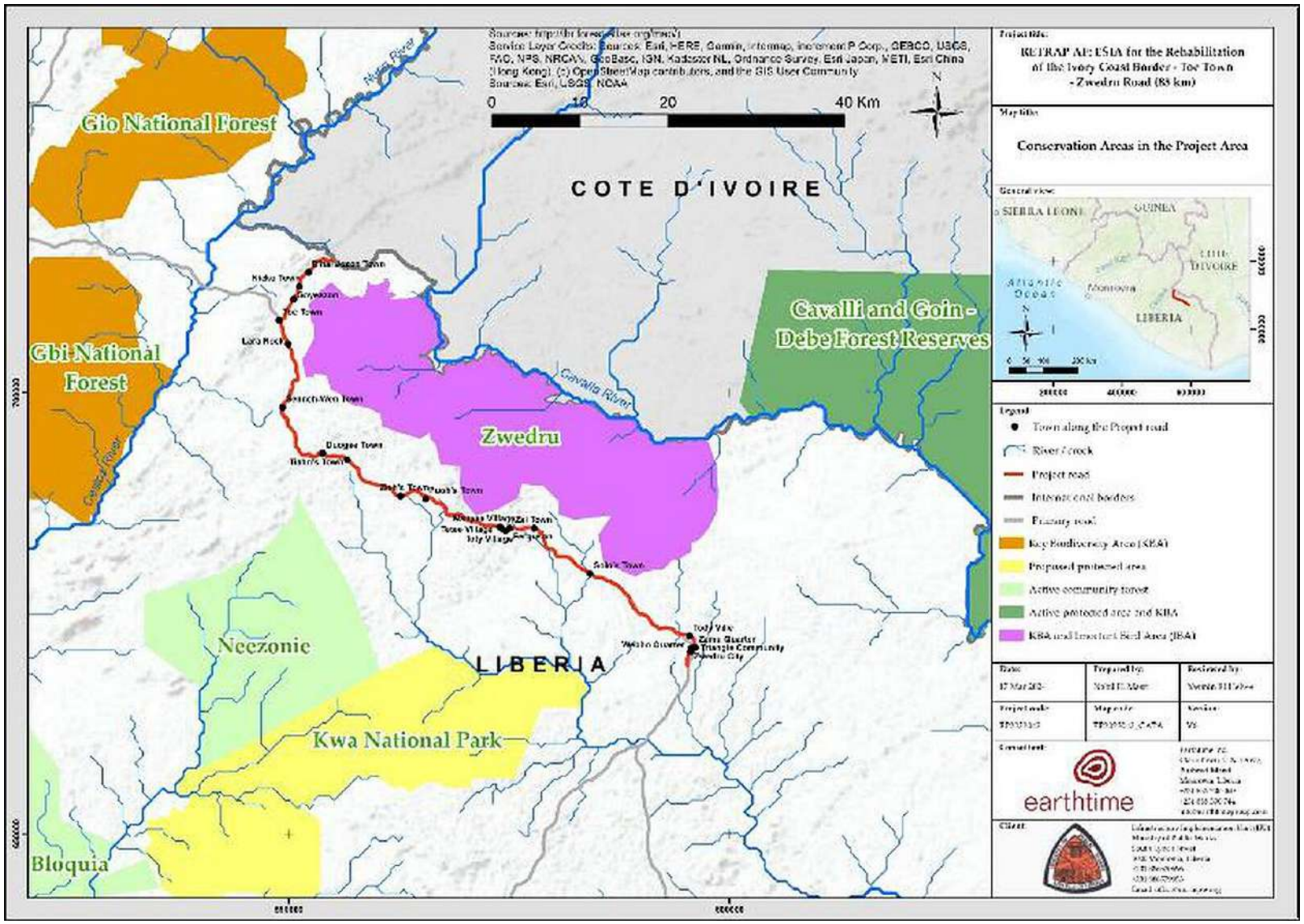


Figure 7.7: Conservation areas and internationally recognised areas relative to the Project (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this ESIA).

The proximity of the Zwedru KBA and the Putu Range, and the corridor's position on chimpanzee and megafauna movement pathways between the Krahn-Bassa complex and the KBA reported in the 2024 ESIA consultations, are reflected in the Critical Habitat determination and sensitivity zoning at Section 7.5 (Earthtime, 2024; BFS, 2026).

7.3 Flora

7.3.1 Composition, Structure and Diversity

The BFS botanical programme recorded 2,670 stems of at least 10 cm diameter at breast height in 85 plots (5.31 ha), identifying 96 tree species with a further 11 genera pending confirmation, across 38 families; Fabaceae and Malvaceae jointly account for 34 per cent of stems (BFS, 2026). Phase 2 alone yielded 87 species from 2,186 stems. Diameter distributions follow the reverse-J form in both zones, and floristic diversity is high (Shannon H′ 3.45 in the AoI, 3.72 in the buffer). The 2024 ESIA's rapid botanical survey — a broader vascular-plant inventory across 16 transects — recorded 168 species in 51 families, including five Vulnerable and four Near Threatened taxa, and remains a valid reference inventory for the wider flora (Earthtime, 2024). The 2026 update survey recorded 72 species from 182 individuals of at least 20 cm diameter in 15 plots totalling 6,000 m², dominated by Fabaceae (23.6 per cent), with secondary-forest plots showing 75–85 per cent canopy cover, canopy heights of 15–35 m and a five-layer structure (RE-GROUP, 2026).

7.3.2 Flora of Conservation Concern

Fourteen IUCN-listed tree taxa (13 threatened and the Near Threatened Iroko, Milicia regia) were recorded in the BFS plots and targeted searches, represented by 657 listed stems — 261 within the AoI and 396 in the surveyed buffer, the buffer holding approximately 52 per cent more listed stems than the AoI (BFS, 2026). The principal species, their status and corridor locations are set out in Table 7.1; the full record-level register, with GPS-tagged individuals, is held in the BFS threatened-flora annex.

Table 7.1: Flora species of conservation concern recorded in the corridor AoI and surveyed buffer, with IUCN status, FDA class and corridor location (BFS, 2026)

Trade / common name	Scientific name	IUCN status	FDA class	Stems (AoI / buffer)	Corridor location
Makoré	*Tieghemella heckelii*	EN	A	0 / 2	Barteh Jam sacred grove (km 3–4) only
Framiré	*Terminalia ivorensis*	VU	A	90 / 98	Corridor-wide; pronounced peak km 18–28
Ekki	*Lophira alata*	VU	A	49 / 105	km 10–55
Niangon	*Heritiera utilis*	VU	A	31 / 57	Mid-corridor concentration km 45–65
Kusia	*Nauclea diderrichii*	VU	A	32 / 35	Riparian zones and stream margins
Iroko	*Milicia regia*	NT (LR/nt)	A	37 / 56	Scattered; sacred-grove stands protected by custom
Abura	*Hallea ciliata*	VU	B	16 / 21	Scattered
Sipo	*Entandrophragma utile*	VU	A	2 / 10	Scattered mature-forest remnants
Kosipo	*Entandrophragma candollei*	VU	A	1 / 1	Scattered
Sapelli	*Entandrophragma cylindricum*	VU	A	1 / 1	Scattered
Tiama	*Entandrophragma angolense*	VU	A	0 / 4	Buffer only
Chewstick	*Garcinia afzelii*	VU	–	1 / 0	Single AoI stem at transect T1 (about km 2)
Bitter kola	*Garcinia kola*	VU	–	1 / 4	Scattered
Omu	*Cryptosepalum tetraphyllum*	VU	B	0 / 3	Buffer only

The flagship threatened tree of the corridor is Makoré, Tieghemella heckelii (EN), confirmed as two mature stems within the Barteh Jam sacred grove at km 3–4 — one large individual of 118 cm diameter (record F-001) and one of 92 cm (F-002) — with traditional ecological knowledge confirming long-term presence at the site (BFS, 2026). The species contributes to the Barteh Jam Priority Biodiversity Feature and carries individual-tree protection; the grove is a full no-go zone for the works. A further possible Tieghemella record at plot SP-010, reported by the 2026 update survey, remains subject to verification. Other frequently recorded species of management interest include Funtumia elastica (FDA Class B, 149 records), Zanthoxylum gillettii (VU, Class B, 136 records) and Khaya ivorensis (VU, Class A, 28 records) (BFS, 2026). The 2026 update survey classified 14 taxa as Vulnerable and three as Near Threatened among its 72 species, adding corridor records of Milicia excelsa, Parinari excelsa, Terminalia superba, Distemonanthus benthamianus, Albizia ferruginea and Anopyxis klaineana to the consolidated inventory (RE-GROUP, 2026).

7.3.3 FDA-Protected Classes and Threatened-Flora Hotspots

Twenty-eight species recorded in the corridor are protected under Forestry Development Authority (FDA) Class A (felling restricted) or Class B (felling only with approved salvage). Twenty high-value Class A stems recorded in the AoI plots and at the Barteh Jam grove (records F-001 to F-020; the two Barteh Jam stems lie outside the works) are flagged for FDA-co-signed pre-construction marking, and right-of-way clearance is contingent on FDA sign-off. Under BMP rev.3 action A4, a pre-clearance walkover, right-of-way pegging and the FDA Class A stem protocol apply before any clearance; a Class A stem that cannot be kept is taken only under the national protocol and is replaced at 5:1, and failed restoration planting is likewise replaced at 5:1 under action A8 (BMP rev.3, Sections 4.4 and 5.4). The National Forestry Reform Law (2006) and FDA Regulation No. 113-08 govern the felling of Class A and Class B species; where the FDA requires a higher replacement ratio under those instruments, the higher ratio applies.

Threatened flora concentrates in three spatial hotspots: (i) the Barteh Jam sacred grove at km 3–4, the corridor's only locations of Tieghemella heckelii and Garcinia afzelii; (ii) the km 18–28 belt, where approximately 380 records of Terminalia ivorensis peak, roughly 140 of them within the AoI, coinciding with the designated flora-hotspot Priority Biodiversity Feature; and (iii) the km 45–65 mid-corridor section, holding more than 350 stems of Lophira alata, Heritiera utilis and Nauclea diderrichii combined (BFS, 2026).

7.3.4 Invasive Species

The 2024 baseline recorded nine invasive plant species along the corridor — Acacia mangium, Bambusa vulgaris, Bidens pilosa, Chromolaena odorata, Erigeron canadensis, Gmelina arborea, Mangifera indica, Mimosa pudica and Stachytarpheta cayennensis — of which two (Bidens pilosa and Chromolaena odorata) appear on the Global Invasive Species Database listing for Liberia, which records 16 invasive flora and 13 invasive fauna species nationally (Earthtime, 2024). The BFS confirmed Chromolaena odorata as the principal invasion risk on disturbed ground: flushes of this shrub follow clearance and threaten regenerating habitat and restoration sites. During construction and the defects-liability period, invasive species are controlled through a clean-plant protocol for construction equipment (CESMP) and through progressive footprint restoration under BMP rev.3 action A8, with no seed-bearing invasive cover left on a section before certification (BMP rev.3, Section 5.5 and Table 4.4).

7.4 Fauna

7.4.1 Mammals

The consolidated BFS inventory comprises 30 mammal species confirmed by all methods (camera traps, transects, reconnaissance and validated traditional ecological knowledge) from 967 records: 19 Least Concern, 6 Near Threatened, 3 Vulnerable, 1 Endangered and 1 Critically Endangered species (BFS, 2026). The quantitative camera and transect subset comprises 19 species from 540 direct and indirect records plus 10 camera events of listed species; within this subset only 7 species were recorded in the AoI against 16 in the buffer, indicating that the buffer functions as a partial refugium. The most frequently recorded species were Bushbuck Tragelaphus scriptus (166 records, 30.7 per cent), Black Duiker (86,

15.9 per cent), Maxwell's Duiker (75, 13.9 per cent) and Cusimanse (53, 9.8 per cent). Overall, 27 threatened species (8 mammals in the camera-trap and transect subset of the BFS, including the Endangered White-bellied Pangolin and the precautionary Western Chimpanzee record; 6 birds; and 13 trees) were recorded across the survey (BFS, 2026). Conservation-significant mammals, their evidence types and locations are presented in Table 7.2.

Table 7.2: Conservation-significant mammal species of the corridor AoI and surveyed buffer, with IUCN status and evidence type (BFS, 2026; RE-GROUP, 2026)

Common name	Scientific name	IUCN status	Evidence and records	Corridor location and role
Western Chimpanzee	*Pan troglodytes verus*	CR; CITES I	One verified camera-trap event: a single adult at station SCNL04 on transect T59, 3 February 2026; corroborated by hunter reports from two independent focus groups (BFS, 2026)	Surveyed buffer at about km 19, about 1.6 km off the alignment near Sennehwein Town (about 560 m outside the AoI); single record treated precautionarily through the Chimpanzee Sensitivity Zone, not the primary trigger
White-bellied Pangolin	*Phataginus tricuspis*	EN; CITES I	Four verified independent camera-trap events at four AoI stations (T16, T18, T27, T30), spanning both survey phases; supplementary community and hunting reports (BFS, 2026)	Two clusters at km 38–44 and km 46–50; primary Critical Habitat trigger; AoI relative abundance 0.46 versus 0.19 in the buffer
Giant Pangolin	*Smutsia gigantea*	EN; CITES I	One direct sighting at plot SP-010 on 8 July 2026, recorded by the 2026 update survey, subject to verification (RE-GROUP, 2026)	Secondary forest, mid-corridor; referred to SCNL (BFS lead) for two-specialist verification; if verified, to be screened against ESS6 Criterion 1
Jentink's Duiker	*Cephalophus jentinki*	EN	One unconfirmed camera-trap event in the buffer, pending two-specialist review (BFS, 2026)	Buffer; unconfirmed record pending two-specialist review (BFS, 2026)
Black-bellied Pangolin	*Phataginus tetradactyla*	VU; CITES I	One verified camera-trap video (station SCNL02, transect T21, AoI); two further buffer detections at km 40–55 reported as "long-tailed pangolin" (another common name for this species) are included in this taxon (BFS, 2026)	AoI, mid-corridor; contributes to the eastern pangolin Critical Habitat delineation
Sooty Mangabey	*Cercocebus atys*	VU; CITES II	Seven buffer records, including three listed-species events (two direct observations and one camera-trap event)	Buffer forest patches

Common name	Scientific name	IUCN status	Evidence and records	Corridor location and role
			(BFS, 2026); one direct observation of a group of three to four at plot SP-007, recorded by the 2026 update survey, subject to verification (RE-GROUP, 2026)	
Olive Colobus	*Procolobus verus*	VU; CITES II	Seven buffer records (transect, reconnaissance and calls), including two listed-species events (calls and a direct observation) (BFS, 2026)	Buffer only
Liberian Mongoose	*Liberiictis kuhni*	VU; CITES I	Listed on traditional-knowledge evidence only in the BFS (precautionary); direct evidence — a feeding site (SP-008) and footprints (SP-009) — recorded by the 2026 update survey, subject to verification (RE-GROUP, 2026)	Secondary forest, mid-corridor
Brooke's Duiker	*Cephalophus brookei*	VU	One buffer record (BFS, 2026)	Buffer only
African Forest Buffalo	*Syncerus caffer nanus*	NT	39 records (19 AoI / 20 buffer), including 24 camera-trap events (BFS, 2026)	Corridor-wide, favouring swamp margins
Bay Duiker	*Cephalophus dorsalis*	NT	18 records (8 AoI / 10 buffer), including 11 camera-trap events (BFS, 2026)	Corridor-wide
Yellow-backed Duiker	*Cephalophus silvicultor*	NT	One buffer camera-trap event (BFS, 2026)	Buffer only
Bongo	*Tragelaphus eurycerus*	NT	One AoI record (dung, transect T22); not recorded in the buffer (BFS, 2026)	Mid-corridor
Lesser Spot-nosed Monkey	*Cercopithecus petaurista*	NT	Seven buffer records (BFS, 2026)	Buffer only

The single verified Western Chimpanzee record — one adult photographed at camera station SCNL04 on transect T59 on 3 February 2026, at approximately corridor km 19, some 1.6 km off the alignment near Sennehwein Town and about 560 m outside the AoI boundary — is the most significant record for precautionary management. It is consistent with hunter accounts from two independent focus groups of approximately five chimpanzees crossing a community path south of the corridor, and it is consistent with the 2024 ESIA consultation reports of chimpanzee presence south of the road between Sennehwein Town and Zleh City (Earthtime, 2024; BFS, 2026). Habitat overlay places the detection within a zone dominated by swamp forest (about 1.6 km² of the 3.14 km² sensitivity zone), with secondary forest (about 0.9 km²) and a cocoa-shade agroforestry matrix (about 0.4 km²), consistent with dispersal or transient use of mature closed canopy. Residency is not established: a single record cannot confirm a resident population and is not evidence of one. The record is managed precautionarily through the Chimpanzee Sensitivity Zone and the construction-phase controls of BMP rev.3 (actions A1–A3, A9 and A10). The record is reproduced at Plate 7.2; the precautionary response to it is set out in Section 7.5.5.

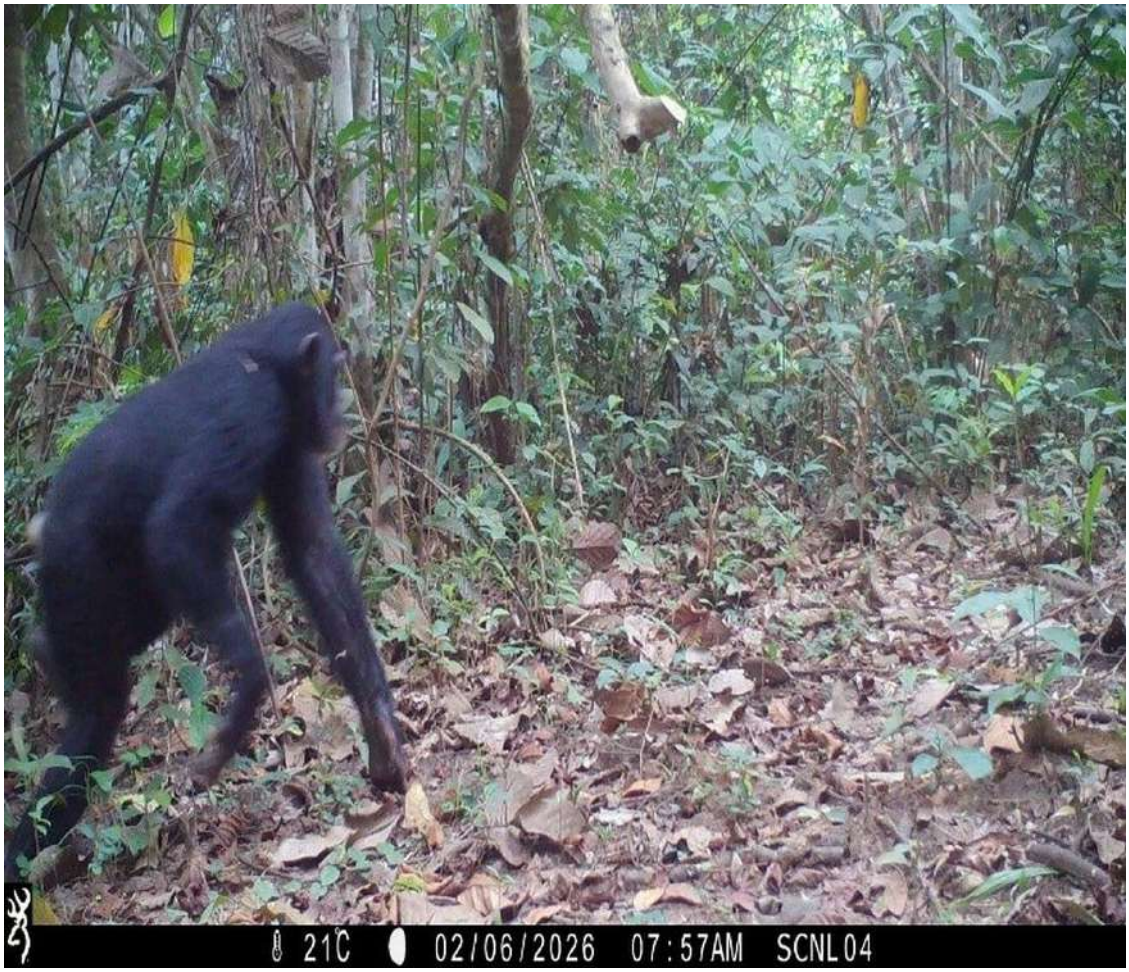


Plate 7.2: Camera-trap record T59/SCNL04 — Western Chimpanzee, 3 February 2026, km 19 (the record underlying the precautionary Chimpanzee Sensitivity Zone) (adopted from the Biodiversity Field Survey (BFS, 2026); reproduced for this ESIA).

The White-bellied Pangolin *Phataginus tricuspis* (EN, CITES Appendix I, fully protected under Liberian law) is the corridor's primary Critical Habitat trigger, with four verified independent camera events at four AoI stations clustered at km 38–50. Its AoI relative abundance index of 0.46 events per 100 trap-nights against 0.19 in the buffer — a 2.42-fold concentration along the corridor — is described by the BFS as the single most important baseline figure in the report, because it places the species' local stronghold squarely within the zone of project influence and within the km 35–50 hunting hotspot (BFS, 2026). Kernel analysis around the detection stations, supported by published home ranges of 0.4–1.2 km², underpins the Critical Habitat polygons described in Section 7.5. Consistent with the BFS data-governance protocol, precise coordinates of pangolin, chimpanzee and rockfowl records are managed at 1 km resolution in public

documents, with full-precision data held by IIU/MPW, the World Bank, the FDA and SCNL as custodian of the BFS geodatabase.

The 2026 update survey directly recorded 10 mammal species (35 observations) and collected community reports of a further 12 (RE-GROUP, 2026). Its three most significant results — a Giant Pangolin *Smutsia gigantea* (EN) sighting at plot SP-010, direct evidence of Liberian Mongoose *Liberiictis kuhni* (VU), and a Sooty Mangabey *Cercocebus atys* (VU) group — are each recorded by the 2026 update survey, subject to verification, and have been referred for verification before any revision of the Critical Habitat determination is considered. Key-informant reports of Diana Monkey, Upper Guinea Red Colobus and Pygmy Hippopotamus from the same survey are unsubstantiated by physical evidence and do not alter the BFS findings. The 2024 eDNA survey additionally confirmed the Nimba Otter Shrew *Micropotamogale lamottei* (VU) at one stream sample, the only IUCN-threatened species detected by that method (Earthtime, 2024).

Relative-abundance comparisons reinforce the buffer-refugium pattern: three threatened or near-threatened duikers (Yellow-backed, Jentink's and Brooke's) were recorded only in the buffer, and duiker community diversity is 31 per cent higher there (Shannon H′ 1.58 versus 1.21) (BFS, 2026). Mammal movement across the alignment concentrates on a small number of crossing corridors first identified by the 2023–24 surveys and consultations, shown in Figure 7.8; the movement hotspots documented by the BFS (Section 7.5.3) refine these locations on the 2025–26 field evidence.

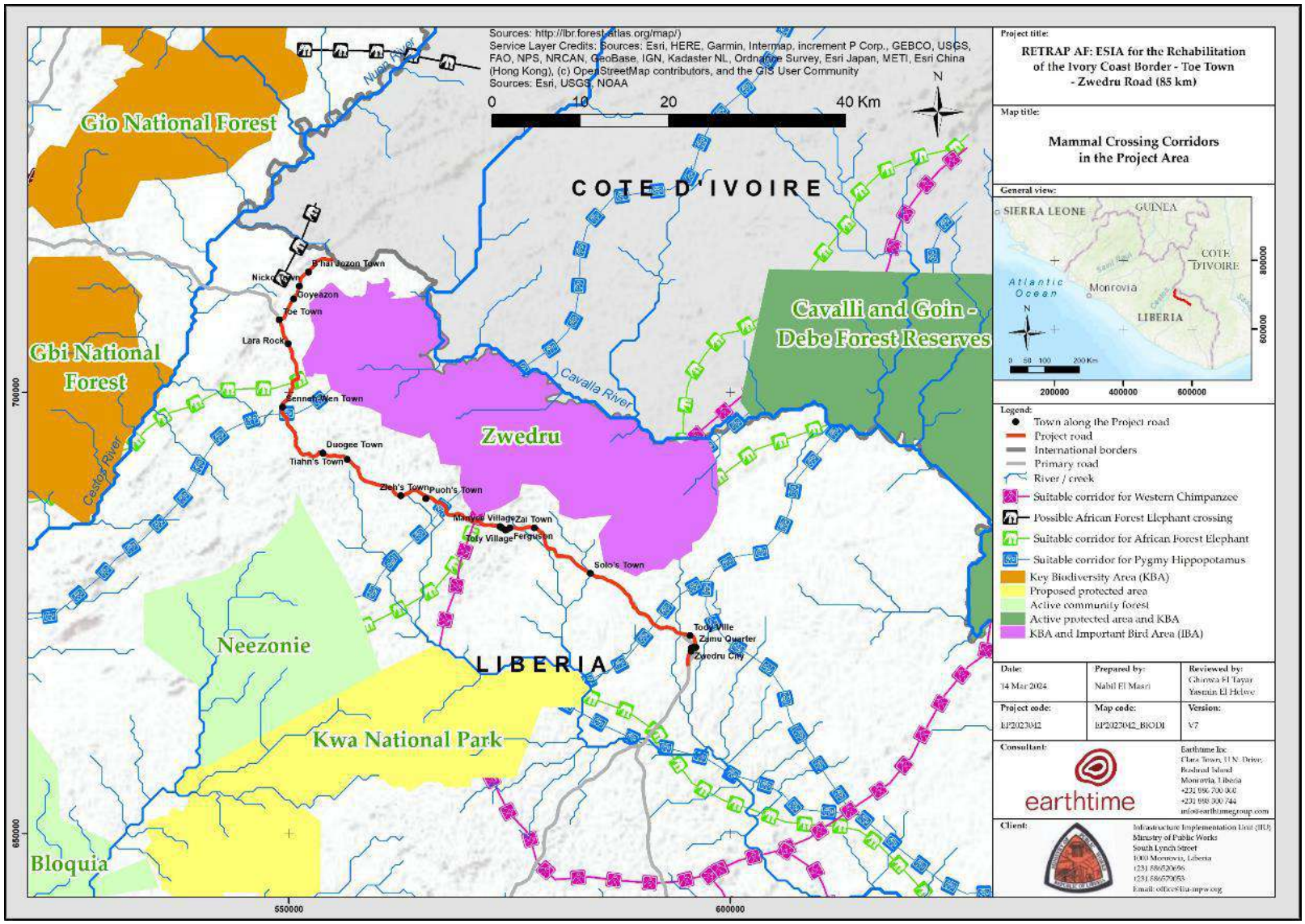


Figure 7.8: Mammal crossing corridors identified in 2023–24 (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this Updated ESIA).

7.4.2 Confirmed Absences

Three flagship species expected from historical range maps are effectively absent from the AoI and buffer: African Forest Elephant (Loxodonta cyclotis), Pygmy Hippopotamus (Choeropsis liberiensis) and Leopard (Panthera pardus). No field evidence of any of the three was obtained in either BFS season — no leopard was recorded on any camera — and elders consulted across six villages consistently placed the last reliable elephant and pygmy-hippopotamus sightings 15–20 years ago. The BFS therefore treats these species as historically extirpated from the corridor landscape, an absence validated by traditional ecological knowledge and attributable to past hunting and habitat conversion rather than to the Project (BFS, 2026). Elephant and pygmy-hippopotamus populations persist in the wider county landscape (Krahn-Bassa complex and the Zwedru KBA), and any sighting during the works would be reported under the BMP rev.3 protected-species stop-work trigger (a verified sighting within 50 m of an active front); unverified 2026 key-informant reports of pygmy hippopotamus are noted at Section 7.4.1.

7.4.3 Avifauna

The BFS recorded 206 bird species from 3,581 records across 45 point and roving counts (33 logged on BirdLasser) supplemented by transect and opportunistic registration (BFS, 2026). Six species are threatened — one Endangered and five Vulnerable (Table 7.3) — four are Near Threatened, and 27 Upper Guinea endemic species were recorded (BFS, 2026). The community is dominated by insectivores (40 per cent) and canopy frugivores (23 per cent). Forest specialists and endemics concentrate in the buffer (65 forest specialists versus 49 in the AoI; 16 endemics versus 11), mirroring the mammal pattern. The operative list of conservation-significant species is given in Table 7.3.

Table 7.3: Conservation-significant bird species recorded in the corridor AoI and surveyed buffer (BFS, 2026; RE-GROUP, 2026)

Common name	Scientific name	IUCN status	Records	Source	Habitat and distribution
Grey Parrot (Timneh)	*Psittacus timneh*	EN; CITES I	15	BFS (2026)	Small foraging flocks at dawn and dusk in six villages; roost and nest trees in village emergents and cocoa shade; capture and trade risk paramount
Yellow-casqued Hornbill	*Ceratogymna elata*	VU	23	BFS (2026)	Buffer forests at km 5–45 and km 55–65; canopy fruit specialist
Brown-cheeked Hornbill	*Bycanistes cylindricus*	VU	22	BFS (2026)	Mature canopy; mixed flocks with Yellow-casqued Hornbill
Sharpe's Apalis	*Apalis sharpii*	VU	18	BFS (2026)	Understorey insectivore of intact and regrowing forest patches
Yellow-bearded Greenbul	*Criniger olivaceus*	VU	1	BFS (2026)	Dense thickets; recorded at km 24 only
White-necked Rockfowl	*Picathartes gymnocephalus*	VU	1 colony (7 mud nests)	BFS (2026)	Rock outcrop about 2.5 km from the road near km 4 (beyond the 2 km surveyed buffer), near the Cestos River; Priority Biodiversity Feature
Black-casqued Hornbill	*Ceratogymna atrata*	VU	2	2026 update survey (RE-GROUP, 2026)	Secondary-forest canopy at plots SP-006 and SP-010
White-breasted Guineafowl	*Agelastes meleagrides*	VU	3	2026 update survey (RE-GROUP, 2026)	Closed-canopy forest floor at plots SP-007 and SP-010

The six BFS species contributed 80 georeferenced records. Two findings carry particular weight for management. First, the large-hornbill encounter rate is 0.90 per 10 km overall (45 detections over 500 effort-km), but only 0.62 in the AoI against 1.12 in the buffer, straddling the Grebo-Krahn periphery regional benchmark of 0.80 (the generalist African Pied Hornbill, by contrast, registers 5.2 per 10 km). Second, the single White-necked Rockfowl breeding colony of seven mud nests, discovered from community descriptions of "bird houses on rocks", lies on a rock outcrop approximately 2.5 km from the road, beyond the 2 km surveyed buffer, and is protected by a 1 km no-disturbance, no-blasting buffer (BFS, 2026). The Timneh Grey Parrot has 15 records across six villages and no concentrated breeding stronghold on the corridor; roost trees within the cleared width are recorded in the pre-clearance walkover (BMP action A4), and capture or trade by the workforce is prohibited under the Code of Conduct (action A5). The 2026 update survey recorded 30 species (73 sightings), adding Black-casqued Hornbill and White-breasted Guineafowl to the corridor's Vulnerable list; plot SP-010 held both new Vulnerable birds in addition to the Giant Pangolin record, marking it as a site of conservation interest (RE-GROUP, 2026).

7.4.4 Herpetofauna

Systematic herpetofauna data were first collected for this corridor by the 2026 update survey, closing a gap identified by both the 2024 ESIA (which relied on regional literature) and the BFS (which had recommended a specialist survey). Sixteen amphibian species were recorded, all of Least Concern status and all exclusively within inland-wetland habitat — Hyperoliidae (four species, 11 individuals), Ptychadenidae (three species, 14 individuals), Phrynobatrachidae (three species, five individuals), Bufonidae (two species, five individuals) and four further taxa — confirming the wetlands' function as the corridor's amphibian breeding habitat (RE-GROUP, 2026). Seventeen reptile taxa were registered: four species directly observed (14–19 individuals, comprising *Agama agama*, *Trachylepis maculilabris* and *Trachylepis albilabris*) and thirteen credibly community-reported, including Ball Python *Python regius* and Nile Crocodile *Crocodylus niloticus* — both protected under the National Wildlife Conservation and Protected Area Management Law (2016) — together with Gaboon Viper *Bitis gabonica*, mambas *Dendroaspis* spp., Nile Monitor *Varanus niloticus* and West African Mud Turtle *Pelusios castaneus* (RE-GROUP, 2026). No threatened herpetofauna were confirmed; amphibian dependence on the wetland network is carried into the drainage and wetland-protection design requirements.

7.4.5 Aquatic Habitats

The corridor's aquatic network, inventoried by the 2026 field campaign, comprises nine significant creeks and streams within the 150 ft right-of-way (two of them named: Donneh Creek and Kougae Creek) — 7–16 m wide, five perennial and four intermittent — and 31 inland wetlands (IW-001 to IW-031) of 0.3–0.8 ha each, all lying within the right-of-way (RE-GROUP, 2026). Expressed on the canonical B'hai-origin chainage, the wetlands distribute as follows: km 0–25, eight wetlands (25.8 per cent); km 25–45, ten (32.3 per cent); km 45–65, eight (25.8 per cent); and km 65–85, five (16.1 per cent). Drainage divides between the Cavalla Basin to the east and the headwaters of the Cestos system west of approximately km 55. The two dominant wetland systems are the Towah swamp (approximately 380 ha at km 12–14), which supports otter sign, hornbill foraging, amphibian breeding and a wildlife crossing function, and the New Tuzon swamp complex at km 65–72 (BFS, 2026). Plate 6.6 shows the characteristic inland wetlands adjoining the alignment.



Plate 7.3: Aerial view of inland wetland areas adjoining the project corridor — Grand Gedeh County, August 2026 (RE-GROUP field survey)

Fish were not surveyed by either the BFS or the 2026 update survey. Communities report fish in Donneh Creek and in the two sacred creeks — the B'hai Jorzon sacred creek (SS-003), whose fish may not be eaten, and the Kougae Creek at Nicko Town (SS-004), whose water may not be taken into the town; the 2024 eDNA survey returned 42 fish operational taxonomic units among 115 vertebrate units from 30 stream samples, confirming a diverse but largely unidentified fish fauna (Earthtime, 2024; RE-GROUP, 2026). A formal ichthyological survey of all nine creeks is a committed pre-construction action (Sections 6.3.2 and 11.9.3: IIU-commissioned, funded from the E&S provisional sums, complete before in-stream works at each crossing); the bat and Jentink's Duiker follow-ups are survey recommendations for the IIU outside the works contract, funded through the Project's monitoring provisional sums, not BMP rev.3 commitments. Maintenance of flows and aquatic connectivity at all crossings, avoidance of direct wetland fill and sediment control are corresponding design commitments. At the sacred creeks (SS-003, SS-004 and, where affected, SS-006) the survey follows the custodial protocol of Section 6.3.2 — consent before sampling, non-lethal methods, no removal of fish or water where custom forbids it, findings shared with the custodians and the crossing design and in-stream method agreed with them — so that the fish survey also closes the sacred-creek concern raised in consultation (Section 8.6).

7.5 Critical Habitat Determination and Sensitivity Zones

7.5.1 Assessment Framework

The Critical Habitat assessment tests the corridor against the five criteria of World Bank ESS6 paragraph 23 — (1) habitat of significant importance to Critically Endangered or Endangered species; (2) habitat of significant importance to endemic or restricted-range species; (3) habitat supporting globally significant concentrations of migratory or congregatory species; (4) highly threatened or unique ecosystems; and (5) areas associated with key evolutionary processes — applying the quantitative decision rules of IFC Performance Standard 6 Guidance Note 6 (2019), as provided for in the project's environmental and social framework documentation. Triggering any single criterion requires the ESS6 conditions for Critical Habitat to be met, applying the mitigation hierarchy — avoidance first, then minimization and restoration — the Project discharges them through the construction-phase controls of the BMP (Section 7.5.6). Critical Habitat polygons were delineated using a 1 km kernel around confirmed detection points, extended by expert judgment to contiguous suitable habitat, following Guidance Note 6 paragraph GN61 (BFS, 2026). The spatial outcome of the assessment is shown in Figure 7.9.

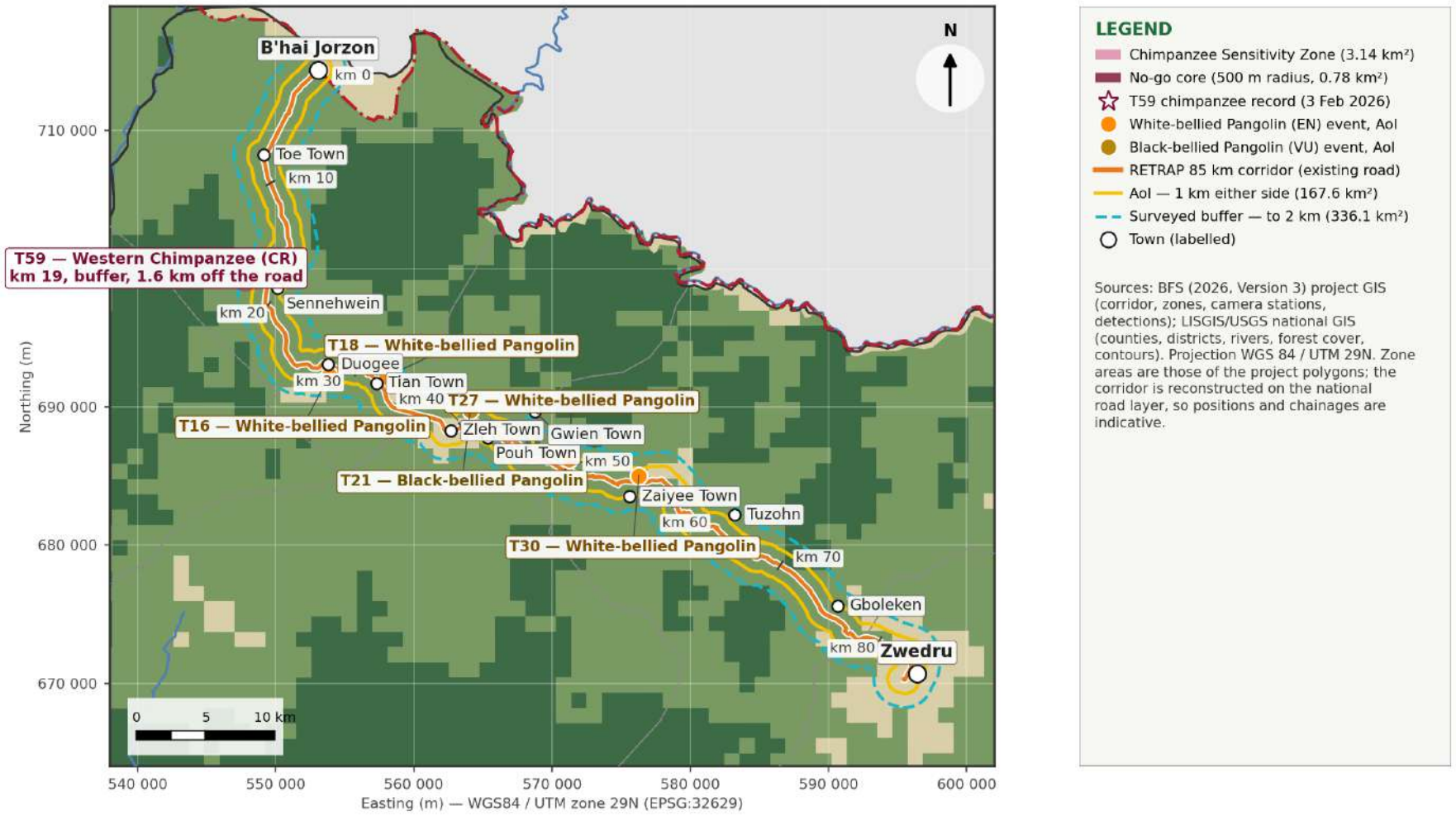


Figure 7.9: Critical Habitat context — the pangolin camera records of the km 38–50 reach, the precautionary Chimpanzee Sensitivity Zone (km 18–20) and the T59 record, within the AoI and surveyed buffer (BFS, 2026, Map 6; national GIS base)

7.5.2 Criterion-by-Criterion Determination

Table 7.4 summarises the determination for each criterion. Critical Habitat is TRIGGERED under Criterion 1 only. The primary trigger is the White-bellied Pangolin (EN); the Western Chimpanzee (CR), recorded once, is treated precautionarily through the Chimpanzee Sensitivity Zone and is not raised to the level of the pangolin trigger; Criteria 2–5 are not triggered, with Priority Biodiversity Features designated under Criteria 2 and 4 to secure values that approach but do not meet the thresholds (BFS, 2026). The screening logic — thresholds, decision points and outcomes for each criterion — is reproduced at Figure 7.10.

Table 7.4: Critical Habitat determination against the five ESS6 paragraph 23 criteria, applying IFC PS6 Guidance Note 6 decision rules (BFS, 2026)

Criterion	Decision rule (abridged)	Corridor evidence assessed	Determination
1. Threatened species	Habitat of significant importance to CR or EN species (GN6: areas known to sustain, on a regular basis, at least 0.5 per cent of the global population and at least five reproductive units, or VU species whose loss would change their Red List status); precautionary treatment where the data are limited	White-bellied Pangolin (EN): four verified camera events at four AoI stations, clusters km 38–50 — regular occurrence. Western Chimpanzee (CR): one verified camera event (T59, 3 February 2026) — precautionary weight per GN6 §§GN48–GN53 asymmetric-consequences logic. *Tieghemella heckelii* (EN): two mature stems — below polygon threshold, protected within a PBF. Grey Parrot (EN): diffuse use of six villages — below threshold. Jentink's Duiker (EN): one unconfirmed buffer event — below threshold, pending two-specialist review. Giant Pangolin (EN): one unverified 2026 record — pending verification	**TRIGGERED** (White-bellied Pangolin — primary; Western Chimpanzee — precautionary)
2. Endemic / restricted-range species	Range below 50,000 km² (birds) or below 20,000 km² (other taxa) and at least 1 per cent of the global population	All recorded candidates exceed range thresholds: Sharpe's Apalis about 520,000 km²; Yellow-bearded Greenbul about 285,000 km²; White-necked Rockfowl about 110,000 km²; *Heritiera utilis* about 380,000 km²; *Tieghemella heckelii* about 420,000 km² (fragmented). Nimba Flycatcher (about 14,000 km²) not recorded; Liberian Greenbul (about 8,000 km²	**NOT TRIGGERED** (PBFs designated)

Criterion	Decision rule (abridged)	Corridor evidence assessed	Determination
		if valid) not recorded and taxonomically contested	
3. Migratory / congregatory species	Periodic concentrations of at least 1 per cent of the global or flyway population	No waterbird, bat, raptor, fish or amphibian congregations identified in either season	**NOT TRIGGERED**
4. Highly threatened or unique ecosystems	Globally threatened (CR/EN) ecosystem, or irreplaceable or unique ecosystem	Upper Guinean lowland moist forest is reported by the BFS as Vulnerable in the 2022 IUCN Red List of Ecosystems assessment (BFS, 2026, Table 4.6) but is present only as degraded fragments (primary forest at most 0.5 per cent of the AoI); swamp forest unlisted; four sacred groves are cultural-natural hybrid features	**NOT TRIGGERED** (PBFs designated)
5. Key evolutionary processes	Edaphic endemism centres, refugia, hybrid zones or speciation loci	No such features identified; the adjoining Putu Range is not an identified endemism centre	**NOT TRIGGERED**

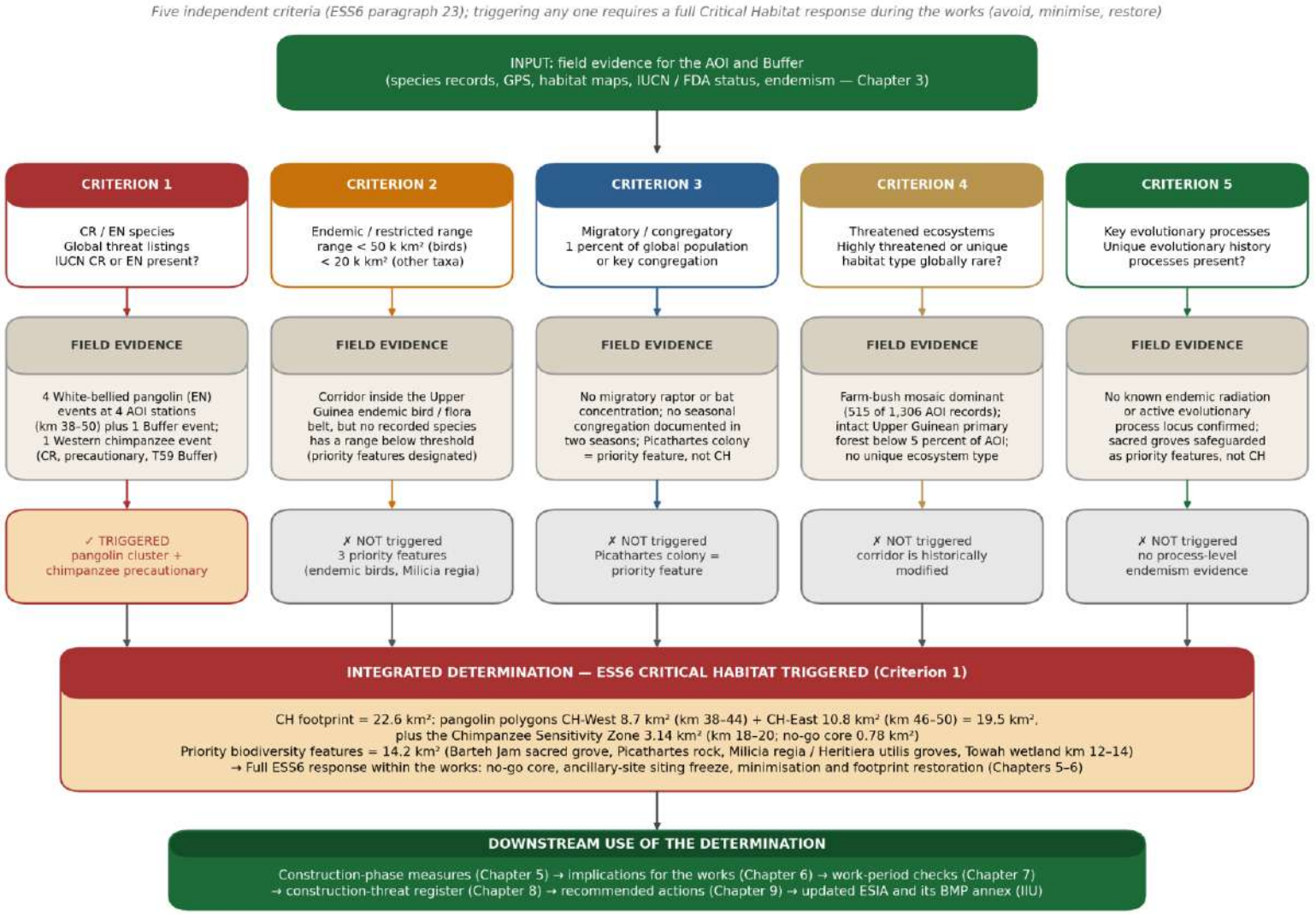


Figure 7.10: ESS6 Critical Habitat screening decision tree applied to the corridor (adapted from BFS, 2026, Figure 4.1).

7.5.3 The Critical Habitat Polygons

The Critical Habitat footprint totals 22.6 km² (BFS, 2026): two White-bellied Pangolin Critical Habitat polygons (19.5 km²) and the precautionary Chimpanzee Sensitivity Zone (3.14 km²):

- **CH-West (Pangolin)** — 8.7 km² at km 38–44, anchored on verified White-bellied Pangolin events (stations T16 and T18). Construction-phase controls (corridor segment S6, BMP rev.3): no clearing outside the pegged right-of-way (A4); no new quarry, borrow pit, crusher, batching plant, camp or laydown within the polygon (A3); works 08:00–16:00 with no night work or blasting (A2); 20 km/h limit and node warning signs (A9); community notice before a works front enters S6 (A10); weekly supervision checks while a front is in S6.
- **CH-East (Pangolin)** — 10.8 km² at km 46–50, anchored on verified events (T27 and T30) with the Black-bellied Pangolin record contributing. The same controls apply as for CH-West; any micro-adjustment of the working face to spare a marked tree or a detection microsite remains inside the approved right-of-way (A4).
- **Chimpanzee Sensitivity Zone (CSZ)** — 3.14 km² at km 18–20, described at Section 7.5.5, including a 0.78 km² absolute no-go core.

The two pangolin polygons together cover 19.5 km². The polygons, the six Priority Biodiversity Features and the documented movement hotspots (the Towah swamp at km 12–14, the Chimpanzee Sensitivity Zone at km 18–20 and the pangolin polygons at km 38–50) constitute the corridor's biodiversity sensitivity zonation, which governs ancillary-facility siting: no new ancillary site (quarry, borrow pit, crusher, batching plant, camp or laydown) may be located inside the CSZ or a pangolin polygon (siting freeze at design review, BMP action A3), within the rockfowl buffer or within a sacred grove, and the candidate borrow pits BP2 (overlapping wetland IW-007) and BP3 (secondary forest), together with the sites flagged in Table 3.6, require pre-clearance screening (BFS, 2026; BMP rev.3; RE-GROUP, 2026). For management the corridor is divided into the BMP segments S1 km 0–12, S2 km 12–18 (Towah), S3 km 18–20 (CSZ), S4 km 20–28 (flora hotspot), S5 km 28–38, S6 km 38–50 (pangolin polygons) and S7 km 50–85.

7.5.4 Priority Biodiversity Features

Six Priority Biodiversity Features (PBFs), totalling approximately 14.2 km² net of the overlaps between the flora hotspot, the Chimpanzee Sensitivity Zone and the riparian corridors (BFS, 2026), are designated for values that inform but do not trigger the Critical Habitat determination (Table 7.5). PBFs are managed through the mitigation hierarchy with feature-specific prescriptions and construction-phase supervision checks, consistent with the ESS6 requirements for natural habitat and biodiversity values of significance.

Table 7.5: Priority Biodiversity Features of the corridor, with areas and key management responses (BFS, 2026)

Priority Biodiversity Feature	Location	Area	Qualifying features	Key management response
Barteh Jam sacred grove	km 3–4	3 ha	White-necked Rockfowl colony association; two *Tieghemella heckelii* (EN) stems; cultural heritage	Full no-go zone during the works; no blasting or quarrying in the agreed buffer (1 km in the BFS); pre-construction walkover; custodial consultation before any works nearby
Towah swamp wetland	km 12–14	about 380 ha	Wildlife crossing corridor; otter sign; hornbill foraging; amphibian breeding	Span or large box culvert to the design engineer's drawings; low-flow in-stream construction method; silt control each week of in-stream work (BMP rev.3, action A7)
Threatened-flora hotspot	km 18–28	about 1,200 ha	*Terminalia ivorensis peak (about 380 plot and targeted-search records); FDA Class A and IUCN VU tree cluster*	FDA Class A stem protocol: pre-clearance walkover and FDA-co-signed tree marking before each cut; micro-adjustment within the approved right-of-way where a marked stem can be kept; 5:1 replacement of any stem lost (BMP action A4)
Three additional sacred groves	Toe Town (2 ha); Kparblée (1 ha); Bassa Village (1.5 ha)	about 4.5 ha	Cultural heritage; remnant forest structure	Full no-go zones during the works; awareness with the nearest community before the front arrives; exclusion areas loaded into the Contractor's GIS and physically marked on the ground; grievance mechanism if a further grove is declared after mobilisation

Priority Biodiversity Feature	Location	Area	Qualifying features	Key management response
White-necked Rockfowl outcrop	Extended buffer (beyond the 2 km surveyed buffer), about 2.5 km from the road at about km 4, near the Cestos River	about 1 ha plus 1 km buffer	One breeding colony of seven mud nests	1 km no-disturbance buffer; no blasting or quarrying; no ancillary site (BMP action A3); re-screening of any design change that moves an ancillary site
Riparian corridors	All stream crossings, corridor-wide (82 culverts and five bridges in the design)	about 5 km² (linear)	First- and second-order streams; hydrological connectivity; wildlife movement	Undisturbed riparian buffer of at least 30 m each side outside the approved crossing footprint, within the approved right-of-way (no land-control buffer is claimed beyond it; BFS, 2026, Table 4.8); sediment traps at all crossings; low-flow in-stream working (BMP action A7)
Total		**about 14.2 km²**		

7.5.5 The Chimpanzee Sensitivity Zone

The Chimpanzee Sensitivity Zone is the precautionary Critical Habitat response to the verified T59 detection. It comprises a 1 km kernel of 3.14 km² centred on the detection point (about 1.6 km off the alignment near Sennehwein Town, at corridor km 19), enclosing contiguous closed-canopy and swamp-forest refuge habitat, with an absolute no-go core of 500 m radius (0.78 km²) (Figure 7.11). Because the zone lies off the alignment, the road-based controls that accompany it are applied by chainage to corridor segment S3 (km 18–20), as in BMP rev.3. The zone as delineated by the BFS, on the GPS-validated 3 February 2026 record, supersedes the km 64–72 chimpanzee zone identified in the 2024 ESIA, which rested on community-reported crossings that are no longer used as a delineation anchor; the km 18–20 zone is managed as corridor segment S3 under BMP rev.3, and the commitments attached to the 2024 ESIA's km 64–72 zone are superseded (Earthtime, 2024; BFS, 2026).

Figure 6.13 places the zone in its landscape setting — forest cover, contours, the AoI and surveyed-buffer boundaries and the camera stations around Sennehwein Town — on the BFS integrated map.

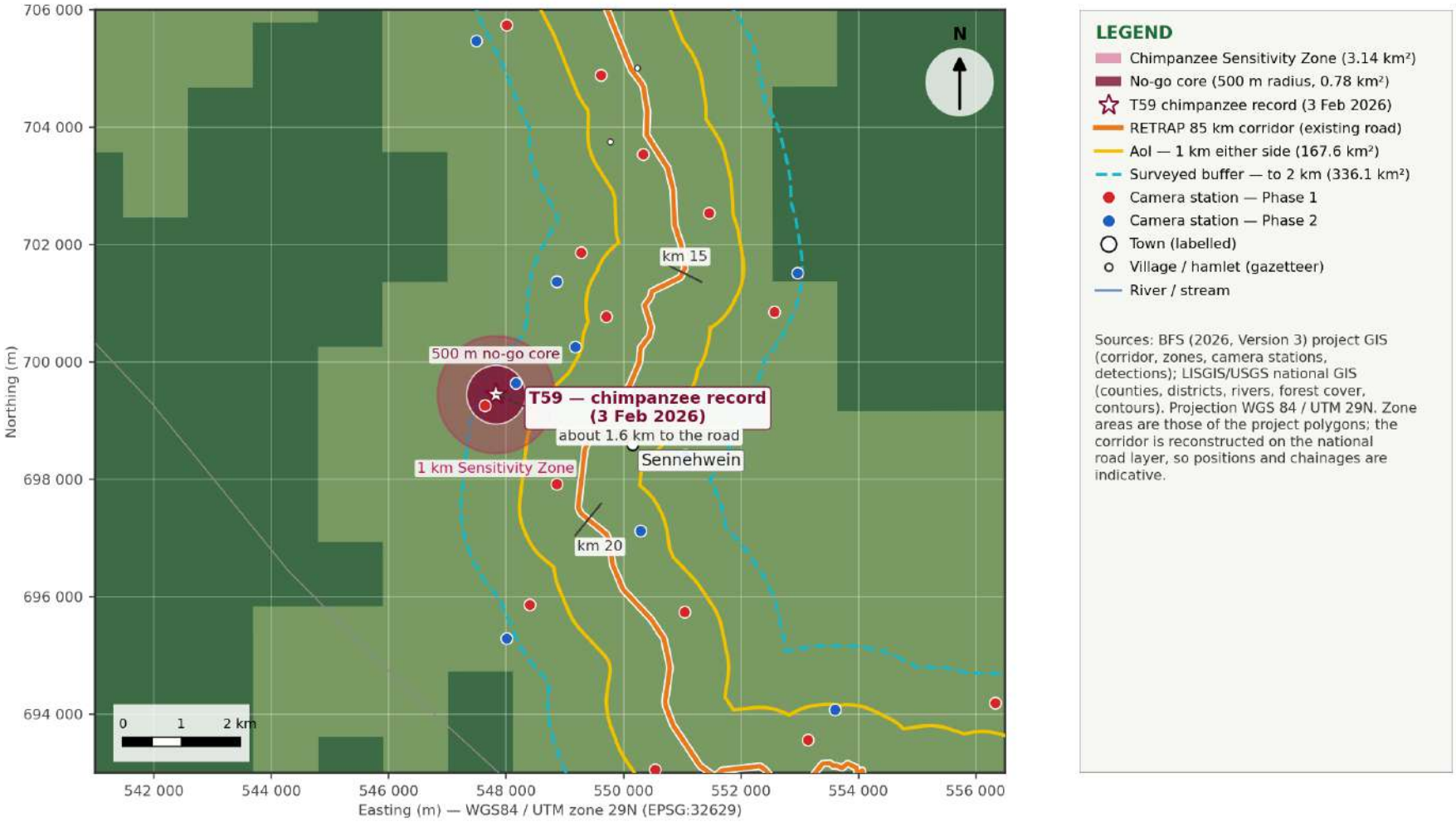


Figure 7.11: Chimpanzee Sensitivity Zone close-up at km 18–20 near Sennehwein Town, showing the 1 km kernel (3.14 km²) and the 500 m no-go core (0.78 km²) centred on the T59 detection, with the AoI and surveyed-buffer boundaries and the camera stations of both survey phases (BFS, 2026, Map 8; national GIS base)

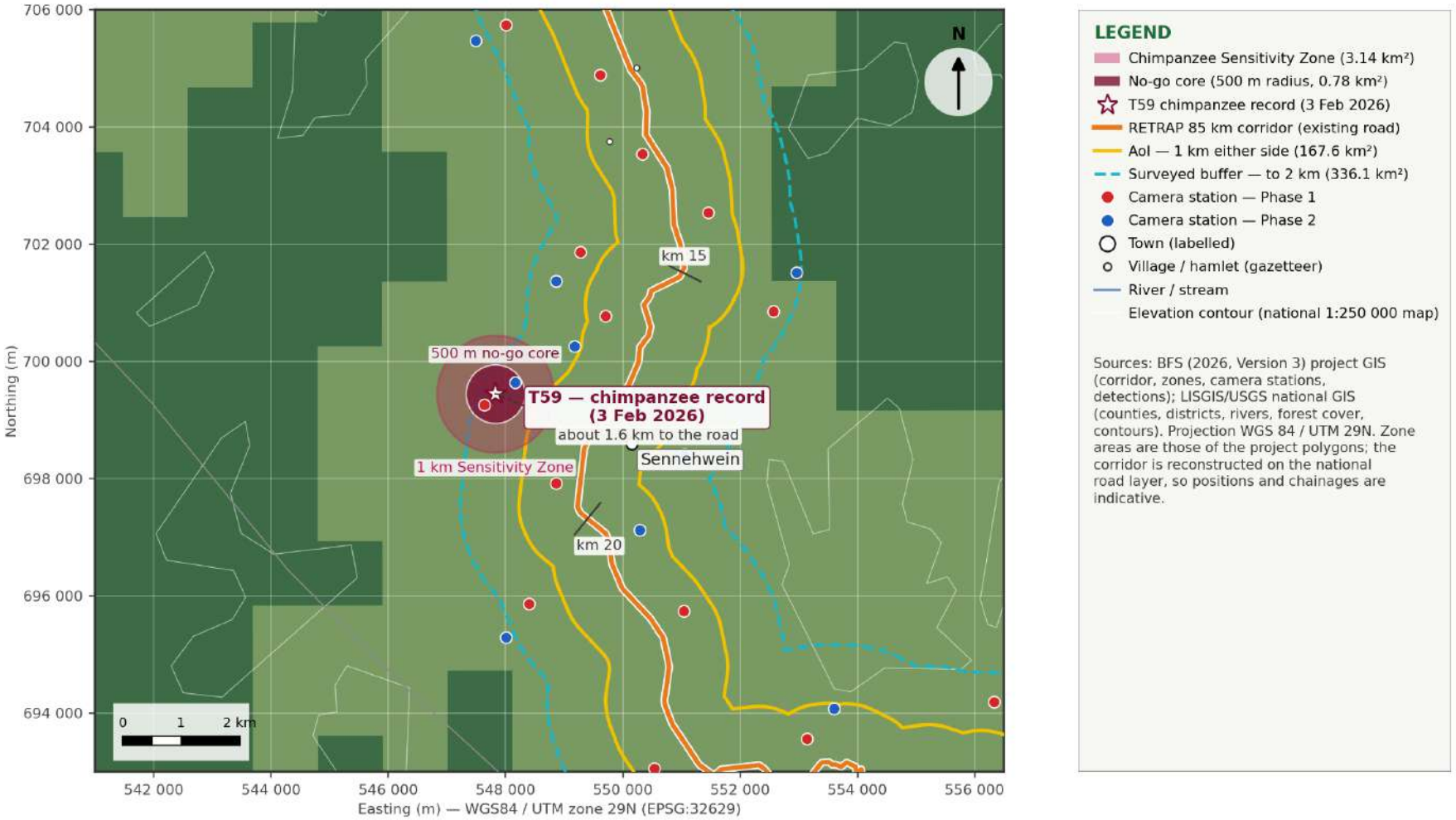


Figure 7.12: Chimpanzee Sensitivity Zone in its landscape setting — forest cover, contours, zones and camera stations around Sennehwein Town (BFS, 2026, Integrated Map B; national GIS base).

The construction-phase controls attached to the zone (corridor segment S3) under BMP rev.3 are as follows:

- **Absolute no-go core (0.78 km²)**: demarcated with durable posts before any clearance in S3 (A1); no construction, plant, stockpile, temporary track, night lighting or blasting inside the core; entry only by written clearance, with an entry log; unauthorised entry is a stop-work trigger; breaches are handled under the works-contract penalty schedule and the CESMP Biodiversity Compliance Plan.
- **Siting exclusions**: no realignment and no new quarry, borrow pit, crusher, batching plant, camp or laydown within the zone, with a siting freeze at design review (A3); sites within 1 km of the zone boundary are flagged for the design-review overlay.
- **Working hours**: 08:00–16:00, with no night work and no blasting, while a front is in S3 (the CSZ) or in the pangolin polygons (S6) (A2); the window excludes the dawn and dusk chimpanzee activity periods. Adjacent to the Towah swamp (segment S2, km 12–14), the window is 07:00–17:00 (BFS, 2026, Figure 5.6).
- **Noise, light and speed:** no blasting (mechanical rock-breaking only); task lighting aimed at the working face and switched off when the face is idle, no floodlighting of the no-go core, and generators and noisy plant not sited against the core boundary (BMP rev.3, Sections 5.2 and 5.6); a 20 km/h construction-traffic limit and node warning signs in S3, S6 and at documented hotspots (A9).
- **Canopy** and clearance: clearing confined to the pegged right-of-way, preceded by the pre-clearance walkover and the FDA Class A stem protocol (A4), with the canopy retained wherever the approved right-of-way allows; canopy connections only where the BFS documents a crossing hotspot, on drawings prepared by the Contractor's design engineer (A6).
- **Response:** work stops on any BMP rev.3 stop-work trigger, including a verified protected-species sighting within 50 m of an active front, which suspends the front until the Supervising Engineer issues written clearance. Injury to or death of a chimpanzee, or work inside the no-go core, is a serious incident reported to the Employer within 24 hours and to the World Bank and the EPA within 48 hours. The workforce Code of Conduct, induction (with the chimpanzee module for crews deployed at km 18–20) and weekly camp checks apply (A5).
- **Supervision:** weekly Supervising Engineer checks while a works front is in S3 (demarcation intact, no unauthorised entry, hours observed, signage in place) and monthly at other times during the works; community notice with grievance contacts before a front enters S3 (A10). No camera or acoustic monitoring programme is maintained under the works contract.

Ground disturbed in S3 is restored progressively under action A8 (at least 70 per cent cover by the end of the first rainy season after planting and at least 60 per cent survival; 5:1 replacement where restoration fails; taking-over withheld until these are achieved). It is a fixed rule of this Project that no ancillary facilities be established in the sensitive ecological zones recorded by the BFS, cautioning specifically that "caution should be taken especially at km 19 (a key chimpanzee crossing point)"; this instruction is carried into the A3 siting freeze of BMP rev.3, the siting rule of this ESIA and the ESMP.

7.5.6 Implications for Project Management

Because Criterion 1 is triggered, the Project must show that its construction-phase impacts on the values for which Critical Habitat was designated are avoided or minimised and that the works footprint is restored. The BMP sets ten actions: A1, demarcation of the no-go core before clearance in segment S3; A2, working hours of 08:00–16:00 with no night work or blasting in the CSZ and the pangolin polygons; A3, no new ancillary site (quarry, borrow pit, crusher, batching plant, camp or laydown) inside the CSZ or a pangolin polygon, with a siting freeze at design review; A4, a pre-clearance walkover, right-of-way pegging and the FDA Class A stem protocol, with 5:1 replacement of any stem lost; A5, the workforce Code of Conduct,

induction and weekly camp check; A6, crossings, oversized culverts and canopy connections only at documented hotspots, to the design engineer's drawings; A7, a span or large box culvert at the Towah swamp, with a low-flow in-stream method and silt control; A8, progressive footprint restoration (at least 70 per cent cover at the end of the first rainy season and at least 60 per cent survival, with 5:1 replacement where restoration fails and taking-over withheld until achieved); A9, a 20 km/h limit and node warning signs in S3, S6 and documented hotspots; and A10, community notice before a works front enters S3 or S6. The corridor is divided into seven segments: S1 km 0–12; S2 km 12–18 (Towah); S3 km 18–20 (CSZ); S4 km 20–28 (flora hotspot); S5 km 28–38; S6 km 38–50 (pangolin polygons); and S7 km 50–85.

Supervision checks are weekly while a works front is in S3 or S6 and monthly elsewhere. Work stops on any BMP rev.3 stop-work trigger: unauthorized entry into the no-go core or a Critical Habitat polygon; night work or blasting in the CSZ or a pangolin polygon; unauthorized felling of an FDA Class A stem; verified hunting or bushmeat activity by Project personnel; uncontrolled sediment release; a damaged crossing structure; failed restoration; or a verified protected-species sighting within 50 m of an active front. Serious incidents are reported to the Employer within 24 hours and to the World Bank and the EPA within 48 hours. Contractor obligations sit in the CESMP and the works contract. The cost of biodiversity structures (A6, A7) is estimated by the Contractor's design engineer within the works contract, supervision checks are carried in the ESMP supervision budget, and corrective work is funded from the works-contract contingency. Six conditions underpin the residual conclusion (A1, A2, A3, A4, A5 and A8): with them in place, residual significance on Criterion 1 is Medium on the BMP scale — Moderate on the scale of this report — and no feature remains High or Severe through the defects-liability period (BMP rev.3, Chapters 6–8). This is the ESS6 close for the rehabilitation of an existing road as agreed with the World Bank. Chapters 9 and 10 present the impact assessment and mitigation.

7.6 Ecosystem Services and Community Resource Use

7.6.1 Basis of Assessment

Ecosystem services were characterised from the BFS community engagement programme — 21 consultations with 464 participants (250 men, 214 women; 46 per cent women), including women's and youth focus groups, hunter and traditional-leader interviews and sacred-grove visits with Zoe custodians (the traditional custodians of sacred sites) — triangulated with the 2023 household survey of the previous ESIA (100 households, 473 persons) and its 15 ecosystem-services focus groups with 57 hunters, honey gatherers, zoes and craft makers, the 2026 qualitative refresh, and the High Conservation Value (HCV) assessment of the 2026 update survey, which found HCV categories 1, 2, 4, 5 and 6 present in the corridor landscape and HCV 3 absent (Earthtime, 2024; BFS, 2026; RE-GROUP, 2026).

7.6.2 Provisioning Services

Corridor communities depend directly on the habitat mosaic for provisioning services. Non-timber forest products — fruits, medicinal plants, thatch, rattan and other gathered goods — are a priority repeatedly raised by women, alongside firewood; 60 per cent of 2023 HHS households collected wild plants or honey (Earthtime, 2024), and loss of useful and NTFP-bearing trees was raised in 11 of the 21 BFS consultations (52 per cent). Timber is extracted informally by pit-sawing, observed along the corridor including near Duogee Town. Bushmeat is the most consequential provisioning service for biodiversity management: 92 per cent of households consume bushmeat (16.3 per cent daily, 34.8 per cent weekly), 87 per cent purchase it, and 52 per cent of households include members who hunt, supplying the Zwedru and Toe Town markets (Earthtime, 2024). In the BFS consultations the bushmeat-livelihood transition was the single most frequent community concern, raised in 14 of 21 engagements (67 per cent), with 43 active hunters identified among participants (BFS, 2026). Fisheries are a secondary provisioning service in Kougae and Donneh Creeks; customary rules protect the two sacred creeks at B'hai Jorzon (SS-003, whose fish may not be eaten) and Nicko Town (the Kougae Creek, SS-004), a de-facto community conservation measure. Domestic water is drawn from handpumps, wells and creeks in most communities, and protection of water sources during construction was raised in six consultations (29 per cent); the riparian buffers of at least 30 m and sediment controls respond directly to this concern.

7.6.3 Regulating Services

The corridor's 31 inland wetlands and nine creeks provide flood attenuation, low-flow maintenance and natural water purification for downstream users, functions of particular value given the region's 2,100–3,000 mm annual rainfall and the corridor's history of wet-season impassability; the Towah and New Tuzon swamp complexes are the principal regulating nodes. Forest and tree cover deliver microclimate moderation, erosion control on the km 30–45 erodible belt, carbon storage and pollination services — the last of direct economic significance, since cocoa, the cash crop of 68.9 per cent of surveyed farm plots, depends substantially on forest-associated pollinators and on shade services from retained trees (BFS, 2026; RE-GROUP, 2026). These regulating functions underpin the design commitments to cross the Towah swamp by a span or large box culvert (BMP rev.3, action A7), avoid wetland fill and maintain aquatic connectivity at all crossings.

7.6.4 Cultural Services

Cultural ecosystem services centre on the sacred-grove and sacred-water network. The BFS identified four sacred groves (Barteh Jam, Toe Town, Kparblée and Bassa Village) — all disclosed exclusively by community elders, as no desk source listed any of them — and manages them as no-go Priority Biodiversity Features during the works, with custodial oversight. The 2026 field campaign's cultural-heritage register adds six sacred sites (SS-001 to SS-006), including the Ziah Town Sacred Forest, the B'hai Jorzon Sacred Cotton Tree and Sacred Creek, the Kougae Sacred Creek at Nicko Town, the Goyeazon Sacred Forest and the Toe Town Sacred Stream, together with 12 grave sites; the two registers are merged in the cultural-heritage baseline presented at Section 8.6, and the five sacred features adjoining or crossed by the right-of-way are subject to avoidance, custodial consultation and chance-find procedures (BFS, 2026; RE-GROUP, 2026). Sacred groves double as biodiversity refugia — Barteh Jam holds the corridor's only Tieghemella heckelii stems — so their customary protection delivers measurable conservation value alongside cultural continuity.

7.6.5 Traditional Ecological Knowledge

Traditional ecological knowledge (TEK) materially shaped this baseline in six documented respects: (i) hunter accounts of chimpanzees near Sennehwein Town guided the survey effort that produced the T59 detection and the Sensitivity Zone delineation; (ii) all four sacred groves were identified by elders alone; (iii) hunter-identified wildlife crossing points, notably the Towah swamp at km 12–14, informed crossing-structure siting; (iv) community descriptions of "bird houses on rocks" led to the discovery of the White-necked Rockfowl colony; (v) elder testimony of last elephant and pygmy-hippopotamus sightings 15–20 years ago validated the megafauna-absence finding; and (vi) vernacular tree names (Iroko, Ekki, Niangon, Abura) enable communities to report felling of marked trees through the Project grievance mechanism (Section 5.6). Seventeen species reported by hunters but not detected by survey remain unverified (BFS, 2026).

7.6.6 Dependence, Vulnerability and Implications for Management

Dependence on the corridor's ecosystem services is high for agriculture and fuelwood and medium for fish, bushmeat and construction materials, against a background of 63.7 per cent absolute poverty in the county (Earthtime, 2024). Vulnerability is unevenly distributed: women depend disproportionately on water sources, firewood and NTFPs (women undertake about 90 per cent of water fetching), hunting households depend on a resource already under heavy pressure, and title-less and vulnerable resource users have the least fallback capacity. These dependencies link the biological baseline directly to the livelihood and social measures of this ESIA. During construction, BMP rev.3 addresses the Project's own contribution to resource pressure through the workforce Code of Conduct, which prohibits hunting, bushmeat purchase and plant collection, weekly camp checks (action A5) and community notice before works enter sensitive segments (action A10); the longer-term livelihood, ranger and community-conservation measures proposed in earlier versions of the BFS are not Project commitments. Priority ecosystem services identified here — bushmeat regulation, water supply and quality, wetland flood attenuation, pollination and the sacred-site network — are carried into the impact assessment in Chapter 9 and the management commitments of Chapter 10 and the BMP.

8 BASELINE CONDITIONS: THE SOCIO-ECONOMIC ENVIRONMENT

This chapter presents the socio-economic baseline. The quantitative base remains the 2023 household survey and institutional data of the 2024 ESIA (Earthtime, 2024, Chapter 8, referenced); this revision adds the 2026 qualitative refresh — community profiles, key-informant interviews and focus groups — together with the updated administrative and demographic setting, economy and livelihoods, infrastructure and services, land tenure, gender, vulnerability and GBV context, and the 2026 cultural-heritage register of sacred sites and graves that the works must avoid or manage.

8.1 Administrative Setting and Demography

Sections 8.1 to 6.17 present the socio-economic, gender and cultural-heritage baseline of the corridor. They integrate the quantitative baseline established by the 2024 ESIA — principally its 100-household survey of November 2023 (473 persons, 22 towns), 35 key informant interviews and focus group programme (Earthtime, 2024, Ch. 8) — with the qualitative refresh delivered by the 2026 field campaign of 3–10 August 2026, which comprised community consultations in every principal settlement, key informant interviews with county, district and customary authorities, women's focus group discussions, transect walks, market and facility observation, and targeted discussions with traders, farmers, youth and migrant residents (RE-GROUP, 2026). The 2026 refresh was qualitative by design: no new statistically representative household survey was undertaken, and quantitative indicators are therefore carried from the 2023 household survey ("the 2023 HHS") and national statistical sources with their vintages labelled. Statements reported consistently by different stakeholder groups, or directly observed, are presented as field-confirmed qualitative findings.

8.1.1 Administrative framework

The entire corridor lies within Grand Gedeh County, south-eastern Liberia. From the Côte d'Ivoire border at B'hai Jorzon (km 0) to the county capital Zwedru (km about 83.7), the road traverses the B'hai, Gbao, Cavalla and Tchien administrative districts, together with the Gbarzon Statutory District in the Goyeazon area; Zwedru City, the terminal settlement, is the seat of Tchien District and of the county administration. Electorally the corridor falls within Districts #2 and #3, with most settlements in District #3 (County Development Officer KII, August 2026). Local governance combines the statutory hierarchy — County Superintendent, district commissioners and city mayors — with the customary hierarchy of paramount, clan and town chiefs, councils of elders, and women's and youth leaders. Customary institutions, including the Poro and Sande societies, remain influential in community decision-making, land relations and cultural-site custodianship, most prominently at Goyeazon Town (Section 8.6).

8.1.2 Population and settlement pattern

Grand Gedeh County recorded a population of 216,692 at the 2022 National Population and Housing Census, an increase of 73 per cent over the 2008 census figure of 125,258 (LISGIS, 2022) — one of the fastest county growth rates in Liberia, driven by natural increase, return migration and in-migration linked to cocoa expansion and cross-border trade. Settlement-level census releases were not yet available at the time of drafting; the indicative populations in Table 8.1 are therefore the 2023 key-informant estimates collected by the 2024 ESIA, cross-checked against 2026 observations. The 2026 campaign found that the larger corridor communities commonly exceed 2,000 residents each excluding migrants, and that Zwedru — recorded at about 25,300 in the 2008 census — is now substantially larger.

The corridor supports fifteen principal project-affected communities (PACs) on the 75 km Toe Town–Zwedru leg and the 10 km border leg, including Suaken Town as an off-corridor host community, together with numerous smaller villages; the RAP census enumerated affected assets in 24 settlements in total, 21 rural and 3 urban (RAP, 2025). The settlement pattern is overwhelmingly linear and road-oriented: dwellings, shops, kiosks, places of worship, schools, water points and social facilities face directly onto the road, and the roadway itself functions as the principal public and social space of each town. This morphology concentrates both project benefits (access, trade, visibility) and project impacts (dust, noise, vibration, traffic danger, temporary loss of frontage access) on the same receptors, and it is the reason the assessment treats corridor settlements as continuous linear receptors rather than points. Households are

typically nuclear families extended by dependants and relatives, sharing farming, trading, care and transport responsibilities; the 2023 HHS recorded a mean household size of 4.6 persons (county mean 4.3 per the 2016 HIES). Children, elders, pregnant women and persons with disabilities are the members most dependent on safe, affordable road access. The communities constituting the social area of influence, as delineated in 2023–24, are shown in Figure 8.1; the principal corridor settlements and their indicative populations are mapped in Figure 8.2.

Housing stock grades with settlement size. Typical structures are mud-daub or earth walls under thatch or zinc roofing, mud-brick walls under zinc, and concrete-block construction under zinc, with more durable and commercial buildings concentrated in the larger towns and in Zwedru; occupancy mixes owner-occupiers, tenants, informal users and small businesses, often within a single structure. Two baseline principles follow for the assessment: a structure's low replacement value does not imply low livelihood significance, and censuses and valuations must recognise users — tenants, operators and informal traders — as well as owners, a principle applied by the RAP entitlement framework (RAP, 2025; Section 10.7).

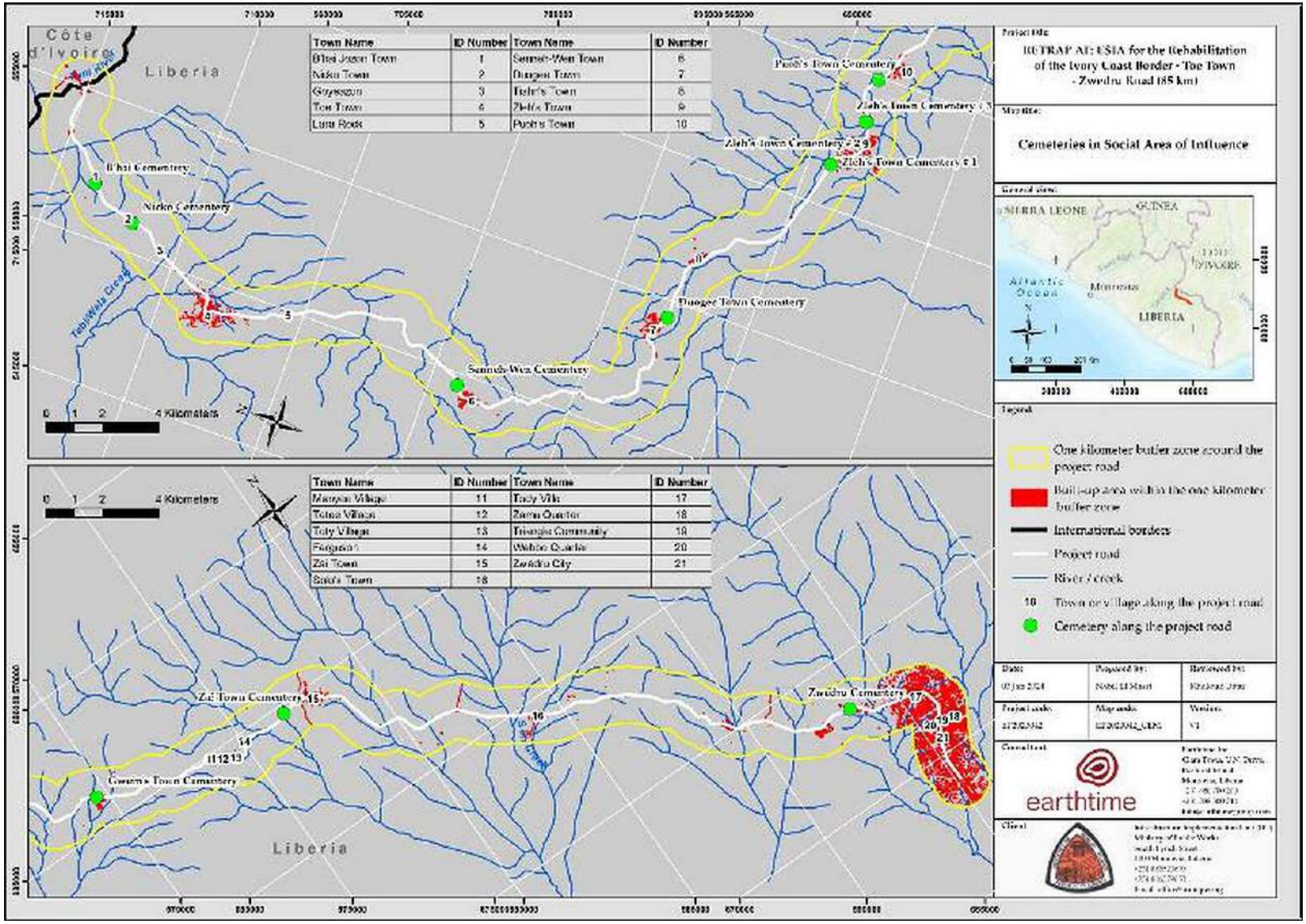


Figure 8.1: Communities in the social area of influence (2023–24) (adopted from the 2024 ESIA (Earthtime, 2024, Ch. 8); reproduced for this ESIA).

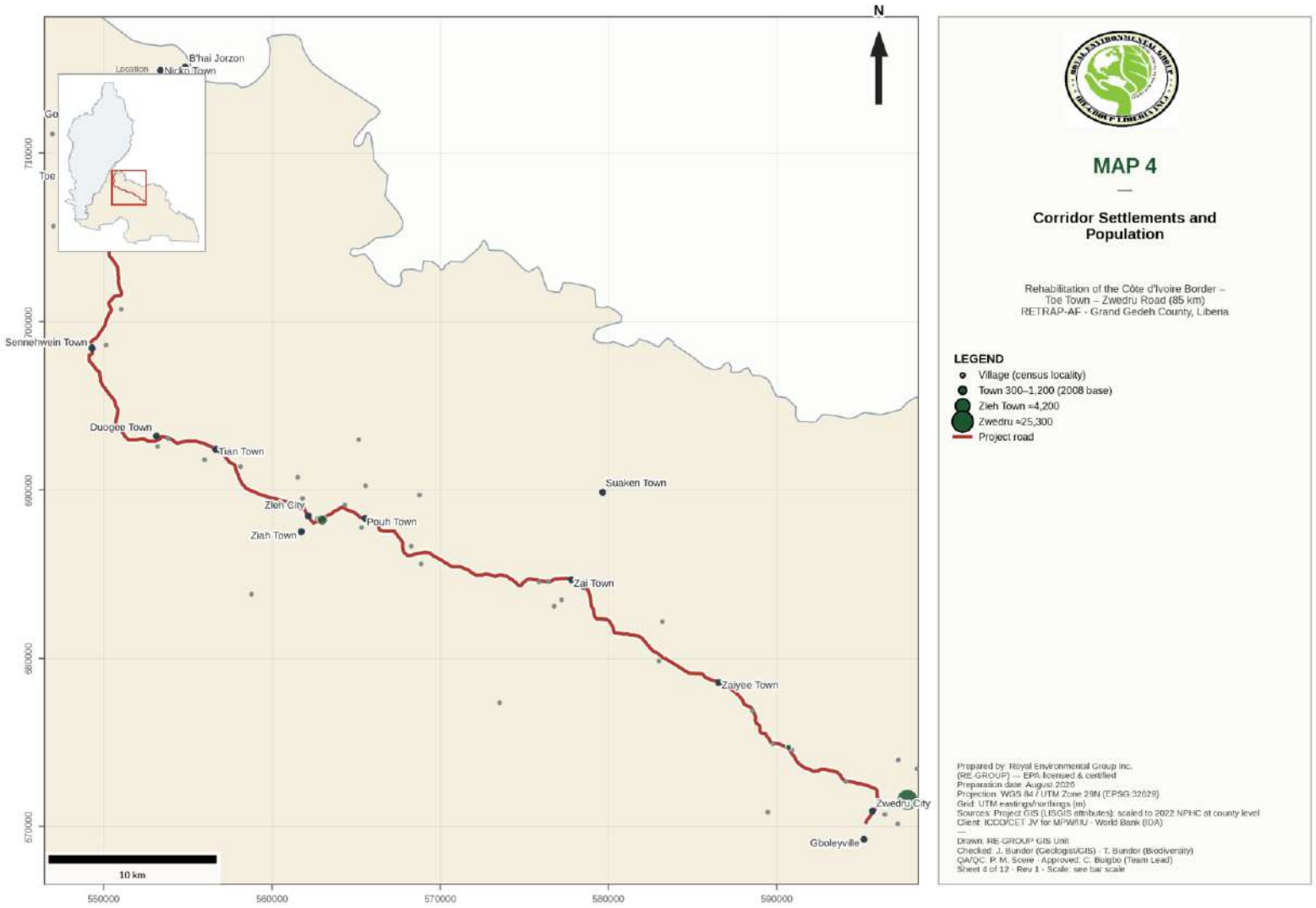


Figure 8.2: Principal corridor settlements and indicative population distribution, Côte d'Ivoire Border–Toe Town–Zwedru corridor

Table 8.1: Principal project-affected communities along the corridor, north to south (populations are 2023 key-informant estimates reported in the 2024 ESIA except where stated; the 2026 campaign reported larger PACs at more than 2,000 residents each excluding migrants)

No.	Settlement (canonical name)	Corridor position	Indicative population	Key settlement and household attributes (2026)
1	B'hai Jorzon	km 0, border settlement	1,010	Border-post economy; Liberia Immigration Service office within the RoW; sacred cotton tree and sacred creek; football field; handpump (GW-05)
2	Nicko Town	Border segment	429	Largest Mossi (Burkinabè) migrant concentration on the corridor, engaged in cocoa; Kougae Sacred Creek; borrow pit BP17 nearby
3	Goyeazon Town	Border segment	1,500	Most notable sacred community; hosts the central Poro Bush of Gbarzon Statutory District; sacred tree and forest; strict cultural protocols
4	Toe Town	about km 10–12	6,622	Principal transport and commercial node of the northern corridor; Saturday market; public school; city mayoralty; police post; sacred stream
5	Sennehwein Town	about km 19–20	4,500	Linear road-oriented settlement; school; adjoins the Chimpanzee Sensitivity Zone (about km 19, about 1.6 km off the road)
6	Duogee Town	North-central section	7,000	Agricultural community; secondary school; clinic in vicinity; pit-sawing observed nearby; women's FGD community
7	Tian Town	North-central section	2,115	Roadside settlement; community borehole; football field within the 150 ft corridor; cocoa farms adjoining
8	Zleh City (Zleh Town)	Mid-corridor	5,878	Weekly (Friday) market; public school (signposted Gborho Central High School); large swamp-rice farms; cemetery nearby; police post; Fulani cattle herding

No.	Settlement (canonical name)	Corridor position	Indicative population	Key settlement and household attributes (2026)
9	Pouh Town	Mid-corridor	2,500	Road-dependent mobility; junction settlement; NOI posting and women's FGD community
10	Ziah Town	Mid-corridor	n/r	Hosts proposed Quarry 2 on its outskirts; Ziah Town Sacred Forest about 300 m off the RoW
11	Zai Town (with Zuoyou)	South-central section	6,000	Community clinic; Thursday market (2023); handpump (GW-01); proposed Contractor's camp and mechanical site at Zuoyou
12	Suaken Town	about 6.5 km off-corridor host community	n/r (small settlement)	Host of proposed Quarry 1 (about 431 m from town) and the batching/asphalt/crusher complex; quarry MOU under negotiation
13	Zaiyee Town	Southern section	n/r	Cocoa and household agriculture; football field within the 150 ft corridor; unmarked graves reported; largest 2026 consultation (128 participants)
14	Gboleyville	Zwedru approach	n/r	Peri-urban settlement on the Zwedru catchment; roadside structures and trade
15	Zwedru City	about km 83.7, terminal	about 25,300 (2008 NPHC; larger today)	County capital; daily market; referral hospital and Midwifery Training School nearby; deteriorated urban pavement and aged utility lines; CLSG-fed grid

n/r = no verified estimate on record. Additional smaller and adjoining settlements recorded during the 2026 campaign and the RAP census — including Gboloken, Solo Town, Gwein Town, Karr Town, Towah Town, Bassa and Sherman Villages, One Man Village, Mianyee Village, Kahn Town, Jacob Village, Douh, Veyeazohn, Zwedru Gate and the Zwedru quarters — are covered by the engagement programme (Section 1.8 and Appendices M–N) and the RAP's 24-settlement register (RAP, 2025). Spelling variants encountered in field records (Swaken/Suehken, Nico/Niko, Senewhen/Senewehn, Zahi/Zai, Dougee) have been normalised to the canonical forms above.



Plate 8.1: Existing dilapidated carriageway and aged electricity poles along the urban corridor — Zwedru City, August 2026 (RE-GROUP field survey)

8.1.3 Ethnicity, migration and religion

The corridor population is predominantly Krahn — 74 per cent of the 2023 HHS sample — and Krahn customary institutions govern land relations and cultural sites; smaller resident groups include Gio, Kpelleh, Sarpo, Mano, Bassa and Mandingo (Earthtime, 2024). Two migrant communities are prominent and growing. Mossi migrants from Burkina Faso are present in nearly all of the larger PACs and are principally engaged in cocoa farming, typically under arrangements with landholding families; the 2026 campaign recorded a particularly large Mossi influx at Nicko Town. Fulani residents are present in all larger communities as traders and cattle keepers, and cattle herding along the road — observed near Zleh City — is now a common corridor activity with implications for road safety. No field evidence indicates that ethnicity obstructs routine inter-community relations; however, unequal access by migrants to project information, employment or compensation processes could generate grievances, and the engagement programme therefore explicitly includes migrant representatives (Section 1.8 and Appendices M–N). Christianity is the majority religion (Methodist, Lutheran, Pentecostal and Evangelical congregations), with Muslim residents present in the larger towns, including within the migrant communities; among RAP-registered PAPs, 87.5 per cent identified as Christian and 12.4 per cent as Muslim (RAP, 2025).

8.2 Economy and Livelihoods

The corridor economy is agrarian, cash-crop-led and road-dependent. Cocoa is the universal cash crop: the 2026 campaign confirmed cocoa farming in every project community, a corridor-side cocoa storage and buying facility, and continuing expansion of smallholder plots, while the BFS recorded 556 georeferenced farming records within the biodiversity study area, 383 of them (68.9 per cent) cocoa, identifying cocoa expansion as the dominant land-cover-change driver (BFS, 2026). Farming plots are concentrated along and near the corridor, where produce can be evacuated; the notable exception is the 10 km border leg, where no farms were observed immediately adjacent to the road in August 2026. The subsistence base comprises rice — including extensive swamp-rice cultivation in the inland valley swamps at Zleh City — cassava, vegetables and mixed food cropping, complemented by rubber, oil palm, plantain and banana, kola and fruit trees; the 2023 HHS found 60 per cent of households growing tree crops. Livestock holdings are dominated by free-range poultry, goats and sheep, with Fulani-managed cattle along the road.

Beyond farming, livelihoods rest on four pillars. First, petty trade and informal roadside business — provision shops, food preparation and vending, repair services and kiosks — line the road frontage in every town and are highly sensitive to dust, visibility, customer access and any occupation of frontage. Women dominate market vending and prepared-food sales. Second, the motorcycle transport economy: motorcycles are the primary mode for passengers and goods across the corridor and a key livelihood for young men, with small commercial vehicles increasingly operating between Toe Town and Zwedru. Third, cross-border trade: B'hai Jorzon functions within a border economy moving farm produce and consumer goods to and from Côte d'Ivoire, and the 2024 ESIA additionally recorded log exports from a B'hai District logging concession using the project road. Fourth, artisanal and forest-based activities: pit sawing of timber (observed near Duogee Town in 2026), charcoal production (32 per cent of 2023 HHS households), artisanal gold mining, craft making, palm-product processing and the collection of firewood, poles, thatch, bamboo and medicinal plants; 78 per cent of surveyed households consulted traditional healers, underscoring the livelihood and cultural value of the plant resource base.

Markets structure the exchange economy. Nearly all the larger PACs hold weekly or daily markets; the principal market nodes are Toe Town (Saturdays), Zleh City (Fridays) and Zwedru (daily), with Zai Town historically hosting a Thursday market (Earthtime, 2024; RE-GROUP, 2026). Bushmeat remains a significant element of the food economy and of pressure on wildlife: the 2023 HHS found that 92 per cent of households consume bushmeat, 87 per cent purchase it and 52 per cent include a hunter, with sales concentrated in the Zwedru and Toe Town markets — a finding central to the induced-access impact assessment (Chapter 9) and the Biodiversity Management Plan.

Households also draw directly on the natural resource base for subsistence and recreation. Bush, secondary forest, creeks and lowlands supply firewood, poles, thatch, medicinal plants, bamboo and reeds, palm products and non-timber forest products; about 25 per cent of 2023 HHS households fished, mainly youth using hook-and-line, baskets and nets in the Cavalla River and in local rivers and creeks including the Seh River. Community recreation is organised around football (men and boys) and kickball (women and girls), and the pitches — including those at Zaiyee Town and Tian Town that lie within the 150 ft corridor — double as meeting grounds; they may not be occupied by the Contractor without community agreement and full reinstatement. Construction-phase restrictions, clearing, borrow-pit development and any worker harvesting could pressure these resources, and the workforce prohibition on hunting, bushmeat purchase and plant collection (Chapter 10) responds directly to this baseline.

Poverty is deep and predominantly rural. The most recent county-level measurement — the 2016 Household Income and Expenditure Survey, as carried in the 2024 ESIA — put absolute poverty in Grand Gedeh at 63.7 per cent, food poverty at 47.8 per cent and extreme poverty at 17.5 per cent, against national rates of 50.9 per cent, 39.1 per cent and 16.5 per cent respectively (LISGIS 2016 HIES, in Earthtime, 2024); no more recent county-level poverty survey was available in 2026, and the figures are quoted with that vintage. Household cash income is irregular and seasonally linked to the cocoa cycle; food, transport and education are the dominant expenditure pressures. The present poor road condition depresses farm-gate returns through high fares, produce spoilage and long travel times, and community expectations of the Project centre on reversing precisely these losses (Section 1.8 and Appendices M–N).



Plate 8.2: Market survey with vendors during the socio-economic baseline studies — Toe Town, August 2026 (RE-GROUP field survey)



Plate 8.3: Aerial view of Toe Town, the principal commercial node of the northern corridor — Toe Town (approximately km 10–12), August 2026 (RE-GROUP field survey)

8.3 Infrastructure and Services

8.3.1 Road condition and transport

The existing road is an unpaved laterite single carriageway, generally 6.5–7.4 m wide, with short surfaced lengths in some villages and a deteriorated concrete/asphalt section at the Zwedru urban entry. Long sections are graded below natural ground level, producing ponding and rutting; side drains exist only in

Zwedru; and several crossings traverse swampy ground. The 2026 campaign found that recent Government road-sector interventions have restored dry-season passability along most of the 75 km leg, but the 10 km Toe Town–B'hai Jorzon border leg remains the principal constraint, deteriorating badly in the rains with mud, roughness and constrained creek crossings. Traffic volumes were last counted in 2017 (310 AADT on the border leg; 922 AADT Toe Town–Zwedru, all classes including motorcycles — Aurecon 2017 base year, in Earthtime, 2024) and are treated as dated. Wet-season isolation raises fares, damages produce, delays medical referrals and interrupts schooling. The 2026 campaign profiled the corridor's trip purposes and their sensitivities: agricultural marketing (high fares and produce damage today; lower costs and wider market reach with the Project); health and referral travel (motorcycle-dependent today; faster access, including to the new referral hospital); education (long, unreliable journeys; improved attendance but heightened crossing risk on a faster road); cross-border commerce (variable conditions; predictable movement); and social and administrative travel to Zwedru (seasonal isolation; year-round connectivity). Conversely, the transition to a fast paved road will replace a low-speed environment with a high-speed one, and without settlement gateways, speed management, safe crossings, sight-distance control, signage and education the severity of pedestrian and motorcycle crashes could rise — a central community concern (Section 1.8 and Appendices M–N) carried into the impact assessment (Chapter 9).

8.3.2 Water supply and sanitation

Domestic water along the corridor comes from handpumps, boreholes, hand-dug wells, creeks and purchased sachet water. The 2023 HHS recorded 92 per cent of households drawing drinking water from handpumps, with collection performed overwhelmingly (90 per cent) by women and girls; smaller settlements depend more heavily on unimproved and seasonal sources. Georeferenced community sources sampled in 2026 include handpumps at Zai Town, Zleh City, Suaken Town and B'hai Jorzon and a hand-dug well at Zleh City (stations GW-01 to GW-05); all met LQWS Class I criteria, though suspended-solids concentrations at 69–80 per cent of the class limit indicate that wells and pumps require deliberate protection from construction sediment (Section 6.4). Communities also identified NGO-installed pumps at Solo Town and a community borehole at Tian Town as assets requiring protection or reinstatement. Sanitation is poor: in 2023, 45 per cent of households had no facility, 45 per cent used pit latrines and only 10 per cent had permanent toilets, with open defecation common — a baseline that heightens the sensitivity of water sources, including sacred creeks, to any additional contamination. There are no municipal waste-collection services along the corridor; households burn or bury refuse or feed organic waste to animals, so all construction-phase waste streams will require self-contained, EPA-compliant management (Chapter 10).

8.3.3 Energy and telecommunications

All major PACs now have electricity access through the national grid supplied by the regional CLSG (Côte d'Ivoire–Liberia–Sierra Leone–Guinea) interconnection — a material change since the 2024 ESIA — although household connection rates, affordability, reliability and supply hours vary widely. Distribution lines and poles run along the road through most towns; in Zwedru the corridor carries aged utility poles and street lighting requiring relocation (Plate 8.1), and rural electrification works were ongoing along the corridor in August 2026. The RAP flags relocation or removal of electrical poles within the RoW as an implementation item requiring a joint utility survey, a relocation schedule and safe temporary supply (RAP, 2025). Mobile telephone coverage (Lonestar and Orange) extends across the corridor towns, supporting the Project's grievance and disclosure channels, though signal quality declines between settlements.

8.3.4 Education and health

Schools in the larger communities serve surrounding smaller settlements. The 2024 ESIA recorded some 12–14 public elementary schools along the road — including B'hai Nicko Public School, Toe Town Public School and schools at Solo Town, Pouh Town and Gwein Town — with secondary schools at Zwedru, Duogee Town, Zleh City, Toe Town and Ziah Town, and the Grand Gedeh Community College at Zwedru. The 2026 campaign verified the public school serving Zleh City (signposted Gborho Central High School) and school buildings fronting the road at Tian Town and Sennehwein Town. Educational attainment is constrained by household costs, distances, road condition and limited progression beyond elementary and junior-high level: in the 2023 HHS, 12.8 per cent of persons aged 15 and above had never attended school,

and adult literacy is markedly lower among women. Walking remains the dominant mode for elementary pupils (75 per cent in 2023), while junior- and senior-high students rely predominantly on motorcycles, placing school frontages and crossings among the corridor's most sensitive receptors; a chainage-referenced register of school gates, walking routes and peak crossing times is a pre-construction commitment carried into the ESMP. Low literacy also dictates the Project's communication approach: written disclosure must be combined with oral, visual and local-language channels (Section 5.7).

Health services comprise clinics and health centres in the larger communities — the 2024 ESIA counted six health clinics and one hospital in the project-affected towns, and the Zai Town community clinic was verified in 2026 — the existing Martha Tubman Memorial Hospital in Zwedru, and two significant new facilities near Zwedru: the Grand Gedeh County (referral) Hospital, nearing completion in August 2026, and the Midwifery Training School, which is simultaneously an education and a health receptor. Common conditions reported are malaria, febrile illness, respiratory and gastrointestinal disease, and maternal-health emergencies. Access, not availability, is the binding constraint: smaller communities depend on motorcycle referral over rough roads, and the women's focus groups in all six FGD communities identified emergency obstetric travel as difficult, slow and costly — with roadside births reported in the 2023 baseline — making the maintenance of emergency access during construction, and coordination with clinics on closures, a gender-specific mitigation requirement (Sections 8.5 and 7.5). Three police posts (Toe Town, Zleh City, Zwedru) and a single bank (Zwedru) complete the service picture.

8.4 Land Tenure and Use

Land relations along the corridor are customary at their foundation. The Land Rights Act 2018 formally recognises customary land ownership with equal protection to private title, vesting management in communities through their governance structures; in practice, chiefs and elders allocate land, formal deeds are scarce (few new deeds have been issued since the war), and holdings are managed through a hybrid of customary allocation, inheritance, leases, occupancy and use rights, with vernacular land transactions in the larger towns. Migrant farmers, notably the Mossi cocoa growers, access land through arrangements with landholding families. Dominant land uses are settlements, cocoa and food-crop farms, young fallows, degraded secondary forest, inland wetlands and lowland rice, hunting and fishing areas, and small commerce; the 2026 update survey recorded 31 inland wetlands (IW-001–IW-031) and 9 creeks within the 150 ft RoW itself (RE-GROUP, 2026). The composition of land-use sites recorded at the ancillary and corridor survey plots in 2026 is charted at Figure 8.3.

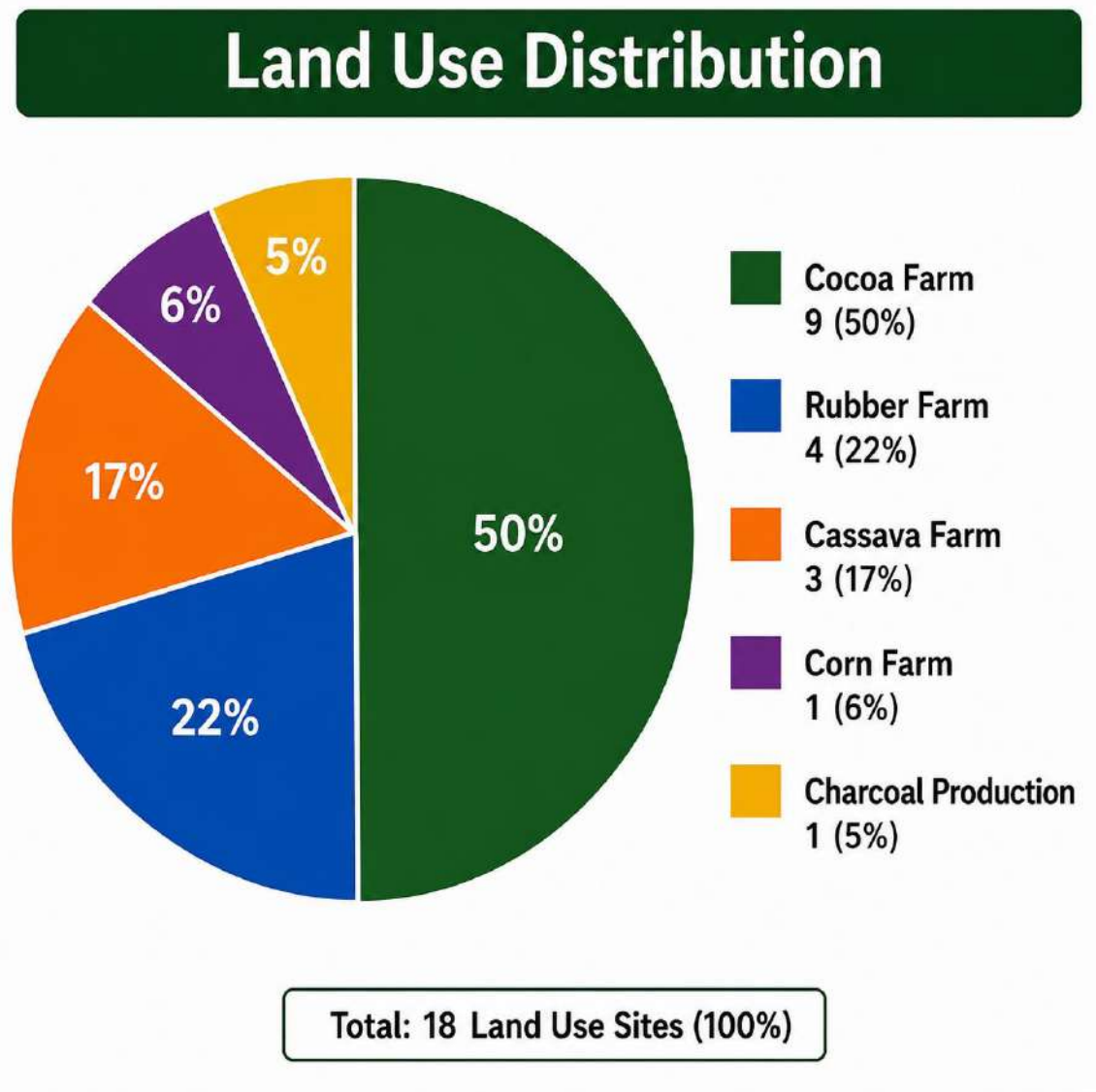


Figure 8.3: Land-use sites recorded at ancillary/corridor plots, 2026 (adopted from the 2026 update field assessment (RE-GROUP, 2026f); reproduced for this ESIA).

The road corridor is government reserved land: a right-of-way of 150 ft (45.7 m; 75 ft either side of the centreline) in rural areas and 100 ft (30.5 m; 50 ft either side) in urban areas. The works are confined to this RoW and no private land acquisition is anticipated (RAP, 2025). The RoW has, however, been extensively occupied over decades — by dwellings, shops, kiosks, public structures, graves and economic trees — and it is this historic occupation, not land take, that generates the Project's resettlement impacts. The RAP census of 6–17 December 2024, with a cut-off date of 15 December 2024, enumerated 860 project-affected persons holding 1,084 affected assets across 24 settlements: 854 private structures (93 per cent fully affected), 16 public structures, 15 graves, 6 farms with 2,185 economic trees, 84 businesses without structures and 98 tenants, including 116 vulnerable PAPs (RAP, 2025, §§4–5). Seven settlements — Zwedru City, Zleh City, Zai Town, Toe Town, Sennehwein Town, Duogee Town and B'hai Jorzon — account for 81 per cent of affected properties. Occupants of the RoW are compensated at full replacement cost for structures, assets and transitional losses, but not for land, consistent with ESS5 treatment of persons without recognisable land claims; schools and clinics lie outside the RoW and are not affected, although 16 public structures, two football fields (Zaiyee Town and Tian Town) and the Liberia Immigration Service office at B'hai Jorzon lie within it. The RAP budget is US$3,658,686.97, and no civil works may commence in an affected section until compensation for that section is paid in full and the payment-completion report is cleared by the World Bank, with site handover no earlier than three months after compensation. The resettlement impact assessment is presented in Section 9.4.6, its management in Section 10.7 (Table 10.6) and the reconciliation of the RAP with this ESIA in Appendix N; the RAP (Final Report V2, 23 July 2025), with its entitlement framework, remains the authoritative resettlement instrument.

Two tenure matters extend beyond the RoW. First, ancillary facilities — the Contractor's camp, quarries, borrow pits, batching/asphalt/crusher sites and the mechanical yard (Chapter 3) — are outside the RAP scope; land access requires documented voluntary lease agreements or MOUs with landholding communities, or a RAP addendum cleared by the Bank. At the proposed Suaken quarry the host community has held two meetings with the Contractor and expressed willingness to lease, but no MOU had been signed by August 2026; this remains a precondition for quarry permitting and operation. Second, community recreational land: football fields at Zaiyee Town and Tian Town lie within the 150 ft corridor and communities have requested relocation support should they be taken, and the Liberia Immigration Service office at B'hai Jorzon lies within the corridor and requires advance coordination — both carried into the mitigation register (Chapter 10).

8.5 Gender, Vulnerability and GBV Context

Women carry a central and disproportionate share of the corridor economy and its burdens. They dominate food-crop production tasks, produce processing and marketing, prepared-food and petty trade, firewood collection and water fetching (90 per cent of collection trips in 2023), while men dominate land clearing, tree-crop management and transport. Head-loading of produce to market remains physically demanding and time-consuming for women where transport is unaffordable — a finding emphasised in the Duogee FGD. Women's incomes derive mainly from market stalls, food vending and farm-gate sales, and in the 2023 HHS more women than men reported running businesses. Yet women face systematic disadvantages: literacy of 32 per cent against 62 per cent for men (Carter Center 2014, in Earthtime, 2024), informal employment above the (already high) county rate of 84.6 per cent, limited access to information customarily channelled through male leaders, and under-representation in decision-making.

The 2026 women's focus group discussions in six PACs — Pouh Town, Zleh City, Duogee Town, Sennehwein Town, Toe Town and B'hai Jorzon (Section 5.5) — sharpened this picture into project-specific findings: (i) emergency obstetric travel is currently difficult, expensive and dangerous, and construction closures could worsen it unless emergency access is guaranteed; (ii) head-loading and long walking routes make women disproportionately sensitive to diversions and blocked paths; (iii) labour influx creates a recognised risk of sexual exploitation of adolescent girls and of transactional relationships, alongside alcohol-related disorder near camps; (iv) displacement of kiosks and market stalls — particularly in the dense Toe Town trading environment — threatens women's livelihoods if only structure owners are recognised; and (v) women without land title, widows and women with disabilities risk being missed by impact screening unless eligibility is based on actual use and vulnerability rather than title. Each finding is

matched to mitigation in Section 5.5 and Chapter 10, including the SEA/SH prevention and response measures.

The gender-based violence context is serious. Grand Gedeh is reported among the counties with the highest known incidence of rape in Liberia, with an estimated 12.5 per cent of cases reported to police (UN Response to Rape data, in Earthtime, 2024); attitudes condoning intimate-partner violence remain widespread; and female genital mutilation affects approximately 44 per cent of women aged 15–49 nationally (UN Women 2016, in Earthtime, 2024), with Sande initiation practised in the project area. Nationally, 39 per cent of women aged 15–49 have experienced intimate-partner physical or sexual violence. Against this baseline, the labour influx associated with an estimated workforce of about 780 (approximately 100 international and 680 national staff; 2024 planning estimate pending the CESMP) constitutes a substantial SEA/SH risk requiring the funded prevention-and-response architecture set out in Chapter 10 and the LMP, anchored on the workers' code of conduct, survivor-centred referral and the confidential grievance channel described in Section 5.6.

Vulnerable groups identified along the corridor comprise female-headed households (27 per cent of the 2023 HHS sample), the elderly, children, pregnant and lactating women, persons with disabilities or chronic illness, food-insecure and very poor households, tenants and informal roadside users, migrant residents and labourers with weaker information access, and households dependent on a single roadside livelihood. The RAP registered 116 vulnerable PAPs (13.5 per cent of all PAPs) — 56 elderly persons, 22 persons with disabilities, one chronically sick person and 37 female household heads — each entitled to supplementary transitional assistance (RAP, 2025). The 2026 baseline maps the pathways through which harm could concentrate on these groups: frontage loss (small traders, tenants, women vendors); unsafe mobility (children, elders, persons with disabilities, motorcyclists, livestock keepers); information exclusion (low-literacy residents, migrants, persons absent during the day); employment exclusion or abuse (women, youth, migrants, persons with disabilities); SEA/SH (women, girls, children, economically dependent persons); and compensation capture (women, tenants and customary users where payments are channelled through titleholders or intermediaries). The corresponding gender-mainstreaming actions — advertising jobs through women's and youth networks, equal pay, separate safe sanitation and appropriate PPE, care-responsive working arrangements, SEA/SH prevention with survivor-centred referral, and sex-, age- and community-disaggregated monitoring — are embedded in Chapter 10 and the ESMP. Screening under ESS7 confirmed that no group along the corridor meets the criteria for Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities; protection of customary institutions and of minority and migrant residents is nonetheless mainstreamed through the engagement and mitigation frameworks.

8.6 Cultural Heritage

The corridor traverses a living cultural landscape in which sacred natural sites, secret-society institutions and burial places are integral to community identity and governance. The 2026 field campaign, working through custodial consultation rather than intrusive survey, consolidated all previously recorded features — including the four community sacred groves documented by the BFS at Barteh Jam, Toe Town, Kparblée and Bassa Village (the Barteh Jam grove also holding two mature stems of the Endangered timber tree Tieghemella heckelii) — into a single project cultural-heritage register. Six principal sacred sites (SS-001 to SS-006, numbered per the 2026 field register) are recorded in Table 8.2; verification proceeded through on-site custodial consultation at each feature, as recorded at Plate 8.4. At the custodians' request, precise coordinates are deliberately withheld from public documents; a confidential register, maintained separately from public drawings, supports design and construction control. Five of the six features adjoin, or are crossed by, the 150 ft RoW; the Ziah Town Sacred Forest (SS-001) lies about 300 m from it.

Table 8.2: Register of sacred sites recorded by the 2026 field campaign (SS-001 to SS-006)

ID	Site	Community (custodians)	Type	Position relative to the road	Management requirement
SS-001	Ziah Town Sacred Forest	Ziah Town	Sacred forest	about 300 m off the RoW	Avoidance with agreed buffer; excluded from any ancillary-facility siting
SS-002	Sacred Cotton Tree	B'hai Jorzon	Gigantic sacred cotton tree; forbidden site for strangers	Within the settlement, adjoining the RoW	Root-protection zone; no cutting, storage or vibration works at the tree; custodial consultation on access and rituals
SS-003	B'hai Sacred Creek	B'hai Jorzon	Sacred watercourse managed by traditional leaders	Border segment; adjacent to/crossed by the alignment	No contamination, diversion or unauthorised access; crossing method and timing agreed with custodians; ichthyological survey of the creek under the custodial protocol of Section 6.3.2 (consent, non-lethal methods, no fish removed), findings shared with the custodians
SS-004	Kougae Sacred Creek	Nicko Town (Nieko)	Sacred watercourse, highly revered	Border segment; near the alignment	As SS-003 (no water drawn from the creek for the survey); exclusion mapping in the Contractor's GIS
SS-005	Goyeazon Sacred Forest	Goyeazon Town	Sacred forest and sacred tree after which the town is named; outsiders may not see or visit the tree	Adjoining the settlement, off the carriageway	Strict avoidance; micro-alignment to retain tree and root zone; confidential custodial verification and agreed buffer
SS-006	Toe Town Sacred Stream	Toe Town	Sacred watercourse	Near the urban section	No contamination or unauthorised access; custodial consultation; where the works affect the stream, the ichthyological survey and the

ID	Site	Community (custodians)	Type	Position relative to the road	Management requirement
					crossing design follow the custodial protocol of Section 6.3.2



Plate 8.4: Custodial consultation at a sacred creek (cultural-heritage verification, August 2026) (adopted from the 2026 update field assessment (RE-GROUP, 2026f); reproduced for this Updated ESIA).

Goyeazon Town warrants particular note: it hosts the central Poro Bush of the Gbarzon Statutory District — the most central and largest Poro Society institution in the district — and is the most notable sacred community in the project area. The 2026 consultation there was conducted under, and documented, the community's cultural protocols: visitors may not enter wearing plain red shirts; firearms may not be carried; the sacred tree may not be viewed or visited by outsiders; fish from a designated creek may not be eaten; and men are required to keep their hair cut. These protocols will bind the Contractor's workforce through site-specific cultural rules agreed with the leadership, and all engagement at Goyeazon is to be channelled through the traditional authorities.

Burial heritage is extensive. The 2026 campaign recorded 12 grave sites — community cemeteries and family burial places — along the corridor, and communities in five settlements (Zaiyee Town, Zleh City, Duogee Town, Tian Town and Solo Town) reported additional graves without headstones or tombs, privately known and unmapped, within or near the corridor. The RAP separately enumerated 15 affected individual graves (13 owners), compensated at US$20,280 for full tomb replacement, relocation and family and traditional rituals, and identified ten roadside cemeteries which the design avoids altogether; unmarked graves discovered during works are handled through the chance-find procedure and may be registered through the GRM for capture and compensation (RAP, 2025). At Zwedru, the RAP also records the community's request that the historic, self-funded Kudah pavement be preserved through use of the Kudah Bypass — an unresolved alignment question with ESS8 dimensions, carried forward in Section 4.3 as a discrete alignment assessment before the affected segment is finalised.

The management implications, carried into Chapters 9 and 10 and the ESMP, follow three principles. First, avoidance: known sacred resources are treated as design and construction avoidance constraints, not as items to be compensated after impact; no Contractor personnel may enter, photograph, clear, quarry, camp, discharge water or store materials within an agreed cultural exclusion area, and no ancillary facility may be sited in a sacred grove (a binding siting exclusion, Chapter 3). Second, custodial consultation: confidential verification of each site with its custodians before final alignment and drainage approval, agreed buffers and crossing protocols, and cultural induction of the workforce. Third, the chance-find procedure: any suspected grave, shrine, artefact or sacred feature encountered during works triggers an immediate stop-work, cordon and notification sequence — Supervising Engineer, community leadership

and the Ministry of Information, Cultural Affairs and Tourism, with FDA involvement for forest sites — and work resumes only on written clearance, consistent with ESS8 and the ESMF chance-finds procedure (ESMF, 2021, P175263).



Plate 8.5: Sacred cotton tree (SS-002) towering above the settlement — B'hai Jorzon, August 2026 (RE-GROUP field survey)

9 ENVIRONMENTAL AND SOCIAL ASSESSMENT OF IMPACTS

This chapter identifies and assesses the Project's environmental and social impacts — beneficial and adverse, by phase, direct, indirect, cumulative and induced — using the significance methodology carried from the 2024 ESIA and strengthened for this revision. The biodiversity assessment is rebuilt on the Biodiversity Field Survey, and the social assessment carries the new concerns recorded by the 2026 consultations. Unplanned-event risks, which are distinct from the impacts of planned activities, are summarised at Section 9.8 with their management framework.

9.1 Approach

The assessment applies, without modification, the methodology defined in Section 1.6 of this report: for each interaction of a Project activity with a receptor, the nature (adverse or beneficial; direct, indirect, induced or cumulative), magnitude (Negligible, Low, Medium, High — defined per receptor), extent, duration, frequency, reversibility and probability are characterised; magnitude is then crossed with receptor sensitivity (Low, Medium, High, informed by the Chapters 6–8 baseline) in the significance matrix to yield a pre-mitigation significance of Negligible, Minor, Moderate or Major. Chapter 10 then applies the mitigation hierarchy (avoid, minimise, restore, offset/compensate) and states residual significance. Only the four significance terms above are used for ESIA ratings. For biodiversity, the BMP (rev.3) applies avoidance, minimisation and footprint restoration only and uses no offset or net-gain step; where Chapter 10 cites the BFS/BMP residual scale (Low, Medium, High, Severe), the equivalent term on this scale is stated alongside (Section 5.5).

The starting point is the impact register of the 2024 ESIA (Earthtime, 2024, Ch. 9, Table 10.5), which identified eleven positive impacts and nineteen adverse impact categories. That register has been comprehensively updated and re-coded for four reasons. First, the baseline has changed: the 2026 field campaign (Chapters 6–8) provides current air, noise, water and soil data at twenty co-located stations, five groundwater points, three surface-water points and twelve soil stations, replacing the November 2023 dataset (the 2026 physical campaign is itself a single wet-season campaign, 3–13 August 2026; only the BFS is two-season). Second, the BFS (2026) has fundamentally revised the biodiversity evidence base: ESS6 Critical Habitat is triggered under Criterion 1, with the White-bellied Pangolin (Phataginus tricuspis, EN) as the primary trigger and the Western Chimpanzee (Pan troglodytes verus, CR) treated precautionarily on a single verified camera record; the Chimpanzee Sensitivity Zone (CSZ) has been relocated to km 18–20 near Sennehwein Town, superseding the 2024 ESIA's km 64–72 zone; and two pangolin Critical Habitat polygons (CH-West and CH-East, 19.5 km²) and the precautionary Chimpanzee Sensitivity Zone (3.14 km²) — together 22.6 km² — and six Priority Biodiversity Features (14.2 km²) now constrain the works. Third, the ancillary facilities — sixteen borrow pits (BP1–BP17, no BP10), two quarries, the Suaken crusher–asphalt–batching complex, the Zuoyou Town construction camp (about 4 acres) and the mechanical site — are now identified with coordinates (Chapter 3), permitting site-specific assessment in place of the 2024 ESIA's generic assumptions. Fourth, the resettlement footprint is now quantified by the RAP census (RAP, 2025), replacing the 2024 ESIA's unquantified displacement assessment.

Each adverse impact is assigned a register code IMP-01 to IMP-46; beneficial impacts are coded IMP-B01 to IMP-B08. These codes are carried through this chapter's assessment and are consolidated in Chapter 10 into the receptor-prefixed management codes used by the ESMP and the CESMP; the BMP (rev.3) uses its own action codes A1–A10, which Section 10.6 maps to the biodiversity codes, and Table 10.11 shows the impact-to-code mapping (group-level mapping also in ESMP Table 4.1), so that every impact can be traced from identification through mitigation to monitoring. The 2024 ESIA folded certain unplanned events (landslides, road traffic accidents, wildlife road-kill as an "accidental" impact) into its impact matrix; in line with the analytical standards of this update, such event-based scenarios have been transferred to the Section 10.8 risk register, while their predictable, planned-activity components (for example, the changed traffic environment, or statistically predictable operational wildlife mortality) remain assessed here.

The spatial frame of the assessment is the Area of Influence defined in Chapter 1: the direct footprint (the 150 ft rural / 100 ft urban right-of-way and the ancillary sites), the BFS Area of Influence (AoI: 1 km either

side of the centreline, a 2 km-wide band of about 167.6 km²), the surveyed buffer (to 2 km either side, about 336.1 km²) and the wider induced-access area. Within this frame the BFS sub-AoI (500 m either side) represents the direct works footprint, while the BFS 5 km extended buffer (about 850 km²) is reference landscape only. The integrated constraints mapping that underpins the screening — overlaying the Critical Habitat polygons, the CSZ, wetlands and watercourses, cultural heritage features, settlements and the ancillary sites — is presented in Figure 9.1 and should be read alongside every section of this chapter.

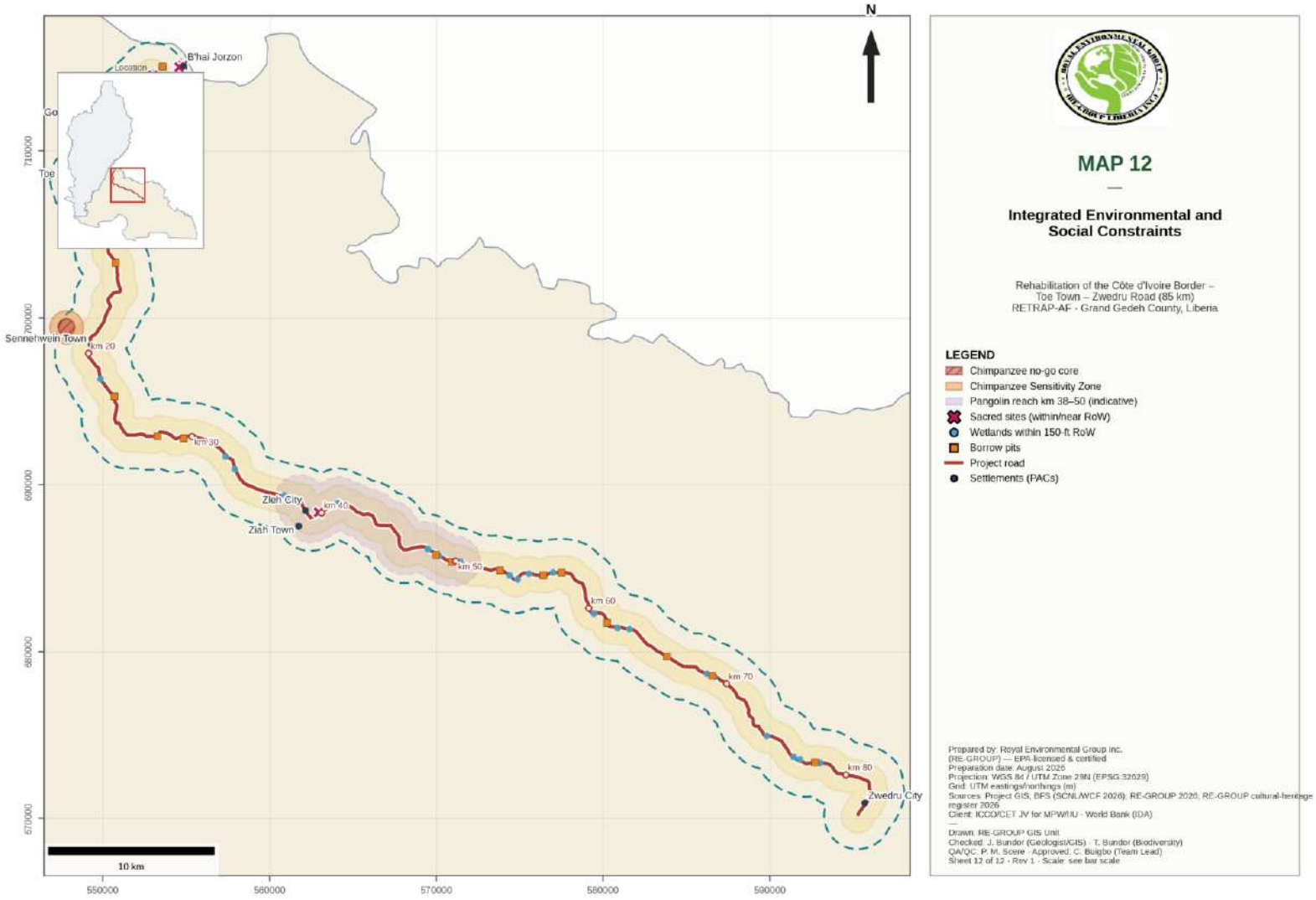

N
B'hai Jorzon
Location
Go
Toe
Sennehwein Town
km 20
km 30
Zlah City
Zlah Town
km 40
km 50
km 60
km 70
km 80
Zwedru City
10 km
710000
700000
690000
680000
670000
550000
560000
570000
580000
590000
MAP 12
Integrated Environmental and Social Constraints
Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (85 km)
RETRAP-AF · Grand Gedeh County, Liberia
LEGEND
Chimpanzee no-go core
Chimpanzee Sensitivity Zone
Pangolin reach km 38–50 (indicative)
Sacred sites (within/near RoW)
Wetlands within 150-ft RoW
Borrow pits
Project road
Settlements (PACs)
Prepared by: Royal Environmental Group Inc. (RE-GROUP) — EPA-licensed & certified
Preparation date: August 2026
Projection: WGS 84 / UTM Zone 29N (EPSG:32629)
Grid: UTM eastings/northings (m)
Sources: Project GIS, BFS (SCNLWCF 2026), RE-GROUP 2026, RE-GROUP cultural-heritage register 2026
Client: ICCO/CET JV for MPW/IU · World Bank (IDA)
Drawn: RE-GROUP GIS Unit
Checked: J. Sundor (Geologist/GIS) · T. Sundor (Biodiversity)
QA/QC: P. M. Sceie · Approved: C. Bolgbo (Team Lead)
Sheet 12 of 12 · Rev 1 · Scale: see bar scale

Figure 9.1: Integrated environmental and social constraints along the corridor — pangolin Critical Habitat polygons CH-West (km 38–44) and CH-East (km 46–50), the precautionary Chimpanzee Sensitivity Zone (km 18–20), wetlands and creeks within the RoW, cultural heritage features, settlements and ancillary facilities (RE-GROUP, 2026)

9.2 Impact Screening

Screening was undertaken as a structured interaction analysis between the Project activities scheduled in Table 3.7 (grouped by phase: pre-construction/mobilisation, construction, operation) and ten receptor groups defined from the Chapters 6–8 baseline: air quality; noise and vibration; water resources; soils and geology; biodiversity; land and livelihoods; community health and wellbeing; cultural heritage; traffic and access; and landscape/visual. Tables 8.1 and 8.2 present the resulting activity–receptor interaction matrix (environmental and social receptor groups respectively). A tick (✓) denotes a credible interaction carried forward for assessment; a dash (–) denotes no credible interaction or one screened as Negligible and not assessed further. Interactions arising only from unplanned events are excluded here and captured in the Section 10.8 risk register (Tables 10.2a–10.2d).

Table 9.1: Activity–receptor interaction matrix (part 1 of 2) — environmental receptor groups

Activity (Table 3.7)	Air	Noise/vibration	Water	Soils	Biodiversity
PC1 Design surveys and geotechnical/hydrological investigations	–	–	–	✓	✓
PC2 Establishment of camp, offices and mechanical yard (Zuoyou Town)	✓	✓	✓	✓	✓
PC3 Development of quarries, Suaken plant complex and borrow pits	✓	✓	✓	✓	✓
PC4 Mobilisation of plant and materials; haul-route preparation	✓	✓	–	✓	✓
C1 Vegetation clearance, grubbing and topsoil stripping within RoW	✓	✓	✓	✓	✓
C2 Demolition of compensated structures; utility relocation	✓	✓	–	–	–
C3 Earthworks (cut/fill, subgrade, soft-ground replacement)	✓	✓	✓	✓	✓
C4 Quarrying, blasting, crushing and screening	✓	✓	✓	✓	✓
C5 Borrow-pit excavation	✓	✓	✓	✓	✓
C6 Materials haulage and plant movements	✓	✓	–	–	✓
C7 Asphalt, concrete-batching and crushing plant operation (Suaken)	✓	✓	✓	✓	✓
C8 Culvert and drainage works (42 box, 40 pipe culverts; lined drains)	–	✓	✓	✓	✓
C9 Bridge rehabilitation and widening (5 structures)	–	✓	✓	✓	✓

Activity (Table 3.7)	Air	Noise/vibration	Water	Soils	Biodiversity
C10 Pavement construction and asphalt paving	✓	✓	✓	–	–
C11 Water abstraction (surface and groundwater)	–	–	✓	–	✓
C12 Camp operation and workforce presence	✓	✓	✓	✓	✓
C13 Waste and wastewater management	–	–	✓	✓	–
C14 Traffic management, diversions and temporary access	✓	✓	✓	✓	✓
C15 Reinstatement and demobilisation of ancillary sites	✓	✓	✓	✓	✓
O1 Road operation (traffic at design speeds)	✓	✓	✓	–	✓
O2 Routine and periodic maintenance	✓	✓	✓	✓	✓
O3 Induced access and development (indirect)	–	–	✓	✓	✓

Table 9.2: Activity–receptor interaction matrix (part 2 of 2) — social receptor groups

Activity (Table 3.7)	Land/livelihoods	Community	Cultural heritage	Traffic/safety	Landscape
PC1 Design surveys and investigations	–	–	✓	–	–
PC2 Camp, offices and mechanical yard	✓	✓	–	✓	✓
PC3 Quarries, plant complex and borrow pits	✓	✓	✓	✓	✓

Activity (Table 3.7)	Land/livelihoods	Community	Cultural heritage	Traffic/safety	Landscape
PC4 Mobilisation and haul-route preparation	–	✓	–	✓	–
C1 Vegetation clearance and topsoil stripping	✓	–	✓	–	✓
C2 Demolition and utility relocation	✓	✓	✓	✓	✓
C3 Earthworks	✓	✓	✓	✓	✓
C4 Quarrying, blasting and crushing	✓	✓	–	✓	✓
C5 Borrow-pit excavation	✓	–	–	✓	✓
C6 Materials haulage	–	✓	–	✓	–
C7 Plant operation (Suaken)	–	✓	–	–	✓
C8 Culvert and drainage works	✓	✓	✓	✓	–
C9 Bridge rehabilitation and widening	–	✓	–	✓	✓
C10 Pavement construction and paving	✓	✓	–	✓	–
C11 Water abstraction	–	✓	✓	–	–
C12 Camp operation and workforce presence	✓	✓	✓	✓	✓
C13 Waste and wastewater management	–	✓	–	–	–

Activity (Table 3.7)	Land/livelihoods	Community	Cultural heritage	Traffic/safety	Landscape
C14 Traffic management and diversions	✓	✓	–	✓	–
C15 Reinstatement and demobilisation	✓	✓	–	✓	✓
O1 Road operation	✓	✓	–	✓	–
O2 Routine and periodic maintenance	–	✓	–	✓	–
O3 Induced access and development	✓	✓	✓	✓	✓

The screening confirms that every receptor group interacts with multiple activities in at least two phases. The most interaction-dense activities are earthworks (C3), the ancillary-facility cluster (PC3, C4, C5, C7) and camp operation/workforce presence (C12); the most exposed receptor groups are water resources, biodiversity and community wellbeing. All ticked interactions are assessed in Sections 9.3 to 8.6.

9.3 Beneficial Impacts

The Project's beneficial impacts are assessed — not merely listed — using the same methodology, with significance for beneficial impacts a function of the scale and duration of the benefit and the sensitivity (need) of the receiving population. The receiving context documented in Chapters 6–8 (Sections 8.1–6.16) makes that need unambiguous: county absolute poverty of 63.7 per cent (HIES 2016), a road impassable for much of May–November, motorcycle-dominated transport with high fares, head-loading of produce by women, and roadside births reported because referral journeys fail (Earthtime, 2024; RE-GROUP, 2026).

IMP-B01 Connectivity and market access. Rehabilitation converts an unreliable laterite corridor into an all-season paved link between Zwedru (county capital; about 25,300 at the 2008 census and now substantially larger), the fifteen principal project-affected communities (PACs) and the Côte d'Ivoire border at B'hai Jorzon, completing the 225 km Ganta–Tappita–Zwedru corridor with the 40 km Tappita–Toe Town lot. The impact is direct and induced, regional-to-national in extent, long-term, and accrues to a population with very high sensitivity to access failure. Significance: **Major (beneficial)**.

IMP-B02 Travel time and transport cost. The paved surface, 80/60 km/h design speeds and year-round passability will reduce vehicle operating costs, journey times and fares from the current constrained baseline (2017 AADT of only 310 border–Toe Town and 922 Toe Town–Zwedru reflects suppressed demand). Communities in all fourteen 2026 consultations anticipated lower fares and cheaper goods (Chapter 7). Long-term, corridor-wide, high-need receptors. Significance: **Major (beneficial)**.

IMP-B03 Employment and local procurement. Construction is planned to engage approximately 100 international and 680 national workers (2024 ESIA planning estimate, pending confirmation in the CESMP), with contractual local-hire preference and a women's employment target of at least 30 per cent, plus local procurement of goods and services and skills transfer. The benefit is direct but temporary (about 3-year works period) and concentrated on communities within the corridor; local employment was raised in all fourteen 2026 community meetings and was the most frequently raised expectation (Section 1.8 and Appendices M–N). Significance: **Moderate (beneficial)**.

IMP-B04 Cocoa value chain. Cocoa is the universal cash crop of the corridor — 383 field-recorded plots, 68.9 per cent of farming records (BFS, 2026) — and evacuation cost and spoilage on the present road depress farm-gate prices. Reliable access will raise farm-gate shares, reduce input costs and support processing and storage investment (a cocoa storage facility already operates on the corridor). The benefit is long-term and corridor-wide; its induced land-use corollary (accelerated conversion) is assessed as an adverse impact at IMP-39. Significance: **Major (beneficial)**.

IMP-B05 Access to services, including obstetric referral. The corridor hosts clinics (for example Zai Town), a public school at Zleh City, markets at Toe Town, Zleh and Zwedru, and — at Zwedru — Martha Tubman Memorial Hospital, a Midwifery Training School and a referral hospital nearing completion (Chapters 6–8, Section 8.3). Women's FGDs in six PACs identified difficult and costly emergency obstetric travel as a defining hardship (RE-GROUP, 2026). All-season access is expected to shorten referral journeys for a catchment in which roadside births and preventable deaths were recorded in the 2023 baseline. Significance: **Major (beneficial)**.

IMP-B06 Border trade. B'hai Jorzon functions within a border economy; the road is already the export route for timber and farm produce to Côte d'Ivoire. Predictable border movement will expand cross-border commerce and formalise trade flows, with customs/immigration facilities at the border (the Immigration Service office adjoins the RoW). The benefit is long-term but its direct beneficiaries are more localised. Significance: **Moderate (beneficial)**.

IMP-B07 Dust reduction after paving. The current unpaved surface generates the dominant dust nuisance experienced by the linear roadside settlements (Chapters 6–8, Section 6.5; the 2026 baseline

PM is low partly because traffic is suppressed and partly because sampling took place in the wet season, 3–13 August 2026 — dust rises with every passing vehicle in the dry season). Sealing the carriageway removes most traffic-generated road dust from the roadside settlements. Long-term, corridor-wide. Significance: **Moderate (beneficial)**.

IMP-B08 Road safety improvement after works. The completed road replaces a rutted, unlit, undrained alignment shared by pedestrians, motorcycles and trucks with an engineered surface, 1.5 m shoulders, 1.5 m urban walkways, covered urban drains, signage, markings and guardrails (ICCO/CET, 2025). Relative to the baseline of frequent loss-of-control incidents on the degraded surface, the engineered environment is a benefit — conditional on the speed-management measures in Chapter 10 (CS-04) that respond to IMP-38, because higher speeds redistribute hazard even as surface-related hazard falls. Significance: **Moderate (beneficial)**.

Table 9.3: Beneficial impacts — summary of assessment

Code	Beneficial impact	Principal beneficiaries	Phase	Duration/extent	Significance
IMP-B01	Connectivity and market access	Corridor PACs; county; national	Operation	Long-term; regional–national	Major (beneficial)
IMP-B02	Travel time and transport cost reduction	All road users; traders; patients	Operation	Long-term; corridor-wide	Major (beneficial)
IMP-B03	Employment and local procurement	Local workforce incl. at least 30% women target	Construction	Temporary (about 3 yr); corridor	Moderate (beneficial)
IMP-B04	Cocoa value-chain strengthening	Farming households in all PACs	Operation	Long-term; corridor-wide	Major (beneficial)
IMP-B05	Access to services incl. obstetric referral	Women; patients; students	Operation	Long-term; corridor-wide	Major (beneficial)
IMP-B06	Border trade expansion	Border communities; traders	Operation	Long-term; localised–national	Moderate (beneficial)
IMP-B07	Dust reduction after paving	about 24 roadside settlements	Operation	Long-term; corridor-wide	Moderate (beneficial)
IMP-B08	Road safety improvement after works	Pedestrians, motorcyclists, drivers	Operation	Long-term; corridor-wide	Moderate (beneficial)

Chapter 10 (Section 10.11, Table 10.10) identifies enhancement measures to secure and enlarge these benefits (local-content provisions, gender-responsive recruitment, market and vendor infrastructure, referral-route coordination).

9.4 Construction-Phase Adverse Impacts

This section assesses the adverse impacts of pre-construction/mobilisation and construction activities, grouped by receptor. Each impact is presented in a standardised one-row format stating code, impact, receptor and location (with chainage where known), phase, magnitude, sensitivity and pre-mitigation significance. The magnitude rating synthesises the extent, duration, frequency, reversibility and probability characterised for each impact under the Section 1.6 method; the characterisation worksheets are held in the RE-GROUP assessment file and summarised, group by group, in the narrative that precedes each table. Works began at the Zwedru end after the Contractor's kick-off meeting at the Zwedru project site on 2 August 2026 and progress north-westward over an approximately three-year construction period; each linear works front therefore affects any given settlement for a limited period, whereas the ancillary sites (Suaken complex, Zuoyou camp, quarries, borrow pits) generate sustained local effects for most of the construction period.

9.4.1 Air Quality

The 2026 baseline (Chapters 6–8, Section 6.5) records very low ambient particulate concentrations at the eighteen stations with reported results (PM2.5 5.78–7.34 µg/m³; PM10 5.55–7.63 µg/m³; results for AQ-07 and AQ-12 are outstanding, and the particulate values are under laboratory query), well within WHO reference values — a clean-air baseline with ample headroom to guideline values, against which construction dust will be conspicuous to residents. Earthworks over about 83.75 km of centreline, topsoil stripping, borrow-pit and quarry working, crushing, and haulage on unpaved surfaces (including the Suaken access, about 6.5 km off-corridor, and borrow-pit links at roughly 10 km spacing) will generate fugitive dust; the December–March dry season, when the desiccating Harmattan wind coincides with peak earthworks trafficability, is the critical period, extending deposition distances and coating vegetation, foodstuffs, laundry and water containers in the linear settlements whose dwellings face the carriageway. Dust deposition on cocoa and food crops within about 50 m of works is a recognised crop-damage pathway (Earthtime, 2024). The Suaken complex concentrates combustion and process emissions (asphalt plant, crusher, batching plant, generators) approximately 700 m from Suaken Town, with the quarry about 431 m from the town; asphalt paving additionally releases bitumen fumes transiently at the works front, including through about 9 km of town sections. Dust was raised as a priority concern in all fourteen 2026 community consultations, with Tian Town requesting daily water trucks (Section 1.8 and Appendices M–N).

Table 9.4: Construction-phase impacts — air quality

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-01	Fugitive dust from clearance, earthworks, haulage and diversions, intensified in the Harmattan season	Roadside dwellings, schools, clinics, markets and crops in about 24 settlements corridor-wide; haul routes incl. Suaken link	Construction	High	High	Major
IMP-02	Plant and combustion emissions at the Suaken crusher–asphalt–batching complex and quarries	Suaken Town (about 431 m quarry; about 700 m plant); Ziah Town quarry outskirts	Construction	Medium	Medium	Moderate
IMP-03	Asphalt fumes and paving emissions at the works front	Communities along town sections (about 9 km incl. Toe Town, Zwedru); paving crews (OHS interface, Chapter 10/LMP)	Construction	Low	Medium	Minor

9.4.2 Noise and Vibration

Baseline daytime noise is 46.3–55.0 dB(A) across the twenty 2026 stations (Chapters 6–8, Section 6.6); away from the road, rural ambient levels of 35–45 dB(A) are typical of forest-farm landscapes (WBG EHS Guidelines reference conditions); B'hai Town/Border (55.0 dB(A)) already sits at the WBG EHS daytime residential guideline. Construction sources of 70–100 dB(A) at source will therefore exceed ambient by well over 10 dB within at least 100–300 m of the works front, affecting each settlement sequentially, and continuously near fixed installations. Sensitive receptors identified in Chapters 6–8 include the Zleh City public school, the Zai Town clinic, Martha Tubman Memorial Hospital, the Midwifery Training School and new referral hospital at Zwedru — where works begin — and market concentrations at Toe Town, Zleh and Zwedru. The Zuoyou Town camp (about 4 acres) and adjacent mechanical yard introduce generator and workshop noise, including at night, into a town setting. Production blasting at the Suaken quarry and mechanical rock-breaking, together with vibratory compaction, generate ground vibration; Suaken residents specifically raised the fragility of older mud-brick dwellings under blasting vibration during the August 2026 consultations, and the quarry MOU remains outstanding (Section 1.8 and Appendices M–N). Vibration effects on graves near the works are assessed with cultural heritage (IMP-33); flyrock and accidental structural damage are unplanned events assessed in Section 10.8.

Table 9.5: Construction-phase impacts — noise and vibration

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-04	Construction noise at community receptors along the works front	Schools, clinics, hospitals (Zwedru cluster), markets and dwellings corridor-wide; rural ambient 35–45 dB(A)	Construction	Medium	High	Major
IMP-05	Continuous fixed-plant noise (crusher, asphalt and batching plants; quarry working)	Suaken Town (about 431–700 m); Ziah Town quarry environs	Construction	Medium	Medium	Moderate
IMP-06	Camp and mechanical-yard noise, including night-time generator operation	Zuoyou Town residents adjoining the camp (about 4 acres) and the mechanical site	Construction	Medium	Medium	Moderate
IMP-07	Ground vibration from production blasting, rock-breaking and compaction	Older mud-brick dwellings at Suaken and settlements near heavy compaction fronts	Construction	Medium	Medium	Moderate

9.4.3 Water Resources

The 2026 inventory records nine named creeks (five perennial, four intermittent, 7–16 m wide — including Donneh Creek and the Kougae Creek, a sacred watercourse at Nicko Town) and thirty-one inland wetlands (IW-001–IW-031, 0.3–0.8 ha each) within the 150 ft RoW, with the highest wetland density between approximately km 24 and km 44 (Chapters 6–8, Section 6.3). More than 30 creeks and streams cross the alignment (Chapters 6–8, Section 6.3), served in the design by 82 new culverts (42 box and 40 pipe) and five bridges; the corridor drains to the Cavalla Basin over most of its length and to the Cestos headwaters west of approximately km 55. Earthworks in erodible lateritic soils under 2,500–3,000 mm/yr rainfall, construction of 42 box and 40 pipe culverts largely in or immediately beside channels, works at five bridges (corridor about km 42.5, 48.4, 57.3, 67.4 and 81.6), and borrow pits within drainage lines will predictably mobilise sediment to these receiving waters; the BFS identifies a km 30–45 erosion belt where steeper gradients coincide with crossings (BFS, 2026). The 2026 baseline shows generally compliant surface water (turbidity 0.57–0.66 NTU; TSS 7.9–8.3 mg/l) — sensitive, low-turbidity systems used for domestic supply, fishing and cultural practice, with limited assimilative headroom (the flagged SW-03 chromium result is a laboratory-verification matter recorded in Chapters 6–8, not a Project effect). Groundwater at the five community sources sampled (GW-01–GW-05) is compliant but TSS already stands at 69–80 per cent of the LQWS Class I limit and GW-05 (B'hai Jorzon) pH sits at the lower bound; wellheads and handpumps within or beside the RoW — several enumerated as affected public structures in the RAP — are therefore highly exposed to construction sediment ingress and turbidity spikes. Water demand for compaction, concrete, dust control and the camp will be met from creeks and boreholes (ICCO/CET, 2025); dry-season abstraction from intermittent creeks can measurably deplete flows relied upon by communities and aquatic habitat. Concrete washout (high pH), aggregate wash-water and wheel-wash effluent are planned process streams requiring engineered containment; accidental fuel and chemical spills are assessed in Chapter 10.

Table 9.6: Construction-phase impacts — water resources

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-08	Sediment loading of watercourses and wetlands from earthworks, crossings and borrow areas	9 creeks and 31 RoW wetlands corridor-wide; erosion belt km 30–45; Towah swamp km 12–14; Cavalla/Cestos tributaries	Construction	High	High	Major
IMP-09	Surface- and groundwater abstraction for construction and camp supply	Intermittent creeks (4 of 9) in dry season; community sources near works and camp	Construction	Medium	Medium	Moderate
IMP-10	Process, wash-water and camp wastewater discharges (concrete washout, aggregate washing, wheel-wash, camp sewage and grey water)	Drainage lines at Suaken complex, camp, structures works fronts	Construction	Medium	Medium	Moderate
IMP-11	Sediment ingress and turbidity at community wells and handpumps near works	GW sources corridor-wide (2026 TSS already 69–80% of Class I limit; GW-05 pH 6.53)	Construction	Medium	High	Major

9.4.4 Soils and Geology

Corridor soils are lateritic, moderately acidic (2026 pH 5.65–6.65) and of low fertility, over deeply weathered Precambrian basement (Chapters 6–8, Section 6.2); the 2026 soil survey at all twelve ancillary-site stations found no contamination signal (lead below detection). The impact pathway is physical, not chemical: cuts and fills exposed through wet seasons of 2,500–3,000 mm will erode rapidly (fill slopes 1V:1.5H, soil cuts 1V:1H; ICCO/CET, 2025), with gully initiation, loss of formation material and downstream sedimentation (link to IMP-08). Sixteen borrow pits (BP1–BP17, no BP10; Table 3.4) and two quarries will remove laterite and rock over multi-hectare footprints, permanently altering landform and, without reinstatement, leaving pits that pond, breed vectors and sterilise farmland — the 2024 ESIA rated this among its residual impacts that cannot be fully mitigated (Earthtime, 2024). Topsoil is a scarce agronomic resource on ferralsols; stripping without segregation and reuse, and compaction of working widths and diversions, reduce post-works recovery of farmland and RoW re-vegetation capacity (progressive restoration of the works footprint under BMP action A8 — at least 70 per cent cover at the end of the first rainy season after planting and at least 60 per cent survival of planted stems — depends on conserved topsoil). Earthworks will also generate surplus spoil and unsuitable material (notably from soft-ground replacement and drainage desilting), and the camp and works will produce solid-waste and sewage streams (2024 planning basis about 280 kg/day municipal waste and about 30 m³/day wastewater; Earthtime, 2024); uncontrolled tipping of spoil or waste onto farmland, wetlands or drainage lines is a predictable land-degradation pathway, assessed within IMP-10 and IMP-14 and controlled through the approved-disposal-site, spoil-reuse and waste-management regime of Chapter 10 and the CESMP. Slope failure and landslide events are addressed in Section 10.8.

Table 9.7: Construction-phase impacts — soils and geology

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-12	Erosion of cuts, fills and exposed surfaces under intense rainfall	Corridor-wide earthworks; steeper reaches and km 30–45 erosion belt; downstream drainage lines	Construction	High	Medium	Major
IMP-13	Land degradation and landform change at borrow pits and quarries	16 borrow pits (BP1–BP17, no BP10) at about 10 km spacing; Suaken and Ziah Town quarries	Construction	High	Medium	Major
IMP-14	Topsoil loss, compaction and sterilisation of laterite resources; disposal of surplus spoil and construction waste	RoW working width, diversions and ancillary footprints corridor-wide; approved disposal sites	Construction	Medium	Medium	Moderate

9.4.5 Biodiversity

The BFS (2026) outlines the biodiversity context of the corridor. It identifies that the ESS6 Critical Habitat has been triggered under Criterion 1, with the White-bellied Pangolin (Endangered) as the primary trigger. Verified camera events have been recorded at kilometers 38 to 50 within two Critical Habitat polygons: CH-West (8.7 km², from km 38 to 44) and CH-East (10.8 km², from km 46 to 50). Additionally, a precautionary Chimpanzee Sensitivity Zone (CSZ) of 3.14 km² exists between kilometers 18 and 20, which includes a no-go core area with a 500-meter radius (0.78 km²). This core is based on a single verified camera sighting of the Western Chimpanzee (Critically Endangered) at station T59 on February 3, 2026, near Sennehwein Town (Senewehn in the BFS), approximately 1.6 km away from the alignment and 560 m outside the Area of Influence (AoI). However, this sighting does not provide evidence of a resident population.

The assessment highlights six Priority Biodiversity Features, including the Barteh Jam sacred grove (located between km 3 and 4, containing Tieghemella heckelii, Endangered), the Towah swamp (between km 12 and 14), and a flora hotspot located between km 18 and 28. A total of 657 tree stems have been recorded across the AoI and the surveyed buffer, with 261 within the AoI (as noted in Chapters 6–8, Section 7.3). Furthermore, twenty high-value FDA Class A stems have been flagged for pre-construction marking. The snare density stands at about 0.31 snares per kilometer throughout the corridor and 0.41 snares per kilometer within the AoI (refer to Chapters 6–8, Sections 7.2–6.10).

Currently, approximately 64% of the habitat records within the AoI are non-forest (with 39.4% categorized as farm-bush and 14.7% as plantation). The proposed works will interact with the remaining natural values in eight predictable ways. Right-of-way (RoW) clearance will remove vegetation—including wetland fringes and threatened species—along the entire alignment, in an environment already losing forest at a rate of 3.2% per year within the AoI, compared to 0.8% annually in the surveyed buffer.

Borrow pit BP3 (UTM Zone 29N 586518/678582, located between Zaiyee Town and Zwedru) is situated in secondary forest, which is designated as a natural habitat requiring pre-clearance screening. Similarly, BP2 overlaps with wetland IW-007, necessitating further evaluation. Ancillary development in these areas converts natural habitat beyond the RoW.

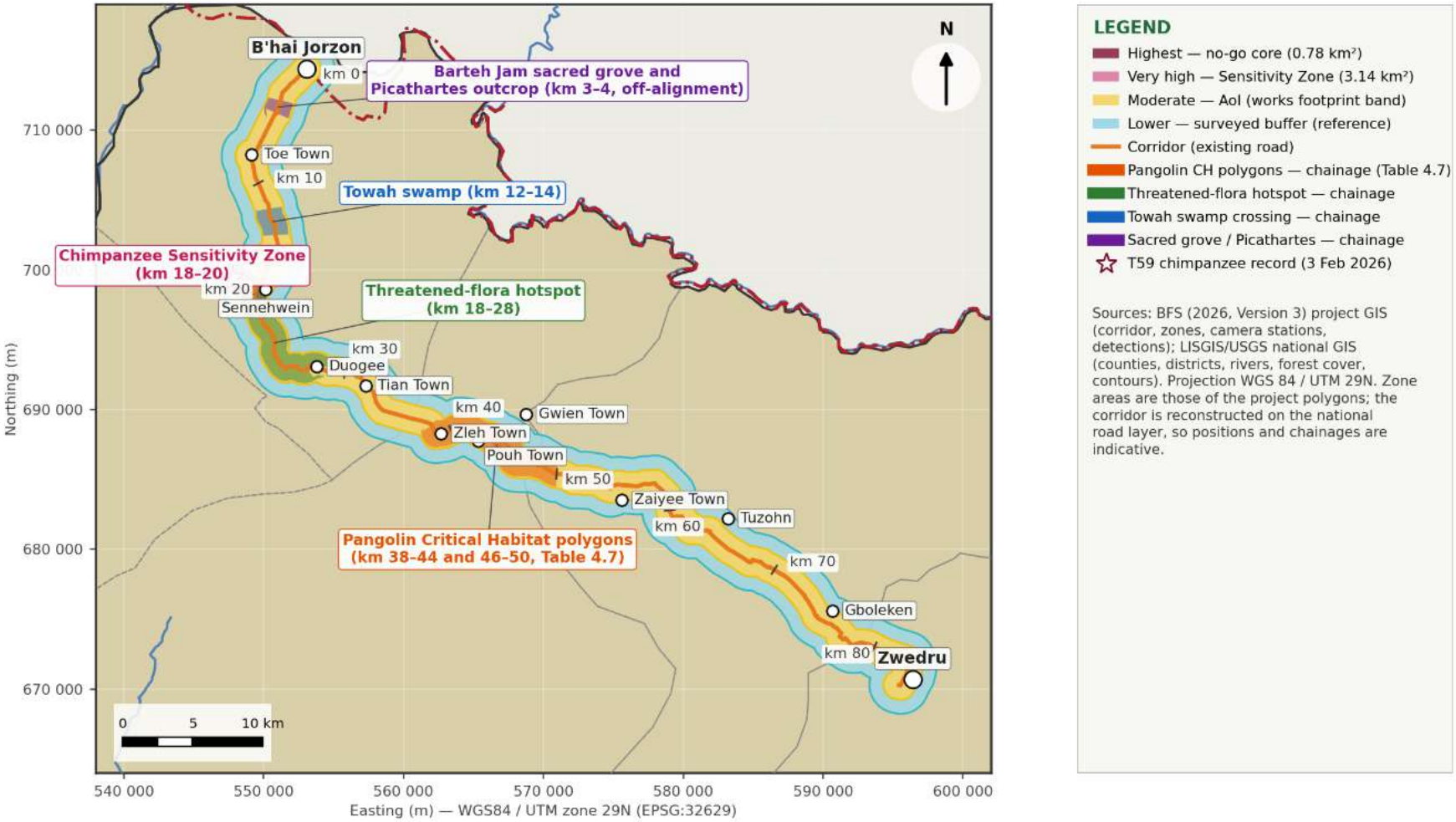
Works adjacent to the CSZ and the pangolin polygons will create edge effects—such as canopy openings, desiccation, and increased human presence—impacting the habitats designated under Criterion 1. Construction noise and light from night work, security measures, and equipment will disturb nocturnal pangolins and the dawn and dusk activity periods of chimpanzees. Additionally, open excavations, trenches, and equipment movements will hinder the daily movements of terrestrial fauna at key hotspots (specifically the Towah swamp between km 12 and 14, the CSZ between km 18 and 20, and the pangolin polygons between km 38 and 50).

The workforce, estimated to be around 780 individuals in a corridor where 92% of households consume bushmeat, will create a predictable demand for bushmeat and facilitate hunting (classified as BFS construction threat C7). Equipment movement may also introduce and spread invasive species, particularly Chromolaena odorata (threat C10). Furthermore, the construction of culverts, temporary diversions, and soft-ground excavation in swampy areas could encroach on the thirty-one RoW wetlands and the Towah swamp crossing if not properly managed.

These construction-phase impacts affect receptors of the highest sensitivity class (such as Critically Endangered and Endangered species and their designated habitats), which results in Major pre-mitigation ratings and informs the actions outlined in Chapter 10 of the Biodiversity Management Plan (BMP, rev.3). The actions include:

1. Demarcating the no-go core before clearance in S3 (A1).
2. Limiting working hours to 08:00–16:00 with no night work or blasting in the CSZ and the pangolin polygons (A2).
3. Instituting an ancillary-site siting freeze (A3).

4. Conducting pre-clearance walkover, right-of-way pegging, and following the FDA Class A protocol (A4).
5. Implementing a workforce Code of Conduct (A5).
6. Enforcing a speed limit of 20 km/h and the use of node warning signs (A9).
7. Supporting actions for crossing, footprint restoration, and community notifications related to the Towah swamp (A6, A7, A8, A10).



Any breaches will be addressed according to the works-contract penalty schedule and the CESMP Biodiversity Compliance Plan. Figure 8.2 illustrates the composite biodiversity sensitivity zonation, which serves as the foundation for these ratings and the controls specified in Chapter 10. This figure overlays the Critical Habitat polygons, the CSZ, the Priority Biodiversity Features, and the habitat condition along the corridor (BFS, 2026, Map 7).

Figure 8.2: Composite biodiversity sensitivity zonation — no-go core, Chimpanzee Sensitivity Zone, AoI works-footprint band and surveyed buffer, with the pangolin polygons, flora hotspot, Towah swamp and sacred-grove nodes by chainage (BFS, 2026, Map 7; national GIS base).

Table 9.8: Construction-phase impacts — biodiversity

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-15	Habitat loss and degradation from RoW clearance, incl. threatened flora (20 FDA Class A stems; km 18–28 hotspot)	Vegetation within the 150 ft rural / 100 ft urban RoW along about 83.75 km; disturbed footprint subject to progressive restoration (BMP A8)	Construction	Medium	High	Major
IMP-16	Natural-habitat loss at ancillary sites, notably BP3 secondary forest and BP2/IW-007 wetland overlap	BP3 (Zaiyee–Zwedru reach); BP2; other unscreened pits pending clearance	Construction	Medium	High	Major
IMP-17	Edge effects and disturbance into the CSZ (km 18–20) and pangolin CH (km 38–50)	White-bellied Pangolin (EN) CH-West and CH-East (km 38–50); precautionary Western Chimpanzee (CR) CSZ near Sennehwein Town (km 18–20)	Construction	Medium	High	Major
IMP-18	Severance of fauna movement and construction-phase mortality at crossing reaches	Documented movement hotspots: Towah swamp km 12–14; CSZ km 18–20; pangolin polygons km 38–50	Construction	Low	High	Moderate
IMP-19	Noise and light disturbance to fauna, incl. nocturnal EN species and	CSZ km 18–20; pangolin CH km 38–50; Towah swamp km 12–14	Construction	Medium	High	Major

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
	chimpanzee activity windows					
IMP-20	Workforce-driven bushmeat demand and hunting facilitation (snare density 0.31/km corridor-wide; 0.41/km in the AoI)	Huntable mammals and CH species corridor-wide; camp environs (Zuoyou); hunting hotspots km 35–50, 60–75	Construction	High	High	Major
IMP-21	Introduction and spread of invasive species on disturbed ground	Disturbed footprints corridor-wide; restoration sites	Construction	Medium	Medium	Moderate
IMP-22	Wetland encroachment and hydrological disruption from crossings, diversions and soft-ground works	31 RoW wetlands (peak density about km 24–44); Towah swamp km 12–14	Construction	Medium	High	Major

9.4.6 Land and Livelihoods

Physical and economic displacement within the RoW is quantified by the RAP census (cut-off 15 December 2024): **860 project-affected persons holding 1,084 affected assets across 24 settlements — 854 private structures (93 per cent fully affected), 16 public structures, 84 non-structure businesses, 98 tenants, 6 farms with 2,185 economic trees, and 15 graves — including 116 vulnerable PAPs**; seven settlements (Zwedru City, Zleh City, Ziah Town, Toe Town, Sennehwein Town, Duogee Town and B'hai Jorzon) hold 81 per cent of affected properties (RAP, 2025). Because the road works are confined to the government RoW, no private land is acquired for them; the losses are nonetheless severe for those affected — permanent for structures, and concentrated among households already below the poverty line. The significance of this displacement is assessed here; its management — full replacement cost compensation, allowances and the US$3,658,686.97 RAP budget, under the condition precedent that no civil works commence in an affected section until all compensation for that section has been paid in full and the payment-completion report has been cleared by the World Bank (RAP Final V2, 23 July 2025; Section 11.9, Table 11.5) — is set out in the RAP and summarised in Chapter 10. Beyond the census, construction predictably disrupts roadside livelihoods temporarily: itinerant and market-day vendors (enumerated in only four settlements by the RAP), shop frontages, loading areas and customer access at works fronts, disproportionately affecting women traders (Chapter 5 records vendor-displacement and market-access concerns at Toe Town, Pouh Town, Duogee Town, Sennehwein Town and Zleh City). Farm access tracks, produce evacuation and drainage-dependent plots (notably the Zleh City swamp rice fields) can be interrupted or altered by works and culvert reconstruction; dust deposition damages crops within about 50 m (link IMP-01). Ancillary facilities occupy land outside the RAP's scope — the Suaken quarry MOU remains outstanding and no land agreements are yet documented for the camp, mechanical, batching or borrow-pit sites — such that Contractor-procured sites require documented voluntary agreements or a Bank-cleared RAP addendum before occupation (Section 11.9, Table 11.5, condition 5) (RAP, 2025; Chapter 3).

Table 9.9: Construction-phase impacts — land and livelihoods

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-23	Physical and economic displacement within the RoW (860 PAPs; 1,084 assets incl. 854 structures, 84 businesses, 98 tenants, 2,185 trees)	24 settlements; 81% of properties in 7 settlements led by Zwedru City, Zleh City, Ziah Town	Pre-construction/Construction	High	High	Major
IMP-24	Temporary disruption of roadside vending and informal businesses at works fronts	Market towns (Toe Town, Zleh, Zwedru, Zai) and roadside traders corridor-wide, esp. women vendors	Construction	Low	High	Moderate
IMP-25	Disruption of farm access, produce evacuation and drainage-dependent plots; dust damage to crops	Farms and access paths corridor-wide; Zleh City swamp rice; crops within about 50 m of works	Construction	Medium	Medium	Moderate
IMP-26	Land occupation for ancillary facilities and diversions outside the RAP scope	Suaken quarry (MOU outstanding), Zuoyou camp, mechanical site, plant complex, 16 borrow pits	Construction	Medium	Medium	Moderate

9.4.7 Community

The predictable community impacts of the planned works derive principally from labour influx and from the works' physical presence in linear settlements whose social and economic life faces the road. A workforce of roughly 780 (estimate pending the CESMP), plus opportunistic followers, will interact with PACs whose larger settlements exceed 2,000 residents: demand pressure on rented rooms, food, water and services will raise prices locally (rent and commodity inflation was explicitly anticipated in the Toe Town women's FGD), and camp-adjacent communities (Zuoyou/Zai area) experience the concentration most directly. Influx interacts with an established migration context — Mossi (cocoa) and Fulani (trade, cattle) communities in all larger PACs and strong customary institutions, including Goyeazon Town, where customary conduct rules are strictly observed (Chapters 6–8, Section 8.6) — so that unmanaged worker behaviour, perceived hiring unfairness or disregard of town rules can predictably strain social cohesion (Chapter 6, Sections 8.1 and 6.16; Section 1.8 and Appendices M–N). Disease transmission dynamics are assessed as a predictable influx impact in line with this ESIA's method: increased STI/HIV transmission associated with workforce–community interaction (raised in at least five 2026 consultations), and waterborne and vector-related illness where camp sanitation, wastewater and standing water in borrow pits are inadequately managed, in a baseline of high malaria burden, 45 per cent of households without sanitation facilities, and creek-dependent water use. Works through settlements temporarily sever the roadway that doubles as the community's public space: household entrances, footpaths to farms, schools and water points, market frontages and referral journeys are all predictably interrupted by trenching, stockpiles and diversions — the single most consistent ask across the women's FGDs was maintained daily access, including end-of-day reinstatement of crossings (RE-GROUP, 2026). Finally, planned relocation of utilities — the ageing light poles and lines through Zwedru City, CLSG-connected distribution in major PACs — and works around community water points (NGO-installed pumps at Solo Town; the Tian Town borehole; wells enumerated as public structures in the RAP) predictably interrupt services and require coordinated relocation, notice and reinstatement. SEA/SH incidents, gender-based violence, trafficking, security incidents and communicable-disease outbreaks are unplanned events assessed in Section 10.8 and managed through the SEA/SH Action Plan, LMP and adopted GRM; they are intentionally not restated here as impacts.

Table 9.10: Construction-phase impacts — community

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-27	Labour-influx pressure on services, housing and local prices	PACs corridor-wide; camp-adjacent Zuoyou/Zai area; market towns	Construction	Medium	Medium	Moderate
IMP-28	Pressure on social cohesion and migrant–host dynamics from influx and hiring competition	All larger PACs (Krahn host communities; Mossi and Fulani migrants); Goyeazon (strict customary rules)	Construction	Medium	Medium	Moderate
IMP-29	Communicable-disease transmission dynamics associated with influx (STI/HIV; waterborne/vector where sanitation and drainage are poor)	Workforce–community interface corridor-wide; camp environs; borrow-pit ponding sites	Construction	Medium	High	Major
IMP-30	Community severance and temporary loss of access to homes, farms, schools, clinics, markets and water points during works	Linear settlements corridor-wide; school and obstetric-referral routes	Construction	Medium	High	Major
IMP-31	Interference with community water points and planned utility relocation outages	Zwedru City light poles/lines; CLSG-served PACs; pumps and wells at Solo Town, Tian Town and corridor-wide	Construction	Medium	Medium	Moderate

9.4.8 Cultural Heritage

The 2026 cultural heritage register (Chapters 6–8, Section 8.6, Table 8.2) records six sacred sites (SS-001–SS-006) — including the Ziah Town Sacred Forest (about 300 m off-RoW), the B'hai Jorzon Sacred Cotton Tree and Sacred Creek, the Kougae Sacred Creek at Nicko Town, the Goyeazon Sacred Forest and the Toe Town Sacred Stream — with five of the six sacred features adjoining or crossed by the RoW, plus the Central Poro Bush of Gbarzon at Goyeazon, the district's most significant traditional institution. The BFS separately registers four sacred groves as Priority Biodiversity Features, including Barteh Jam (km 3–4). Planned works interact with these receptors through proximity: earthworks and drainage alteration near sacred creeks (contamination and flow change violate use taboos), root-zone disturbance and vibration at sacred trees, visual and access intrusion at sites forbidden to strangers, and workforce presence in a town (Goyeazon) with strict conduct rules. Twelve grave sites are recorded along the corridor, and the RAP enumerates fifteen individual graves for compensated, ceremonially managed relocation while ten RoW cemeteries are avoided by design; unmarked graves without headstones were reported in five communities (Zaiyee Town, Zleh City, Duogee Town, Tian Town and Solo Town) during the 2026 consultations, and compaction or blasting vibration near graves is a further predictable proximity effect. These receptors are of the highest sensitivity — non-replaceable, spiritually significant and in several cases deliberately undocumented — so pre-mitigation significance is Major even though no sacred site is to be removed; the relocation of fifteen graves under the RAP (IMP-33) is the only planned direct take; Chapter 10 carries the avoidance-first regime (exclusion zones, custodial consultation, confidential registers) and the discovery of previously unknown remains is handled as a chance-find risk in Section 10.8.

Table 9.11: Construction-phase impacts — cultural heritage

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-32	Proximity disturbance to sacred sites: creeks, trees, groves and the Central Poro Bush	SS-001–SS-006 (five adjoining or crossed by the RoW); Goyeazon Poro Bush; Barteh Jam grove km 3–4; B'hai and Nicko sacred creeks	Construction	Medium	High	Major
IMP-33	Disturbance and relocation of graves, incl. vibration near graves and works near unmarked burials	15 RAP-registered graves (relocation); 10 avoided RoW cemeteries; unmarked graves in Zaiyee, Zleh, Duogee, Tian, Solo Town	Construction	Medium	High	Major

9.4.9 Landscape and Visual

The corridor traverses a settled, working agricultural landscape of farm-bush, cocoa and secondary regrowth in which the road is an established feature; landscape sensitivity is moderate, deriving mainly from the daily views of residents of the 24 roadside settlements rather than from scenic designation. Construction introduces works fronts, stockpiles, plant, night lighting at the camp and Suaken complex, and — most durably — quarry faces and sixteen borrow-pit excavations whose landform change is permanent in the absence of reinstatement (link IMP-13). The effect is adverse but localised and, for the linear works, transient at any one location.

Table 9.12: Construction-phase impacts — landscape and visual

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-34	Landscape and visual change from works, plant sites, night lighting, quarry faces and borrow pits	Residents of 24 settlements; Suaken and Ziah quarry environs; 16 borrow-pit sites	Construction	Medium	Medium	Moderate

9.4.10 Traffic and Access During Construction

Construction on a single-carriageway alignment that is the only through-route requires lane closures, temporary diversions (kept within the RoW except at culvert and bridge reconstructions), convoy working and haulage movements between quarries, borrow pits (sixteen along the corridor), the Suaken complex and the works fronts. Predictable consequences are journey delays and unreliability for passenger and goods transport (with knock-on cost effects on fares and produce evacuation), degraded passability of diversions in the wet season, and a substantially changed street environment in the settlements — heavy vehicles, reversing plant, dust and obstructed walking routes — for a population that moves overwhelmingly on foot and by motorcycle, with children walking to school along the carriageway. Speed control at settlements was requested in twelve of the fourteen 2026 consultations, and the design's embedded traffic-management commitments (signed detours, flaggers, temporary speed limits, maintained emergency access, temporary pedestrian walkways; ICCO/CET, 2025) are carried into Chapter 9 and the CESMP. The occurrence of traffic accidents involving workers or the public is an unplanned event assessed in Section 10.8; assessed here is the predictable deterioration of traffic conditions and of the safety of non-motorised transport (NMT) during the works period.

Table 9.13: Construction-phase impacts — traffic and access

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-35	Traffic delays, diversions and degraded passability during works	All corridor road users; wet-season diversion reaches; emergency/referral journeys	Construction	Medium	Medium	Moderate
IMP-36	Degraded pedestrian/NMT environment from construction and haulage traffic through settlements	Pedestrians, schoolchildren, motorcyclists and livestock in about 24 settlements; haul routes incl. Suaken link	Construction	Medium	High	Major

9.5 Operation-Phase Impacts

Operation-phase adverse impacts arise from traffic using the completed road at design speeds, from periodic maintenance, and — most significantly on this corridor — from the access the road creates. The beneficial impacts, most of which arise in operation, are assessed in Section 9.3 (IMP-B01–IMP-B08; IMP-B03 is a construction-phase benefit) and are not restated.

Traffic environment in towns (IMP-37, IMP-38). Traffic will grow from the suppressed baseline as costs fall and border trade develops; vehicles will travel at up to 60 km/h through about 9 km of town sections and at 80 km/h between them, against a present-day environment of low speeds enforced by surface failure. Along town frontages this produces a permanent increase in traffic noise and vehicle emissions (noticeable against the elevated market-town baseline recorded in Chapters 6–8, Section 6.6) and — more significantly — a severance effect: the carriageway that today functions as a shared social and market space becomes a fast road bisecting linear settlements in which dwellings, schools, churches, markets and water points face each other across the alignment. Pedestrian crossing exposure rises accordingly, particularly for children, the elderly and market users; the communities' own insistence on speed breakers (twelve of fourteen consultations) demonstrates both the sensitivity and the awareness of this change. The occurrence of crashes is assessed in Section 10.8; the changed exposure environment is the predictable impact assessed here, and its mitigation (gateway treatments, engineered calming, school-zone control, enforcement support) is specified in Chapter 10.

Induced access effects (IMP-39, IMP-40, IMP-41). The corridor's defining induced-impact evidence is quantified in the BFS: forest loss within the AoI has averaged 3.2 per cent a year against 0.8 per cent a year in the surveyed buffer (2001–2024), with cocoa the dominant conversion driver (68.9 per cent of farming records); BMP rev.3 (Section 2.4) treats this long-term forest loss as a baseline condition, not a Project impact. An all-season paved road reduces the cost of market access and of moving labour, inputs and produce, and will predictably accelerate conversion of remaining secondary forest to cocoa within and beyond the AoI, intensifying pressure on the Critical Habitat polygons, the km 18–28 flora hotspot and riparian corridors. In parallel, improved access predictably intensifies commercial hunting and the bushmeat and wildlife trade: better vehicle access links the hunting hotspots (km 60–75; km 35–50, overlapping the pangolin polygons) to markets in Zwedru, Toe Town and Côte d'Ivoire, in a baseline of 92 per cent household bushmeat consumption and an existing cross-border trade in pangolin products and the Endangered Timneh Grey Parrot; improved access likewise intensifies the extraction of timber and non-timber forest products along the corridor, a pathway the 2024 ESIA also identified (Earthtime, 2024, Ch. 9). Finally, in-migration and secondary settlement growth along the corridor — already visible in the Mossi influx at Nicko Town — will concentrate at junctions, market towns and the peri-urban termini (about km 0–5 and 80–85), generating pressure for RoW re-occupation (a question raised repeatedly in consultations) and incremental service demand. These induced impacts are assessed as Project impacts because they are predictable consequences of the planned improvement of access, and their aggregation with third-party actions is assessed in Section 9.6. During construction, the workforce contribution to hunting is controlled through the Code of Conduct, induction and weekly camp check (BMP A5) and through community notice and the grievance mechanism (A10). The BMP (rev.3) is confined to detailed design, mobilisation, construction and the defects-liability period; it records post-paving access-related hunting and conversion as a landscape pressure and does not assign them a residual class that the works contract must close (BMP, Section 1.2; BFS, 2026). Management of these operation-phase induced effects therefore rests with the responsible Government agencies — MPW right-of-way management, FDA and EPA enforcement of the wildlife and forestry laws, and county land-use coordination — supported by the recommendations of Chapter 12.

Wildlife mortality and barrier effect (IMP-42). Operating traffic at design speeds predictably kills wildlife crossing the alignment and deters crossings, partially severing habitat either side — most consequentially at the documented movement hotspots (the Towah swamp at km 12–14, the CSZ at km 18–20 and the pangolin polygons at km 38–50) used by duikers, forest buffalo and the nocturnal, slow-moving White-bellied Pangolin (EN), and precautionarily by chimpanzees at the CSZ. During the works and the defects-liability period the BMP (rev.3) applies a 20 km/h limit and node warning signs in S3, S6 and other documented hotspots (A9) and provides crossings, oversized culverts or canopy connections only where

the BFS documents a movement hotspot, on drawings prepared by the Contractor's design engineer (A6); the earlier default package of five crossings, small-fauna culverts and rope bridges is withdrawn (BMP rev.3, Section 10.3). The death of a pangolin, chimpanzee or other protected species caused by a Project vehicle is a serious incident: the front stops, the Employer is notified within 24 hours and the World Bank and the EPA within 48 hours. The impact is assessed here because it is statistically predictable from planned operation; after the defects-liability period, speed management, maintenance of the signs and structures and any road-kill recording fall to MPW as the road authority (Section 11.9).

Maintenance (IMP-43). Routine and periodic maintenance — drain and culvert clearing, vegetation control, patching, eventual resealing, possible re-opening of borrow areas — generates short, localised recurrences of construction-type effects (dust, noise, sediment, waste, traffic control), at small scale and manageable through the operation-phase ESMP provisions.

Table 9.14: Operation-phase adverse impacts

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
IMP-37	Traffic noise and emissions along town frontages under traffic growth	Dwellings, schools, clinics and markets along about 9 km of town sections	Operation	Medium	Medium	Moderate
IMP-38	Community severance and increased pedestrian exposure at design speeds	Linear settlements corridor-wide, esp. Toe Town, Zleh, Zwedru approaches; schoolchildren and market users	Operation	Medium	High	Major
IMP-39	Induced land-use change and accelerated forest conversion (3.2%/yr AoI trend; cocoa-driven)	Secondary forest and farm-bush in AoI and buffer; CH polygons; km 18–28 flora hotspot; riparian corridors	Operation (induced)	High	High	Major
IMP-40	Induced intensification of hunting and bushmeat/wildlife trade via improved access	Huntable and CH fauna; hunting hotspots km 60–75 and km 35–50; Zwedru/Toe Town/cross-border markets	Operation (induced)	High	High	Major
IMP-41	In-migration and secondary settlement growth; RoW re-occupation pressure	Corridor settlements, junctions and peri-urban termini (about km 0–5, 80–85)	Operation (induced)	Medium	Medium	Moderate
IMP-42	Operational wildlife mortality and barrier effect at crossing reaches	Documented movement hotspots: Towah swamp km 12–14; CSZ km 18–20; pangolin polygons km 38–	Operation	Medium	High	Major

Code	Impact	Receptor/location	Phase	Magnitude	Sensitivity	Significance (pre-mitigation)
		50; White-bellied Pangolin (EN); CSZ fauna				
IMP-43	Periodic maintenance impacts (dust, noise, sediment, waste, traffic control)	Localised works sites corridor-wide	Operation	Low	Medium	Minor

Construction and operational greenhouse-gas emissions are a predictable result of planned activities; their order-of-magnitude estimate is presented in Section 9.8 and their management in Chapter 10 (AQ-03). Climate-change risks to the works and the asset (flood, erosion, heat) are screened in Section 9.8.

9.6 Cumulative and Induced Impacts

The cumulative study area is the 225 km Ganta–Zwedru corridor and its districts: the assessment aggregates this Project with the two adjoining road sections — Ganta–Tappita (approximately 100 km, under construction since 2021 under SECRAMP, P149279) and Tappita–Toe Town (approximately 40 km, delivered under the parent RETRAP project) — together with the agricultural, plantation and settlement dynamics of the Project area (Appendix W).

Cumulative impacts were assessed against three Valued Environmental and Social Components (VECs), selected from the Chapters 6–8 baseline for their sensitivity, stakeholder value and exposure to multiple pressures, by aggregating this Project's impact pathways (before mitigation) with reasonably foreseeable other actions: (i) the 40 km Tappita–Toe Town lot (RETRAP Lot 1, works and operation overlapping this Project; Earthtime, 2025) and the operational SECRAMP Ganta–Tappita road, which together complete the corridor; (ii) growth of cross-border trade with Côte d'Ivoire; (iii) continued cocoa expansion, driven by migrant-linked investment and prices; (iv) artisanal gold mining in the wider catchments (a candidate contributor to the mercury detections in the 2023 baseline); and (v) commercial logging activity in B'hai District, CLSG-linked electrification and associated settlement growth.

VEC 1 — Forest habitat and Critical Habitat species (IMP-44). The White-bellied Pangolin and its Critical Habitat polygons, and — precautionarily — chimpanzees using the CSZ, face the aggregation of this Project's edge, disturbance and access effects (IMP-15–IMP-20, IMP-39, IMP-40, IMP-42) with similar pathways from the 40 km Tappita–Toe Town lot, continuing cocoa conversion, commercial bushmeat networks reaching Ivorian markets, and settlement expansion. Forest loss in the AoI (3.2 per cent a year over 2001–2024, against 0.8 per cent in the surveyed buffer) is a baseline condition driven largely by these other actions (BFS, 2026; BMP rev.3, Section 2.4). During the works, the Project's contribution is controlled by the BMP (rev.3) actions A1–A10, which keep plant, camps and extraction sites out of the CSZ and the pangolin polygons and control working hours, clearance and workforce conduct; the BMP does not extend beyond the defects-liability period and contains no offset or net-gain programme, and a consolidated corridor instrument covering the 40 km lot, if prepared, would not expand the scope of the 85 km plan (BMP rev.3, Section 1.3). Pre-mitigation cumulative significance is Major; the post-construction cumulative pressure rests with the Government agencies identified in Section 10.12.

VEC 2 — Cavalla tributaries and aquatic ecosystems (IMP-45). The nine RoW creeks and their receiving systems (Cavalla Basin east of about km 55; Cestos headwaters west) will accumulate sediment loads from this Project's earthworks and crossings (IMP-08, IMP-12), concurrent works on the 40 km lot within the same wet seasons, borrow-pit and quarry runoff, artisanal mining inputs (sediment and potentially mercury), and land-use-change-driven erosion as forest converts to cocoa. Individually compliant discharges can jointly degrade low-turbidity, domestically used waters; the unresolved 2023 manganese and mercury detections (carried as a verification commitment in Chapters 6–8) counsel precaution about pre-existing catchment stress. Pre-mitigation cumulative significance: **Moderate**, manageable through corridor-wide sequencing of in-channel works, shared turbidity monitoring (ESMP/CESMP criterion: downstream turbidity not more than twice the upstream value at active crossings; uncontrolled sediment beyond the approved footprint is a BMP stop-work trigger) and the pre-construction verification sampling committed in Chapters 6–8.

VEC 3 — Community wellbeing (IMP-46). Corridor communities will experience, in overlapping periods, this Project's workforce (about 780) and that of the 40 km lot, price and housing pressure, changed migration dynamics, accelerated market integration and border-trade growth, and progressive urbanisation of the corridor. The aggregate is double-edged: cumulative benefits (IMP-B01–IMP-B08) are the RETRAP rationale, but the concurrent pressures on services, prices, social cohesion and disease dynamics (IMP-27–IMP-29) will be larger and longer than either project alone would generate, in a county with thin service capacity. Pre-mitigation cumulative significance: **Moderate**, addressed through coordinated influx

management, shared GRM infrastructure (the adopted RETRAP GRM spans the programme), county-level engagement and the monitoring framework in Chapter 10 and the ESMP.

Table 9.15: Cumulative impact assessment by Valued Environmental and Social Component

Code	VEC	Principal contributing actions	Pre-mitigation cumulative significance
IMP-44	Forest habitat and CH species (White-bellied Pangolin EN; Western Chimpanzee CR, precautionary; threatened flora)	This Project + 40 km lot + cocoa expansion (BFS landscape pressure) + commercial hunting/trade (BFS landscape pressure) + settlement growth + logging	Major
IMP-45	Cavalla tributaries and aquatic ecosystems (incl. Cestos headwaters west of about km 55)	Sediment from both road lots + borrow/quarry runoff + artisanal gold mining + land-use-change erosion	Moderate
IMP-46	Community wellbeing (services, prices, cohesion, health)	Concurrent workforces of both lots + border-trade growth + in-migration + market integration	Moderate

9.7 Summary of the Impact Assessment

Table 9.16 consolidates all forty-six adverse impacts identified in this chapter with their pre-mitigation significance; Table 9.17 summarises the counts by receptor group and phase. In aggregate the assessment identifies **23 Major, 21 Moderate and 2 Minor** adverse impacts before mitigation (interactions screened as Negligible were scoped out at Table 9.1/8.2 stage and are not registered), alongside eight beneficial impacts of which four are Major (beneficial).

Table 9.16: Consolidated register of adverse impacts and pre-mitigation significance

Code	Impact (short title)	Receptor group	Phase	Pre-mitigation significance
IMP-01	Fugitive dust incl. Harmattan interaction	Air	Construction	Major
IMP-02	Suaken plant complex and quarry emissions	Air	Construction	Moderate
IMP-03	Asphalt fumes at paving front	Air	Construction	Minor
IMP-04	Works noise at community receptors	Noise/vibration	Construction	Major
IMP-05	Fixed-plant and quarry noise	Noise/vibration	Construction	Moderate
IMP-06	Camp and generator noise (Zuoyou)	Noise/vibration	Construction	Moderate
IMP-07	Blasting/compaction vibration at structures	Noise/vibration	Construction	Moderate
IMP-08	Sediment loading of 9 creeks and 31 RoW wetlands	Water	Construction	Major
IMP-09	Construction water abstraction	Water	Construction	Moderate
IMP-10	Process and wash-water discharges	Water	Construction	Moderate
IMP-11	Sediment ingress at community wells/handpumps	Water	Construction	Major
IMP-12	Erosion of cuts and fills (2,500–3,000 mm rainfall)	Soils	Construction	Major
IMP-13	Borrow-pit and quarry land degradation	Soils	Construction	Major

Code	Impact (short title)	Receptor group	Phase	Pre-mitigation significance
IMP-14	Topsoil loss and compaction; spoil and waste disposal	Soils	Construction	Moderate
IMP-15	RoW habitat loss incl. threatened flora	Biodiversity	Construction	Major
IMP-16	Natural-habitat loss at ancillary sites (BP3; BP2/IW-007)	Biodiversity	Construction	Major
IMP-17	Edge effects into CSZ (km 18–20) and pangolin CH (km 38–50)	Biodiversity	Construction	Major
IMP-18	Construction-phase severance and fauna mortality	Biodiversity	Construction	Moderate
IMP-19	Noise/light disturbance to fauna	Biodiversity	Construction	Major
IMP-20	Workforce bushmeat demand and hunting facilitation	Biodiversity	Construction	Major
IMP-21	Invasive species introduction/spread	Biodiversity	Construction	Moderate
IMP-22	Wetland encroachment and hydrological disruption	Biodiversity	Construction	Major
IMP-23	Displacement: 860 PAPs / 1,084 assets (RAP-managed)	Land/livelihoods	Pre-construction/Construction	Major
IMP-24	Temporary roadside vending/business disruption	Land/livelihoods	Construction	Moderate
IMP-25	Farm access disruption and crop damage	Land/livelihoods	Construction	Moderate
IMP-26	Ancillary land occupation outside RAP scope	Land/livelihoods	Construction	Moderate

Code	Impact (short title)	Receptor group	Phase	Pre-mitigation significance
IMP-27	Influx pressure on services and prices	Community	Construction	Moderate
IMP-28	Social cohesion and migrant-dynamics pressure	Community	Construction	Moderate
IMP-29	Influx-linked disease transmission (STI/HIV; waterborne)	Community	Construction	Major
IMP-30	Community severance and access disruption during works	Community	Construction	Major
IMP-31	Water-point and utility interference/outages	Community	Construction	Moderate
IMP-32	Proximity disturbance to sacred sites (SS-001–006; Poro Bush)	Cultural heritage	Construction	Major
IMP-33	Grave disturbance/relocation incl. vibration; unmarked graves	Cultural heritage	Construction	Major
IMP-34	Landscape/visual change (works, pits, quarry faces)	Landscape	Construction	Moderate
IMP-35	Traffic delays and diversions during works	Traffic/access	Construction	Moderate
IMP-36	Degraded pedestrian/NMT environment (works and haulage)	Traffic/access	Construction	Major
IMP-37	Operational traffic noise/emissions in towns	Air and noise	Operation	Moderate
IMP-38	Severance and pedestrian exposure at design speeds	Community/traffic	Operation	Major
IMP-39	Induced land-use change and forest conversion	Biodiversity/land	Operation (induced)	Major

Code	Impact (short title)	Receptor group	Phase	Pre-mitigation significance
IMP-40	Induced hunting and bushmeat/wildlife trade	Biodiversity	Operation (induced)	Major
IMP-41	In-migration and secondary settlement growth	Community/land	Operation (induced)	Moderate
IMP-42	Operational wildlife mortality and barrier effect	Biodiversity	Operation	Major
IMP-43	Periodic maintenance impacts	Multiple	Operation	Minor
IMP-44	Cumulative: forest habitat and CH species (VEC 1)	Biodiversity	Cumulative	Major
IMP-45	Cumulative: Cavalla tributaries and aquatic ecosystems (VEC 2)	Water	Cumulative	Moderate
IMP-46	Cumulative: community wellbeing (VEC 3)	Community	Cumulative	Moderate

Table 9.17: Counts of adverse impacts by receptor group and pre-mitigation significance

Receptor group / phase	Major	Moderate	Minor	Total
Air quality (construction)	1	1	1	3
Noise and vibration (construction)	1	3	0	4
Water resources (construction)	2	2	0	4
Soils and geology (construction)	2	1	0	3
Biodiversity (construction)	6	2	0	8
Land and livelihoods (construction)	1	3	0	4
Community (construction)	2	3	0	5
Cultural heritage (construction)	2	0	0	2

Receptor group / phase	Major	Moderate	Minor	Total
Landscape (construction)	0	1	0	1
Traffic and access (construction)	1	1	0	2
Operation phase (all receptors)	4	2	1	7
Cumulative (VECs)	1	2	0	3
Total	23	21	2	**46**

The pre-mitigation profile is dominated by biodiversity (six construction Majors plus three operation/induced and one cumulative Major, reflecting the Criterion-1 Critical Habitat context), by the water–soils erosion complex characteristic of high-rainfall lateritic terrain, and by the social consequences of displacement, influx and the works' passage through linear settlements. The twenty-three Major impacts — IMP-01, IMP-04, IMP-08, IMP-11, IMP-12, IMP-13, IMP-15, IMP-16, IMP-17, IMP-19, IMP-20, IMP-22, IMP-23, IMP-29, IMP-30, IMP-32, IMP-33, IMP-36, IMP-38, IMP-39, IMP-40, IMP-42 and IMP-44 — are priority subjects of Chapter 10, where the mitigation hierarchy is applied impact by impact and residual significance is stated; the twenty-one Moderate impacts are likewise carried to Chapter 10 with proportionate measures, and the two Minor impacts (IMP-03, IMP-43) are managed through standard good-practice controls in the ESMP without impact-specific analysis. No Major impact lacks an available mitigation pathway. The BMP (rev.3) actions A1–A10, the RAP and its condition precedent, the adopted RETRAP GRM, the design's embedded traffic-management and drainage commitments, and the EPA permitting regime for each ancillary facility together provide the framework within which Chapter 10 demonstrates that every Major impact can be reduced to Moderate or below. The operation-phase induced impacts (IMP-39, IMP-40) and the cumulative forest-habitat impact (IMP-44) are the most demanding: the BMP is confined to design, construction and the defects-liability period, so their residual significance depends on measures outside the works contract, stated in Section 10.12.

9.8 Unplanned Events and Project Risks (Summary)

Distinct from the impacts of planned activities assessed above, the Project carries risks from unplanned or uncertain events, assessed in the update process on a five-by-five likelihood × severity matrix with mitigation to as-low-as-reasonably-practicable (ALARP). The register spans forty-one risk heads across worker health and safety (including excavation and slope work, plant and traffic interfaces, snake-bite, malaria and Lassa fever), hazardous-materials and fuel spills, fire, flood and severe weather, structural and borrow-pit collapse, community incidents (with community traffic accidents the highest residual risk, held at ALARP through the traffic-management, school-zone and driver-control programme), disease outbreak, security incidents, chance finds, and — conditional on its adoption at Suaken — blasting. Each risk head carries defined controls, an owner, and monitoring; the emergency scenarios are covered by the Contractor’s Emergency Preparedness and Response Plan under the ESMP (Chapter 11), with serious incidents notified to the IIU within 24 hours and to the World Bank within 48 hours. Climate risk screening finds the principal exposures to be intense rainfall and flood events during construction and accelerated deterioration under maintenance failure — addressed by the 10/50/100-year drainage design (Section 3.5), wet-season work sequencing, and the maintenance arrangements of the contract. This summary carries the substance of the update’s full risk assessment; the consolidated register — with the ALARP basis for community traffic accidents, the environmental-risk controls, the climate allowance in the drainage design, the blasting sensitivity and the aligned incident-reporting times — is reproduced at Appendix X and operates through the ESMP.

10 ENVIRONMENTAL AND SOCIAL MITIGATION

This chapter sets out the mitigation and enhancement measures for the impacts assessed in Chapter 9, organised by receptor and anchored in the mitigation hierarchy. The biodiversity measures adopt the BFS mitigation cascade in full — avoidance, minimisation and restoration to a verified net-gain outcome — as made binding through the Biodiversity Management Plan (Appendix T). The chapter closes with the residual-impact summary and the BFS integration and gap-closure tables that trace how the survey's recommendations are embedded in this report.

10.1 Approach

The mitigation strategy follows the hierarchy of avoid, minimise, restore and offset/compensate, in that strict order of preference, as required by ESS1 and — for biodiversity, including Critical Habitat — by ESS6 and IFC PS6 Guidance Note 6. Avoidance has been pursued first through design and siting; minimisation through engineering controls, operating restrictions and scheduling; restoration through reinstatement and re-vegetation obligations; and compensation only for residual effects that cannot otherwise be avoided — principally the RAP entitlements (RAP, 2025). For biodiversity, the hierarchy stops at footprint restoration; the BMP applies avoidance, minimisation and restoration of the works footprint during detailed design, mobilisation, construction and the defects-liability period, and uses no offset or net-gain step (BMP rev.3, Chapter 4); on that basis it finds residual significance on Criterion 1 to be Medium (Moderate on the scale of this report), with no feature High or Severe through defects liability (BMP rev.3, Chapters 6–8). Enhancement measures are applied to beneficial impacts so that Project benefits are maximised and equitably shared (Section 10.11). The package consolidates and updates the mitigation framework and integrated ESMP of the 2024 ESIA (Earthtime, 2024, Chs 10–11), re-anchored to the 2026 evidence base. Figure 10.1 illustrates the mitigation applied to the works: avoidance, minimisation and restoration of the works footprint (BFS, 2026, Figure 5.1).

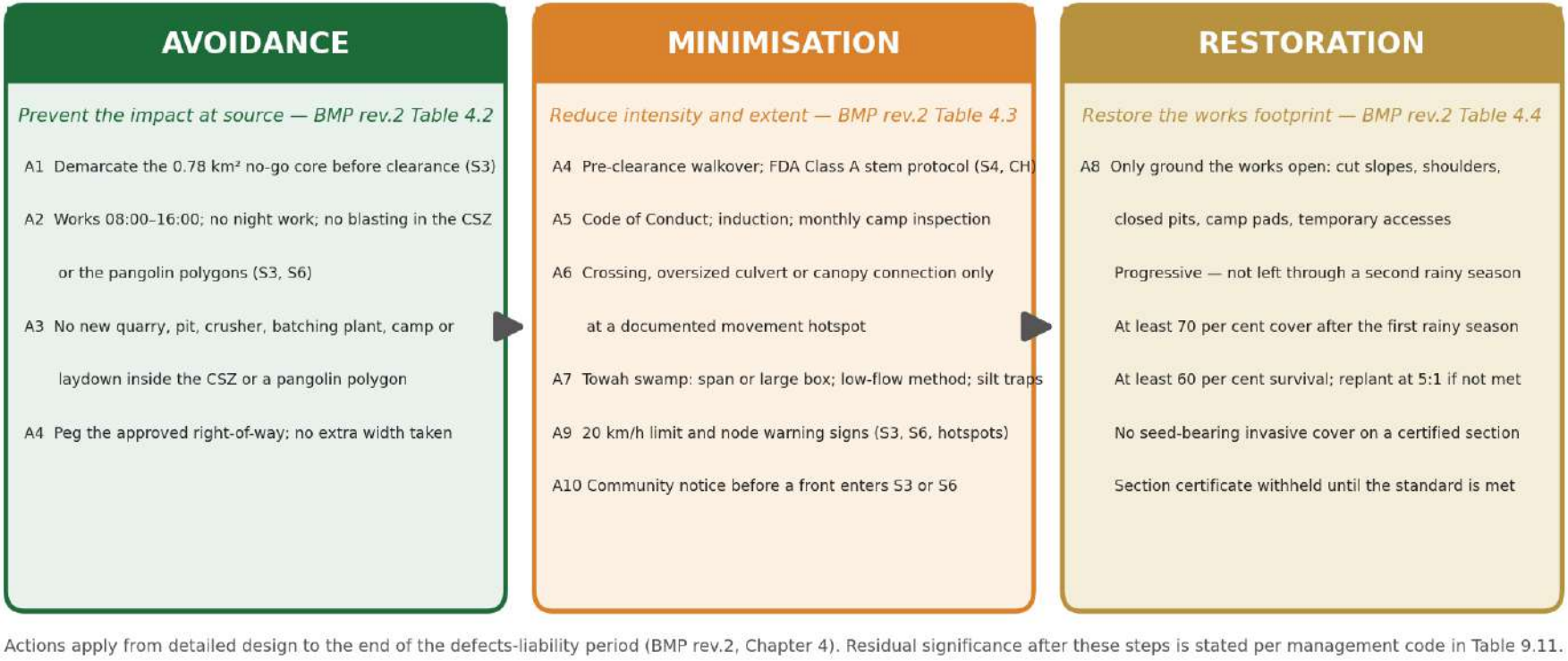


Figure 10.1: Mitigation applied to the works — avoidance, minimisation and restoration of the works footprint, by BMP rev.3 action A1–A10 (RE-GROUP, 2026, after BFS, 2026, Figure 5.1).

Measures already embedded in the Design-and-Build design are credited in the assessment and are tagged **[E&S-in-design]** in the tables below. The principal embedded measures are: confinement of all permanent works to the existing government right-of-way (150 ft rural / 100 ft urban), avoiding private land acquisition (RAP, 2025); retention and widening of the five existing bridges rather than construction of new crossings; hydraulic design of 42 box culverts and 40 pipe culverts to 10-, 50- and 100-year flood standards with lined drains and riprap protection (ICCO/CET, 2025); a span or large box culvert at the Towah swamp (km 12–14) instead of culvert-and-fill (BMP A7, on design-engineer drawings accepted at design review, gate G6); crossings, oversized culverts or canopy connections only at movement hotspots documented in the BFS (BMP A6); and the sealed pavement itself, which removes the existing dust and sediment sources.

Each measure in this chapter is carried into the standalone ESMP, where it is assigned an owner, a timeframe, a performance standard, a monitoring indicator, a means of verification and a cost (ESMP Table 4.1 maps the codes below to ESMP Sections 5.1–5.17); unless a table states otherwise, the Contractor implements the measure, the Supervising Engineer verifies it through the inspection and monitoring regime of Section 11.4, and the IIU holds the sanction; Contractor-level operationalisation follows in the CESMP, which the works contract requires within eight weeks of mobilisation (mobilisation followed the kick-off meeting of 2 August 2026). The biodiversity actions are set out in the BMP (2026; annexed to this ESIA as Appendix T); its actions A1–A10, supervision checks (BMP Table 7.1) and stop-work triggers (BMP Table 7.2) must be written into the CESMP before any works front enters segment S3 (km 18–20) or S6 (km 38–50) (BMP Table 8.2, gate G1). Displacement is managed through the RAP, which remains the authoritative instrument for compensation and resettlement. This chapter addresses the impacts of planned activities; preventive controls, contingency planning and emergency response for unplanned events (spills, slope failure, flooding, traffic accidents, SEA/SH incidents, security incidents and chance finds) are addressed in the risk chapter (Section 10.8) and are not repeated here.

Impact codes in the tables below are receptor-prefixed consolidations of the Chapter 9 impact register (IMP-01–IMP-46; the IMP codes consolidated under each management code are listed in Table 10.11, and the group-level mapping is in ESMP Table 4.1): SG (soils, geology and terrain), WR (water resources), AQ (air quality and greenhouse gases), NV (noise and vibration), BD (biodiversity), LR (land acquisition and resettlement), SE (socio-economy and labour), CS (community health, safety and traffic), CU (cultural heritage), CI (cumulative impacts) and B (beneficial impacts). Residual significance uses the same four-point scale as Chapter 9 (Negligible, Minor, Moderate, Major).

10.2 Soils, Geology and Terrain

The corridor's lateritic, moderately acidic soils (2026 pH 5.65–6.65) are highly erodible under rainfall of 2,500–3,000 mm/yr, and the BFS identifies an erosion belt at km 30–45. Earthworks, the 16 borrow pits (BP1–BP17, no BP10), the two quarries and the Suaken plant complex are the principal sources of soil disturbance. Mitigation centres on strict footprint control, progressive stabilisation, topsoil husbandry and pollution prevention, with quarry and borrow-pit management plans and EPA permits required for each site before opening.

Table 10.1 presents the measures.

Table 10.1: Mitigation of impacts on soils, geology and terrain

Impact code(s)	Mitigation/enhancement measures	Residual significance
SG-01 Erosion and sediment mobilisation from earthworks	Confine clearance to the design footprint; sequence earthworks to minimise open ground and align bulk cut/fill with the drier months; install cut-off drains, berms, check dams and silt fences before opening any face; progressive restoration of completed slopes and other surfaces opened by the works (BMP A8: at least 70 per cent cover at the end of the first rainy season after planting and at least 60 per cent survival; five-for-one replanting at the Contractor's cost, and section taking-over withheld, if either test fails); riprap and lined drains at outfalls [E&S-in-design]; slope-protection works inspected weekly and before forecast storms	Minor
SG-02 Land disturbance and landform change at borrow pits and quarries	Site selection per the siting standards: quarries at most 5 km and borrow pits at most 1 km from the road; the Suaken quarry does not meet two of these standards (about 6.5 km off the corridor by road and about 431 m from the nearest dwellings, Table 3.5) and is therefore carried as condition 5 of Table 11.5 (documented agreement with Suaken Town; blast design, vibration limits and monitoring, or agreed measures with compensation); no extraction within 50 m of any watercourse, well or borehole; no sand or aggregate extraction from rivers or creeks (crusher-run fines only, carrying forward the 2024 ESIA siting rules); quarry faces, crushers and asphalt plants at least 500 m from the nearest dwelling; biodiversity and cultural-heritage pre-clearance screening of every site, including the BMP A3 overlay at detailed-design review (no new quarry, borrow pit, crusher, batching plant, camp or laydown inside the CSZ or a pangolin polygon); BP2 (overlap with wetland IW-007), BP3 (secondary forest), the sites flagged in Table 3.6 and the RC2 candidate crusher are not opened until the Supervising Engineer has signed the overlay and, for BP2 and BP3, the	Minor

Impact code(s)	Mitigation/enhancement measures	Residual significance
	A4 walkover is complete (BMP rev.3, Table 3.2); topsoil stripped and stockpiled for reinstatement; progressive restoration and full closure to agreed after-use with sign-off by the EPA and the Supervising Engineer	
SG-03 Topsoil loss and degradation	Topsoil stripped separately, stockpiled not more than 2 m high away from drainage lines, seeded to prevent loss, and reused in reinstatement; no trafficking or hazardous storage on topsoil stockpiles; balance of spoil reused in embankments before disposal at approved sites	Minor
SG-04 Soil contamination from fuels, hazardous materials and waste	Fuelling and maintenance at least 50 m from watercourses on impermeable, bunded areas; hydrocarbon tanks roofed and bunded to at least 110% of the largest container; drip trays under all standing plant; dedicated washout pits for concrete; waste segregated, stored on hardstanding and removed by EPA-certified contractors; no on-site burning or burial; contaminated soil excavated and remediated at closure (accidental spill response is addressed in Section 10.8)	Minor
SG-05 Ground and farmland disturbance at diversions and access tracks	Diversions kept within the RoW except at structures; no felling of trees larger than 200 mm DBH for temporary works, and no felling of any marked FDA Class A stem except under the A4 protocol; earth access tracks constructed and maintained to the ESMP guideline with drainage control; temporary occupation of land outside the RoW only with documented voluntary agreement and compensation consistent with the RAP; full reinstatement to pre-existing or better condition	Negligible

10.3 Water Resources and Hydrology

More than 30 watercourses cross the alignment, and the 2026 field campaign inventoried 9 creeks and 31 inland wetlands (IW-001–031) within the 150 ft corridor, draining to the Cavalla Basin in the east and the Cestos headwaters west of about km 55. Groundwater is the principal drinking source in the PACs, and the 2026 results (GW-05 pH near the lower bound; TSS at 69–80 per cent of the Class I limit) show that community wells have little headroom for additional sediment. The mitigation package protects both surface and groundwater through buffers, treatment before discharge and a strict wetland no-fill rule. Table 10.2 presents the measures.

Table 10.2: Mitigation of impacts on water resources and hydrology

Impact code(s)	Mitigation/enhancement measures	Residual significance
WR-01 Sedimentation of watercourses and wetlands	Sediment traps at all stream crossings and settlement (settling) ponds at every quarry, crusher, batching plant and wash-down area, with discharge only after treatment; performance standard: downstream turbidity not more than twice the upstream value (ESMP/CESMP water-quality criterion), checked monthly at active crossings and in each week of in-stream work at the Towah swamp and other live crossings (BMP A7); uncontrolled sediment beyond the approved footprint is a BMP stop-work trigger; in-stream works restricted to the dry season and completed in single continuous operations; 30 m undisturbed riparian buffer each side of all first- and second-order streams, except within the approved crossing footprint (ESMP/CESMP water measure); dewatering discharged to vegetated ground, never directly to watercourses	Minor
WR-02 Contamination by fuels, oils, bitumen and concrete	No fuelling, plant maintenance or fuel/chemical storage within 50 m of any watercourse, well or borehole; bunded storage (at least 110%) with oil–water separators on workshop and refuelling drainage; drip trays for mobile plant; bitumen heated and handled on sealed areas; concrete washout contained; verification actions carried as conditions: SW-03 (Donneh Creek) hexavalent-chromium re-test and the Mn/Hg re-tests before works reach the affected reaches (Chapter 12, Table 11.5, condition 4)	Minor
WR-03 Camp and site wastewater and sanitation discharges	Camp designed with septic tank and soakaway systems sized for the workforce; sealed or portable toilets at borrow pits and mobile sanitation at work fronts, separate for men and women; no discharge of untreated sewage or grey water; sludge removed by certified service providers; sanitation inspected weekly	Negligible

Impact code(s)	Mitigation/enhancement measures	Residual significance
WR-04 Water abstraction pressure on community sources and environmental flows	Abstraction only under a water-abstraction licence from approved points agreed with communities and the county authorities; no abstraction from community handpumps or wells; abstraction rates capped at the limit set in the water-abstraction licence (by default not more than 10 per cent of the measured dry-season flow at any single surface-water intake) and metered daily; community water points within 100 m of works physically protected (barriers, drainage control), with groundwater at GW-01–GW-05 and the community water points monitored monthly in situ and by six-monthly laboratory analysis (Section 11.4) and any Project-attributable damage or contamination remedied with an equivalent replacement supply at the Contractor's cost	Minor
WR-05 Drainage alteration and hydrological change at crossings and wetlands	**Wetland no-fill rule:** no filling or drainage of any of the 31 inventoried wetlands beyond the approved design footprint at crossings, and no ancillary siting in any of them; Towah swamp (km 12–14) crossed on a span or large box culvert rather than culvert-and-fill, with a low-flow in-stream method and weekly silt control during in-stream work (BMP A7; design-engineer drawings accepted at design review); culverts sized to 10/50/100-year events maintaining existing flow paths and aquatic connectivity [E&S-in-design]; swamp-complex culvert works restricted to the January–February dry window; pre- and post-works photographic verification at each crossing	Minor

10.4 Air Quality and Greenhouse Gases

The 2026 baseline (20 stations, AQ-01–AQ-20; results for AQ-07 and AQ-12 outstanding) recorded air quality within WHO reference values at all eighteen stations reported; the management objective is therefore to prevent construction from degrading a currently clean airshed, particularly at the linear roadside settlements, schools, clinics and markets that abut the works. Dust is the dominant concern in the dry season and on haul routes through towns. Table 10.3 presents the measures.

Table 10.3: Mitigation of impacts on air quality and greenhouse gases

Impact code(s)	Mitigation/enhancement measures	Residual significance
AQ-01 Construction dust at communities and on crops	Water sprays (bowsers) on active works and unpaved haul routes through towns, with application frequency increased in the dry season and during Harmattan conditions; 20 km/h limit on haul routes through towns; all friable loads covered; drop heights minimised; crushers and asphalt plants fitted with dust suppression and sited at least 500 m from dwellings; stockpiles sheltered or dampened; PM10 kept within the EPA ambient standard applied in Chapters 6–8 (24-h PM10 at most 50 µg/m³ as the certificate reference; WHO 2021 guideline 45 µg/m³ as the stricter target) at sensitive receptors, verified by continuous monitors at the quarry/crusher and asphalt plant and monthly spot checks in towns; compensation payable by the Contractor, at the RAP valuation rates and through the GRM, where dust demonstrably destroys crops within 50 m of the works	Minor
AQ-02 Combustion and plant emissions (asphalt plant, crusher, batch plant, vehicles)	Plant selected and maintained to manufacturer emission specifications; no burning of waste or cleared vegetation; asphalt plant operated with burner controls and daylight-only operation; generators sized and maintained to avoid smoking; idling restrictions at camps and queues; fuel quality controlled	Minor
AQ-03 Greenhouse-gas emissions (construction plant, materials and induced traffic)	Local sourcing of aggregates and fill to cap haul distances (borrow pits at roughly 10 km spacing); efficient plant utilisation and preventive maintenance; sealed pavement reduces per-vehicle fuel consumption and emissions in	Minor

Impact code(s)	Mitigation/enhancement measures	Residual significance
	operation [E&S-in-design]; progressive restoration of the works footprint (BMP A8) provides a small sequestration co-benefit; the Project GHG estimate and climate-risk screening are presented in Sections 9.8 and 10.6	

10.5 Noise and Vibration

Noise limits are those of the EPA Noise Pollution Control and Standards Regulation (2017) and the WBG General EHS Guidelines. The 2026 baseline (20 co-located stations) found ambient levels already elevated at market and roadside locations; the controls therefore concentrate on night-time protection, plant siting and the sensitive-receptor frontages (clinics, schools, mosques and churches). Within the Chimpanzee Sensitivity Zone and the two pangolin Critical Habitat polygons, the BMP hours rule (08:00–16:00, no night work or blasting; A2) also serves an ecological function (Section 10.6). Table 10.4 presents the measures.

Table 10.4: Mitigation of noise and vibration impacts

Impact code(s)	Mitigation/enhancement measures	Residual significance
NV-01 Construction and plant noise at community receptors	Working hours of 06:00–18:00 in and near settlements (as set in the CESMP), with no night working within 2 km of communities; in segments S3 and S6, works only between 08:00 and 16:00 with no night work or blasting (BMP A2), and 07:00–17:00 adjacent to the Towah swamp (km 12–14; BFS, 2026, Figure 5.6); low-noise equipment and intact silencers; crushers and asphalt plants at least 500 m and batch plants at least 200 m from dwellings, with daylight-only operation and no Sunday/religious-holiday crushing; advance notice to affected frontages for unavoidable noisy operations; compliance with EPA category limits verified monthly at no fewer than six locations	Minor
NV-02 Vibration effects on structures and occupants	Vibration-generating operations (compaction, rock-breaking) managed within 200 m of buildings using reduced-energy methods; pre-condition surveys of fragile structures adjacent to the works; no blasting in the CSZ or the pangolin Critical Habitat polygons; blasting confined to the permitted quarry and carried out only under a Ministry of Mines and Energy licence, a Blasting Plan, at	Negligible

Impact code(s)	Mitigation/enhancement measures	Residual significance
	least 24 hours' notice, a 500 m exclusion zone and vibration/air-overpressure monitoring; at the Suaken quarry, about 431 m from the nearest dwellings, a 500 m exclusion zone would extend into Suaken Town, so the Blasting Plan must set the blast design, monitoring and any temporary evacuation agreed with the community (Table 11.5, condition 5)	
NV-03 Operational traffic noise change	Speed management through towns (60 km/h urban design speed, traffic calming at schools and markets) [E&S-in-design]; smooth-running sealed surface replaces corrugated gravel noise; maintenance regime preserves surface condition	Minor

10.6 Biodiversity and Ecosystem Services

Biodiversity mitigation is governed by the BFS (BFS, 2026) and the Biodiversity Management Plan (BMP, November 2026; annexed to this ESIA as Appendix T). The BFS determined that ESS6 Critical Habitat is triggered under Criterion 1. The primary trigger is the White-bellied Pangolin (EN): verified camera events (stations T16, T18, T27 and T30) are clustered at km 38–50, within two Critical Habitat polygons, CH-West (8.7 km², km 38–44) and CH-East (10.8 km², km 46–50). The Western Chimpanzee (CR) is treated precautionarily, on a single verified camera record (station T59, 3 February 2026, near Sennehwein Town, about 1.6 km off the alignment), through a Chimpanzee Sensitivity Zone of 3.14 km² at km 18–20 with a 0.78 km² no-go core; the record is not evidence of a resident population. The total Critical Habitat footprint is 22.6 km². Criteria 2–5 are not triggered, and six Priority Biodiversity Features (14.2 km²) require control during the works. Biodiversity management is confined to detailed design, mobilisation, construction and the defects-liability period. The BMP applies avoidance, minimisation and restoration of the works footprint through ten actions (A1–A10); it uses no offset or net-gain step and sets no long-term performance targets. Provided the six conditions that hold the residual conclusion are met (A1, A2, A3, A4, A5 and A8), the BMP finds residual significance on Criterion 1 to be Medium on the BFS/BMP scale — Moderate on the scale of this report — with no feature High or Severe through the defects-liability period (BMP rev.3, Chapters 6–8). This section summarises the actions and maps them to the impact register; the BMP contains the full prescriptions.

The ten BMP actions are:

- A1 — Demarcation of the 0.78 km² no-go core with durable posts before vegetation clearance in segment S3 (km 18–20); no plant, stockpile, temporary track, night lighting or blasting inside the core; unauthorised entry is a stop-work trigger.
- A2 — Working hours 08:00–16:00, with no night work and no blasting, in the Chimpanzee Sensitivity Zone (S3) or the pangolin polygons (S6) while a front is in those segments.
- A3 — No new quarry, borrow pit, crusher, batching plant, camp or laydown inside the CSZ or a pangolin polygon: a siting freeze fixed at detailed-design review through the ancillary-site overlay (BMP rev.3, Table 3.2); the camp proposed at about km 45 is rejected.
- A4 — Pre-clearance walkover, pegging of the approved right-of-way and the FDA Class A stem protocol before each clearance package (first in S3 and S4); no extra width taken; a Class A stem that must be lost is replaced five-for-one.

- A5 — Workforce Code of Conduct (no hunting, bushmeat, wildlife pets or wildlife trade; no weapons or snares), induction before deployment, protein that is not wild-caught and weekly camp check; breach is a dismissible offence and, where the law requires, is referred to the FDA.
- A6 — Crossings, oversized culverts, spans or canopy connections only at movement hotspots documented in the BFS, on drawings prepared by the Contractor's design engineer and accepted at design review; no default crossing package on every kilometre.
- A7 — Span or large box culvert at the Towah swamp (km 12–14), with a low-flow in-stream method and silt control at Towah and the other live crossings in each week of in-stream work.
- A8 — Progressive restoration of the surfaces opened by the works: at least 70 per cent cover at the end of the first rainy season after planting and at least 60 per cent survival of planted stems; five-for-one replanting at the Contractor's cost if either test fails, with taking-over of the section withheld.
- A9 — 20 km/h speed limit and node warning signs in S3, S6 and other documented hotspots, posted before the front enters.
- A10 — Community notice, with grievance contacts, before a front enters S3 or S6; wildlife, grove and camp complaints handled through the Project grievance mechanism.

Sacred groves and the White-necked Picathartes outcrop (about 2.5 km off-road near km 4) are no-go areas during the works, with no blasting or quarrying in the agreed buffer (BMP rev.3, Table 3.1). The Supervising Engineer checks compliance weekly while a front is in S3 or S6 (and in each week of in-stream work at Towah) and monthly elsewhere (BMP rev.3, Table 7.1), and applies the stop-work triggers of BMP Table 7.2: unauthorised entry into the no-go core or a Critical Habitat polygon; night work or blasting in the CSZ or a polygon; unauthorised Class A felling; verified hunting, capture or bushmeat by Project personnel; uncontrolled sediment beyond the approved footprint; a damaged or blocked crossing; failed restoration; and a verified protected-species sighting within 50 m of an active front. Serious incidents (injury or death of a chimpanzee, pangolin mortality caused by the Project, work inside the no-go core, unauthorised Class A felling) are reported to the Employer within 24 hours and to the World Bank and the EPA within 48 hours.

Contractor obligations sit in the works contract and the CESMP, including the CESMP Biodiversity Compliance Plan and the works-contract penalty schedule, and are verified by the Supervising Engineer; the costs of A6 and A7 structures are estimated by the Contractor's design engineer within the works contract, supervision checks sit in the ESMP supervision budget, and corrective work is funded from the works-contract contingency (BMP rev.3, Chapter 10). Table 9.5 maps the actions to the impact register and states the residual significance; the BMP contains the full detail. Figure 9.2 shows the construction-phase controls along the corridor, and Figure 10.3 the structure types available where the BFS documents a movement hotspot.

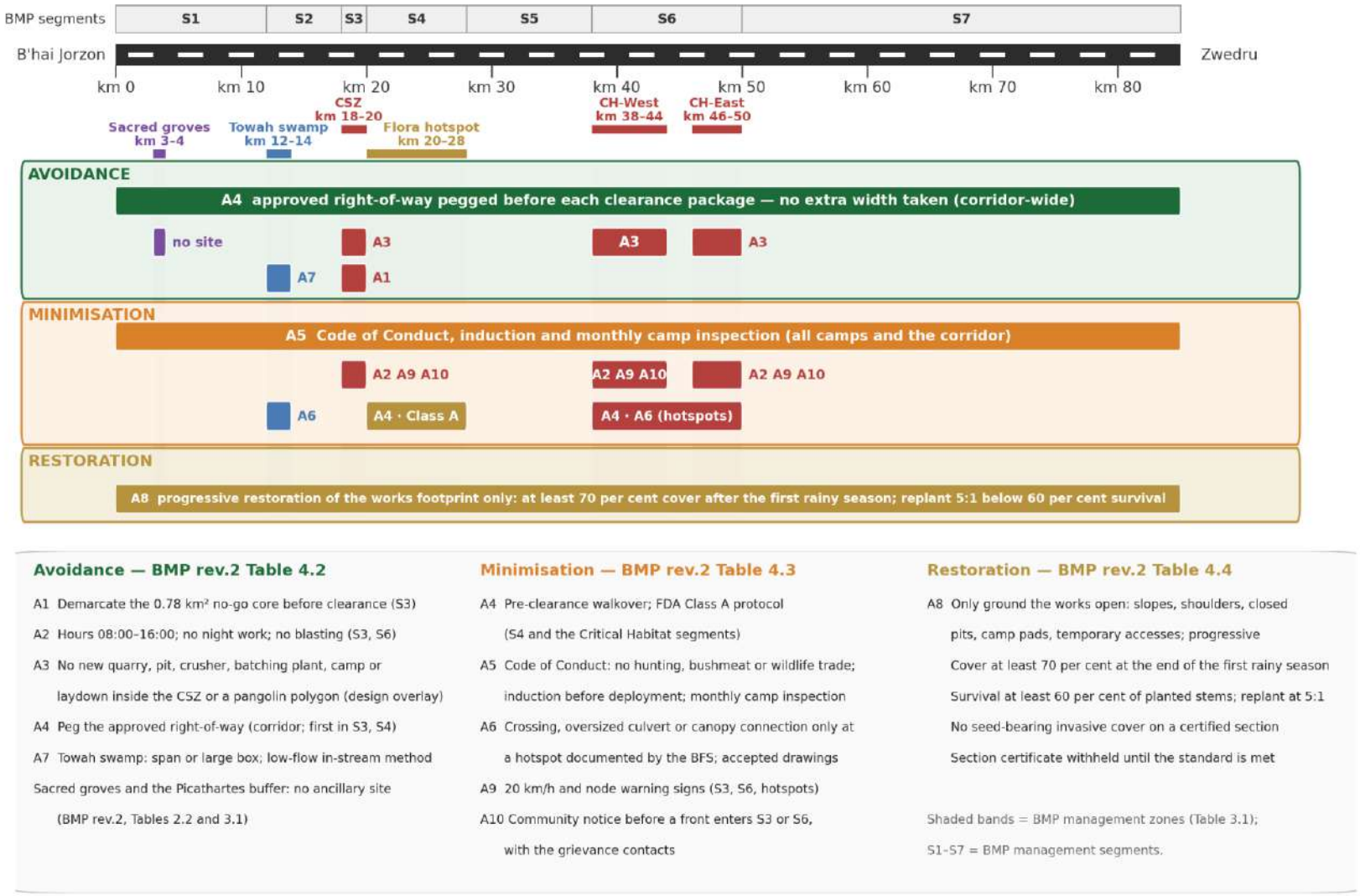
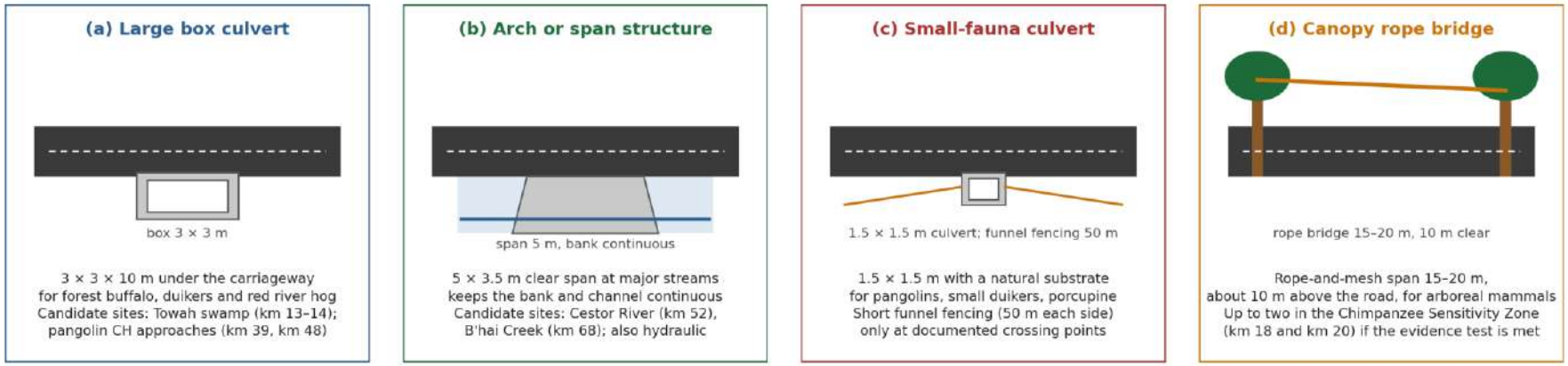
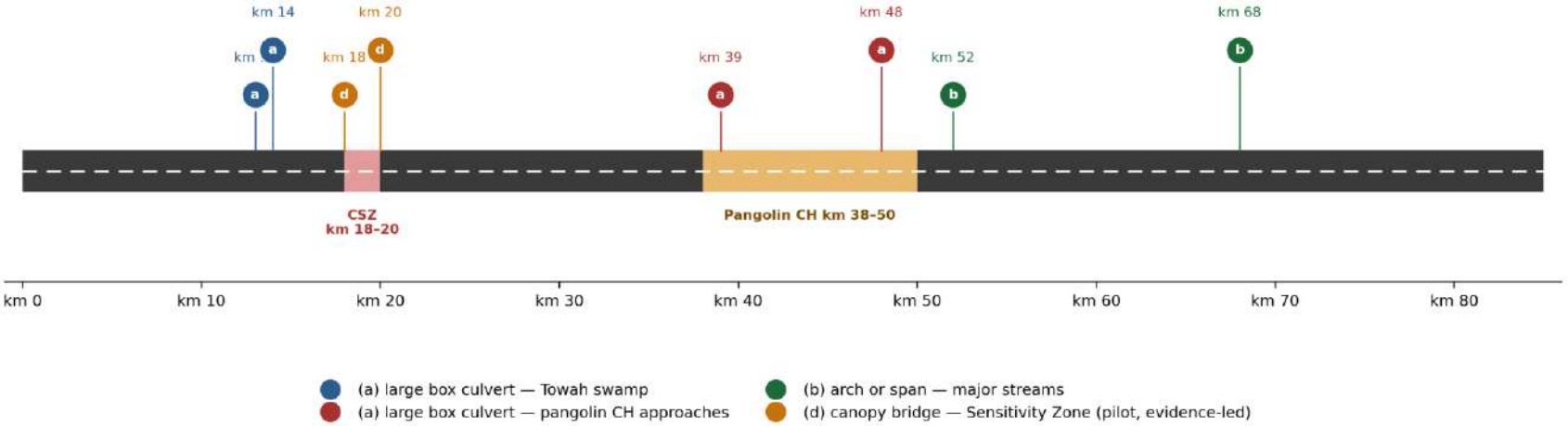


Figure 10.2: Construction-phase controls on the existing 85 km alignment — BMP rev.3 actions A1–A10 by chainage and management segment S1–S7 (RE-GROUP, 2026, after BFS, 2026, Figure 5.3).

Provided only where Chapters 3 and 4 document a hotspot or where fill would block Towah swamp (M5 / A6); ordinary hydraulic culverts elsewhere remain hydraulic



Candidate structure locations on the existing alignment — each subject to the Chapter 3 evidence test before drawings (A6)



Design principles applied to any justified structure: width-to-length ratio at least 0.3 for box culverts; natural substrate; vegetation cover retained to the entrance; funnel fencing only at the structure; drawings by the Contractor's design engineer, reviewed by the Supervising Engineer and the Employer before construction (Chapter 5).

Figure 10.3: Structure types available for documented movement hotspots — large box culvert, arch or span, small-fauna culvert and canopy rope bridge — indicative only: the candidate locations and numbers shown in the BFS graphic are not Project commitments, and a structure is built only where the BFS documents a movement hotspot and the design engineer's drawings are accepted under BMP action A6 (adapted from BFS, 2026, Figure 5.2).

Table 10.5: Mitigation of biodiversity and ecosystem-services impacts

Impact code(s)	Mitigation/enhancement measures	Residual significance
BD-01 Habitat loss and degradation in the RoW and ancillary footprints	A4 pre-clearance walkover, right-of-way pegging and FDA Class A protocol before each package (no extra width taken); clearing confined to the pegged footprint, with piecemeal, directional clearance to allow fauna to escape; pre-clearance fauna checks with rescue of salvageable individuals before any front opens; A3 siting freeze — no new quarry, borrow pit, crusher, batching plant, camp or laydown inside the CSZ or a pangolin polygon (BP2, BP3, RC2 and the sites flagged in Table 3.6 not opened until the overlay is signed); no ancillary facility in sacred groves or the Picathartes buffer; wetland no-fill rule (WR-05); A8 progressive restoration of surfaces opened by the works (70 per cent cover, 60 per cent survival)	Minor
BD-02 Disturbance and fragmentation of the Chimpanzee Sensitivity Zone (km 18–20)	A1 demarcation of the 0.78 km² no-go core before clearance in S3; A2 works 08:00–16:00, no night work or blasting; A3 no new ancillary site in the CSZ; A9 20 km/h and node warning signs; A10 community notice before the front enters S3; task lighting aimed at the working face and no floodlighting of the core; the front suspended on a verified chimpanzee sighting within 50 m until the Supervising Engineer clears a restart; weekly Supervising Engineer checks while the front is in S3; canopy connections only if the BFS documents a crossing hotspot (A6); breaches handled under the works-contract penalty schedule and the CESMP Biodiversity Compliance Plan	Moderate (BMP rev.3 residual Medium on Criterion 1, precautionary; held through defects liability on conditions A1, A2 and A3)

Impact code(s)	Mitigation/enhancement measures	Residual significance
BD-03 Impacts on the White-bellied Pangolin Critical Habitat (km 38–50)	A3 no new quarry, borrow pit, crusher, batching plant, camp or laydown in either polygon (the camp proposed at km 45 is rejected; BMP rev.3, Table 3.2; Quarry 2, BP6, BP8, BP9, BP11 and BP12 subject to the overlay, Table 3.6); 08:00–16:00 with no night work or blasting while the front is in S6; A4 walkover and RoW pegging (any micro-adjustment kept within the approved RoW); A5 Code of Conduct and weekly camp check; A9 20 km/h and node warning signs; A10 community notice; the front suspended on a verified pangolin sighting within 50 m; weekly Supervising Engineer checks during clearance in S6	Moderate (BMP rev.3 residual Medium on Criterion 1; held through defects liability on conditions A2, A3, A4 and A5)
BD-04 Loss of threatened and protected flora (657 IUCN-listed stems in the AoI and surveyed buffer; 20 high-value Class A stems flagged, F-001 to F-020; Tieghemella heckelii at Barteh Jam)	A4 pre-clearance walkover and FDA Class A protocol: FDA-co-signed marking of the twenty high-value Class A stems (F-001 to F-020), and of any further stems found, before each cut in S4 and the Critical Habitat segments; RoW clearance permit contingent on FDA sign-off; Barteh Jam sacred grove (with its two Tieghemella heckelii stems) a no-go area; salvage and translocation of saplings; any Class A stem that cannot be kept is taken only under the national protocol and replaced five-for-one on the works footprint or an agreed adjoining strip; unauthorised Class A felling halts the segment the same day (BMP Table 7.2) and is a serious incident, reported to the Employer within 24 hours and to the World Bank and the EPA within 48 hours	Moderate (BFS, 2026, Table 10.2: residual Medium for the threatened-flora hotspot and Class A stems — a bounded loss inside the approved RoW, replaced five-for-one under A4)
BD-05 Barrier effects and wildlife road mortality	During the works and the defects-liability period: A9 20 km/h limit and node warning signs in S3, S6 and other documented hotspots; A6 crossings, oversized culverts or canopy connections only at BFS-documented movement hotspots, on accepted design-engineer drawings (the earlier five-crossing package is	Moderate during the works until the A6 structures are certified (BFS, 2026, Table 10.2: residual Medium for documented movement hotspots); Minor on certification

Impact code(s)	Mitigation/enhancement measures	Residual significance
	withdrawn); built structures checked monthly during construction and at completion, with damage or blockage repaired under BMP Table 7.2; the death of a protected species caused by a Project vehicle is a serious incident (front stopped; 24-hour and 48-hour notification). After the defects-liability period: speed management, maintenance of signs and structures and any road-kill recording fall to MPW as the road authority (Section 11.9)	
BD-06 Sensory disturbance (noise, light, vibration, dust) to fauna	A2 working hours 08:00–16:00 with no night work or blasting in S3 and S6; task lighting aimed at the working face and switched off when idle; no floodlighting of the no-go core; generators not sited against the core boundary (BMP rev.3, Sections 5.2 and 5.6); dust control as AQ-01; compliance checked weekly by the Supervising Engineer while a front is in S3 or S6	Minor
BD-07 Workforce and induced-access hunting, bushmeat trade and wildlife trafficking	Construction phase: A5 CoC (incl. SEA/SH) signed by all deployed staff, subcontractor and supply-chain driver (no hunting, trapping, bushmeat purchase or consumption, wildlife pets or trade, weapons or snares); induction before deployment; protein that is not wild-caught; weekly inspection of camp kitchens and quarters; verified hunting or bushmeat by Project personnel triggers the disciplinary process and, where the law requires, referral to the FDA (BMP Table 7.2); A10 community notice and the GRM for wildlife complaints. Operation phase (induced access): the BMP does not extend beyond the defects-liability period; post-paving hunting and wildlife trade are addressed by FDA and EPA enforcement of the Wildlife Conservation and Protected Areas	Moderate (workforce increment Medium after A5 on the BFS scale; operation-phase component outside the works contract)

Impact code(s)	Mitigation/enhancement measures	Residual significance
	Management Act (2016), supported by the recommendations of Section 11.9	
BD-08 Induced land-use change — cocoa-driven forest conversion and secondary settlement	Construction phase: influx controls (SE-01) and RoW encroachment monitoring (LR-01); no new ancillary site in the CSZ or the pangolin polygons (A3); closure and reinstatement of temporary accesses (A8). Operation phase: the BMP treats post-paving conversion as a landscape pressure outside the works contract (BMP rev.3, Section 1.2); the residual rating relies on MPW right-of-way management, county land-use coordination and FDA enforcement, set out as recommendations in Chapter 12	Moderate (largely exogenous driver; outside the works contract — basis stated in Section 10.12)
BD-09 Invasive species introduction and spread	Clean-plant hygiene: wash-down before mobilisation and between sites; plant, fill and mulch entering S3 or S6 visibly free of seed-bearing invasive material (BMP rev.3, Section 5.5); no seed-bearing invasive cover (notably Chromolaena odorata) left on a restored section, with manual removal before certification (A8)	Negligible
BD-10 Degradation of aquatic and riparian habitat and ecosystem services	30 m riparian buffers (WR-01); WR-01/WR-02 controls; A7 span or large box at the Towah swamp, with a low-flow in-stream method and weekly silt control during in-stream work; A8 restoration of disturbed banks within the works footprint, using native species from the BFS planting palette; dry-season windows for in-stream work; protection of community fishing reaches and the three sacred watercourses (SS-003, SS-004, SS-006; CU-01); the fish and herpetofauna surveys recommended by the BFS are IIU activities outside the works contract, the ichthyological survey of the nine creek crossings being designed with the custodians at the sacred creeks (Section 6.3.2)	Moderate during the works until the A6 and A7 structures at the live crossings are built to drawing and certified (BFS, 2026, Table 10.2: other live watercourse crossings residual Medium); Minor on certification; Towah swamp Low with A7 built as drawn

Impact code(s)	Mitigation/enhancement measures	Residual significance
CI-01 Cumulative forest and habitat loss (Project + agricultural expansion + other corridor developments)	During the works: A1–A10 limit the Project's contribution (no ancillary site in the CSZ or the pangolin polygons; controls on hours, clearance and conduct; footprint restoration). After the defects-liability period: the BMP does not cover cumulative landscape forest loss; the residual rating relies on the Government agencies and instruments identified in Section 10.12	Moderate (outside the works contract — basis stated in Section 9.12)

10.7 Land Acquisition, Physical and Economic Displacement

Displacement is managed through the RAP, which is the authoritative instrument: 860 PAPs holding 1,084 affected assets across 24 settlements — 854 private structures (93 per cent fully affected), 16 public structures, 15 graves, 6 farms (2,185 economic trees), 84 non-structure businesses and 98 tenants, including 116 vulnerable PAPs — compensated at full replacement cost under a budget of **US$3,658,686.97** (compensation US$3,021,533.61; implementation US$637,153.36), with a census cut-off of 15 December 2024. No civil works may commence in an affected section until all compensation for that section has been paid in full and the payment-completion report has been cleared by the World Bank — a hard condition of this ESIA (Section 11.9, Table 11.5, condition 1) — and site handover follows no earlier than three months after payment. The Updated ESIA does not re-perform the RAP; it adds the construction-phase safeguards and monitoring shown in Table 10.6, including livelihood-restoration monitoring and targeted measures for vulnerable PAPs.

Table 10.6: Management of displacement impacts (RAP interface)

Impact code(s)	Mitigation/enhancement measures	Residual significance
LR-01 Physical displacement of residential and public structures and graves	RAP implementation in full in each affected section before works in that section: full-replacement-cost compensation without depreciation; payment-completion report Bank-cleared; at least three months' notice between payment and site handover; demolition only after independent verification of payment; works strictly confined to the RoW with encroachment monitoring [E&S-in-design]; any realignment, design change or diversion outside the census footprint triggers a RAP update and a new cut-off before that segment proceeds	Minor
LR-02 Economic displacement (businesses, tenants, farms and economic trees)	Three-month transitional allowances for the 84 businesses and 98 tenants and full productive-value compensation for the 2,185 trees, per the RAP entitlement matrix; MoA extension support to affected farmers; ESIA supplement **— livelihood-restoration monitoring**: quarterly tracking of business resumption, tenant re-housing and farm re-establishment against pre-displacement baselines for at least 24 months, with top-up assistance where outcomes remain below pre-project levels (ESS5) and an external completion audit before closure	Minor
LR-03 Impacts on vulnerable PAPs (116 identified)	RAP vulnerable-persons allowances (US$100/person/month for the three-month transition); ESIA supplement	Minor

Impact code(s)	Mitigation/enhancement measures	Residual significance
	— case-managed support: named IIU social-team contact for each vulnerable PAP; assistance with documentation, banking and relocation logistics; priority scheduling so vulnerable households are never left between demolition and re-establishment; disability-appropriate reinstatement; monthly monitoring until re-established	
LR-04 Temporary access restriction and economic disruption during works (roadside vendors, diversions)	Maintained pedestrian and vehicular access to homes, shops, farms and markets at all work fronts (footbridges, ramps, signed detours); works phased through market frontages outside principal market days; mobile and itinerant vendors assisted to relocate temporarily within the same frontage; damage or losses outside the RAP census routed through the adopted GRM and settled by the Contractor under the works contract where caused by the works, or from the RAP contingency (10 per cent of compensation) where they fall within the RAP scope; utility (light-pole) relocation planned and funded before frontage works; land for ancillary facilities (quarries, plant complex, camp, mechanical site and borrow pits) occupied only once a documented voluntary agreement or MOU meeting the ESS5 requirements for voluntary transactions, or a Bank-cleared RAP addendum, is in place (IMP-26); the Suaken MOU is outstanding (Table 11.5	Minor

10.8 Socio-Economy, Employment and Labour

The Project workforce is estimated at about 100 international and about 680 national staff (2024 planning estimate, to be confirmed in the CESMP), against strong local expectations of employment recorded in the 2026 consultations. The management response secures local benefit while controlling influx and protecting labour welfare under the LMP (P175263) and the Decent Work Act (2015). SEA/SH incident risk is assessed and managed in Section 10.8 and the SEA/SH action framework; the measures here address the predictable social pressures of the workforce and of in-migration. Table 10.7 presents the measures.

Table 10.7: Mitigation of socio-economic and labour impacts

Impact code(s)	Mitigation/enhancement measures	Residual significance
SE-01 Labour influx and opportunistic in-migration	Influx management plan within the CESMP: unskilled and semi-skilled recruitment restricted to communities within 5 km of the road, through community structures with published criteria — no at-gate hiring and no recruitment fees; workforce housed in the managed camp at Zuoyou Town; because the camp lies within a town, the siting standard (at least 5 km from towns) is met only through the documented agreement with the community and the IIU required before occupancy, and the camp is also subject to the BMP A3 overlay (BMP rev.3, Table 3.2, row C-4); camp perimeter control; no informal markets or settlements permitted at camp gates; quarterly monitoring of influx indicators (settlement population estimates at camp-host and junction towns, rents and staple prices, in-migrant registrations, grievance counts) with corrective action through the GRM and county authorities	Minor
SE-02 Employment access, fair labour conditions and child-labour prevention	Local-hire commitment with a women's participation goal of at least 30%; written contracts in plain language; wages at or above the statutory minimum with itemised pay statements; 40-hour week and 10-hour daily cap; minimum working age 18 with documented verification (LMP); freedom of association; separate sanitation for men and women; camp clinic, first-aiders and ambulance; workers' GRM per LMP Section 10 operational before any worker is engaged; Supervising Engineer daily labour-conditions oversight	Minor
SE-03 Pressure on community services, utilities and cost of living	Camp self-sufficiency in water, power, sanitation and food supply so that community systems are not drawn upon; community water-point protection (WR-04); Contractor procurement of local goods and services phased to avoid price shocks; monitoring of rents and staple prices in host PACs;	Minor

Impact code(s)	Mitigation/enhancement measures	Residual significance
	community liaison officers resident on both the 10 km border leg and the 75 km Toe Town–Zwedru leg	
SE-04 Worker–community relations and social cohesion	CoC (incl. SEA/SH) signed by every worker before deployment, covering community respect, cultural norms (including Poro/Sande sensitivities), prohibition of transporting community members in project vehicles, and the biodiversity undertakings of the BMP Code of Conduct (A5; BMP rev.3, Section 5.1), with dismissal for serious breach; induction and quarterly refresher training; community awareness sessions twice yearly; grievances through the adopted three-tier GRM (24-hour acknowledgement; 5-day community-level resolution)	Minor
CI-02 Cumulative socio-economic pressure (border traffic growth, other RETRAP lots, in-migration)	Coordination through the MoA-PMU across RETRAP lots; sequencing of works with the 40 km lot to avoid simultaneous peak workforces in shared host towns; county-level monitoring of migration and service pressure; adaptive review at the annual audit	Minor

10.9 Community Health, Safety and Traffic

Community consultations in August 2026 (471 participants) placed speed control, road safety near schools and markets, dust and water management at the top of community concerns. Construction traffic through the linear roadside settlements, open excavations, water-filled pits and the eventual higher operating speeds are the principal hazards. Measures follow ESS4, the WB Good Practice Note on Road Safety and the WBG General EHS Guidelines. Table 10.8 presents the measures.

Table 10.8: Mitigation of community health, safety and traffic impacts

Impact code(s)	Mitigation/enhancement measures	Residual significance
CS-01 Construction traffic hazards on haul routes and at work fronts	Traffic Management Plan before works: 20 km/h with water sprays on haul routes through towns; covered loads; trained flagmen at work fronts, junctions and school frontages; segregated pedestrian routes past all works; driver induction, competence checks and a disciplinary code (speeding is a dismissible offence); vehicle roadworthiness and journey-	Minor

Impact code(s)	Mitigation/enhancement measures	Residual significance
	management regime; night haulage through settlements prohibited	
CS-02 Public safety at works and ancillary sites	All excavations barricaded and lit; quarries, borrow pits, plants and the camp fenced, signed and access-controlled; borrow pits dewatered, battered and restored progressively so that no water-filled pit is left accessible (drowning and vector-breeding prevention); blasting (if any) only with community notice, sirens and the 500 m exclusion zone (at Suaken, see NV-02 and Table 11.5, condition 5); contractual borrow-site restoration clause per the ESCP	Minor
CS-03 Communicable disease and pressure on health services	Worker health screening and vaccination programme; HIV/STI and hygiene awareness for workforce and host communities in partnership with county health teams; camp clinic treats the workforce so that public facilities are not burdened; standing infectious-disease preparedness (Ebola/COVID-19 protocols) per the EPRP; vector control at all standing-water sites; emergency medical transfer arrangements to Martha Tubman Memorial Hospital, Zwedru	Minor
CS-04 Operational road safety (higher speeds on the improved road)	Engineering package [E&S-in-design]: school-zone traffic calming — speed humps, rumble strips, signage, crossings and street lighting at every school and market frontage; 60 km/h urban speed limit with gateway treatments at settlement entries; 1.5 m pedestrian walkways both sides in urban sections; bus/motorcycle laybys at markets; road-safety education in the corridor schools (17 schools; six school zones with engineering treatments, RSK-24) before opening; accident monitoring in the defects-liability period with remedial engineering where clusters emerge	Minor

10.10 Cultural Heritage

The 2026 cultural-heritage register records six sacred sites (SS-001–SS-006), 12 grave sites, unmarked graves reported in five communities, and the Central Poro Bush of Gbarzon at Goyeazon; five of the six sacred sites adjoin or are crossed by the RoW, and the RAP separately identifies 15 graves for compensated relocation and ten cemeteries that the design avoids. Management follows ESS8 and the avoidance-first principle, with custodial consultation as the non-negotiable gateway to any intervention. Table 10.9 presents the measures.

Table 10.9: Mitigation of cultural-heritage impacts

Impact code(s)	Mitigation/enhancement measures	Residual significance
CU-01 Disturbance of sacred sites, groves and creeks	Avoidance as the default: sacred groves are no-go zones during the works, physically marked (BFS Priority Biodiversity Feature register; RE-GROUP (2026) SS-001–SS-006; ESS8), with no blasting or quarrying in the agreed buffer (1 km at Barteh Jam in the BFS; BMP rev.3, Table 3.1); works adjacent to the sacred watercourses (SS-003 B'hai Sacred Creek, SS-004 Kougae Sacred Creek at Nicko Town, SS-006 Toe Town Sacred Stream) planned with custodial consultation — documented agreement of the Zoes (traditional custodians) on timing, conduct and any required rites before any adjacent works; the ichthyological survey of the sacred creeks (Section 6.3.2) carried out only with the custodians' consent, by non-lethal methods and with its findings shared with them, and the crossing design and in-stream method agreed with them; no ancillary facility within or beside any sacred site; worker induction covers site-specific prohibitions; community MOUs govern each grove	Minor
CU-02 Relocation of graves and effects on cemeteries	Grave relocation only with the documented consent of the family and community, and only through the RAP process (full replacement, relocation and ritual/ceremony costs compensated; 15 graves, US$20,280); time allowed for religious ceremonies before any relocation; the ten roadside cemeteries are avoided by design [E&S-in-design]; works adjacent to cemeteries screened and scheduled	Minor

Impact code(s)	Mitigation/enhancement measures	Residual significance
	respectfully with community liaison present	
CU-03 Chance finds of unknown graves and cultural material	Chance-Find Procedure (Volume the Chance-Find Procedure; ESMF contract provision: stop work, delineate and secure the find, notify the Supervising Engineer and the responsible authorities, resume only with written permission; unmarked graves reported in five communities pre-notified to work-front supervisors as high-likelihood locations; discovered graves handled through the GRM and the chance-find procedure, with capture and compensation from the RAP contingency	Minor Annex 5) as a

10.11 Enhancement of Benefits

The Project's beneficial impacts (Chapter 9, codes IMP-B01 to IMP-B08) are substantial — restored year-round connectivity to the border and Zwedru, lower transport costs and journey times, improved access to markets, health care and education, construction employment, and the elimination of the existing dust and sediment burden. In line with ESS1, this ESIA commits the Project to active enhancement of these benefits rather than passive receipt, through three instruments: a local content plan, a women's participation programme and a community infrastructure reinstatement-plus standard. Table 10.10 sets out the enhancement commitments.

Table 10.10: Enhancement of beneficial impacts

Impact code(s)	Enhancement measures	Outcome sought
IMP-B03 Employment and skills	**Local content plan** in the CESMP: unskilled/semi-skilled hiring from communities within 5 km through transparent community-based recruitment; skills training (masonry, carpentry, plant operation, laboratory and survey assistance) with certification so that skills outlast the contract; local procurement of goods and services where quality and safety permit; quarterly public reporting of local-hire numbers by settlement and sex	At least 30 per cent women among the national workforce; share of the unskilled workforce drawn from communities within 5 km of the works, and value of locally procured goods and services, reported quarterly
IMP-B03, IMP-B05 Women's economic participation	**Women's participation programme**: the goal of at least 30 per cent women in employment backed by recruitment outreach through the	Women's share of Project employment and programme benefits achieved and reported

Impact code(s)	Enhancement measures	Outcome sought
	women's structures consulted in the six FGD communities; safe transport and separate facilities; women's participation in the Contractor's footprint-restoration work under BMP A8; support to women's market activities during works (LR-04 continuity measures); GBV-safe workplaces per the LMP Code of Conduct	
IMP-B05, IMP-B08 Community infrastructure (added enhancement)	**Reinstatement-plus**: every temporary facility, diversion and back road reinstated to at least its condition in the pre-works condition survey, and improved where the design allows; the 16 affected public structures replaced at full replacement cost under the RAP; community water points protected and, where affected, replaced with improved sources; borrow pits restored to community-agreed safe after-uses; street lighting at school and market frontages incorporated into the design response to the women's FGD requests	Net improvement in community assets along the corridor
IMP-B01, IMP-B02, IMP-B04, IMP-B05, IMP-B06 Connectivity, markets and services	Works programming that keeps the road open throughout construction; early completion of the market-town frontages; road-safety education so that benefits are not offset by accidents (CS-04)	Benefits realised progressively during construction, not only at completion
IMP-B07 Environmental co-benefits	Sealing eliminates the chronic dust and sediment sources [E&S-in-design]; progressive restoration of the surfaces opened by the works (BMP A8)	Dust and sediment burden reduced; disturbed surfaces restored

10.12 Residual Impact Summary

Table 10.11 consolidates the pre-mitigation and residual significance of the impacts in the Chapter 9 register. Forty-five of the register's forty-six sequential impacts (IMP-01–IMP-46) are consolidated into the forty-three receptor-prefixed management codes below, each showing the Chapter 9 impacts it consolidates; where an entry consolidates more than one Chapter 9 impact, the highest pre-mitigation significance governs the entry, and three codes (AQ-03, CS-02 and CU-03) are management codes without a Chapter 9 impact of their own. The remaining impact, the Minor periodic-maintenance impact IMP-43, is managed through the operation-phase provisions of the ESMP without a separate code (Section 9.7). With the mitigation set out in this chapter, every impact assessed as Major before mitigation is

reduced to Moderate or Minor, and most to Minor or Negligible. Eight residual impacts remain Moderate, all of them biodiversity-related. Six are held at Moderate because the BFS and the annexed BMP (rev.3) rate them Medium on their own scale after the works controls, on a precautionary basis and on the six conditions A1, A2, A3, A4, A5 and A8 (BFS, 2026, Table 10.2; BMP rev.3, Chapters 6–8): disturbance of the Chimpanzee Sensitivity Zone (BD-02) and of the pangolin Critical Habitat polygons (BD-03), which carry the Medium residual on Criterion 1 through the defects-liability period; workforce and induced-access hunting (BD-07), for which the BFS rates the workforce hunting increment Medium after A5; barrier effects and road mortality at the documented movement hotspots (BD-05) and degradation of aquatic and riparian habitat at the live watercourse crossings other than the Towah swamp (BD-10), which the BFS rates Medium until the A6 and A7 structures are built to drawing and which fall to Minor once those structures are certified; and the loss of threatened and protected flora (BD-04), which the BFS rates Medium after A4 because stems inside the approved right-of-way may still be lost under the agreed protocol, with five-for-one replacement (BFS, 2026, Version 3, Sections 9.8.4 and 10.2.6). Two — induced land-use change (BD-08) and cumulative forest and habitat loss (CI-01) — are driven principally by exogenous forces, the cocoa economy and regional in-migration, that road improvement accelerates but does not create. They are accepted as residual on the following basis: during construction and the defects-liability period the Project limits its own contribution through the BMP siting freeze (A3), the workforce Code of Conduct (A5), the closure and reinstatement of temporary accesses (A8) and the influx and encroachment controls (SE-01, LR-01); BMP (Section 1.2) and the BFS treat post-paving conversion and hunting as landscape pressures outside the works contract; and the longer-term response rests with the Government of Liberia — MPW management of the right-of-way against re-occupation, FDA and EPA enforcement of the forestry and wildlife laws, and county land-use coordination — for which Section 11.9 makes specific recommendations to the EPA and the IIU. No residual impact is Major, and the beneficial impacts are of Moderate to Major significance after enhancement.

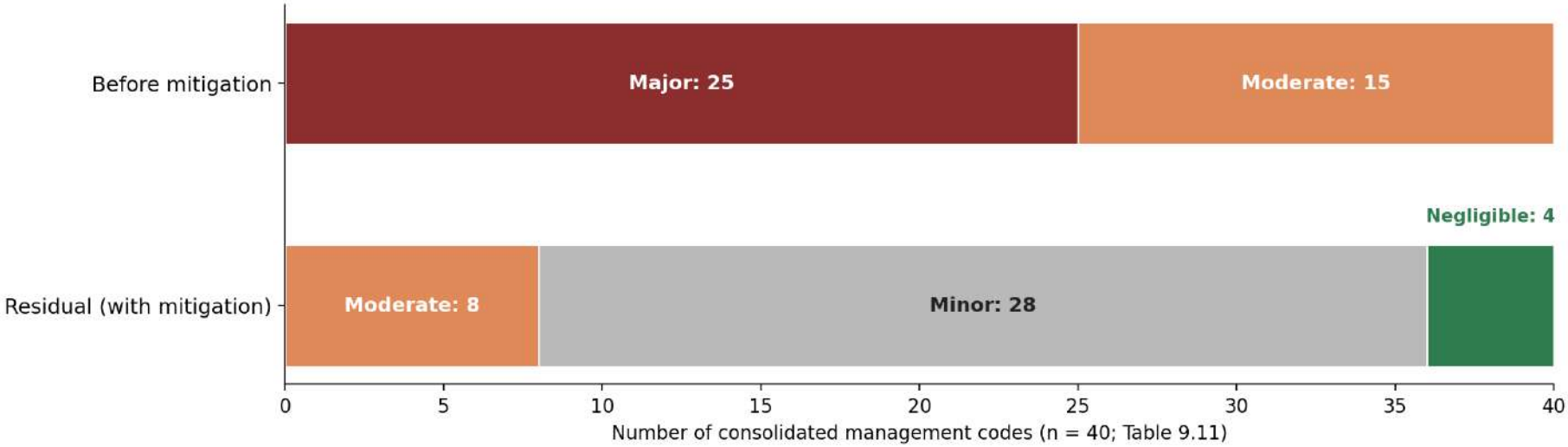
Table 10.11: Residual impact significance summary (consolidated management codes)

Code	Impact (abridged)	Pre-mitigation	Residual
SG-01	Erosion and sediment mobilisation (IMP-12)	Major	Minor
SG-02	Borrow-pit and quarry land disturbance (IMP-13; IMP-34 landscape)	Major	Minor
SG-03	Topsoil loss and degradation (IMP-14)	Moderate	Minor
SG-04	Soil contamination (fuels, hazmat, waste) (IMP-10, part)	Moderate	Minor
SG-05	Diversion and access-track disturbance (IMP-26, part)	Moderate	Negligible
WR-01	Sedimentation of watercourses and wetlands (IMP-08; IMP-45)	Major	Minor
WR-02	Water contamination (fuels, bitumen, concrete) (IMP-10)	Moderate	Minor
WR-03	Camp/site wastewater discharges (IMP-10, part)	Moderate	Negligible
WR-04	Abstraction pressure on community sources and sediment ingress at wells (IMP-09; IMP-11; IMP-31, part)	Major	Minor
WR-05	Drainage and hydrological alteration (IMP-22, hydrology part)	Moderate	Minor
AQ-01	Construction dust at communities and crops (IMP-01)	Major	Minor
AQ-02	Combustion and plant emissions (IMP-02; IMP-03; IMP-37, part)	Moderate	Minor
AQ-03	Greenhouse-gas emissions (management code; estimate in Section 9.8)	n/a (not a Chapter 9 impact)	Minor
NV-01	Construction and plant noise (IMP-04; IMP-05; IMP-06)	Major	Minor
NV-02	Vibration effects on structures (IMP-07)	Moderate	Negligible
NV-03	Operational traffic noise (IMP-37)	Moderate	Minor

Code	Impact (abridged)	Pre-mitigation	Residual
BD-01	Habitat loss in RoW and ancillary footprints (IMP-15; IMP-16)	Major	Minor
BD-02	Chimpanzee Sensitivity Zone disturbance (km 18–20) (IMP-17, CSZ part; IMP-19, part)	Major	Moderate
BD-03	Pangolin Critical Habitat impacts (km 38–50) (IMP-17, pangolin part)	Major	Moderate
BD-04	Threatened and protected flora loss (IMP-15, flora part)	Major	Moderate
BD-05	Barrier effects and road mortality (IMP-18; IMP-42)	Major	Moderate (Minor once the A6 structures are certified)
BD-06	Sensory disturbance to fauna (IMP-19)	Major	Minor
BD-07	Workforce and induced-access hunting and wildlife trade (IMP-20; IMP-40)	Major	Moderate
BD-08	Induced land-use change (cocoa, settlement) (IMP-39; IMP-41, part)	Major	Moderate
BD-09	Invasive species spread (IMP-21)	Moderate	Negligible
BD-10	Aquatic and riparian habitat degradation (IMP-22)	Major	Moderate (Minor once the A6 and A7 structures are certified)
CI-01	Cumulative forest and habitat loss (IMP-44)	Major	Moderate
CI-02	Cumulative socio-economic pressure (IMP-46)	Moderate	Minor
LR-01	Physical displacement (structures, graves) (IMP-23)	Major	Minor
LR-02	Economic displacement (businesses, tenants, farms) (IMP-23; IMP-25)	Major	Minor
LR-03	Impacts on vulnerable PAPs (IMP-23, part)	Major	Minor

Code	Impact (abridged)	Pre-mitigation	Residual
LR-04	Temporary access and trading disruption; community severance during works; ancillary land occupation (IMP-24; IMP-26; IMP-30; IMP-31, part)	Major	Minor
SE-01	Labour influx and in-migration (IMP-27; IMP-41, part)	Moderate	Minor
SE-02	Employment access and labour conditions (IMP-28, part)	Moderate	Minor
SE-03	Pressure on services and cost of living (IMP-27, part)	Moderate	Minor
SE-04	Worker–community relations (IMP-28)	Moderate	Minor
CS-01	Construction traffic hazards; traffic delays and diversions (IMP-35; IMP-36)	Major	Minor
CS-02	Public safety at works and ancillary sites (management code; unplanned events in Section 10.8)	n/a (Section 10.8)	Minor
CS-03	Communicable disease and health pressure (IMP-29)	Major	Minor
CS-04	Operational road safety (IMP-38)	Major	Minor
CU-01	Sacred sites and groves (IMP-32)	Major	Minor
CU-02	Graves and cemeteries (IMP-33)	Major	Minor
CU-03	Chance finds (management code; RSK-33 in Section 10.8)	n/a (Section 10.8)	Minor
IMP-B01–IMP-B08	Beneficial impacts (connectivity, travel time and cost, employment, cocoa value chain, access to services, border trade, dust reduction, road safety)	Moderate–Major (beneficial)	Enhanced per Table 10.10

Figure 10.4 summarises the effect of the mitigation programme on the significance profile of the consolidated register, counted on the forty management codes of Table 10.11 that carry a Chapter 9 impact. Before mitigation, twenty-five codes are Major and fifteen Moderate (the Major ratings number twenty-three in the Chapter 9 register and twenty-five at the consolidated level, where a code inherits the highest rating of the impacts it consolidates). After mitigation the Major ratings are eliminated and the residual profile is eight Moderate, twenty-eight Minor and four Negligible; the eight Moderate codes (BD-02, BD-03, BD-04, BD-05, BD-07, BD-08, BD-10 and CI-01) are all biodiversity-related and remain Moderate on the basis stated above.



Beneficial impacts (IMP-B01–IMP-B08) and the three management codes without a Chapter 8 impact (AQ-03, CS-02, CU-03) are excluded. The eight Moderate residuals are BD-02, BD-03, BD-04, BD-05, BD-07, BD-08, BD-10 and CI-01 (Section 9.12).

Figure 10.4: Effect of the mitigation programme on impact significance (RE-GROUP, 2026).

The CS-04 residual of Minor relies on the school-zone engineering package embedded in the design and carried as a binding commitment in the ESMP commitments register; without that package the residual would be Moderate. The related risk of individual traffic accidents (RSK-24) is assessed in Section 10.8 and retained High under a documented ALARP justification.

10.13 BFS Integration Table

Gap-analysis priority P1 requires the BFS to inform Project design and assessment demonstrably, not to sit in an annex. Table 10.12 shows, finding by finding, where each material BFS output has been carried into this ESIA and its companion instruments, so that reviewers can verify integration at a glance.

Table 10.12: BFS Integration Table — finding, implication and where addressed

BFS finding	Design/assessment implication	Where addressed
ESS6 Critical Habitat TRIGGERED under Criterion 1 — White-bellied Pangolin (EN) as the primary trigger; Western Chimpanzee (CR) treated precautionarily on a single record; Criteria 2–5 not triggered (BFS, 2026)	CH response confined to detailed design, mobilisation, construction and defects liability: avoid, minimise and restore the works footprint (BMP actions A1–A10); no offset or net-gain step; six Priority Biodiversity Features (14.2 km²) managed by avoidance or method	Chapters 6–8 (Section 6.10); Chapter 9 (Section 9.4.5); Section 10.6; BMP rev.3 (Chapters 2–4)
Chimpanzee Sensitivity Zone at km 18–20 (1 km kernel, 3.14 km²; no-go core of 500 m radius, 0.78 km²), superseding the 2024 ESIA km 64–72 zone	A1 demarcation of the no-go core before clearance in S3; A2 08:00–16:00, no night work or blasting; A3 no new ancillary site in the CSZ; A9 20 km/h and node signs; A10 community notice; front suspended on a verified sighting within 50 m; breaches under the works-contract penalty schedule and the CESMP Biodiversity Compliance Plan	Chapter 3 (design); Chapter 4 (alternatives); Section 9.6 (BD-02); CESMP; BMP
White-bellied Pangolin clusters km 38–50: CH-West 8.7 km² and CH-East 10.8 km² (stations T16, T18, T27, T30)	A3 no new quarry, pit, crusher, camp or laydown in either polygon (camp proposed at km 45 rejected); A2 hours and no blasting while the front is in S6; A4 walkover and RoW pegging; A5 Code of Conduct and camp inspection; weekly checks while the front is in S6	Chapter 3 (Table 3.6); Section 4.5; Section 9.6 (BD-03); BMP rev.3 (Tables 3.1 and 3.2)
Eleven construction threats C1–C11 scored before and after controls (BFS, 2026, Table 9.2); residual (BFS Tables 10.2 and 10.4): Criterion 1 Medium, no feature High or Severe through defects liability, provided six conditions hold (A1, A2, A3, A4, A5, A8)	Residual statements in Table 10.11 (BMP Medium carried as Moderate); the six conditions carried into Chapter 12; threat–risk mapping in Section 9.8	Chapter 9; Sections 10.6 and 9.12; Section 10.8; Section 11.9; BMP rev.3 (Chapters 4 and 6)
BMP actions A1–A10 (no-go core demarcation; hours; siting freeze; walkover and Class A protocol; Code of Conduct; evidence-led crossings;	Contract obligations written into the works specification and the CESMP; supervision checks and stop-work triggers (BMP Tables 7.1 and 7.2)	Chapter 3; Section 10.6; Table 10.5; CESMP; BMP rev.3 (Chapters 3–5)

BFS finding	Design/assessment implication	Where addressed
Towah span or large box; footprint restoration; 20 km/h and node signs; community notice)		
Footprint restoration (A8) of the surfaces opened by the works	At least 70 per cent cover at the end of the first rainy season after planting and at least 60 per cent survival; five-for-one replanting at the Contractor's cost; taking-over withheld until met; Class A stems replaced five-for-one (A4)	Section 10.6; Table 10.5; BMP rev.3 (Section 4.4); ESMP
Supervision during the works (BFS, 2026, Section 1.8 a	Weekly Supervising Engineer checks while a nd Appendices M–N) fr (and each in-stream week at Towah), monthly elsewhere; stop-work triggers in BMP Table 7.2; serious incidents reported to the Employer within 24 hours and to the World Bank and the EPA within 48 hours	Chapter 11; ESMP; BMP rev.3 (Chapters 7 and ont is in S3 or S6 10)
Roles during design, construction and defects liability (BMP rev.3, Table 9.1)	Employer (IIU/MPW) holds the BMP, refuses non-compliant ancillary sites and withholds taking-over until A8 is met; Contractor delivers A1–A10; Supervising Engineer verifies and issues same-day instructions; FDA and EPA receive referrals and notices; communities receive A10 notice and use the GRM	Chapter 11 (Table 11.1); ESMP; BMP rev.3
Cost channels for the works controls (BMP rev.3, Chapter 10)	A6 and A7 structures estimated by the Contractor's design engineer within the works contract; Contractor obligations in the CESMP and the works contract; supervision checks in the ESMP supervision budget; corrective work from the works-contract contingency; no activity-level biodiversity budget	Chapter 11 (Section 11.5, Table 11.3); BMP rev.3; works contract
Ancillary-site siting freeze (A3) and overlay (BMP, Table 3.2): no new site inside the CSZ or a pangolin polygon; no facility in sacred groves or	Screening of the canonical ancillary register (16 borrow pits, 2 quarries, plant complex, camp) with indicative GIS chainage (Table 3.6); camp proposed at km 45 rejected; BP2, BP3, RC2, Quarry 2, BP6, BP8, BP9, BP11, BP12, the km 12	Chapter 3; Chapter 4; Sections 10.2 and 9.6; CESMP; Section 11.9 (conditions)

BFS finding	Design/assessment implication	Where addressed
the Picathartes buffer. Caution should especially be taken at kilometer 19.	camp (BMP rev.3, Table 3.2, row C-1) and the Zuoyou camp need a signed overlay, plus the A4 walkover for BP2 and BP3	
Worker conduct rules: no hunting, bushmeat, wildlife pets; induction; dismissal sanction	Code of Conduct clauses, camp inspections and contractual sanctions	Sections 10.6 (A5) and 9.8; CESMP; LMP flow-down
Six conditions that hold the residual conclusion (BMP rev.3, Table 6.3): no-go core demarcated (A1); no new ancillary site in the CSZ or a polygon (A3); hours and no night work or blasting (A2); Class A walkover and RoW pegs (A4); Code of Conduct and camp inspection (A5); restoration standard met before certification (A8)	Gates G1–G6 before a front enters S3 or S6 (BMP rev.3, Table 8.2); conditions precedent in Table 11.5	Section 11.9 (Table 12.2); ESCP; CESMP

10.14 Gap-Closure Table

The RE-GROUP Gap Analysis Report (D1, 1 August 2026) defined ten priority gaps (P1–P10) that this ESIA must demonstrably close. Table 10.13 records the closure of each priority and the location of the evidence.

Table 10.13: Closure of the ten gap-analysis priorities (P1–P10)

Priority	**How this ESIA** Cross- closes it**	reference**
P1 Biodiversity/ESS6 — integrate the BFS (Critical Habitat, relocated CSZ km 18–20, pangolin clusters km 38–50, BMP, bound as Appendix T; no Net Gain C strategy and no standalone monitoring plan under this update	BFS (2026) adopted as the primary biodiversity evidence base; the CH determination and the SZ and pangolin-polygon controls carried into design, assessment and mitigation (Chapters 3, 4, 6, 8 and 9); BMP rev.3 (November 2026) annexed as Appendix T, confining biodiversity management to design, mobilisation, construction and defects liability (actions A1–A10).	Chapters 6–8; Chapter 9; Sections 10.6 and 9.13; Chapter 11; BMP rev.3 (Appendix T)
P2 Ancillary facilities and permits — site-specific assessment for camp, quarry, crusher/asphalt plant, batch plant and borrow pits	Canonical ancillary register (16 borrow pits BP1–BP17, two quarries, Suaken plant complex, ; Zuoyou camp) assessed with siting standards and the BMP action A3 siting rule; five EPA permit applications supported; screening of BP2, BP3, RC2 and the sites flagged in Table 3. carried as conditions (Table 11.5, items 4 and 5)	Chapter 3 (Section 3.8, Tables 3.4 to 3.6); Section 4.5 Sections 9.2 and 9.6; CESMP; Section 11.9
P3 Baseline refresh — current, seasonally representative physical, biological and socio-economic baselines	August 2026 field campaign: 20 air, 20 noise, 5 groundwater, 3 surface-water and 12 soil stations; BFS two-season biodiversity dataset (the 2026 physical baseline is a single wet-season campaign, 3–13 August 2026; residual gaps — AQ-07/AQ-12 results, the PM2.5 query, the Cr/Mn/Hg re-tests — are carried as conditions); 2026 socio-economic and cultural-heritage refresh	Appendix F; Chapters 6–8; Section 11.9
P4 Land acquisition and resettlement (ESS5) — reconcile with the RAP	RAP adopted as authoritative (860 PAPs; US$3,658,686.97; cut-off 15 December 2024); full compensation before civil works in each affected section carried as a hard condition; livelihood-restoration monitoring and vulnerable-PAP measures added; ancillary-site land access via voluntary agreement/MOU or RAP addendum	Section 10.7; Chapter 8; Section 11.9; Volume the RAP (2025)

Priority	**How this ESIA** Cross- closes it**	reference**
P5 Labour and influx (ESS2) — workforce management, camps, workers' GRM, code of conduct	LMP applied to all road workers; influx management plan; camp standards (at least 5 km from towns unless agreed with the community and the IIU — an agreement is required for the Zuoyou Town camp; self-sufficiency); workers' GRM before engagement; 18-year minimum age with verification; Code of Conduct with dismissal sanctions	Section 10.8; Chapter 10; CESMP; LMP
P6 SEA/SH and community health and safety (ESS4)	SEA/SH prevention and response framework with survivor-centred confidential channel, notification by the Contractor to the Employer (IIU/MPW) within 24 hours, and by the Employer to the World Bank within 48 hours (Section 5.6); road-safety and community-health packages; security-personnel screening	Section 10.9; Chapter 10; Section 5.6 (GRM); ESMP
P7 Pollution and resource use (ESS3) — quantified emissions, noise, water, waste, hazardous materials, GHG	Quantified source controls and standards for dust, plant emissions, noise/vibration, abstraction, waste and hazardous materials; monitoring network defined; GHG estimate and climate screening presented	Sections 10.3–9.5; Chapter 9; Section 10.8; Chapter 11
P8 Cultural heritage (ESS8) — corridor-wide screening and chance finds	2026 register (6 sacred sites, 12 grave sites, unmarked graves in 5 communities) integrated; avoidance-first management with custodial consultation; consent-based grave relocation via the RAP; compliant Chance-Find Procedure annexed	Section 10.10; Chapter 6; Appendix L
P9 Stakeholder engagement (ESS10) — refreshed mapping, consultation, disclosure, GRM	2026 programme: 17 NOI postings; 14 community meetings (471 participants), 2 government engagements, 5 KIIs, 6 women's FGDs; disclosure plan; the established RETRAP GRM adopted, not replaced, and supplemented with the SEA/SH channel	Chapter 5; SEP (P175263)

Priority	**How this ESIA** Cross- closes it**	reference**
P10 Climate and alternatives — climate risk screening and strengthened alternatives	Climate-change risk and resilience screening of the works and the asset (flood, erosion, heat) with the GHG estimate; alternatives analysis extended to ancillary siting, demonstrating that no new ancillary site is placed in the CSZ (km 18–20) or the pangolin polygons (km 38–50) (BMP A3; camp proposed at km 45 rejected)	Chapter 4; Section 10.8

11 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This chapter presents the Environmental and Social Management Plan (ESMP) for the Project: the institutional arrangements and responsibilities, the architecture of management plans that the design-and-build Contractor must prepare and operate under its CESMP, the monitoring programme, the indicative budget, capacity building, and the non-compliance and corrective-action regime. It updates the 2024 ESMP (Earthtime, 2024, Chapter 11) to the design-and-build contract structure, embeds the Biodiversity Management Plan's works controls (Appendix T), and reflects the SECRAMP lessons of Appendix W — operational grievance and SEA/SH channels, enforced OHS, verified ancillary-site restoration and functioning supervision — as binding features rather than aspirations.

11.1 Purpose and Relationship to the Standalone ESMP

The standalone ESMP referred to throughout this chapter is the Standalone Environmental and Social Management Plan for the Project (Final, November 2026), issued for MPW-IIU and disclosed together with this ESIA as part of the submission package. It carries every Chapter 10 measure and every BMP condition with an owner, timing, monitoring indicator and cost, and maps each costed measure to a Bill of Quantities item or provisional sum of the works contract. The measure-by-measure completeness of that mapping against Chapter 10 and the BMP conditions is verified at Annex E of the standalone ESMP, which accompanies this submission.

The 2024 ESIA carried an integrated, "one-stop" ESMP organised in 19 management areas (Earthtime, 2024, Ch. 11): general environmental protection; environmental health and safety; occupational health and safety; community impacts; traffic; cultural heritage; GBV/SEA/SH; trafficking in persons; hazardous materials (including spill contingency and emergency response); construction materials; waste; soil erosion and stability; water resources; air emissions; noise and vibration; biodiversity; climate change; employment and grievance management; and worker behaviour. This Updated ESIA carries all 19 areas forward — updated to the 2026 evidence base and the Critical Habitat determination — but restructures delivery into a set of standalone, mutually referenced instruments, reflecting the advanced Design-and-Build stage of the Project: a standalone ESMP (the Employer's governing plan), a CESMP (the Contractor's site-specific operationalisation), and the BMP; annexed to this Updated ESIA as Appendix T), which sets out the ESS6 Critical Habitat response from detailed design to the end of the defects-liability period. The standalone ESMP consolidates every commitment in Chapter 10, the adopted GRM described in Section 5.6, the risk controls of Section 10.8 and the monitoring programme summarised below, in thematic management tables with measure-by-measure ownership, timing, standards, indicators, verification and cost. This chapter provides the headline of that plan so that this report remains self-contained for review purposes; readers requiring implementation detail are directed to the standalone ESMP, the CESMP and the BMP (Appendix T).

11.2 Institutional Arrangements

Implementation rests on the institutional architecture established for RETRAP (P175263) and its Additional Financing (P181083): the Ministry of Agriculture PMU leads the project; the IIU of the MPW is the Employer and implements the civil works; the EPA regulates; and the ICCO/CET Joint Venture delivers the works under Design-and-Build conditions incorporating the ESHS specifications. The ESCP requires one Environmental Specialist and one Social Development Specialist in each of the PMU and the IIU, designated County Environmental and Social Focal Points, and an environmental and social management information and reporting system (ESMIS). The Contractor must field a minimum ESHS organisation comprising an ESHS manager, an environmental officer, a social officer/community liaison officer, an OHS officer and a SEA/SH focal point, all mobilised before works. Independent oversight is provided by the Supervising Engineer (daily supervision, including labour conditions), whose duties include the BMP supervision checks — weekly while a front is in S3 (km 18–20) or S6 (km 38–50), monthly elsewhere — and same-day stop-work instructions on the BMP triggers (BMP rev.3, Tables 7.1 and 7.2); SCNL and WCF have no implementation role, apart from the WCF induction materials used for crews deployed at km 18–20. The implementation and supervision organogram is presented in the standalone ESMP (Figure 3.1). Table 11.1 summarises the roles.

Table 11.1: Institutional roles and responsibilities for ESMP implementation

Entity	Role in ESMP implementation	Key obligations and cadence
EPA of Liberia	Regulator; issues the five environmental permits and supervises compliance under the EPML (2002/2003) and the ESIA Procedural Guidelines (2022)	Permit conditions; review of quarterly compliance reports; site inspections through county environmental inspectors; receipt of serious environmental and biodiversity incident notices within 48 hours (BMP rev.3, Section 5.3.1); enforcement powers including restoration orders
IIU/MPW (Employer)	Overall implementation of the road works and of this ESMP; contract administration; land/RAP delivery	Environmental Specialist and Social Development Specialist plus support staff; approval of the CESMP and method statements; RAP completion before works; quarterly reporting to the EPA and the Bank; grievance oversight; holds BMP puts its Table 3.1 in the works specification, refuses any ancillary site that fails A3 and withholds taking-over until A8 is met (BMP rev.3, Table 8.1); accepts gates G1, G3, G5 and G6 (G1 and G6 with the Supervising Engineer)
MoA-PMU (RETRAP)	Project-level coordination, fiduciary and safeguards assurance across RETRAP; SEP implementation	Environmental Specialist and Social Development Specialist (confidential SEA/SH handler); consolidation of quarterly ESCP reporting; training programme; ESMIS
Contractor (ICCO/CET JV)	Delivery of all works and ancillary facilities in conformity with the ESMP/CESMP/BMP and contract ESHS specifications	Minimum ESHS staffing (ESHS manager; environmental officer; social/CLO; OHS officer; SEA/SH focal point); CESMP within 8 weeks of mobilisation; delivery of BMP actions A1–A10 through the CESMP Biodiversity Compliance Plan (the CESMP reproduces BMP Tables 3.1, 7.1 and 7.2 before a front enters S3 or S6); A10 notices; design engineer's drawings and estimates for A6 crossings and the A7 Towah structure within the works contract; monthly E&S reports; Code of

Entity	Role in ESMP implementation	Key obligations and cadence
		Conduct administration; workers' GRM; incident notification within 24 hours
Supervising Engineer	Independent day-to-day supervision of the Contractor, including E&S and labour conditions	Own E&S/OHS specialists; review of the Contractor's reports; BMP checks (weekly while a front is in S3 or S6 and in each in-stream week at Towah, monthly at camps and elsewhere, and A8 restoration inspections, with no section certified that fails A8) and same-day stop-work instructions on BMP triggers; acceptance of gates G2 and G4; monthly biodiversity verification form (BMP Annex B); requests for information (RFIs) and NCRs with corrective-action instructions; monthly monitoring reports to the IIU
County E&S Focal Points and county authorities	County-level screening support, compliance liaison, coordination with district and chiefdom structures	Designated per the ESCP; participation in inspections, consultations and grievance escalation
Grievance Redress Committees (8 community GRCs; County GRC; Project GRC at IIU/MPW)	Operation of the adopted RETRAP grievance mechanism for communities and PAPs	24-hour written acknowledgement; resolution within 5 days (community), 15 days (county), 15 days (project, final administrative tier); registers at each tier; monthly grievance reporting
FDA, Liberia Land Authority (LLA), MME and line agencies	Statutory approvals and technical oversight (tree felling, land records, materials/minerals, water)	FDA co-signature of tree marking and felling permits, the Class A stem protocol (A4) and receipt of wildlife-law referrals; MME materials and blasting permits; water-abstraction licensing

11.3 The Management-Plan Architecture

The Project is managed through a defined family of instruments, each with a clear owner and status. The Updated ESIA is the assessment umbrella; the standalone ESMP is the Employer's governing management plan; the CESMP operationalises it at site level; the BMP carries the ESS6 Critical Habitat response; and the RAP, LMP and SEP remain the authoritative project-level instruments for resettlement, labour and engagement respectively. Table 11.2 sets out the architecture, ownership and status or timing of each instrument.

Table 11.2: Management-plan architecture — instrument, owner and status/timing

Instrument	Owner	Status/timing
Updated ESIA (this report, Volumes I–II)	IIU/MPW (prepared by RE-GROUP for the ICCO/CET JV)	Final for Submission, October 2026 (incorporating BFS and BMP); to be disclosed before finalisation of the road design and before disbursements for road construction (ESCP 1.2)
Standalone ESMP	IIU/MPW (prepared by RE-GROUP)	Issued with this package; governs all mitigation, monitoring and reporting; basis of the ESHS contract specifications
CESMP (Contractor's ESMP, incorporating the OHS Plan, Waste Management Plan, Traffic Management Plan, Emergency Preparedness and Response Plan (EPRP), Biodiversity Compliance Plan (BMP A1–A10, Tables 3.1, 7.1 and 7.2, and the works-contract penalty schedule) and site-specific plans for each ancillary facility)	Contractor (ICCO/CET JV), approved by the IIU with the Supervising Engineer	To be finalised **within 8 weeks of mobilisation per the contract**; no works activity may proceed ahead of its approved relevant provisions
BMP (November 2026; annexed to this ESIA as contract Appendix T): ten the Sup construction-phase actions A1–A10, supervision checks (Table 5.1) and stop-work triggers (Table 5.2)	IIU/MPW (Employer); Contractor obligations in the CESMP and works ; verified by applies ervising design Engineer	Disclosed with this Updated ESIA (ESCP 6.1; BMP Section 9.8); from detailed to the end of the defects-liability period; gates G1–G6 before any front enters S3 or S6 (Table 11.5, item 2)
RAP (Final Report V2, 23 July 2025; P181083)	IIU/MPW with the MoA-PMU	Approved instrument; RAP designated account funded no later than six months before the start of civil works (ESCP); full compensation payment and Bank-cleared completion report before civil works in the affected sections; site handover at least 3 months after compensation; RAP addendum required for any

Instrument	Owner	Status/timing
		contractor-procured ancillary land
LMP (P175263)	MoA-PMU and IIU/MPW; flowed down to the Contractor	In force project-wide; applies to all direct, contracted and primary-supply workers on the 85 km road; workers' GRM operational before workers are engaged
SEP (P175263, as updated)	MoA-PMU with IIU/MPW	In force; 2026 consultation and disclosure programme implemented under it; continues through construction, including the adopted GRM

11.4 Monitoring Overview

Monitoring operates in two streams — compliance monitoring (continuous verification that the measures of Chapter 10 are implemented as specified) and impact-detection monitoring (periodic measurement of environmental and social conditions against the 2026 baseline and applicable standards). The programme, mapped station-by-station in the standalone ESMP, comprises:

- **Air quality:** two continuous dust monitors (quarry/crusher complex and asphalt plant) plus monthly handheld spot measurements at six or more locations including town frontages, referenced to the 20-station 2026 baseline (AQ-01–20) and Liberian EPA/WHO values.
- **Noise:** monthly attended measurements at six or more sensitive receptors (co-located with the 2026 NS-01–20 network), plus verification measurements at any new high-impact location before and during works.
- **Surface water:** monthly in-situ profiling at fifteen or more crossings with continuous probes (two in the ESMP equipment schedule; four if the budget option of Table 11.3 is taken) downstream of the quarry/plant complex and principal bridge sites; six-monthly laboratory suites; construction-phase turbidity criterion: downstream turbidity at most twice the upstream value.
- **Groundwater:** monthly in-situ monitoring of camp supply wells and a rotating set of community handpumps (referenced to GW-01–05); six-monthly laboratory analysis of project-used drinking wells.
- **Soils and land:** weekly visual inspections of all active sites, erosion controls and reinstatement; six-monthly laboratory sampling at hazardous-materials storage and plant sites.
- **Biodiversity:** compliance supervision of BMP actions A1–A10 by the Supervising Engineer against the BMP checklist (BMP rev.3, Table 7.1). Checks are weekly while a front is in S3 (km 18–20) or S6 (km 38–50) and in each week of in-stream work at the Towah swamp, with weekly camp checks and A8 restoration inspections at the end of the first rainy season after planting and before section certification. Stop-work triggers follow BMP Table 7.2. The Contractor reports monthly (biodiversity pages of the CESMP report), the Supervising Engineer verifies (BMP Annex B), and the IIU includes a biodiversity section in its quarterly report to the World Bank and the EPA. No camera-trap grid, population monitoring or indicator dashboard is maintained, and biodiversity supervision ends with the defects-liability period.
- **Social:** quarterly monitoring of grievances, labour and working conditions, influx indicators, community health and safety, RAP livelihood-restoration outcomes and SEA/SH process indicators (training coverage, Code of Conduct signature, referral functionality). Resettlement outcomes are additionally verified by external monitoring twice yearly during active resettlement

and annually thereafter, concluding with the independent RAP completion audit required under ESS5.

- **Weather:** a continuous automatic weather station at the camp/plant complex provides the rainfall record against which erosion-control performance and works sequencing are managed.

Reporting follows a fixed cadence. The Contractor reports monthly (E&S, OHS, labour and grievance performance) through the Supervising Engineer, who reports monthly to the IIU. The IIU reports quarterly to the EPA against the permit conditions and quarterly to the World Bank against the ESCP (including grievance and RAP monitoring), supplemented by the RETRAP programme-level six-monthly ESF progress report (ESMF/ESCP/SEP) and by monthly GRM statistics with six-monthly consolidated summaries under the SEP. An annual independent integrated environmental, social and health-and-safety audit is undertaken and submitted to the EPA and the Bank. Any serious incident — including any fatality, serious injury or SEA/SH incident — is notified by the Contractor to the IIU (Employer) within 24 hours and by the IIU to the World Bank within 48 hours, and, for serious environmental and biodiversity incidents, to the EPA within 48 hours, followed by a detailed report with root-cause analysis within 10 working days. Monitoring results feed the corrective-action provisions of Section 11.7 and the annual review of the monitoring programme itself, which is formally revised after the first full year of works (once both seasons are covered) and whenever the design, the construction methods, the organisational structure or the monitored conditions change materially. All monitoring stations are georeferenced (UTM Zone 29N) and mapped in the standalone ESMP and the Map Atlas so that results remain comparable with the 2026 baseline network.

11.5 Indicative Budget

Table 11.3 presents the indicative environmental and social budget, with the provenance of each figure labelled. The ESMP implementation figures derive from the 2024 ESIA action-plan costing (Earthtime, 2024), restated for this final issue: the RAP preparation and BFS allocations of the 2024 costing (about US$950,000) have been delivered and are no longer carried; the plan-preparation items are Contractor obligations priced in the works contract; and unit rates for equipment, reports and audits are given as current Liberian-market ranges to be confirmed by quotation in the CESMP costing. The Contractor’s biodiversity actions are costed action by action in BMP Table 9.1 (Appendix T) — about US$224,000 at 2026 prices for Actions A1 to A10, plus a provisional sum of US$80,000 for the evidence-led A6 structures; the A7 structure at the Towah swamp is priced in the drainage and structures bill — and those amounts are carried in the standalone ESMP budget (ESMP Section 8: Table 8.1, line 7; Table 8.3), each with its Bill of Quantities item or ESMP budget line and the works-contract priced activity under which it is paid. Biodiversity structures (BMP A6 crossings and the A7 Towah span or large box) are designed and estimated by the Contractor's design engineer within the works contract; the Contractor's other BMP obligations (demarcation, signage, walkovers, induction, camp inspection and footprint restoration) are priced in the CESMP and works contract; the Supervising Engineer's BMP checks are part of the ESMP supervision budget; and corrective work under the BMP triggers is met from the works-contract contingency (BMP rev.3, Section 10.1 and Table 9.1). The resettlement budget is the approved RAP total (RAP, 2025). General mitigation embedded in construction methods (dust suppression, sediment control, reinstatement) is costed within the works contract rates and is not double-counted here.

Table 11.3: Indicative environmental and social budget (provenance labelled)

Budget component	Amount (US$)	Provenance and notes
ESMP implementation — one-off items (Employer systems and monitoring equipment)	About 150,000–250,000	Replaces the 2024 one-off line carried in Rev 1 (about 1,342,500 on the 2024 basis; Earthtime, 2024, E&S Action Plan, Table 11-4). The 2024 allocations for RAP preparation (300,000) and the BFS (650,000) have been delivered and are not carried; the preparation of the Contractor's plans (ESMS, CESMP, quarry ESMP, EPRP, OHS, waste, traffic, blasting and restoration plans, about 442,500 on the 2024 basis) is a Contractor obligation priced in the works contract. Carried here: the IIU environmental and social management information system and training materials (about 40,000–60,000) and the monitoring equipment of Section 11.4 — two continuous dust monitors, two to four water-quality probes, handheld air, noise and water instruments and an automatic weather station — at a current indicative range of about 110,000–190,000 including freight, duty, installation and first-year calibration (2024 schedule 192,500), to be confirmed by quotation
ESMP implementation — recurring monitoring and reporting	About 80,000–150,000 per year	Laboratory programme for the Section 11.4 suites (six-monthly water, groundwater and soil suites with the Mn/Hg/Cr(VI) verification metals and microbiology): about 20,000–35,000 per year (2024 basis 13,800); instrument calibration, consumables and sampling logistics about 15,000–25,000; annual independent integrated ESHS audit with an international lead and field verification in Grand Gedeh about 35,000–60,000; outsourced quarterly report preparation, if used, about 3,000–7,500 per report (12,000–30,000 per year); the Contractor's monthly reports and the Supervising Engineer's checks are within the works and supervision contract rates and are not costed here. The eDNA and

Budget component	Amount (US$)	Provenance and notes
		targeted fauna and flora survey lines of the 2024 costing are withdrawn with the long-term biodiversity programme
Biodiversity structures and Contractor obligations (BMP rev.3, actions A1–A10)	Within the works contract — about 224,000 for Actions A1–A10 at 2026 prices, plus an 80,000 provisional sum for A6; the A7 structure in the drainage and structures bill (BMP Table 9.1)	A6 crossings and the A7 Towah span or large box estimated by the Contractor's design engineer within the works contract; demarcation, signage, walkovers, induction, camp inspection and footprint restoration priced in the CESMP and works contract (indicative amounts by action in BMP Table 9.1: A1 11,000; A4 28,000; A5 26,000; A8 150,000; A9 6,000; A10 3,000 — about 224,000 at 2026 prices, plus the 80,000 A6 provisional sum; each with its Bill of Quantities item or ESMP budget line and the contract activity under which it is paid; to be confirmed in the CESMP costing); BMP supervision checks within the ESMP supervision budget; corrective work from the works-contract contingency (BMP rev.3, Table 10.1). The action-level amounts are those of BMP Table 9.1, carried in the standalone ESMP budget (ESMP Table 8.1, line 7; Table 8.3)
Supervising Engineer's environmental and social supervision, including the BMP checks of BMP Table 5.1	Within the supervision contract	The weekly checks while a front is in S3 or S6, the monthly checks elsewhere and the acceptance of gates G2 and G4 are supervision-contract deliverables; no separate biodiversity consultant is engaged (BMP, Chapters 7 and 9)
ESHS training and capacity building (Section 11.6); SEA/SH service-provider mapping and survivor referral support (Section 10.9); pre-opening road-safety audit (Section 9.8 of this	Within the project-wide ESMF allocations (about 188,000, pro rata), the Contractor rates and the supervision report) contract to the package total	Project ESHS training of about 111,000 and SEP engagement and GRM support of about 77,000 are project-wide allocations applied pro rata to this lot (ESMF, ; not added 2021, Table 24; standalone ESMP); worker induction and toolbox training sit in the Contractor rates; service-provider mapping by the Employer's social/GBV specialist; the road-safety audit

Budget component	Amount (US$)	Provenance and notes
		of the completed works by the Supervising Engineer before opening
Resettlement (RAP)	3,658,686.97	RAP (2025) Table 23: compensation 3,021,533.61 + implementation 637,153.36 (including GRM/committee support 50,000, training 50,000, audit 80,000, contingency 302,153.36); financed by the World Bank through GoL; compensation paid in full before civil works in the affected sections (RAP Final V2, 23 July 2025)
Indicative package total	About 3.8–3.9 million one-off (RAP 3,658,686.97 plus Employer systems and equipment 150,000–250,000) plus about 0.25–0.45 million of recurring monitoring, reporting and audit over a three-year works period	Aggregation of the above for planning purposes only; each component is governed, held and reported under its own instrument. Biodiversity structures, Contractor plans and obligations, the Supervising Engineer's supervision and the ESHS training programme (about 188,000, ESMF Table 24, pro rata) are carried in the works, supervision and project budgets respectively; the SEA/SH service-provider mapping and the pre-opening road-safety audit (Section 9.8 of this report; about 25,000–40,000) are Employer items additional to this total

The standalone ESMP presents the same package, restated on the same basis in this final issue: about US$4.3–4.7 million including three years of recurring monitoring, reporting and audit, the pro-rata ESHS training and SEP allocations, the Employer items and a 15 per cent contingency on the ESMP-specific lines, — reconciling line-by-line to the standalone ESMP's cost tables (measure-by-measure quantities, unit rates and funding sources), with each costed measure carried by MPW-IIU into the Bills of Quantities or provisional sums of the works contract — against the earlier figure of about US$8.6 million that carried the withdrawn biodiversity programme and the delivered 2024 preparation items; both figures are indicative pending the CESMP costing.

Budget governance follows the ownership of each instrument: the biodiversity structures and other Contractor BMP obligations, and all construction-embedded mitigation, sit within the works contract and are payable against verified delivery, with corrective work met from the works-contract contingency; the monitoring programme and the Supervising Engineer's BMP checks are funded through the ESMP supervision budget, administered by the IIU with the MoA-PMU's fiduciary management unit (PFMU); and RAP compensation is paid in full from the dedicated resettlement account, with the Bank-cleared payment-completion report, before civil works in the affected sections. Expenditure against each line is reported in the quarterly reports, and the CESMP costing exercise will restate the 2024-basis ESMP figures at current prices without reducing the scope of any committed measure.

11.6 Capacity Building and Training

The training programme ensures that every duty-holder can discharge the obligations summarised above. Before civil works commence, the ESCP-mandated training must be completed across the PMU, IIU, county focal points, Supervising Engineer and Contractor on: the project GRM; stakeholder engagement; subproject E&S requirements and screening; OHS; emergency preparedness and response; SEA/SH risk mitigation; disability inclusion; documentation and reporting; and biodiversity conservation and management (ESCP capacity-support item). Every worker receives ESHS induction — including the biodiversity code (no hunting, no bushmeat, no wildlife pets), the chimpanzee module (WCF materials) for crews deployed at km 18–20 and a toolbox briefing the first morning any crew enters S3 or S6 (BMP rev.3, Section 5.7 and Annex A), cultural-heritage rules and the Code of Conduct, signed before deployment — with quarterly refreshers. During construction, the programme continues with: environmental and social awareness workshops twice yearly, open to communities and including GBV/SEA/SH awareness; quarterly site-operation training for supervisory staff; grievance-committee training and sensitisation funded under the RAP training line (US$50,000); and specialist coaching of IIU and county staff under the project-level ESMF training programme (US$111,000). Community-facing capacity building continues in parallel: schools outreach on road safety and conservation across the 17 corridor schools, the community notice, with grievance contacts, issued before a works front enters S3 or S6 (BMP A10), semi-annual women's forums building on the 2026 FGD network, and sensitisation of the grievance committees and county structures. Training records, attendance and competence verification are maintained in the ESMIS and reported quarterly; 100 per cent induction coverage and 100 per cent Code of Conduct signature are standing performance indicators.

11.7 Non-Compliance and Corrective Action

The standalone ESMP contains a graduated non-compliance and corrective-action protocol, summarised as follows. Deficiencies observed through daily supervision, inspections, monitoring exceedances or grievances are recorded by the Supervising Engineer as observations or non-conformance reports (NCRs), each with a required corrective action, a responsible person and a deadline; the Contractor must respond with a corrective-action plan, and closure requires verification in the field. Persistent or serious non-conformance escalates contractually — withholding of interim payments against unresolved ESHS NCRs, application of the contract penalty schedule (including the biodiversity sanctions in the works-contract penalty schedule and the CESMP Biodiversity Compliance Plan), and ultimately suspension of the affected works. Defined events trigger automatic responses independent of the NCR cycle: the BMP stop-work triggers (BMP rev.3, Table 7.2) stop the activity concerned on the same day — unauthorised entry or works in the no-go core or a CH polygon; night work or blasting in the CSZ or a pangolin polygon; unauthorised Class A felling (segment halted, national protocol applied, 5:1 replacement if the stem is lost);

verified hunting or bushmeat by Project personnel; uncontrolled sediment; damage to an approved crossing; restoration below the A8 thresholds (5:1 replacement and certification withheld); and a verified protected-species sighting within 50 m of an active front (front suspended until the Supervising Engineer clears restart); and any serious incident invokes the notification chain (Employer within 24 hours; World Bank and, for environmental and biodiversity incidents, the EPA within 48 hours) with root-cause analysis and a recurrence-prevention plan. All personnel hold stop-work authority for imminent danger, with non-retaliation guaranteed under the LMP. The EPA's statutory enforcement powers — including compliance monitoring, audit and environmental restoration orders under the EPML — operate in parallel and are unaffected by the contractual regime. Corrective actions, penalties and their closure are logged in the ESMIS and reported in the monthly, quarterly and annual reports, and unresolved systemic issues are tabled at the annual audit for programme-level correction.

11.8 Emergency Preparedness and Response

The Contractor shall prepare, and the IIU shall approve before any works commence, an Emergency Preparedness and Response Plan covering the scenario set identified by the risk assessment (Section 9.8): hazardous-materials and fuel spills; fire; flood and severe weather; structural, slope, excavation and borrow-pit collapse; medical emergencies and evacuation; community incidents; security incidents; disease outbreak; and blasting emergencies if blasting is adopted at the quarry. The plan assumes self-sufficiency — no municipal fire service operates along the corridor — and therefore provides trained response teams, spill kits at every fuel point, firefighting equipment, a camp clinic with nurse and ambulance, a rehearsed medical-evacuation chain, and posted emergency contacts and communication trees at the camp and every work front. Training is delivered within two weeks of the plan’s adoption, drills are run and recorded on a fixed programme, and the plan is reviewed at least every six months and after any activation. Serious and severe incidents are notified to the Supervising Engineer and the IIU within 24 hours and by the IIU to the World Bank within 48 hours, with root-cause investigation and corrective action within ten working days — the incident-reporting discipline that the SECRAMP experience (Appendix W) shows must be enforced from the first day of mobilisation.

11.9 Overall Conclusion, Conditions Precedent and Recommendations

This closing section states the overall conclusion of this revised ESIA on the environmental and social acceptability of the Project, records the closure of the gap-analysis priorities that drove the update, consolidates the conditions precedent that must be satisfied before civil works enter the affected segments or activities, sets out the recommendations of RE-GROUP to the EPA of Liberia and to the IIU/MPW and the Contractor, and closes with the statement of professional adequacy required of the E&S Consultant.

11.9.1 Overall Conclusion

On the evidence of the refreshed 2026 baselines, the field-verified BFS (BFS, 2026), the reconciled RAP (RAP, 2025) and the assessment presented in Chapters 9 and 10, the assessment concludes — and MPW-IIU, as proponent, adopts the conclusion — that the rehabilitation of the Côte d’Ivoire Border – Toe Town – Zwedru Road (85 km) is environmentally and socially acceptable, subject to the full implementation of the ESMP of this chapter, the CESMP, the BMP (Appendix T) and the RAP, and to the conditions precedent set out in Section 11.9.3**.** The Project rehabilitates an existing corridor within the established government right-of-way and acquires no land outside it; it nonetheless displaces 860 project-affected persons and affects 1,084 assets within the right-of-way, all compensated in full under the RAP before civil works in the affected sections (RAP, 2025), and any Contractor-procured ancillary land is secured by voluntary agreement or a Bank-cleared RAP addendum. The Project delivers benefits of Major significance — restored year-round connectivity to the border and the county capital, lower transport costs, improved access to markets, health care and education, employment, and the removal of the chronic dust and sediment burden of the unpaved road.

The most consequential finding of the update — that Critical Habitat is triggered under ESS6 Criterion 1 — is assessed as manageable. The primary trigger is the White-bellied Pangolin (EN), whose camera events cluster between km 38 and km 50 (CH-West, 8.7 km², km 38–44; CH-East, 10.8 km², km 46–50). The Western Chimpanzee (CR) is treated precautionarily, on a single verified camera record, as a 3.14

km² Chimpanzee Sensitivity Zone at km 18–20. The avoidance-led response — the 0.78 km² no-go core, the pangolin-polygon controls and the ancillary-site freeze — is embedded in design and contract through the ten actions of the BMP (bound at Appendix T), which apply from detailed design to the end of the defects-liability period. Six of those actions hold the residual conclusion: A1 (no-go core demarcated before clearance in S3), A3 (no new ancillary site in the CSZ or a pangolin polygon), A2 (working hours, no night work or blasting), A4 (pre-clearance walkover and Class A protocol), A5 (workforce conduct) and A8 (footprint restoration). On that basis, residual significance on Criterion 1 is Medium on the BMP scale — Moderate on the scale of this report — and no feature remains High or Severe through defects liability (BMP, Ch. 6); this is the ESS6 close for the rehabilitation of an existing road. With the mitigation of Chapter 10 implemented, no residual impact is Major: residual significance is Minor or Negligible for all receptors except eight biodiversity codes that remain Moderate — the two Criterion 1 codes (BD-02, BD-03), the bounded loss of threatened flora and Class A stems (BD-04), barrier effects and road mortality (BD-05) and aquatic and riparian habitat at the live crossings (BD-10) until the A6 and A7 structures are certified, workforce and induced-access hunting (BD-07), induced land-use change (BD-08) and cumulative forest loss (CI-01). The last two remain Moderate because their principal drivers — the cocoa economy and regional in-migration — are exogenous to the Project; during construction and defects liability the Project limits its own contribution through the siting freeze (A3), the workforce Code of Conduct (A5) and the closure and reinstatement of temporary accesses, and the longer-term landscape pressures lie with the responsible Government agencies (Section 10.12). The risk summary of Section 9.8 shows that, with the specified preventive and contingency controls, no risk remains Extreme; one risk — community traffic accidents — is retained at High under a documented ALARP justification and a Road Safety Management commitment (Section 9.8), and all others are Medium or Low.

The purposes of the revision are therefore fulfilled: the BFS evidence base is integrated into design and assessment (Table 10.12); the Design-and-Build design and the identified ancillary facilities are assessed (Sections 3.8, 3.15, 3.16 and 4.5); the 2023–24 baselines are refreshed by the August 2026 field campaign; alignment with the EPML (2002/2003), the EPA ESIA Procedural Guidelines (2022) and the relevant World Bank ESSs is demonstrated (Chapter 2); and the gap-analysis priorities are closed (Table 10.13; Table 11.4 below), and the national-versus-ESS gap analysis and adopted buffers are consolidated at Sections 2.10–2.11. This revised ESIA updates, and does not annul, the 2024 ESIA, whose impact assessment, mitigation framework and integrated ESMP (Earthtime, 2024, Chs 9–11) remain the documentary baseline from which Chapters 9 to 11 of this edition are traceably developed.

11.9.2 Closure of the Gap-Analysis Priorities

The ESIA Gap Analysis (RE-GROUP, 2026; Deliverable D1, 1 August 2026) identified ten priority gaps in the 2024 ESIA. Table 10.13 (Section 10.14) records the evidence by which each priority has been closed; Table 11.4 maps each priority to the chapters and appendices in which it is closed and to any condition precedent of Table 11.5 that remains attached to it. The commitments register that consolidates every mitigation, monitoring and institutional commitment of this report is held in the standalone ESMP, which is the instrument against which implementation is audited.

Table 11.4: Closure of the gap-analysis priorities — where each is closed and what remains attached

Priority (Gap Analysis, D1)	Where closed in this report	Condition precedent (Table 11.5) or action still attached
P1 Biodiversity and ESS6	Section 7.5; Section 9.4; Sections 10.6 and 10.13; Chapter 11; BMP (Appendix T)	Item 2 — BMP gates G1–G6 accepted at design review, before each clearance package in a sensitive segment and before a front enters S6 or S3
P2 Ancillary facilities and permits	Section 3.8 (Tables 3.4 to 3.6); Section 4.5; Sections 10.2 and 10.6; CESMP	Item 3 — permits in hand before the relevant activity; Item 4 — screening of BP2, BP3, RC2 and the sites flagged in Table

Priority (Gap Analysis, D1)	Where closed in this report	Condition precedent (Table 11.5) or action still attached
		3.6; Item 5 — Suaken agreements before the quarry and plant complex are established
P3 Baseline refresh — current physical, biological and socio-economic baselines	Chapters 6 to 8; Appendices F–J; Table 10.13	No condition precedent. Residual laboratory gaps (AQ-07, AQ-12, and the chromium, manganese and mercury re-tests) remain verification actions and are not biodiversity conditions
P4 Land acquisition and resettlement (ESS5)	Section 10.7; Ch. 8; the RAP (2025, referenced)	Item 1 — compensation paid in full before civil works in each affected section
P5 Labour and influx (ESS2)	Section 10.8; Section 9.8; CESMP; LMP	Item 6 — CESMP, workers' GRM and Code of Conduct in place before the relevant works
P6 SEA/SH and community health and safety (ESS4)	Sections 5.6, 10.9 and 9.8; ESMP	Item 6 — EPRP approved before works on any front; Traffic Management Plan approved before the first haul movement on each front
P7 Pollution, resource use and GHG (ESS3)	Sections 10.3 to 10.5; Section 11.4	Item 3 — EPML operational licences (effluent, waste, emissions) before the relevant activity; monitoring programme of Section 11.4
P8 Cultural heritage (ESS8)	Section 8.6; Section 10.10; Chance-Find Procedure (CESMP)	None outstanding — the Chance-Find Procedure flows down through the works contract and the CESMP
P9 Stakeholder engagement (ESS10)	Ch. 5; SEP (P175263)	Disclosure of this ESIA and of BMP rev. 2 (Section 5.7; Table 12.2, items 2 and 6); continuity of the adopted RETRAP GRM
P10 Design information and contract clarity	Sections 3.1–3.8, 3.14–3.16; Appendix A	Item 4 — hilly-terrain and retaining-structure design packages through the design-review gate of Section 3.14

11.9.3 Conditions Precedent to Works

Acceptability is conditional. Table 11.5 consolidates the conditions that must be satisfied — and verified in writing — before works enter the affected segment or activity or, where stated, before the relevant facility is established. The Contractor's kick-off meeting was held at the Zwedru project site on 2 August 2026 and the contractual commencement date is 24 August 2026; **mobilisation, surveys and design are under way and civil works have not yet commenced**, so every condition below is live and none has been overtaken. The activities undertaken to date — mobilisation, surveys and design data collection — require

no EPA works permit and precede the conditions; the statutory conditions (EPA permits; RAP compensation under the RAP and the ESCP) and the C-ESMP approval apply in full before civil works, and the biodiversity conditions attach to vegetation clearance in sensitive segments, to works entering S6 (km 38–50) and S3 (km 18–20) and to design review. These conditions derive from the ESCP (P175263), the RAP (2025), the BMP (Appendix T) and the verification actions identified by the 2026 field campaign.

Table 11.5: Conditions precedent and verification actions before works

#	Condition	Responsibility and timing
1	**Compensation before works (hard condition):** the RAP designated account funded no later than six months before the start of civil works (ESCP); all RAP compensation and resettlement assistance paid to the 860 PAPs; the payment-completion report submitted to and **cleared by the World Bank**; site handover to the Contractor no earlier than three months after payment; any realignment, design change or diversion outside the census footprint assessed and the RAP updated before that segment proceeds	IIU/MPW with the MoA-PMU; before civil works in the affected sections
2	**BMP conditions** (BMP, Appendix T; ESCP item 6.1): (a) at detailed-design review — the ancillary-site overlay (BMP Table 3.2) shows no new quarry, borrow pit, crusher, batching plant, camp or laydown inside the CSZ or a pangolin polygon (A3; gate G3), with the sites flagged in Table 3.6 resolved, and drawings for A6 crossings and the A7 Towah structure exist only where justified (G6); (b) before any vegetation-clearance package in segments S2, S3, S4 and S6 — RoW pegged and the pre-clearance walkover file attached, with FDA Class A markings in S4 and in any Critical Habitat segment (A4); (c) before any front enters S6 (km 38–50) or S3 (km 18–20) — the CESMP reproduces BMP Tables 3.1, 7.1 and 7.2 (G1); Code of Conduct acknowledgements signed for the crews concerned and A9 signs ready (G4); and A10 notice issued to the affected communities (G5); (d) additionally for S3 — the 0.78 km² no-go core demarcated before clearance (A1; G2)	Contractor (delivery); Monitoring Consultant accepts G2 and G4; IIU/MPW accepts G1, G3, G5 and G6 (G1 and G6 jointly with the Monitoring Consultant; BMP Table 8.2). Gates G1, G4 and G5 for segment S6 accepted before the works front reaches km 50; gate G2 for segment S3 accepted before vegetation clearance in that segment. Acceptance after the front has entered the segment does not satisfy this condition

#	Condition	Responsibility and timing
3	**Permits in hand:** the five EPA Environmental Permits — road works; construction camp; quarry; crusher/asphalt plant; concrete batch plant — each issued before the relevant facility is established or operated; plus the FDA tree-felling permit for RoW clearance (contingent on co-signed tree marking), the water-abstraction licence, MME materials/minerals licences (and any explosives/blasting permit), the EPML operational licences (effluent discharge; solid and hazardous waste disposal; pollution emission) before the relevant operation, and county/local clearances	IIU/MPW and Contractor; before the relevant activity
4	**Ancillary-site screening and design gates:** site-specific environmental and social screening of BP2, BP3 and RC2 and of the sites flagged in Table 3.6 completed and accepted before establishment; the hilly-terrain, retaining-structure and cut-and-fill design packages (Section 3.14) submitted with slope-stability assessments and passed through the design-review gate before works in those sections	Contractor (screening and design); Monitoring Consultant review; IIU/MPW acceptance; before establishment of each site and before works in the hilly sections
5	**Suaken land agreements:** documented voluntary land agreements (or a Bank-cleared RAP addendum) for the Suaken quarry and batching/asphalt/crusher complex concluded before the complex is established; the same rule applies to any other Contractor-procured ancillary land (Section 10.7)	Contractor with IIU/MPW; before establishment of the complex
6	**Management-system readiness:** the CESMP (with its constituent plans) approved within the contractual window and before the relevant works; the workers' GRM, signed Codes of Conduct and the SEA/SH referral pathway operational before	Contractor (delivery); Monitoring Consultant review; IIU/MPW approval; before the relevant works

#	Condition	Responsibility and timing
	workers are engaged on the respective fronts; the EPRP approved before works on any front; and the Traffic Management Plan approved before the first haul movement on each front	

Items 1–3 reproduce the conditions carried in the project instruments (ESCP; RAP; BMP); items 4–6 consolidate, in one place, the readiness conditions that this report fixes elsewhere (Sections 3.8, 3.14, 4.5, 10.7 and 11.8 and the ESMP tables of this chapter). Two survey commitments are carried with the same force: the **ichthyological survey of the nine fish-bearing creeks** — commissioned by the IIU through the Monitoring Consultant with a BFS-consortium aquatic specialist, funded from the Project's E&S provisional sums, completed before in-stream works at any of the nine crossings and in any case within six months of commencement, its results informing the crossing designs through the design-review gate and updating the aquatic impact rating and, at the sacred creeks (SS-003, SS-004; SS-006 where affected), following the custodial protocol of Section 6.3.2 (consent before sampling, non-lethal methods, findings shared, in-stream method agreed with the custodians); and the **pre-establishment soil sampling at Quarry 2 and crusher site RC2** (Section 6.6 commitments), so that a baseline exists before either site is opened.

11.9.4 The Applicant's Requests to the EPA

MPW-IIU, as the applicant, requests — on the recommendation of its consultant — that the EPA grant the Environmental Permit subject to the following conditions, which the Project is already structured to meet: (i) incorporation of the conditions precedent of Table 11.5 as permit conditions, including compensation before works and the BMP conditions for design review, clearance and entry to S6 and S3; (ii) the BMP prescriptions for the pangolin Critical Habitat polygons (km 38–44 and km 46–50) and the Chimpanzee Sensitivity Zone (km 18–20) — working hours 08:00–16:00 with no night work or blasting (A2), no new ancillary site inside the CSZ or a pangolin polygon (A3), the no-go core demarcated before clearance (A1), 20 km/h and node warning signs (A9), canopy retention in the CSZ wherever the approved right-of-way allows, and the works-contract penalty schedule — attached to the road-works permit; (iii) the ancillary-siting standards and the BMP siting rule attached to the camp, quarry, crusher/asphalt and batch-plant permits, with each facility permitted individually before establishment; (iv) quarterly compliance reporting to the EPA on the items in Appendix T (its Table 10.1), and the Project's ordinary independent environmental and social audit, which shall include the Appendix T checks and shall not require a separate biodiversity survey; (v) permit validity aligned to the construction programme, with the statutory effluent-discharge, waste and emission licences obtained as operations require; and (vi) notification of a serious biodiversity incident to the Employer within 24 hours, and by the Employer to the Environmental Protection Agency and the World Bank within 48 hours where the Environmental and Social Commitment Plan or the permit so requires (Appendix T, Section 10.3).

11.9.5 Actions for the IIU and the Contractor

For the remainder of mobilisation and for the early works (mobilisation is under way; civil works have not yet commenced), the IIU and the Contractor shall: (a) at design review — confirm the A3 siting freeze through the ancillary-site overlay of every registered and proposed site on the BMP polygon layer, resolving the sites flagged in Table 3.6 (Quarry 2, BP6, BP8, BP9, BP11, BP12), BP2, BP3 and RC2, and accept the design engineer's A6 and A7 drawings only where justified (gates G3, G6); and confirm that the borrow-pit restoration clause is in the works contract; (b) before clearance and segment entry — schedule the BMP gates in the works programme so that they are accepted before the fronts advancing from Zwedru reach S6 (km 50) and, later, S3 (km 20): CESMP reproduction of BMP Tables 3.1, 7.1 and 7.2 in place (G1), signed Code of Conduct acknowledgements and A9 signs (G4) and A10 community notice (G5) for each segment, and the CSZ no-go core demarcated with durable posts before any clearance in S3 (A1; G2); load the mapped exclusions (the CSZ and its no-go core, the pangolin CH polygons, sacred groves and their agreed buffers, the Picathartes outcrop buffer, riparian buffers) into the Contractor's GIS and setting-out systems and peg the RoW before any clearance — physical demarcation of the no-go core is not replaced by software geofencing (BMP Section 3.2); and undertake the FDA-co-signed marking of the 20 Class A stems and the pre-clearance walkovers ahead of each clearing front; (c) social and OHS readiness — finalise and approve the CESMP within the contractual window and mobilise the minimum ESHS staffing first; operationalise the adopted GRM contact points, the workers' GRM and the SEA/SH referral pathway before workers are engaged on further fronts, completing the GBV service-provider mapping for Grand Gedeh (Section 10.9); approve the EPRP and rehearse a medevac from a remote front (Section 11.8); complete pre-condition surveys of structures adjacent to the works; implement the Traffic

Management Plan from the first haul movement on each front; confirm the workforce numbers and local-hire plan (a goal of at least 30 per cent women) in the CESMP; and commission the pre-opening road-safety audit before taking-over (Section 9.8); and (d) verification actions and permits — obtain each permit and licence of Table 11.5, item 3, before the relevant operation, and complete the pre-construction verification re-tests carried from the 2026 campaign (manganese and mercury; SW-03 hexavalent chromium; soil organic matter) before the works that could confound them.

11.9.6 Statement of Professional Adequacy

Royal Environmental Group Inc. (RE-GROUP), an environmental and social consultancy licensed and certified by the EPA of Liberia, prepared this revised and updated ESIA under Service Agreement Ref. 26LBRZWD-ICC/CET-SERAGR-001 in accordance with the EPML (2002/2003), the EPA ESIA Procedural Guidelines (2022), the World Bank ESF (ESS1–ESS10) and the project instruments for RETRAP (P175263/P181083). RE-GROUP confirms that the surveys, data, methods and consultations on which this report relies are, in its professional judgement, adequate and appropriate to the nature and scale of the Project; that the assessment fairly represents the significance of the Project's impacts and risks; and that the stated mitigation, if implemented as specified, is sufficient to reduce all residual impacts to the levels stated in Chapters 9 and 10. RE-GROUP accordingly submits this revised ESIA, which updates and does not annul the 2024 assessment (Earthtime, 2024), as a true and adequate basis for the EPA's permitting decision and the World Bank's clearance.

12 REFERENCES

The principal documents and sources relied on in this revised ESIA are listed below; references internal to retained 2024 text remain as cited there (Earthtime, 2024, Chapter 12).

- Earthtime Inc. (2024b). *Response to Comments — World Bank comments on the RETRAP-AF 85 km ESIA Final Report (V2)*, 28 June 2024. MPW/IIU, EP2023042. (Review record of the 2024 ESIA.)
- Earthtime Inc. (2024). *Environmental and Social Impact Assessment (ESIA) for the Rehabilitation of the Ivory Coast Border – Toe Town – Zwedru Road (85 km) — Final Report (V3)*. Prepared for MPW/IIU, Republic of Liberia. June 2024. (EPA project code EP2023042.)
- SCNL, WCF, Fauna & Flora and Solimar International (2026). *RETRAP 85 km Corridor Biodiversity Field Survey (BFS) — Final Report (v3, clean), 30 September 2026*, with GIS geodatabase and monitoring framework. Commissioned by the IIU/MPW.
- RE-GROUP (2026). *Biodiversity Management Plan (BMP), Revision 2* (reproduced at Appendix T); and *2026 Environmental and Social Update Field Campaign* records (August 2026), including the University of Liberia Civil Engineering Laboratory certificate UL LAB/ICC/002A/2026.
- ICCO/CET Joint Venture (2025). *Design Proposal and Methodology Statement — Design* for the Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (85 km), June 2025, including the box- and pipe-culvert design schedules and combined layout drawings. RFP No. LR-IIU-404122-CW-RFP.
- IIU/MPW (2025). *Resettlement Action Plan (RAP), Final V2, 23 July 2025*, RETRAP AF2 (P181083).
- LEA Associates South Asia Pvt. Ltd. (2026). *Project information — Monitoring/Supervision Consultancy Services, Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (85 km)*: project, works-contract and consultancy-contract particulars. Prepared for the IIU/MPW. (Basis of Section 3.16 and Table 3.8.)
- FIDIC (2017). *Conditions of Contract for Plant and Design-Build*, Second Edition. Fédération Internationale des Ingénieurs-Conseils, Geneva. (The form of the works contract.)
- World Bank (2021–2026). RETRAP Environmental and Social Commitment Plan (ESCP), Environmental and Social Management Framework (ESMF), Stakeholder Engagement Plan (SEP) and Labor Management Procedures (LMP), P175263 (including Additional Financing P181083); *Environmental and Social Framework* (ESS1–ESS10); World Bank Group *General EHS Guidelines* and *EHS Guidelines for Toll Roads*; IFC *Performance Standard 6* and *Guidance Note 6* (2019).
- World Bank (2021). *Restructuring Paper — Southeastern Corridor Road Asset Management Project (SECRAMP, P149279)*, Report of 17 May 2021. World Bank (2025). *SECRAMP Additional Financing appraisal documentation (P149279)*, May–June 2025. (Basis of the lessons-learned analysis at Appendix W.)
- Government of Liberia. Environment Protection and Management Law (2002, published 2003); EPA ESIA Procedural Guidelines (2022); National Environmental Policy (2003); Wildlife Conservation and Protected Area Management Law (2016); National Forestry Reform Law (2006); Community Rights Law (2009); Land Rights Act (2018); Public Health Law (rev. 2017); Decent Work Act (2015); Minerals and Mining Law (2000); Local Government Act (2018); National Gender Policy and NAP-GBV.
- LISGIS (2022). *National Population and Housing Census 2022* — Grand Gedeh County results.
- Hansen/UMD/Google/USGS/NASA Global Forest Watch (2001–2024 tree-cover loss data), as analysed by the BFS.

- WHO ambient air-quality and drinking-water guidelines; Liberia EPA Approved Parameters of Concern and ambient standards, as applied in Chapters 6 and 11.

APPENDIX A — ROAD DESIGN INFORMATION AND DRAWINGS

This appendix presents the road design information: the initial project information, the design basis, and the number of hydraulic and cross-drainage structures. Because the Contract is of a Design and Build nature, the Contractor is responsible for the preparation, updating and implementation of all road design details based on current site conditions, engineering investigations and contract requirements; the updated design details form the basis for the execution of the Works and shall comply with the Employer's Requirements (Section 3.16). The design is produced under the design-and-build contract by the ICCO/CET Joint Venture; the authoritative design documents are the **Design Proposal and the Methodology Statement — Design (June 2025)**, including the combined layout drawings (km 75+000 to km 5+500) held in the Project design file. The 2024 ESIA's Appendix A (road design drawings) is referenced; the schedules below reproduce the current design's structure schedules, credited to ICCO/CET (2025). Stationing is the Road-2 design stationing (Toe Town origin); corridor chainage is obtained by adding 10.345 km (the Road-1 border link), per the Project's canonical chainage convention. Drainage structures on the Road-1 border link and any structures added at detailed design (including the Towah swamp structure required by the BMP) will be carried in the Contractor's updated schedules under the same review procedure. The existing road carries 82 identified structures — five bridges, 69 pipe culverts and eight box culverts (Earthtime, 2024) — which the design below retains (bridges), and replaces, upgrades or consolidates (culverts). The Project is presently in the mobilisation and pre-construction phase: the number and extent of hydraulic and cross-drainage structures, retaining walls, cut-and-fill quantities and material requirements will be determined and confirmed following the finalisation and approval of the detailed design (LEA Associates South Asia, 2026), and the schedules below are the design-stage record against which that confirmation is checked.

A.1 Bridges

The five existing bridges are retained, rehabilitated and widened (details at Table 3.3 in Chapter 3): Road-2 stations 32+160, 38+040, 46+957, 57+034 and 71+256 (corridor ≈ km 42.5, 48.4, 57.3, 67.4 and 81.6).

A.2 Box Culvert Schedule (42 structures)

Table A.1: Box culvert design schedule (reproduced from the Methodology Statement — Design, ICCO/CET, June 2025)

Name	Cells	Dimensions (m)	Road-2 station	Corridor km (approx.)
C0003	2	2.5 × 2	0+321	10.7
C0006	3	3 × 2.5	0+643	11.0
C0045	1	1.5 × 1.5	4+573	14.9
C0101	7	3 × 2.5	10+164	20.5
C0113	2	2 × 2	11+380	21.7
C0114	2	2.5 × 2	11+457	21.8
C0138	5	3 × 2.5	13+882	24.2
C0152	2	2 × 2	15+297	25.6
C0180	2	2 × 2	18+028	28.4
C0195	1	2 × 1.5	19+594	29.9
C0199	1	2 × 1.5	19+941	30.3
C0200	1	2 × 1.5	20+074	30.4
C0202	1	2 × 1.5	20+290	30.6
C0207	1	2.5 × 2	20+716	31.1
C0223	2	2.5 × 2.5	20+336	30.7
C0224	2	2.5 × 2.5	22+474	32.8
C0232	2	2.5 × 2.5	23+257	33.6
C0237	2	2.5 × 2	23+792	34.1
C0255	3	2 × 1.5	25+557	35.9
C0261	1	1.5 × 1.5	26+161	36.5

Name	Cells	Dimensions (m)	Road-2 station	Corridor km (approx.)
C0275	1	1.5 × 1.5	27+536	37.9
C0286	1	1.5 × 1.5	28+616	39.0
C0207*	1	2.5 × 2	29+217	39.6
C0301	1	1.5 × 1.5	30+187	40.5
C0301*	1	1.5 × 1.5	31+003	41.3
C0239*	4	3 × 2.5	32+970	43.3
C0390	1	3 × 2	39+039	49.4
C0398	3	3 × 2.5	39+820	50.2
C0406	3	3 × 2.5	40+616	51.0
C0416	1	2 × 1.5	41+626	52.0
C0458	3	2.5 × 2.5	45+861	56.2
C0482	3	2.5 × 2	48+226	58.6
C0492	1	1.5 × 1.5	49+202	59.5
C0521	4	2.5 × 2.5	52+173	62.5
C0540	1	1.5 × 1	54+036	64.4
C0603	2	2.5 × 2.5	60+341	70.7
C0607	2	2.5 × 2.5	60+738	71.1
C0657	6	3 × 2.5	65+790	76.1
C0677	1	2.5 × 2.5	66+794	77.1
C0679	3	2.5 × 2.5	67+931	78.3
C0696	2	2 × 2	69+674	80.0

Name	Cells	Dimensions (m)	Road-2 station	Corridor km (approx.)
C0714	2	2.5 × 2.5	71+492	81.8

Entries marked * reproduce identifiers as printed in the design schedule, which repeat an earlier identifier; the identifiers (not the structures) are to be reconciled by the Contractor’s design engineer at detailed design.

A.3 Pipe Culvert Schedule (40 structures)

Table A.2: Pipe culvert design schedule — all 1,000 mm diameter (reproduced from the Methodology Statement — Design, ICCO/CET, June 2025)

Name	Diameter (m)	Road-2 station	Corridor km (approx.)
C0010	1.00	1+039	11.4
C0019	1.00	1+989	12.3
C0033	1.00	3+357	13.7
C0038	1.00	3+822	14.2
C0050	1.00	5+027	15.4
C0062	1.00	6+272	16.6
C0069	1.00	6+965	17.3
C0077	1.00	7+777	18.1
C0109	1.00	10+970	21.3
C0118	1.00	11+860	22.2
C0128	1.00	12+828	23.2
C0131	1.00	13+150	23.5
C0135	1.00	13+577	23.9
C0137	1.00	13+760	24.1
C0143	1.00	14+384	24.7
C0168	1.00	16+805	27.2
C0190	1.00	19+071	29.4
C0217	1.00	21+779	32.1
C0246	1.00	24+615	35.0
C0296	1.00	29+657	40.0

Name	Diameter (m)	Road-2 station	Corridor km (approx.)
C0319	1.00	31+991	42.3
C0336	1.00	33+610	44.0
C0348	1.00	34+877	45.2
C0348*	1.00	35+734	46.1
C0375	1.00	37+571	47.9
C0435	1.00	43+592	53.9
C0442	1.00	44+256	54.6
C0452	1.00	45+277	55.6
C0464	1.00	46+498	56.8
C0471	1.00	47+199	57.5
C0502	1.00	50+286	60.6
C0507	1.00	50+703	61.0
C0528	1.00	52+879	63.2
C0547	1.00	54+773	65.1
C0558	1.00	55+820	66.2
C0583	1.00	58+397	68.7
C0623	1.00	62+345	72.7
C0632	1.00	63+202	73.5
C0647	1.00	64+746	75.1
C0725	1.00	72+573	82.9

In total the design provides **42 box culverts and 40 pipe culverts (82 cross-drainage structures)**, in addition to the five bridges and the lined longitudinal drainage of Section 3.5. The asterisked entry reproduces the identifier as printed in the design schedule.

APPENDIX B — NOTICE OF INTENT AND EPA CORRESPONDENCE

This annex reproduces the statutory correspondence with the Environmental Protection Agency of Liberia (EPA) under the EPML (2002/2003) and the EPA ESIA Procedural Guidelines (2022): the Notice of Intent (NOI) letter, the public NOI prepared for newspaper and radio publication, and the Environmental Permit application letter. The instruments are reproduced faithfully as issued on 1 August 2026, with bracketed signature and publication fields preserved; where particulars have since been refined by the body of this ESIA (for example, the canonical chainage and gazetteer of Chapter 1; and the biodiversity commitments — the Net-Gain requirements are replaced by the construction-phase controls of BMP, Appendix T), the Assumptions and Reconciliation Register at assumptions register governs any divergence. The republished NOI was subsequently posted at 17 corridor locations between 3 and 6 August 2026 (Appendix U).

B.1 Notice of Intent to the EPA (Ref RE-GROUP/RETRAP/NOI/2026-001, 1 August 2026)

The following instrument was issued by RE-GROUP:

ROYAL ENVIRONMENTAL GROUP LIBERIA INC. (RE-GROUP) — EPA-Licensed & Certified Environmental & Social Consultancy Firm — 72nd SKD Boulevard, Paynesville City, Montserrado County, Liberia — +231 777 917 398 — info@regroupliberia.org

Our Ref: RE-GROUP/RETRAP/NOI/2026-001 — Date: 1 August 2026

The Executive Director / CEO, **Environmental Protection Agency of Liberia (EPA)**, Environmental Impact Assessment (EIA) Department / Registry, Tubman Boulevard, Sinkor, Monrovia, Liberia. **Attention: Dr. Emmanuel K. Urey Yarkpawolo, Executive Director / Chief Executive Officer.**

RE: NOTICE OF INTENT TO UNDERTAKE AN UPDATE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE REHABILITATION OF THE CÔTE D'IVOIRE BORDER – TOE TOWN – ZWEDRU ROAD (85 KM), GRAND GEDEH COUNTY

Dear Dr. Yarkpawolo,

On behalf of the International Consolidated Contractors Offshore SAL (ICCO) / Consolidated Engineering and Trading Co. S.A.L (CET) – Joint Venture (the "Contractor"), Royal Environmental Group Liberia Inc. (RE-GROUP) — an EPA-licensed and certified environmental and social consultancy firm registered in the Republic of Liberia — hereby formally notifies the Environmental Protection Agency of Liberia of the Contractor's intention to undertake an update of the Environmental and Social Impact Assessment (ESIA) for the above-captioned Project, in fulfilment of Section 6 of the Environmental Protection and Management Law (EPML), 2003 and the EPA's Environmental and Social Impact Assessment Procedural Guidelines.

The Project forms part of the Rural Economic Transformation Project – Additional Financing (RETRAP-AF), implemented by the Infrastructure Implementation Unit (IIU) of the Ministry of Public Works and financed in part by the World Bank (IDA). RE-GROUP has been engaged by the Contractor under a Design-and-Build arrangement (RFP No. LR-IIU-404122-CW-RFP) to update the existing 2024 ESIA, integrate the findings of the recently completed Biodiversity Field Survey (BFS), refresh the environmental and social baseline, and secure the Environmental Permit(s) required for commencement of civil works. In accordance with the EPA's ESIA Procedural Guidelines, the particulars of the proposed undertaking are provided in Table B.1.

Table B.1: Particulars of the Notice of Intent (as submitted, 1 August 2026)

Item	Particulars
1. Name of Project	Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (85 km) — under the Rural Economic Transformation Project – Additional Financing (RETRAP-AF)

Item	Particulars
2. Project Proponent / Contractor	International Consolidated Contractors Offshore SAL (ICCO) / Consolidated Engineering and Trading Co. S.A.L (CET) – Joint Venture, 20th Floor, O20 Tower, Adlieh, Achrafieh, Lebanon
3. Implementing Agency (Employer)	Infrastructure Implementation Unit (IIU), Ministry of Public Works (MPW), Republic of Liberia; financed in part by the World Bank (International Development Association – IDA)
4. Environmental & Social Consultant	Royal Environmental Group Liberia Inc. (RE-GROUP), 72nd Street, SKD Boulevard, Paynesville, Monrovia, Liberia — EPA-Licensed & Certified E&S Consultancy Firm
5. Nature of the Project	Rehabilitation/upgrading of an existing ~85 km laterite road to a paved (bituminous) standard, including earthworks and realignment, drainage and culvert/bridge works, and ancillary facilities (construction camp(s), quarry, crusher/asphalt plant, concrete batch plant, borrow pits and laydown areas)
6. Location — County / Districts / Communities	Grand Gedeh County, South-Eastern Liberia. The 85 km corridor runs B'hai Jorzon (km 0, Liberia–Côte d'Ivoire border) – Toe Town (km 12) – Zwedru (km 83), traversing the B'hai, Cavalla, Gbarzon, Konobo, Tchien and Gborgbor administrative areas and communities including B'hai Jorzon, Toe Town, Senewehn (Senneh-Wen), Duogee, Zleh Town, Zai Town and Zwedru City
7. Activities to be Undertaken	Site clearance and earthworks; pavement and road construction; construction and operation of quarries, crushing/asphalt and concrete batching plants and worker camps; sourcing of construction materials and water; waste management; workforce mobilisation; and, during operation, road use and maintenance
8. Anticipated Products / By-products	A rehabilitated all-weather paved road (principal output). Anticipated by-products/emissions requiring management include dust and exhaust emissions, noise and vibration, quarry/crusher and asphalt-plant emissions, spoil and construction/hazardous waste, and wastewater
9. Land, Air & Water Potentially Affected	The road Right-of-Way and ancillary-site footprints; watercourses and wetlands crossed by the corridor; ambient air and the acoustic environment of roadside communities; and biodiversity within the Area of Interest, including an ESS6 Critical-Habitat trigger (White-bellied Pangolin, Western Chimpanzee Sensitivity Zone at km 18–20)
10. Proposed Timeframe	The ESIA update and permitting are scheduled for the 2026 construction-readiness period, with the updated ESIA and Environmental Permit application to be submitted to the EPA within the timelines of the Contractor's works programme. The construction

Item	Particulars
	period is estimated at approximately 36–48 months, followed by operation and maintenance
11. Availability for Inspection	The Project registration and supporting documentation are/will be available for inspection at the EPA Registry, Monrovia, and the updated ESIA will be publicly disclosed in-country and through the World Bank in line with ESS10

RE-GROUP respectfully requests the Agency's guidance on the screening category for the updated ESIA and on the approval of the Terms of Reference, and confirms its readiness to (i) publish this Notice of Intent in a daily newspaper of national circulation and broadcast it on local radio in English and the relevant vernacular; (ii) conduct scoping and stakeholder consultations; and (iii) submit the updated ESIA together with the applications for the required Environmental Permits, namely the Road Works, Camp, Quarry, Crusher/Asphalt Plant and Concrete Batch Plant permits.

Please do not hesitate to contact the undersigned for any additional information. We look forward to the Agency's kind guidance and cooperation.

Yours faithfully, *for and on behalf of Royal Environmental Group Liberia Inc.*

[Signature] **Clarence E. Buigbo**, Managing Director, Royal Environmental Group Liberia Inc.

cc: Project Director, ICCO/CET JV; Director, Infrastructure Implementation Unit (IIU), Ministry of Public Works; County Environment Officer, Grand Gedeh County; RE-GROUP Project File.

B.2 Public Notice of Intent for Newspaper and Radio Publication

The following instrument was prepared by RE-GROUP:

FOR PUBLICATION — NEWSPAPER & RADIO. PUBLIC NOTICE OF INTENT — *Update of the Environmental & Social Impact Assessment (ESIA)*

PUBLIC NOTICE OF INTENT TO UPDATE AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT. Notice is hereby given, pursuant to the Environmental Protection and Management Law (2003) and the EPA Environmental and Social Impact Assessment Procedural Guidelines, that the ICCO/CET Joint Venture, through its Environmental and Social Consultant, Royal Environmental Group Liberia Inc. (RE-GROUP), intends to update the Environmental and Social Impact Assessment (ESIA) for the Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (approximately 85 km) in Grand Gedeh County, under the Rural Economic Transformation Project – Additional Financing (RETRAP-AF) of the Ministry of Public Works / Infrastructure Implementation Unit, financed in part by the World Bank.

The Project and the ESIA update will involve, among other things:

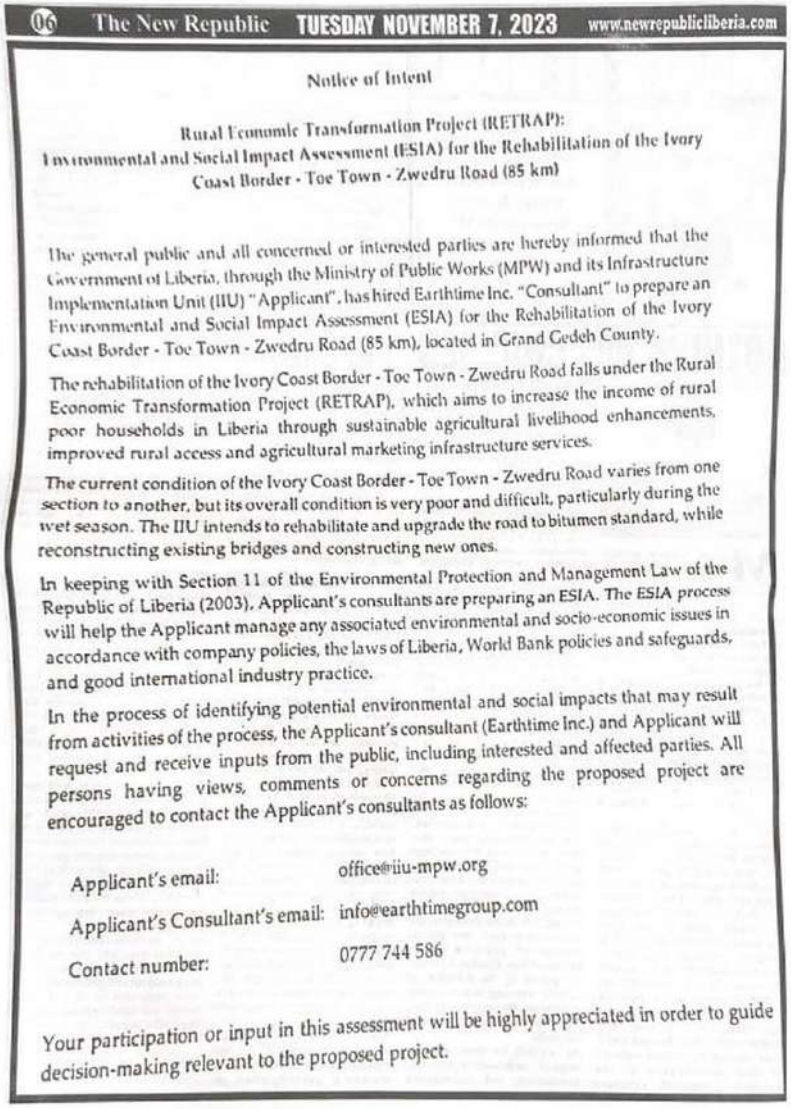
- Rehabilitation and paving of the existing road, drainage, culvert and bridge works, and limited realignment;
- Establishment and operation of construction camps, a quarry, crusher/asphalt plant, concrete batch plant, borrow pits and laydown areas;
- Updating of the environmental and social baseline and integration of the Biodiversity Field Survey findings, including biodiversity-sensitive areas along the corridor;
- Assessment of environmental, social, health, safety, gender and resettlement risks and impacts, and the measures to manage them.

The Project will affect communities along the corridor from B'hai Jorzon (near the Liberia–Côte d'Ivoire border) through Toe Town and Senewehn to Zwedru City. Potentially affected persons, community leaders, institutions and the general public are invited to participate in the forthcoming public consultations and to

submit views, concerns and information relevant to the assessment. Written comments and requests for information may be submitted to Royal Environmental Group Liberia Inc., 72nd Street, SKD Boulevard, Paynesville, Monrovia, Liberia, or to the Environmental Protection Agency of Liberia, Tubman Boulevard, Sinkor, Monrovia, Liberia, within twenty-one (21) days of this notice. Project documentation is available for inspection at the EPA Registry, Monrovia.

Issued by: Royal Environmental Group Liberia Inc. (RE-GROUP) — EPA-Licensed & Certified Environmental & Social Consultancy Firm, for and on behalf of the ICCO/CET Joint Venture. Date of publication: [date] 2026 | Newspaper: [newspaper name] | Radio station(s): [radio station names].

For the documentary record, Figure B.1 reproduces the Notice of Intent as published for the original ESIA process in The New Republic of 7 November 2023; the republished 2026 NOI above was disseminated by posting at 17 corridor and administrative locations, registered at Annex H (Table H.4).



06 The New Republic **TUESDAY NOVEMBER 7, 2023** www.newrepublicliberia.com

Notice of Intent

Rural Economic Transformation Project (RETRAP):
Environmental and Social Impact Assessment (ESIA) for the Rehabilitation of the Ivory Coast Border - Toe Town - Zwedru Road (85 km)

The general public and all concerned or interested parties are hereby informed that the Government of Liberia, through the Ministry of Public Works (MPW) and its Infrastructure Implementation Unit (IIU) "Applicant", has hired Earthtime Inc. "Consultant" to prepare an Environmental and Social Impact Assessment (ESIA) for the Rehabilitation of the Ivory Coast Border - Toe Town - Zwedru Road (85 km), located in Grand Gedeh County.

The rehabilitation of the Ivory Coast Border - Toe Town - Zwedru Road falls under the Rural Economic Transformation Project (RETRAP), which aims to increase the income of rural poor households in Liberia through sustainable agricultural livelihood enhancements, improved rural access and agricultural marketing infrastructure services.

The current condition of the Ivory Coast Border - Toe Town - Zwedru Road varies from one section to another, but its overall condition is very poor and difficult, particularly during the wet season. The IIU intends to rehabilitate and upgrade the road to bitumen standard, while reconstructing existing bridges and constructing new ones.

In keeping with Section 11 of the Environmental Protection and Management Law of the Republic of Liberia (2003), Applicant's consultants are preparing an ESIA. The ESIA process will help the Applicant manage any associated environmental and socio-economic issues in accordance with company policies, the laws of Liberia, World Bank policies and safeguards, and good international industry practice.

In the process of identifying potential environmental and social impacts that may result from activities of the process, the Applicant's consultant (Earthtime Inc.) and Applicant will request and receive inputs from the public, including interested and affected parties. All persons having views, comments or concerns regarding the proposed project are encouraged to contact the Applicant's consultants as follows:

Applicant's email:	office@iiu-mpw.org
Applicant's Consultant's email:	info@earthtimegroup.com
Contact number:	0777 744 586

Your participation or input in this assessment will be highly appreciated in order to guide decision-making relevant to the proposed project.

Figure B.1: Notice of Intent as published, The New Republic, 7 November 2023 (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this ESIA)

B.3 Application for Environmental Permits (Ref RE-GROUP/RETRAP/EPA-PERMIT/2026-002, 1 August 2026)

The following instrument was prepared by RE-GROUP:

ROYAL ENVIRONMENTAL GROUP LIBERIA INC. (RE-GROUP) — EPA-Licensed & Certified Environmental & Social Consultancy Firm — 72nd SKD Boulevard, Paynesville City, Montserrado County, Liberia — +231 777 917 398 — info@regroupliberia.org

Our Ref: RE-GROUP/RETRAP/EPA-PERMIT/2026-002 — Date: 1 August 2026

The Executive Director / CEO, **Environmental Protection Agency of Liberia (EPA)**, Department of Intersectoral Coordination / EIA Department, Tubman Boulevard, Sinkor, Monrovia, Liberia. **Attention: Dr. Emmanuel K. Urey Yarkpawolo, Executive Director / Chief Executive Officer.**

RE: APPLICATION FOR ENVIRONMENTAL PERMIT(S) AND SUBMISSION OF THE UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) — REHABILITATION OF THE CÔTE D'IVOIRE BORDER – TOE TOWN – ZWEDRU ROAD (85 KM), GRAND GEDEH COUNTY (RFP No. LR-IIU-404122-CW-RFP)

Dear Dr. Yarkpawolo,

Royal Environmental Group Liberia Inc. (RE-GROUP), an Environmental Protection Agency (EPA) licensed and certified environmental and social consultancy firm, has the honour to inform the Agency that it has been engaged by the International Consolidated Contractors Offshore SAL (ICCO) / Consolidated Engineering and Trading Co. S.A.L (CET) – Joint Venture (the "Contractor") to update the Environmental and Social Impact Assessment (ESIA) and to obtain the Environmental Permit(s) required for the commencement of the above-referenced Project.

The Contractor has entered into a Design-and-Build Contract (RFP No. LR-IIU-404122-CW-RFP, dated 05 May 2026) with the Infrastructure Implementation Unit (IIU) of the Ministry of Public Works for the rehabilitation of the approximately 85-kilometre road running from the Côte d'Ivoire border at B'hai Jorzon, through Toe Town, to Zwedru in Grand Gedeh County, under the Rural Economic Transformation Project – Additional Financing (RETRAP-AF), financed in part by the World Bank. Under this engagement, RE-GROUP is responsible for updating the Project ESIA and securing the Environmental Permits necessary for the works and their associated facilities.

Purpose and scope of the ESIA update. This application accompanies an update of the existing ESIA (Final, June 2024), undertaken to: (i) integrate the major findings of the recently completed Biodiversity Field Survey (BFS, 2025–2026), including the ESS6 Critical-Habitat determination (White-bellied Pangolin and the Western Chimpanzee Sensitivity Zone at corridor km 18–20) and the associated Biodiversity Management Plan and Net-Gain requirements; (ii) update the previous environmental and social baseline information (physical, biological and socio-economic) to reflect current conditions along the corridor; (iii) reflect the final Design-and-Build engineering design and the siting of ancillary facilities; and (iv) align the assessment with current national requirements and the World Bank Environmental and Social Standards (ESS), so as to enable the issuance of the Environmental Permit for Project commencement.

RE-GROUP therefore respectfully submits this application, together with the Project registration/brief and the updated ESIA (Environmental Impact Statement and Environmental and Social Management Plan), and requests the issuance of the Environmental Permits listed in Table B.2 for the Project and its ancillary facilities.

Table B.2: Environmental Permits applied for (as submitted, 1 August 2026)

No.	Environmental Permit applied for	Description of the associated works / facility
1	Road Works Environmental Permit	Rehabilitation and paving of the ~85 km road, earthworks, drainage, culverts/bridges and limited realignment within the Right-of-Way
2	Construction Camp Environmental Permit	Establishment and operation of the worker/construction camp(s), including accommodation, offices, workshops, fuel storage, water supply, sanitation and waste facilities
3	Quarry Environmental Permit	Development and operation of the rock quarry and borrow pits for construction aggregate, including drilling, blasting, extraction and reinstatement
4	Crusher / Asphalt Plant Environmental Permit	Installation and operation of the aggregate crushing plant and the asphalt (bituminous) mixing plant, including emissions, noise and hazardous-materials management
5	Concrete Batch Plant Environmental Permit	Installation and operation of the concrete batching plant, including cement handling, washout water management and dust control

In support of this application, RE-GROUP confirms that it will provide/attach the following, as required under the EPML (2003) and the EPA ESIA Procedural Guidelines: completed EPA project registration form(s) and the prescribed application/processing fees; the updated ESIA report (Environmental Impact Statement and ESMP) in the required number of hard copies and electronic (PDF) format; evidence of the published Notice of Intent and records of stakeholder consultation and disclosure (ESS10); site-specific information and management plans for each ancillary facility (camp, quarry, crusher/asphalt plant, concrete batch plant and borrow pits); and the firm's valid EPA consultancy licence/registration and the CVs of the assessment team.

Given the Project's construction-readiness schedule, RE-GROUP would be most grateful for the Agency's guidance on the screening determination, the approval of the Terms of Reference and the review timelines, and stands ready to facilitate the site verification, the Environmental Assessment Committee review, any public hearing, and the settlement of all applicable fees. We are committed to full compliance with the conditions the Agency may attach to the permits, including the biodiversity, quarterly-reporting and annual-audit obligations. We thank the Agency for its continued partnership and look forward to your favourable consideration.

Yours faithfully, *for and on behalf of Royal Environmental Group Liberia Inc.*

[Signature] **Clarence E. Buigbo**, Managing Director, Royal Environmental Group Liberia Inc.

cc: Project Director, ICCO/CET JV; Director, Infrastructure Implementation Unit (IIU), MPW; Managing Director, Forestry Development Authority (FDA); County Environment Officer, Grand Gedeh County; RE-GROUP Project File.

APPENDIX C — HIGH-LEVEL STAKEHOLDER CONSULTATION (2023)

The high-level stakeholder consultation of 1 December 2023 — invitation, presentation, attendance sheet and minutes — is retained as presented in the 2024 ESIA (Earthtime, 2024, Appendix C, referenced; the signed attendance sheet is reproduced in the engagement record of this report). The consultation record has since been extended by the 2024 RAP consultations, the 2025–26 BFS engagement and the 2026 update programme, presented in Chapter 5 and Appendix U.

APPENDIX D — WOMEN FOCUS GROUP DISCUSSIONS QUESTIONNAIRE

The women’s focus-group discussion questionnaire of the 2024 ESIA is retained by reference (Earthtime, 2024, Appendices M–N). The 2026 women’s focus groups (six, across Pouh, Zleh, Duogee, Sennehwein, Toe Town and B’hai Jorzon) used a consistent instrument; their records are reported in Chapter 5 and Appendix U.

APPENDIX E — ECOSYSTEM FOCUS GROUP DISCUSSION QUESTIONNAIRES

The ecosystem focus-group questionnaires (hunters; honey gatherers, zoes and craft makers) of the 2024 ESIA are retained by reference (Earthtime, 2024, Appendix E). Equivalent and more extensive instruments were applied by the Biodiversity Field Survey's community engagement (21 consultations, 464 participants), whose biodiversity findings are integrated in Chapter 7.

APPENDIX F — SAMPLING METHODOLOGY AND THE 2026 FIELD PROGRAMME

This annex documents the 2026 field programme that refreshed the environmental and social baseline: the programme dates, the complete register of the 60 environmental sampling stations with coordinates, and the three linked data-collection instruments issued on 1 August 2026 — the ESIA Field Data-Collection Toolkit (forms A–E), the CESMP Data-Collection Checklist (61 items) and the KoboToolbox digital form. The methodology is presented in full in this appendix.

F.1 Programme Design and Dates

The campaign ran in sequence: World Bank technical coordination meeting, 30 July 2026 (Monrovia); issue of the three field instruments, 1 August 2026; Contractor (ICC) scoping meeting, 2 August 2026 (Zwedru); community consultations, NOI postings and key informant interviews, 3–6 August 2026; socio-economic, cultural-heritage and ancillary-site fieldwork, 3–10 August 2026; and environmental sampling, 3–13 August 2026 (air and noise 3–7 August; surface water and groundwater 4–6 August; soils 3–6 August), with laboratory analysis commencing 15 August 2026 at the University of Liberia Civil Engineering Laboratory. All records were georeferenced (UTM Zone 29N, WGS 84) and photo-documented; Kobo digital capture was primary, with paper backup and daily reconciliation. The RE-GROUP supplementary biodiversity survey (15 plots, 5–9 July 2026) is described in Section 5.3 of this report.

The 60-station network pairs the principal roadside settlements (sensitive receptors) with the ancillary facilities requiring EPA permits, so that every permit application is supported by a pre-disturbance baseline. The 20 noise stations (ESIA code NS-01 to NS-20; certificate code SQ-01 to SQ-20) are co-located with the air-quality stations, sharing their coordinates, dates and times.

F.2 Station Register

Table F.1: Air-quality and co-located noise stations AQ-01 to AQ-20 / NS-01 to NS-20 (UTM Zone 29N; certificate UL LAB/ICC/002A/2026)

Station	Location	Easting	Northing	Date (2026)
AQ-01 / NS-01	Zahi Town (mechanical site, Zuoyou)	0578546	0684165	3 August
AQ-02 / NS-02	Zleh City	0562140	0688469	4 August
AQ-03 / NS-03	Quarry 2, Ziah Town (certificate label "Proposed Quarry-1")	0561723	0687540	3 August
AQ-04 / NS-04	Quarry 1, Suaken (certificate label "Proposed Quarry-2")	0580067	0689841	3 August
AQ-05 / NS-05	Batching/asphalt/crusher complex, Suaken	0580324	0689901	3 August
AQ-06 / NS-06	Proposed camp site, Zuoyou Town	0578827	0683905	3 August
AQ-07 / NS-07	Duogee Town	0553143	0693199	3 August
AQ-08 / NS-08	Gboleyville community, Zwedru	0595179	0669230	4 August
AQ-09 / NS-09	Zwedru City	0595667	0670924	4 August
AQ-10 / NS-10	Borrow pit BP1	0592687	0673385	4 August
AQ-11 / NS-11	Borrow pit BP3	0586519	0678581	4 August
AQ-12 / NS-12	Zai Town	0577772	0684664	4 August
AQ-13 / NS-13	Pouh Town	0565524	0688310	4 August
AQ-14 / NS-14	Tian Town	0556632	0692422	5 August
AQ-15 / NS-15	Suaken Town	0579633	0689868	5 August
AQ-16 / NS-16	Sennehwein Town	0549314	0698405	5 August
AQ-17 / NS-17	Toe Town	0548983	0708224	6 August
AQ-18 / NS-18	Nicko Town	0553356	0714948	6 August
AQ-19 / NS-19	Goyeazon Town	0551060	0712120	6 August
AQ-20 / NS-20	B'hai Town / border	0554862	0715095	7 August

Sampling times for every station are recorded on the certificate and in the field GPS/photo log (Toolkit form B.5).

Table F.2: Groundwater and surface-water stations GW-01 to GW-05 and SW-01 to SW-03 (UTM Zone 29N)

Station	Location	Type	Easting	Northing	Date (2026)
GW-01	Handpump, Zai Town	Groundwater	0577772	0684664	4 August
GW-02	Handpump, Zleh City	Groundwater	0562502	0688306	4 August
GW-03	Hand-dug well, Zleh City	Groundwater	0562140	0688469	4 August
GW-04	Handpump, Suaken Town	Groundwater	0579633	0689868	5 August
GW-05	Handpump, B'hai Town	Groundwater	0554748	0715127	6 August
SW-01	Unnamed creek, Zai highway	Surface water	0575746	0684634	4 August
SW-02	Unnamed creek, Pouh highway	Surface water	0567836	0686376	4 August
SW-03	Donneh Creek, near Zleh City	Surface water	0563257	0688488	4 August

The five groundwater stations double as the georeferenced inventory of community water points and are carried into the ESMP as protected receptors.

Table F.3: Soil sampling stations SS-01 to SS-12 (UTM Zone 29N)

Station	Location	Easting	Northing	Date (2026)
SS-01	Zahi Town (mechanical site)	0578546	0684165	3 August
SS-02	Quarry 1, Suaken (certificate label "Proposed Quarry-2")	0580067	0689841	3 August
SS-03	Batching/asphalt/crusher complex, Suaken	0580324	0689901	3 August
SS-04	Proposed camp site, Zuoyou Town	0578827	0683905	3 August
SS-05	Borrow pit BP1	0592687	0673385	4 August
SS-06	Borrow pit labelled BP-12 (coordinates plot at BP11 — under verification, assumptions register)	0554904	0692824	5 August
SS-07	Borrow pit BP17 (Nicko Town)	0553578	0715065	6 August

Station	Location	Easting	Northing	Date (2026)
SS-08	Borrow pit BP3	0586519	0678581	4 August
SS-09	Borrow pit BP5	0577488	0684733	5 August
SS-10	Borrow pit BP6	0576417	0684579	5 August
SS-11	Borrow pit BP15	0549733	0709253	6 August
SS-12	Borrow pit BP16	0551294	0712671	6 August

F.3 The ESIA Field Data-Collection Toolkit (Forms A–E)

The Toolkit (Technical Deliverable 2, RE-GROUP, 1 August 2026) standardised all field data collection to the EPML, the EPA ESIA Procedural Guidelines (2022), ESS1–ESS10, IFC PS6, the WBG EHS Guidelines and the SMART biodiversity protocol. Every record is georeferenced and photo-documented; an informed-consent script is read before every interview; SEA/SH safeguarding applies throughout, with a GBV referral card carried by all teams. Its five instrument groups are:

- **Group A — Mobilisation and QA/QC:** permits and notifications; team roles; pilot-testing; the consent protocol; the equipment checklist (GPS units/tablets; multi-parameter water meter; calibrated PM/gas air sampler; Type-1 sound-level meter for LAeq; vibration monitor; soil augers; camera traps; DBH tapes and quadrats); daily QA/QC and Kobo reconciliation.
- **Group B — Physical environment:** B.1 water sampling (in-situ temperature, pH, EC, DO, turbidity, TDS, salinity, ORP; laboratory ticklist incl. BOD/COD, TSS, nutrients, coliforms, oil and grease/TPH and metals Fe, Mn, Pb, Hg, As, Cd, Cr; chain-of-custody at not more than 4°C); B.2 air quality; B.3 noise and vibration (WBG EHS residential 55 dB(A) day / 45 night; PPV at blasting sites); B.4 soil sampling and contamination screening; B.5 GPS and photo log.
- **Group C — Biodiversity:** C.1 habitat/SMART record; C.2 nested botanical plots; C.3 camera-trap deployment/retrieval; C.4 transect and reconnaissance records; C.5 bird point counts; C.6 the threatened/trigger-species form — Western Chimpanzee (CR, km 18–20 near Sennehwein Town) and White-bellied Pangolin (EN, km 38–50), immediate reporting, no disturbance; C.7 invasive species; C.8 traditional ecological knowledge and resource use.
- **Group D — Socio-economic:** D.1 household questionnaire (Modules 0–6); D.2 community and D.3 institutional KII guides; D.4 FGD guides (women, youth, resource users, PAPs/vulnerable groups); D.5 gender and SEA/SH rapid assessment (female facilitation; GBV service mapping); D.6 community facilities inventory.
- **Group E — Cross-cutting:** E.1 cultural-heritage screening and chance-find register (field antecedent of the Chance-Find Procedure); E.2 land/asset inventory and PAP census linked to the RAP cut-off date; E.3 traffic and road-safety observation; E.4 ancillary-site screening — polygon GPS, tenure, distances to dwellings, watercourses and the BMP action A3 exclusion areas, flood risk, heritage constraints and receptors — the entry point for each of the five EPA permits.

F.4 The CESMP Data-Collection Checklist (61 Items)

The CESMP Data-Collection Checklist (Technical Deliverable 3, 1 August 2026) defines the Contractor-supplied information required to prepare and implement the CESMP and support the five EPA permits, targeting a CESMP within eight weeks of Service Agreement signature and permit applications within six weeks. Its 13 sections comprise 61 numbered data items, each with source, responsible party and priority: project and works information; ancillary siting and design (coordinates, layouts, geology and blasting plan, screening data, distances to receptors and the chimpanzee and pangolin zones, land agreements, reinstatement concepts); workforce and influx (ESS2); camp management and sanitation; materials, water and resources (ESS3); pollution control; occupational health and safety; community health, safety and security (ESS4); SEA/SH prevention and the Code of Conduct; the biodiversity/BMP interface (ESS6 — CH polygons, CSZ prescriptions including the 08:00–16:00 works window and 20 km/h limit, clearance limits, anti-poaching worker rules and the Table 7.1 supervision checks of BMP rev.3); cultural heritage and chance-finds (ESS8, FDA); grievance, emergency, SEP and monitoring arrangements (ESS10); and the permits and legal register.

F.5 The KoboToolbox Digital Form

Digital capture used the XLSForm "RETRAP 85km ESIA Update – Field Data Collection" (form ID **retrap_esia_85km_v1**, version **2026080101**), deployed to KoboToolbox/KoboCollect for offline use with daily reconciliation against paper backups. Its structure is summarised in Table F.4. Module 0 gates every

interview on recorded consent (the form closes if consent is refused), constrains chainage entry to 0–85 km, and captures a GPS geopoint and photographs on every record; Module 4 raises an automatic ESS6 alert, requiring GPS/photo capture and immediate notification of the Team Leader, whenever either trigger species is recorded.

Table F.4: Modules of KoboToolbox form retrap_esia_85km_v1 (version 2026080101)

Module	Content
0 — Identification and consent	Module selector; enumerator; consent gate; county and cascading district; community; chainage (0–85 km); GPS geopoint; photographs
1 — Household survey	Roster and demographics (incl. ethnicity/migration); housing, WASH, energy and assets; livelihoods, income bands, assets within the RoW (gating to Module 5); health, education, services; mobility and road safety; perceptions, SEA/SH risk perception, vulnerability flags, grievance-channel preference
2 — Community KII	Informant type; population and households; livelihoods and services; sacred sites; land administration and disputes; vulnerable groups; road history and concerns
3 — Facility/service inventory	Facility type (school, clinic, water point, market, worship, administration); name; condition; users; distance from road
4 — Biodiversity/species sign	Habitat; method; priority species; sign types; count and freshness; automatic ESS6 alert on chimpanzee or pangolin selection; hunting/snaring evidence
5 — Asset and PAP census (RAP)	PAP identity and contact; asset type, tenure, use, size, materials; vulnerability flag; witness; cut-off date notation
6 — Ancillary-site screening	Site type; area; land cover; tenure; distances to dwellings and watercourses; mandatory yes/no on siting within 2 km of the biodiversity-sensitive zones (chimpanzee km 18–20; pangolin km 38–50) — a screening flag only, the siting rule being BMP rev.3 action A3; flood/erosion risk; receptors; suitability notes

Together the three instruments form the auditable method trail of the 2026 update: the Toolkit governs how data were collected, the Kobo form is the primary capture platform, and the CESMP Checklist defines the data hand-off to the Contractor for the CESMP and permit applications.

APPENDIX G — LABORATORY ANALYSIS: SOILS (2026)

The corresponding 2023 laboratory report of the 2024 ESIA is referenced and not reproduced (Earthtime, 2024); the tables below present the 2026 campaign results (University of Liberia laboratory, certificate UL LAB/ICC/002A/2026).

Data qualifications and commitments. The certificate record will be supplemented with the reporting units for each determinand (mg/kg dry weight; cation-exchange capacity in cmol(+)/kg), the method detection limits and the sampling depth (0–30 cm), obtained in writing from the University of Liberia laboratory before construction. No Liberian soil quality standard applies; results are screened against internationally used agricultural soil reference ranges (FAO guidance, with the Dutch target values as screening references), and significance is judged by that comparison together with the absence of anthropogenic sources along the corridor. The station labelled “BP-12 (SS-06)” plots at the coordinates of the registered pit BP11; the label is reconciled to the canonical register, whose numbering is confirmed as BP1–BP17 with no BP10 (sixteen pits; Section 3.8, Table 3.4). Soil sampling at Quarry 2 and at crusher candidate site RC2 is committed **before either site is established**, so that a pre-disturbance baseline exists (Section 11.9.3).

Twelve soil stations (SS-01 to SS-12), sited at the mechanical site, Quarry 1, the plant complex, the camp and eight borrow pits (the SS-06 label "BP-12" is under verification — assumptions register, item M-08), were analysed for nine parameters; the certificate cites no soil reference standard, and results are interpreted as contamination screening.

Table G.5: Soil results, August 2026 — stations SS-01 to SS-06 (certificate UL LAB/ICC/002A/2026)

Parameter (method)	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06
pH (pH meter)	5.65	6.57	6.49	5.69	6.65	5.99
Organic matter, % (gravimetry)	52.00	51.05	49.00	47.80	49.45	50.00
Organic carbon, % (gravimetry)	53.16	50.84	47.70	51.99	51.76	52.00
Nitrate (colorimeter)	0.44	0.46	0.51	0.45	0.42	0.44
CEC (digital titration)	52.90	51.74	49.65	53.86	57.70	55.65
Lead (spectrophotometer)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (colorimeter)	0.57	0.60	0.59	0.76	0.79	0.63
Zinc, ppm (colorimeter)	0.042	0.064	0.063	0.080	0.074	0.066
Sulphate (colorimeter)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Table G.6: Soil results, August 2026 — stations SS-07 to SS-12 (certificate UL LAB/ICC/002A/2026)

Parameter (method)	SS-07	SS-08	SS-09	SS-10	SS-11	SS-12
pH (pH meter)	6.00	5.99	6.03	5.87	6.44	5.77
Organic matter, % (gravimetry)	48.07	46.09	49.50	52.31	51.60	49.76
Organic carbon, % (gravimetry)	50.89	54.00	53.66	52.80	49.99	50.77
Nitrate (colorimeter)	0.50	0.49	0.53	0.57	0.60	0.61
CEC (digital titration)	54.00	53.78	51.00	52.10	53.50	49.00
Lead (spectrophotometer)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (colorimeter)	0.55	0.66	0.58	0.56	0.75	0.68
Zinc, ppm (colorimeter)	0.050	0.057	0.065	0.069	0.070	0.058
Sulphate (colorimeter)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

The soils are moderately acidic (pH 5.65–6.65), typical of lateritic profiles, and show **no contamination signal at any ancillary site**: lead is below detection at all twelve stations and zinc is at trace levels. **Data-quality caveat (assumptions register):** the reported organic-matter (46.09–52.31 per cent) and organic-carbon (47.70–54.00 per cent) percentages are agronomically implausible for mineral lateritic soils (expected roughly 1–10 per cent), and organic carbon exceeds organic matter — a physical impossibility — in ten of twelve samples; CEC values are also high with units unstated (as for soil nitrate, iron, zinc and sulphate), and sampling depths were not recorded. A method/unit clarification and re-analysis have been requested, and the organic-matter, organic-carbon and CEC results are excluded from interpretation pending resolution; the contamination-screening conclusions stand.

APPENDIX H — AMBIENT AIR QUALITY MONITORING RESULTS (2026)

The corresponding 2023 laboratory report of the 2024 ESIA is referenced and not reproduced (Earthtime, 2024); the tables below present the 2026 campaign results (University of Liberia laboratory, certificate UL LAB/ICC/002A/2026).

Air quality was measured at 20 stations (AQ-01 to AQ-20) with a portable air-quality meter reporting CO, CO_2, VOC, PM2.5, PM10, SO_2 and NO_2 against the WHO reference values cited on the certificate. Results for 18 stations are transcribed in Table H.1; results for AQ-07 (Duogee Town) and AQ-12 (Zai Town) do not appear in the certificate's results tables although both appear in its sampling register, and have been queried with the laboratory. VOC was below detection (<0.001 ppm) at every reported station against a reference of 0.75 ppm and is not tabulated separately.

Table H.1: Ambient air-quality results, August 2026, against the WHO reference values cited on certificate UL LAB/ICC/002A/2026

Station	CO (ppm)	CO_2 (ppm)	PM2.5 (µg/m³)	PM10 (µg/m³)	SO_2 (µg/m³)	NO_2 (ppm)
AQ-01 Zahi Town (mechanical site)	7.45	15.80	6.20	7.60	0.31	0.01
AQ-02 Zleh City	6.30	14.70	5.89	6.70	0.29	0.01
AQ-03 Quarry 2, Ziah Town	6.22	17.45	6.22	7.56	0.39	0.01
AQ-04 Quarry 1, Suaken	5.90	16.50	7.34	5.99	0.44	0.01
AQ-05 Plant complex, Suaken	6.65	13.60	6.98	6.81	0.40	0.01
AQ-06 Camp site, Zuoyou	5.99	18.90	5.99	6.02	not reported	0.01
AQ-08 Gboleyville	7.00	19.00	6.00	6.67	0.33	0.01
AQ-09 Zwedru City	6.56	20.00	7.21	7.34	0.36	0.01
AQ-10 Borrow pit BP1	6.45	18.80	5.78	5.89	0.41	0.01
AQ-11 Borrow pit BP3	5.86	16.34	6.45	7.00	0.38	0.01
AQ-13 Pouh Town	6.67	19.23	6.44	7.11	0.35	0.01
AQ-14 Tian Town	7.00	20.83	6.20	7.63	0.43	0.01
AQ-15 Suaken Town	7.04	17.70	5.89	6.76	0.27	0.01
AQ-16 Sennehwein Town	6.33	18.87	6.22	7.58	0.37	0.01
AQ-17 Toe Town	5.90	16.56	7.34	5.90	0.41	0.01
AQ-18 Nicko Town	6.65	20.60	6.98	6.84	0.42	0.01
AQ-19 Goyeazon Town	5.99	18.99	5.99	5.66	0.35	0.01
AQ-20 B'hai Town / border	7.00	19.67	6.00	5.55	0.33	0.01

Station	CO (ppm)	CO_2 (ppm)	PM2.5 (µg/m³)	PM10 (µg/m³)	SO_2 (µg/m³)	NO_2 (ppm)
WHO reference value (certificate)	50.00	5,000	35.00	50.0	20.0	1.00

All reported values lie below the certificate's WHO references at every station — no exceedances. Baseline particulates are very low (PM2.5 5.78–7.34 µg/m³; PM10 5.55–7.63 µg/m³), complying even against the stricter WHO 2021 24-hour PM2.5 guideline of 15 µg/m³; fugitive dust will therefore be the dominant construction-phase air issue against a near-pristine baseline. Data-quality qualifications (assumptions register): the ambient CO_2 readings (13.60–20.83 ppm) are physically implausible (ambient about 420 ppm), indicating an instrument or unit issue; the AQ-06 SO_2 cell is blank; the PM2.5 row of the certificate's second table repeats the first, suggesting a copy artefact; and at six stations (AQ-04, AQ-05 and AQ-17 to AQ-20) the reported PM2.5 exceeds PM10, which is physically impossible because PM2.5 is a fraction of PM10 — the particulate results are therefore indicative pending the laboratory's response.

APPENDIX I — WATER QUALITY RESULTS: SURFACE AND GROUNDWATER (2026)

The corresponding 2023 laboratory report of the 2024 ESIA is referenced and not reproduced (Earthtime, 2024); the tables below present the 2026 campaign results (University of Liberia laboratory, certificate UL LAB/ICC/002A/2026).

I.3 Surface Water

Three surface-water stations (SW-01, SW-02 and SW-03, all sampled 4 August 2026) were analysed against the Liberia Water Quality Standard (LQWS) Class III. The certificate's notes state that values in bold are above the permissible limit, that NS means "not stated" and n.d. "not detectable".

Table I.3: Surface-water results, August 2026, against LQWS Class III (certificate UL LAB/ICC/002A/2026)

Parameter (method)	SW-01	SW-02	SW-03 (Donneh Creek)	LQWS Class III
pH (multi-meter)	6.90	7.48	6.34	5.5–9.0
Turbidity, NTU (turbidity meter)	0.64	0.57	0.66	≤10.0
Electrical conductivity, µS/cm (EC meter)	55.10	49.00	43.30	NS
Total dissolved solids, mg/l (gravimetric)	53.24	50.18	48.21	≤1,200.0
Total suspended solids, mg/l (gravimetric)	8.00	8.33	7.86	≤50.0
Sulphate, mg/l (colorimeter)	0.68	0.59	0.90	≤250.0
Chloride, mg/l (photometer)	0.55	0.77	0.65	≤450.0
Nitrate, mg/l (colorimeter)	0.50	0.39	0.40	≤80.0
Chromium (VI), mg/l (spectrometry)	0.035	0.044	**0.39**	≤0.1
Iron, mg/l (colorimeter)	0.052	0.071	0.73	≤2.0
Cadmium, mg/l (spectrometry)	≤0.001	≤0.001	≤0.001	≤0.01

All parameters comply at all three stations with a single exception as printed: **hexavalent chromium at SW-03 (Donneh Creek), reported at 0.39 mg/l against the LQWS Class III limit of 0.1 mg/l — 3.9 times the limit as printed**. Verification note: the certificate states that exceedances are bolded, yet this value is not, and it is inconsistent with every other chromium result of the campaign (0.025–0.044 mg/l across all water stations), suggesting a possible transcription of 0.039 mg/l; the value has been referred to the laboratory for verification, and if confirmed, Donneh Creek will be re-sampled and the source investigated before construction (assumptions register). SW-03 also records the campaign's highest iron (0.73 mg/l, within not more than 2.0) and lowest pH (6.34, within class). Manganese and mercury — flagged by the 2023 campaign — were not analysed in 2026 (nor were arsenic, BOD/COD, coliforms, or oil and grease/TPH); iron and total suspended solids, also flagged in 2023, are now well within limits. For chain-of-evidence continuity with those 2023 comparisons, Figure I.1 reproduces the cover page of the 2023 certificate of analysis issued to Earthtime Inc. by Liberlab (report 030-002, 27 December 2023; EPA project EP2023042) — the laboratory record from which the 2023 baseline values cited in this annex derive.



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Liberlab

Company Name	Earthtime Inc
Project No	EP2023042
Project period	
Contact Person	Basma Shamas Environmental Consultant bshamas@earthtimegroup.com
Laboratory Name	Liberlab
Quote No	LBQ2023015
Liberlab's Contact	Wafaa Alhalabi Lab manager wafaa.alhalabi@liberlab.com
Analyzed by	Fatima El Hajj Mousa
Report No	030-002
Report Issue Date	27-December-23

Certificate of Analysis

Liberlab received (8) soil samples on Monday, November 13th, 2023, these samples were scheduled for analysis which was completed on Wednesday, December 27th,2023.

Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside our scope.

The client is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved by

Wafaa Alhalabi
Lab manager

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Figure I.1: 2023 laboratory certificate (Liberlab) — cover page (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this Updated ESIA)

I.4 Groundwater

Five groundwater stations (GW-01 to GW-05; community handpumps and one hand-dug well) were analysed against LQWS Class I.

Table I.4: Groundwater results, August 2026, against LQWS Class I (certificate UL LAB/ICC/002A/2026)

Parameter	GW-01	GW-02	GW-03	GW-04	GW-05	LQWS Class I
pH	6.95	7.25	7.58	6.70	6.53	6.5–8.0
Turbidity (NTU)	0.60	0.53	0.55	0.66	0.64	≤5
EC (µS/cm)	52.00	51.88	49.50	44.20	48.15	1,000
TDS (mg/l)	45.21	40.01	39.28	46.21	47.00	≤500
TSS (mg/l)	8.00	6.98	7.33	7.86	6.86	≤10
Sulphate (mg/l)	0.55	0.54	0.53	0.64	0.67	≤150.0
Chloride (mg/l)	0.51	0.47	0.67	0.60	0.59	250
Nitrate (mg/l)	0.48	0.45	0.36	0.44	0.39	≤40.0
Chromium (VI) (mg/l)	0.033	0.025	0.042	0.031	0.028	≤0.05
Iron (mg/l)	0.043	0.034	0.039	0.045	0.029	≤0.1
Cadmium (mg/l)	≤0.001	≤0.001	≤0.001	≤0.001	≤0.001	n.d.

There are no groundwater exceedances. Two findings warrant attention: GW-05 (handpump, B'hai Town) records pH 6.53, just inside the Class I floor of 6.5; and total suspended solids at all five points (6.86–8.00 mg/l) stand at 69–80 per cent of the strict Class I limit of not more than 10 mg/l — community wells and handpumps therefore require positive protection from construction sediment (ESMP/CESMP commitment). The 2023 groundwater flags (nitrate 68.2 mg/l; lead 21.6 µg/l, at differently sited 2023 stations) are not reproduced at any 2026 station; microbiological potability of the five community sources remains unverified and is a pre-construction verification commitment (assumptions register).

APPENDIX J — NOISE MONITORING RESULTS (2026)

The corresponding 2023 laboratory report of the 2024 ESIA is referenced and not reproduced (Earthtime, 2024); the tables below present the 2026 campaign results (University of Liberia laboratory, certificate UL LAB/ICC/002A/2026).

Daytime spot noise levels were measured at the 20 co-located stations (certificate code SQ-01 to SQ-20; ESIA code NS-01 to NS-20) with a sound-level meter, against the certificate's cited reference of 75.0 dB(A).

Table J.2: Noise results, August 2026 (dB(A); certificate reference 75.0 dB(A))

Station	dB(A)	Station	dB(A)
NS-01 (SQ-01) Zahi Town	50.20	NS-11 (SQ-11) Borrow pit BP3	52.00
NS-02 (SQ-02) Zleh City	51.65	NS-12 (SQ-12) Zai Town	53.13
NS-03 (SQ-03) Quarry 2, Ziah Town	48.99	NS-13 (SQ-13) Pouh Town	52.45
NS-04 (SQ-04) Quarry 1, Suaken	54.02	NS-14 (SQ-14) Tian Town	49.99
NS-05 (SQ-05) Plant complex, Suaken	49.00	NS-15 (SQ-15) Suaken Town	50.02
NS-06 (SQ-06) Camp site, Zuoyou	52.12	NS-16 (SQ-16) Sennehwein Town	49.34
NS-07 (SQ-07) Duogee Town	47.88	NS-17 (SQ-17) Toe Town	50.11
NS-08 (SQ-08) Gboleyville, Zwedru	46.30	NS-18 (SQ-18) Nicko Town	48.88
NS-09 (SQ-09) Zwedru City	54.00	NS-19 (SQ-19) Goyeazon Town	47.37
NS-10 (SQ-10) Borrow pit BP1	51.90	NS-20 (SQ-20) B'hai Town / border	55.00

Measured levels range from 46.30 to 55.00 dB(A), all below the certificate's 75 dB(A) reference. Against the WBG EHS daytime residential guideline of 55 dB(A) applied in Chapter 6, NS-20 (B'hai Town/border) sits at the guideline and NS-04 (54.02), NS-09 (54.00) and NS-12 (53.13) approach it — market and roadside locations with elevated ambient activity. The dataset comprises single daytime spot readings only — no night-time measurements, statistical descriptors, durations or meter metadata, and no vibration baseline at the Suaken quarry despite the community's blasting concern (assumptions register); full-period measurement is committed in the ESMP before and during works.

APPENDIX K — RECORDS OF BIODIVERSITY CONSULTATIONS

The 2023 biodiversity consultation minutes are retained by reference (Earthtime, 2024, Appendix K). They are superseded in evidential weight by the Biodiversity Field Survey's structured engagement programme — 21 community consultations with 464 participants (46% women), including hunter and resource-user groups in the settlements adjacent to the Chimpanzee Sensitivity Zone — whose methods, records and integration into the baseline and management response are presented in Chapter 7 and the BFS report (SCNL et al., 2026, referenced).

APPENDIX L — BUSHMEAT MARKETS SURVEY

The 2023 bushmeat markets survey is retained by reference (Earthtime, 2024, Appendix L) as the historical record. Hunting pressure and the bushmeat economy were re-quantified by the BFS — corridor snare index 0.31 per km (0.41 per km within the Critical Habitat polygons), hunting hotspots at km 35–50 and km 60–75, and market monitoring is carried forward as a standing indicator of the Biodiversity Management Plan’s monitoring programme (Appendix T).

APPENDIX M — THREATENED FLORA AND BOTANICAL SURVEY TABLES (BFS, 2026)

The 2023 flora transect and botanical lists are referenced and not reproduced (Earthtime, 2024, Appendices M and N); the governing botanical record is the Biodiversity Field Survey, summarised below.

M.3 Threatened Flora

The BFS botanical programme recorded approximately 96 tree species (2,555–2,670 stems in 85 plots), including 28 FDA Class A and B species and **657 threatened stems (261 AoI / 396 buffer)**; 20 Class A stems within the AoI RoW are flagged for FDA co-signed pre-construction marking (F-001 to F-020).

Table M.3: Threatened flora register — IUCN-listed stems by zone (BFS, 2026)

Species (trade name)	Scientific name	IUCN / FDA class	Stems AoI / buffer	Distribution
Framire	Terminalia ivorensis	VU / A	90 / 98	Peak km 18–28 (hotspot PBF); 380 records
Ekki	Lophira alata	VU / A	49 / 105	km 10–55
Iroko	Milicia regia	LR/nt / A	37 / 56	Sacred-grove protected
Niangon	Heritiera utilis	VU / A	31 / 57	Mid-corridor concentration km 45–65
Kusia	Nauclea diderrichii	VU / A	32 / 35	Riparian zones and stream margins
African satinwood	Zanthoxylum gillettii	VU / B	136 records	Widespread
Abura	Hallea ciliata	VU / B	16 / 21	Swamp margins
Sipo	Entandrophragma utile	VU / A	2 / 10	Scattered
African mahogany	Khaya ivorensis	VU / A	28 records	Scattered
Kosipo	Entandrophragma candollei	VU / A	1 / 1	Rare
Sapelli	Entandrophragma cylindricum	VU / A	1 / 1	Rare
Tiama	Entandrophragma angolense	VU / A	0 / 4	Buffer only
Chewstick	Garcinia afzelii	VU	1 / 0	Single AoI record, about km 2
Bitter kola	Garcinia kola	VU	1 / 4	Scattered
Makoré	**Tieghemella heckelii**	**EN / A**	**0 / 2**	Two mature stems, Barteh Jam grove (km 3–4; DBH 118 and 92 cm)
Omu	Cryptosepalum tetraphyllum	VU / B	0 / 3	Buffer only

The 2026 update survey added further VU records not on the BFS list — Milicia excelsa, Parinari excelsa, Terminalia superba, Distemonanthus benthamianus, Albizia ferruginea and Anopyxis klaineana — held subject to verification (RE-GROUP, 2026). The operative replacement standard is 5:1 for any Class A stem lost and 5:1 for restoration-planting mortality (BMP rev.3, actions A4 and A8), applied under the National Forestry Reform Law (2006) and FDA Regulation No. 113-08; a higher ratio applies where the FDA requires it.

APPENDIX N — FAUNA AND BIODIVERSITY ANNEX TABLES (BFS, 2026)

N.1 Conservation-Significant Mammals

Table N.1: Conservation-significant mammals of the corridor Area of Influence and surveyed buffer (BFS, 2026; RE-GROUP, 2026)

Species	Scientific name	IUCN	Evidence
Western Chimpanzee	Pan troglodytes verus	CR	Single verified camera event, station SCNL04, transect T59, 3 February 2026 (UTM 547823/699446), about km 19, about 1.6 km west of the road near Sennehwein Town; TEK corroboration. ESS6 Criterion 1, treated precautionarily (not evidence of a resident population) — CSZ (Table N.5)
White-bellied Pangolin	Phataginus tricuspis	EN	Four verified camera events at four AoI stations (T16, T18, T27, T30), clusters km 38–50; TEK reports. ESS6 Criterion 1 primary trigger — CH-West/CH-East (Table F.5)
Giant Pangolin	Smutsia gigantea	EN	One direct sighting, 8 July 2026, plot SP-010 (UTM 0555120/0692839) — 2026 update survey, subject to specialist verification (two-specialist identification rule, BFS, Chapter 11) before any CH revision
Jentink's Duiker	Cephalophus jentinki	EN	One unconfirmed camera event (buffer), pending two-specialist review of the image; precautionary treatment under the sighting trigger (Table N.7)
Black-bellied Pangolin	Phataginus tetradactyla	VU	One camera video (station SCNL02, transect T21, AoI); two further buffer detections at km 40–55 reported as "long-tailed pangolin" (another common name for this species) are included in this taxon
Olive Colobus	Procolobus verus	VU	Buffer camera records and calls
Sooty Mangabey	Cercocebus atys	VU	Buffer camera records; 2026 direct group observation (SP-007)
Brooke's Duiker	Cephalophus brookei	VU	One buffer record
Liberian Mongoose	Liberiictis kuhni	VU	TEK-only in the BFS; two direct records (SP-008, SP-009) by the 2026 update survey, subject to verification
African Forest Buffalo	Syncerus caffer nanus	NT	39 records, AoI and buffer
Bay Duiker	Cephalophus dorsalis	NT	Camera events (4 AoI / 7 buffer)

Species	Scientific name	IUCN	Evidence
Yellow-backed Duiker	Cephalophus silvicultor	NT	One buffer record
Bongo	Tragelaphus eurycerus	NT	One AoI dung record (T22); one buffer camera event
Lesser Spot-nosed Monkey	Cercopithecus petaurista	NT	Seven buffer records

Forest elephant (*Loxodonta cyclotis*, EN), pygmy hippopotamus (*Choeropsis liberiensis*, EN) and leopard are effectively absent — historical extirpation validated by traditional ecological knowledge — and carry a watching brief only; KII-only 2026 reports of Diana Monkey, Upper Guinea Red Colobus and pygmy hippopotamus are treated as unverified (BFS, 2026; RE-GROUP, 2026).

N.2 Conservation-Significant Birds

Of the 206 bird species recorded (3,581 records; 45 point counts; 27 Upper Guinea endemics), the threatened species are registered in Table F.2 with the two additional VU species recorded by the 2026 update survey. The large-hornbill encounter rate — the BFS forest-health indicator — is 0.62 per 10 km in the AoI against 1.12 in the buffer.

Table N.2: Conservation-significant birds (BFS, 2026; RE-GROUP, 2026)

Species	Scientific name	IUCN	Records	Distribution and notes
Grey Parrot (Timneh)	Psittacus timneh	EN	15 records	Small dawn/dusk foraging flocks at six villages; CITES Appendix I; trade risk paramount; roost-tree protection PBF
Yellow-casqued Hornbill	Ceratogymna elata	VU	23 records	Buffer forests, km 5–45 and 55–65; canopy fruit specialist
Brown-cheeked Hornbill	Bycanistes cylindricus	VU	22 records (BFS); 6 sightings 2026	Mature canopy; mixed flocks with Yellow-casqued Hornbill
Sharpe's Apalis	Apalis sharpii	VU	18 records	Understorey insectivore in intact and regrowing patches
Yellow-bearded Greenbul	Criniger olivaceus	VU	1 record	Dense thickets, km 24; watching-brief PBF
White-necked Rockfowl (Picathartes)	Picathartes gymnocephalus	VU	1 colony (7 mud nests)	Rock outcrop about 2.5 km from the road near km 4 (beyond the 2 km surveyed buffer), near the Cestos River; site-specific PBF with 1 km no-blasting buffer
Black-casqued Hornbill	Ceratogymna atrata	VU	2 sightings (SP-006, SP-010)	Recorded by the 2026 update survey, subject to verification

Species	Scientific name	IUCN	Records	Distribution and notes
White-breasted Guineafowl	Agelastes meleagrides	VU	3 sightings (SP-007, SP-010)	Recorded by the 2026 update survey, subject to verification

The six BFS-listed species account for 80 georeferenced records (BFS, 2026).

N.4 The Construction-Threat Register

The BFS (September 2026) scores eleven construction threats, C1 to C11, on a likelihood (L, 1–5) by severity (S, 1–5) matrix with the classes Low (1–6), Medium (7–12), High (13–19) and Critical (20–25), before and after the BMP controls (BFS, 2026, Table 8.2; BMP rev.3, Table 4.1A). Only work-driven threats are scored: clearance fronts, plant and crews, ancillary sites, in-stream work and the workforce. Landscape pressures that the works contract cannot mitigate — commercial hunting after paving and cocoa expansion in the buffer — are excluded from the register and are assessed as induced and cumulative impacts in this report (BD-07, BD-08 and CI-01). No threat remains High or Critical after the controls, and the six residual conditions of BMP rev.3 (Table 6.3) hold the Criterion 1 residual at Medium (Moderate on the scale of this report).

Table N.4: The construction-threat register C1–C11 with pre-control and residual likelihood × severity scores (BFS, 2026, Table 8.2; BMP rev.3, Table 4.1A)

ID	Construction threat	Where	Pre-control (L × S)	Control (BMP rev.3 action)	Residual (L × S)
C1	Clearance beyond the approved right-of-way	Any segment; highest at km 18–28 and km 38–50	4 × 4 (High)	Right-of-way pegged; pre-clearance walkover (A4)	2 × 2 (Low)
C2	Works inside the Chimpanzee Sensitivity Zone no-go core	km 18–20	3 × 5 (High)	Demarcation before clearance (A1); Table N.7 stop-work	1 × 3 (Low)
C3	Night work or blasting in the Sensitivity Zone or Critical Habitat	km 18–20; km 38–50	3 × 4 (Medium)	Hours 08:00–16:00; no blasting in those nodes (A2)	1 × 3 (Low)
C4	New quarry, borrow pit, crusher or camp in the Sensitivity Zone or Critical Habitat	Ancillary sites of the register	3 × 5 (High)	Siting freeze and design-review overlay (A3)	1 × 4 (Low)
C5	Unauthorised Class A felling	Flora hotspot km 18–28	3 × 4 (Medium)	Class A protocol; 5:1 replacement if a stem is lost (A4)	2 × 2 (Low)
C6	Sediment at the Towah swamp and live crossings	km 12–14 and other watercourses	4 × 3 (Medium)	Span or large box; low-flow work; silt control (A7)	2 × 2 (Low)
C7	Workforce hunting or bushmeat	Camps and corridor	3 × 4 (Medium)	Code of Conduct; weekly camp check (w	2 × 3 (Low) ith monthly Supervising Engineer verification) (A5)
C8	Collision at a documented hotspot during the works	Sensitivity Zone and camera clusters	3 × 3 (Medium)	20 km/h and signage (A9); crossing only where the BFS evidence supports it (A6)	2 × 2 (Low)
C9	Blocked or poorly built crossing or culvert	Sites justified by the BFS evidence	2 × 3 (Low)	Design engineer's drawings (A6); Table N.7 repair	1 × 2 (Low)

ID	Construction threat	Where	Pre-control (L × S)	Control (BMP rev.3 action)	Residual (L × S)
C10	Invasive plants on opened ground	Disturbed right-of-way, pits, camp edges	3 × 2 (Low)	Progressive restoration; 70 per cent cover rule (A8)	2 × 1 (Low)
C11	Sighting of a protected species at an active front	Any live front	2 × 4 (Medium)	Table N.7 suspend-and-clear (50 m rule)	1 × 3 (Low)

Spatially, the threats concentrate at the Chimpanzee Sensitivity Zone (km 18–20; ten of the eleven threats) and the pangolin reach (km 38–50), which is why segments S3 and S6 are checked first in each supervision week (BMP, Section 7.2.1) and why the ancillary-site freeze, the hours rule and the community notice attach to those two segments (BFS, 2026, Table 8.3; BMP, Table 3.3).

N.5 Critical Habitat Polygons and Priority Biodiversity Features

ESS6 Critical Habitat is triggered under Criterion 1 only (Criteria 2–5 tested and not triggered), with the White-bellied Pangolin (EN) as the primary trigger and the Western Chimpanzee (CR) treated precautionarily on a single verified record. The two pangolin Critical Habitat polygons (19.5 km²) and the Chimpanzee Sensitivity Zone (3.14 km²) total 22.6 km², and six Priority Biodiversity Features total approximately 14.2 km². The Chimpanzee Sensitivity Zone at km 18–20 supersedes the km 64–72 zone of the 2024 ESIA (assumptions register). The management responses below are the BMP rev.3 actions A1–A10 that bind the works (Appendix T).

Table N.5: The Critical Habitat polygons, the Chimpanzee Sensitivity Zone and the six Priority Biodiversity Features (BFS, 2026; BMP)

Feature	Type	Area	Location	Qualifying values	Key management
CH-West (Pangolin)	Critical Habitat	8.7 km²	km 38–44	White-bellied Pangolin (EN): events T16, T18	No clearing outside the pegged RoW (A4); no new quarry, pit, crusher, batching plant, camp or laydown in the polygon (A3); works 08:00–16:00, no night work or blasting while a front is in S6 (A2); 20 km/h and node signs (A9); community notice (A10)
CH-East (Pangolin)	Critical Habitat	10.8 km²	km 46–50	White-bellied Pangolin (EN): events T27, T30; Black-bellied Pangolin (VU)	As CH-West; the camp proposed at about km 45 in the BFS ancillary package rejected (BMP rev.3, Table 3.2); BP8 and BP9 subject to the A3 overlay (this report, Table 3.6)
Chimpanzee Sensitivity Zone	Critical Habitat (precautionary)	3.14 km² incl. 0.78 km² no-go core	km 18–20, centred on T59 near Sennehwein Town	Western Chimpanzee (CR): verified detection, 3 February 2026 (precautionary)	No-go core demarcated before clearance (A1); no new ancillary site in the CSZ (A3); works 08:00–16:00, no night work or blasting (A2); 20 km/h and node signs (A9); canopy retention; front suspended on a verified sighting within 50 m (Table N.7)
Barteh Jam sacred grove	PBF	3 ha	km 3–4	Picathartes colony (7 nests); 2 Tieghemella heckelii (EN); cultural heritage	Full no-go during the works; no blasting or quarrying in the agreed buffer (1 km in the BFS); community MOU; custodial consultation
Towah swamp wetland	PBF	about 380 ha	km 12–14	Wildlife crossing corridor; otter sign; hornbill foraging; amphibian breeding	Span or large box culvert to the design engineer's drawings; low-flow in-stream method; weekly silt control during in-stream work (A7)

Feature	Type	Area	Location	Qualifying values	Key management
Flora hotspot	PBF	about 1,200 ha	km 18–28	Terminalia ivorensis peak; Class A and VU cluster	FDA Class A stem protocol: pre-clearance walkover and FDA-co-signed marking before each cut; micro-adjustment within the approved RoW where a marked stem can be kept; 5:1 replacement of any stem lost (A4)
Three additional sacred groves	PBF	about 4.5 ha	Toe Town; Kparblée; Bassa	Cultural heritage; remnant forest structure	Full no-go during the works; community MOUs; exclusion areas loaded into the Contractor's GIS and physically marked
Picathartes rock outcrop	PBF	about 1 ha + 1 km buffer	Buffer, about 2.5 km from the road at about km 4, near the Cestos River	One colony, 7 mud nests	1 km no-disturbance buffer; no blasting or quarrying; no ancillary site (A3); re-screening of any design change near the site
Riparian corridors	PBF	about 5 km² linear	All stream crossings corridor-wide (82 culverts and five bridges in the design)	Hydrological connectivity; wildlife corridors	Undisturbed riparian buffer of at least 30 m each side outside the approved crossing footprint; sediment traps at all crossings; low-flow in-stream work; bank restoration under A8

N.6 Works-Period Supervision Checks and Stop-Work Triggers

Table N.6: Supervision checks during the works (BMP rev.3, Table 7.1; BFS, 2026, Table 7.1)

Location	What is checked	When	Who
Chimpanzee Sensitivity Zone and no-go core (km 18–20)	Demarcation intact; no unauthorised entry; works 08:00–16:00; no night work or blasting; 20 km/h signage in place	Weekly while the front is in the zone; monthly at other times during the works	Contractor records; Supervising Engineer verifies
Pangolin polygons km 38–50	No new quarry, camp or laydown; pre-clearance walkover done; clearance inside the approved RoW only	Weekly during vegetation clearance; monthly during other works in the segment	Contractor records; Supervising Engineer verifies
Crossing, culvert or canopy-connection sites justified by the BFS evidence	Built as the accepted drawings; not blocked; drainage working	Monthly while the structure is under construction; at completion	Supervising Engineer
Towah swamp and live watercourse works	Sediment contained; in-stream work in low flow where practicable	Each week of in-stream work	Contractor; Supervising Engineer
Flora hotspot km 18–28	Class A protocol followed; RoW pegs in place	Before and during clearance	Contractor with Supervising Engineer
Restored surfaces (works footprint only)	Cover and survival against the 70 per cent and 60 per cent rules	End of the first rainy season after planting; before section certification	Supervising Engineer
Camps and corridor	Code of Conduct records; weekly camp check (with mo grievance entries on wildlife; signage	Monthly nthly Supervising	Contractor; Engineer verification); Supervising Engineer; Employer as needed

Table N.6 is the checklist held by the Supervising Engineer: inspections are weekly while a front is in segment S3 or S6 and in each in-stream week at the Towah swamp, monthly at camps and elsewhere, with a check at the end of the first rainy season after planting and a defects-liability inspection for action A8; the monthly verification form is BMP rev.3, Annex B. Table N.7 lists the events that stop work or require notification on the same day.

Table N.7: Stop-work and notify triggers (BMP rev.3, Table 7.2; BFS, 2026, Table 7.2)

Trigger	Threshold	First action	Notify
No-go core or CH polygon	Any unauthorised entry or works	Stop work in the vicinity; reinstate demarcation; record the incident	Employer within 24 hours

Trigger	Threshold	First action	Notify
Working hours/blasting	Night work or blasting in the CSZ or a CH polygon	Written instruction; a repeat event may suspend the front	Employer on repetition
Class A stem	Unauthorised felling	Halt the segment; apply the agreed protocol; replace at 5:1 if the stem is lost	Employer; FDA as required
Code of Conduct	Verified hunting, capture or bushmeat by Project personnel	Disciplinary process; review induction	Employer; FDA where the law requires
Watercourse	Uncontrolled sediment beyond the approved footprint	Add silt control; correct drainage; photograph	Supervising Engineer
Approved crossing or canopy connection	Damage or persistent blockage	Repair within the agreed time	Supervising Engineer and Employer
Restoration	Cover below 70 per cent, or survival below 60 per cent, at the first rainy-season check	5:1 replacement at the Contractor's cost; re-inspect after the next rainy season	Supervising Engineer before certification
Protected or priority species	Verified sighting within 50 m of an active front	Suspend the front until the Supervising Engineer clears restart	Supervising Engineer and Employer

Serious incidents — the injury or death of a chimpanzee, works inside the no-go core and unauthorised Class A felling — are reported by the Contractor to the Employer within 24 hours and by the IIU to the World Bank and the EPA within 48 hours (BMP Section 7.3.1). Biodiversity results are carried in the monthly environmental and social report and verified by the Supervising Engineer (BMP, Table 7.3).

APPENDIX O — SAMPLING PROTOCOL FOR eDNA

The environmental-DNA sampling protocol is retained by reference (Earthtime, 2024, Appendix O). Continuation of eDNA sampling is carried in the biodiversity monitoring programme of the BMP (Appendix T), using methods consistent with the 2023 protocol for comparability.

APPENDIX P — ENVIRONMENTAL DNA SAMPLING RESULTS (2023)

The 2023 eDNA results (vertebrates; mammals) are **referenced and not reproduced** (Earthtime, 2024, Appendix P): the field-verified camera-trap, transect and acoustic record of the Biodiversity Field Survey now provides the governing faunal evidence (Chapter 7 and Appendices M–N), and future eDNA rounds report through the BMP monitoring programme.

APPENDIX Q — SOCIAL SURVEY QUESTIONNAIRES

The key-informant and household survey questionnaires of the 2024 ESIA are retained by reference (Earthtime, 2024, Appendix Q). The 2023 household survey remains the quantitative socio-economic baseline (Chapter 8); the 2026 refresh was qualitative by design, using community profiles, key-informant interviews and focus groups recorded at Appendix U.

APPENDIX R — ENVIRONMENTAL AND SOCIAL STANDARDS AND LEGAL REGISTER

This annex expands the legal and permitting framework of Chapter 2 of this report into a working compliance register: Table R.1 sets out each principal national instrument, its administering body, the obligations it creates and the evidence of compliance in this submission package; Table R.2 sets out the permits register with triggers and timing. International conventions and the World Bank ESF are covered in Tables 2.2–2.4 of this report. The register is maintained live in the ESMP.

Table R.1: Expanded legal register — obligations and evidence of compliance (RE-GROUP, 2026)

Instrument	Administering body	Key obligations for the Project	Evidence of compliance in this package
Environment Protection and Management Law (EPML), 2002 (published 2003)	EPA	Mandatory ESIA for road works (EPML Annex No. 13); environmental permits before commencement; annual effluent, waste and emission licences for camp and plants; protection of watercourses and wetlands; audit powers	This Updated ESIA, ESMP, I; CESMP and BMP; NOI and permit application (Annex A); wetland/creek controls (Chapters 3, 6, 9); monitoring framework (Chapter 11)
Environmental Protection Agency Act, 2002/2003	EPA (County Environmental Officer)	Registration through the County Environmental Officer (Section 36); EPA standards, inspection and enforcement	Registration under EPA code EP2023042 (2024 ESIA) and 2026 correspondence (Appendix B); county inspection provided for in the ESMP
EPA ESIA Procedural Guidelines (2022)	EPA	NOI publication; screening; ToR approval; EIS preparation; disclosure, 30-day public comment, possible hearing; permit decision	Republished NOI, 17 postings (Appendices B and U); consultation record (Chapter 5; Appendix U); this EIS/ESMP; disclosure plan (Section 5.7)
National Environmental Policy (2003)	EPA	Environmental integration; sustainable resource use; public participation	Assessment framework and alternatives (Chapters 4–5); participation record (Chapter 5)
National Wildlife Conservation and Protected Area Management Law (2016)	FDA	Protection of listed species; regulation of hunting, possession and bushmeat trade	Critical Habitat determination and CSZ prescriptions (Chapters 6–8); workforce hunting ban (Chapter 10; CESMP); BMP rev.3 action A5 (Code of Conduct: no hunting, bushmeat, wildlife trade, weapons or snares; weekly camp check (with monthly Supervising Engineer verification))
National Forestry Reform Law (2006); FDA Regulation No. 113-08	FDA	Felling authorisation; Class A and Class B protection; FDA-co-signed marking before each cut and 5:1 replacement of any Class A stem lost (BMP rev.3, action A4)	FDA co-signed tree marking commitment (Chapter 10; BMP rev.3, action A4); felling authorisation (Table R.2); progressive footprint restoration with 5:1 replacement of failed planting (BMP rev.3, action A8)
Community Rights Law with respect to Forest Lands (2009)	FDA with communities	Consultation and benefit-sharing on community forest resources	Consultations (Chapter 5); community notice before a works front enters S3 or S6 (BMP rev.3, action A10); sacred-grove MOUs
Land Rights Act (2018)	Liberia Land Authority	Equal protection of customary land; lawful land-use acquisition	Works confined to the government RoW; no private land acquisition (RAP, 2025); ancillary-site agreements/MOU route with LLA validation (Section 3.8; RAP record)

Public Health Law (Title 33, revised 2017)	Ministry of Health	Sanitation, potable water, vector control, disease prevention, occupational hygiene	Camp and site health provisions (Chapter 10; CESMP); community health assessment (Chapters 8–10)
Decent Work Act (2015)	Ministry of Labour	Labour standards; prohibition of forced/child labour and sexual harassment; OHS duties	LMP applied in full; minimum working age 18; Code of Conduct; workers' GRM (Section 5.6); CESMP labour and OHS plans
Minerals and Mining Law (2000)	MME	Licensing of quarrying and materials extraction; explosives authorisation	Materials/blasting authorisations (Table C.2); quarry and borrow-pit register with conditions (Section 3.8)
Local Government Act (2018)	MIA; county authorities	County/district clearances; local participation in grievance redress	Government engagements (Appendix U); county/district GRC membership (Section 5.6); clearances (Table R.2)
Water Resources Management Regulations (2009)	EPA	Protection of wetlands and watercourses affected by works	Register of 9 creeks and 31 RoW wetlands with no-fill and buffer rules (Chapters 3, 6, 9); sediment controls (CESMP)
Water Quality Regulations (2018) / LQWS	EPA	Ambient water-quality classes; abstraction licensing; discharge controls	2026 baseline against LQWS Classes I and III (Annex E); abstraction licences (Table R.2); CESMP discharge controls
Freedom of Information Act (2010)	Independent Information Commission	Public access to project information	Disclosure plan (Section 7.7); public registers and grievance records (Section 5.6)
National Gender Policy; National Action Plan on GBV	Ministry of Gender, Children and Social Protection	Gender mainstreaming; GBV prevention and response	Gender/GBV baseline (Section 8.5); SEA/SH framework and referral pathway (Section 5.6)
World Bank ESF (ESS1–ESS10) with ESCP, ESMF, SEP, LMP (P175263, incl. AF P181083)	World Bank; IIU/MPW; MoA PMU	ESS1–6, 8 and 10 relevant (ESS7, ESS9 not relevant); disclosure before design finalisation and civil-works disbursements; BMP cleared before works; quarterly reporting; 48-hour incident notification	ESS conformance matrix and ESCP commitments (Tables 2.3–2.4); this package; adopted GRM (Section 5.6); reporting framework (Chapter 11)

Compliance is verified through the Contractor's monthly E&S reports, the IIU's quarterly reports to the World Bank and EPA inspection; changes of law or permit conditions are logged at each ESMP revision.

Table R.2: Permits and approvals register — triggers, timing and status (RE-GROUP, 2026)

Permit / approval (authority)	Trigger	Timing requirement	Status (October 2026)
Environmental permit — road works (EPA)	Rehabilitation of the 85 km road; mandatory-ESIA activity (EPML Annex I No. 13)	Before commencement of civil works	Application supported by this ESIA; EPA review pending
Environmental permit — construction camp (EPA)	Camp and mechanical yard (Zuoyou Town area)	Before camp establishment	Pending; supported by this ESIA and the CESMP
Environmental permit — quarry (EPA)	Quarry development/operation (Suaken; Ziah Town if used), incl. blasting	Before quarry development	Pending; Suaken MOU outstanding; siting subject to the BMP action A3 overlay
Environmental permit — crusher / asphalt plant (EPA)	Crushing and asphalt plant (Suaken complex)	Before plant operation	Pending; follows siting screening
Environmental permit — concrete batch plant (EPA)	Concrete batching plant	Before plant operation	Pending
EPML operational licences — effluent; solid/hazardous waste; pollution emission (EPA)	Discharges, waste and emissions at camp and plants	Before the licensed activity; renewed annually	To be applied for with the facility permits
Tree-felling authorisation (FDA)	Felling within the RoW and at ancillary sites	Before vegetation clearance	To be obtained; tree inventory to accompany
Water abstraction licence(s) (EPA/MME)	Surface or groundwater abstraction	Before abstraction begins	To be obtained; volumes per the CESMP
Materials extraction licences; explosives/blasting authorisation (MME)	Quarry and borrow extraction (16 borrow pits); blasting	Before extraction and any blasting	To be obtained
County/district clearances and community agreements	Mobilisation, ancillary-site access, local operations	Before mobilisation to the respective sites	In progress; Suaken MOU outstanding; BP2/BP3 pre-clearance screening
BMP ancillary-site overlay and segment gates G1–G6 (IIU/MPW as Employer, with the Supervising Engineer)	Every proposed or existing ancillary site (BMP action A3 overlay); any front entering segment S3 (km 18–20) or segment S6 (km 38–50)	Detailed-design review; before a front enters S3 or S6	Pending (BMP rev.3, Section 3.3 and Table 8.2)

The permits are conditions precedent: no facility may operate and no works may commence before the corresponding permit is in hand, before the RAP compensation condition is discharged and the payment-completion report cleared by the World Bank, and — for a works front entering the Chimpanzee Sensitivity Zone (S3) or a pangolin Critical Habitat polygon (S6). The BMP is disclosed with this ESIA as Appendix T.

APPENDIX S — MONITORING PROGRAMME PARAMETERS

The monitoring parameters of the 2024 ESIA (Earthtime, 2024, Appendix S) are updated by this revision as follows: the physical-environment parameters, stations, frequencies and standards are consolidated in the ESMP monitoring programme (Chapter 11, Section 11.4), maintaining the 2026 baseline station network (20 air, 20 noise, 5 groundwater, 3 surface water, 12 soil) for comparability; the biodiversity parameters are governed by the BMP monitoring framework (Appendix T) — the key performance indicators with Year-0 baselines and Year-5/Year-10 targets, the node-scaled compliance monitoring, and the adaptive-management triggers with fixed response timelines; and the social parameters (grievance resolution performance, employment and local-content reporting, SEA/SH process indicators) are carried in the ESMP and reported monthly by the Contractor and quarterly by the IIU. Parameters flagged for pre-construction verification (manganese and mercury re-tests; SW-03 hexavalent-chromium verification; soil organic-matter re-analysis) are binding commitments carried from Chapter 6.

APPENDIX T — BIODIVERSITY MANAGEMENT PLAN (NOVEMBER 2026)

The Biodiversity Management Plan is reproduced in full below as an integral, binding appendix of this ESIA; it is maintained as a live instrument under its own revision protocol, and its six binding conditions are conditions precedent to works in the sensitive segments. Document control, approvals and the plan's own annex instruments are held in the Project safeguard file.

1. INTRODUCTION

This chapter states the purpose, status, scope and governing framework of the Biodiversity Management Plan (BMP) for the Rehabilitation of the Côte d'Ivoire Border – Toe Town – Zwedru Road (85 km), Grand Gedeh County, Liberia, financed under the Liberia Rural Economic Transformation Project Additional Financing (RETRAP-AF, P181083; parent project P175263), and explains how the plan relates to this ESIA, the ESMP, the CESMP and the project-level World Bank instruments.

1.1 Purpose and Status

This BMP is the Project instrument that translates the revised Biodiversity Field Survey (BFS) of the 85 km B'hai Jorzon–Toe Town–Zwedru corridor into measures that can be designed, contracted, supervised, and certified. The Project is the rehabilitation of an existing laterite road under the RETRAP-AF, P175263 / P181083. The BFS determined that Environmental and Social Standard 6 (ESS6) Critical Habitat is triggered under Criterion 1. This plan therefore specifies, for the period of detailed design, civil works, and defects liability, how those values will be avoided, minimized, and restored within the works footprint; how compliance will be checked; and how communities will be notified when a construction front enters a mapped node.

The purpose of this BMP is to: (i) record the Critical Habitat and Priority Biodiversity Feature findings that bind the works; (ii) set the avoidance, minimization and footprint-restoration actions the Contractor shall implement; (iii) set the supervision checks and stop-work triggers the Supervising Engineer shall apply; and (iv) identify the conditions the Employer shall hold before vegetation clearance begins in segment S3 (approximately kilometer 18–20) or segment S6 (approximately kilometer 38–50).

The plan discharges the Environmental and Social Commitment Plan (ESCP) requirement that necessary biodiversity management measures be prepared and applied before the relevant works commence. It is issued as an annex to the 85 km Environmental and Social Impact Assessment (ESIA). It shall be operationalized through the Construction Environmental and Social Management Plan (CESMP) before a front enters S3 or S6. Until those CESMP clauses are in place, vegetation clearance shall not start in those segments.

The BMP was prepared by Royal Environmental Group Liberia Inc. (RE-GROUP) for the Infrastructure Implementation Unit (IIU) of the Ministry of Public Works (MPW), the Employer. Its evidential basis is the two-season BFS undertaken by the Society for the Conservation of Nature of Liberia (SCNL) with the Wild Chimpanzee Foundation (WCF), Fauna & Flora and Solimar International (October 2025 – February 2026; Final Report, 30 September 2026), supplemented by the RE-GROUP 2026 update survey and the biological baseline of this ESIA (Chapter 6). The BMP is self-contained and can be read, implemented and audited without reference to any other volume; cross-references are provided for traceability. In substance, this BMP consolidates the BFS's BMP-ready outputs into the Project's biodiversity management plan, restating them as enforceable obligations without altering their technical content.

1.2 Scope

The alignment is an existing public road. Habitat conversion along most of the corridor is already part of the environmental baseline (BFS, Sections 1.1.2 and 1.3.6). The Project does not open a new forest corridor. Additional biodiversity risk arises where plant, ancillary sites, hours of work, blasting, right-of-way clearance and a concentrated workforce meet mapped Criterion 1 nodes and Priority Biodiversity Features. This BMP is written for that increment, not for historical forest loss.

Physical works comprise rehabilitation within the approved right-of-way, associated drainage and structures, and ancillary facilities (borrow pits, quarries, crushers, batching plants, camps and laydowns) as registered in the ESIA's canonical ancillary register (ESIA Section 3.8, Tables 3.4 to 3.6) and screened on the overlay of Table 3.2 of this plan; the BFS records the sensitivity zones within which none of them may be sited. Existing ancillary sites outside the Chimpanzee Sensitivity Zone and the pangolin polygons may continue in use if they meet the same environmental controls. New sites shall not be opened inside those polygons (Action A3).

Spatially, the plan applies to the 85 km centerline, the approved rural and urban right-of-way, all ancillary sites proposed or approved for the works, the Chimpanzee Sensitivity Zone (approximately 3.14 square kilometers at kilometer 18–20, including a 0.78 square kilometer no-go core), the two White-bellied Pangolin Critical Habitat polygons at kilometer 38–50, and the Priority Biodiversity Features listed in Table 2.2.

Temporally, the plan applies to detailed design, mobilization, peak construction and the defects-liability period. It does not extend into a separate operation-phase biodiversity program, and it does not set long-term performance targets. Access-related hunting or conversion that may follow paving is noted in the BFS as a landscape pressure. It is not assigned a residual class that this works contract is required to close.

Construction will begin at the Zwedru end of the corridor; the contractor's kick-off was held on 2 August 2026 and, at the date of this revision, mobilization, surveys and design are under way and civil works have not yet commenced. Detailed design is progressing from the Zwedru terminus (km 85+000) westward and has been completed for approximately the first 10 km from Zwedru (about km 85 to km 75); every candidate quarry, borrow pit, spoil area, stockpile, camp and equipment yard is being plotted against Figure 3.1 as the design advances (Action A3), the wildlife-crossing warning and awareness signage of Action A9 is being carried into the road-furniture design, and the evidence-led crossing provisions of Actions A6 and A7 are tested at each design review (ESIA Section 3.16). This provides program lead time for the pre-mobilization prerequisites attached to the sensitive western and mid-corridor segments.

1.3 Relationship to other Project Instruments

The 85 km ESIA is the assessment umbrella. Biological baseline and impact assessment remain in the ESIA; this BMP does not reopen those chapters. The Environmental and Social Management Plan (ESMP) summarizes biodiversity controls for the Employer's overall environmental and social management. This BMP governs the biodiversity detail. In any difference in biodiversity specifications for the works, this BMP prevails.

The CESMP shall reproduce Table 3.1 (zone rules and actions), Table 7.1 (checks) and Table 7.2 (triggers) of this plan, with method statements for hours of work, pre-clearance walkover, the Code of Conduct and in-stream method at Towah Swamp. The Stakeholder Engagement Plan and the Project grievance mechanism remain the instruments for notice and complaints; this BMP adds only the node-specific notice required before a front enters S3 or S6 (Action A10). The Resettlement Action Plan and Labor Management Procedures are not duplicated here.

A consolidated corridor instrument covering the parallel 40 km segment, if prepared, shall not expand the scope of this 85 km plan: this plan's obligations run for the construction and defects-liability period of the 85 km works contract only, and the 40 km section is governed by its own instruments — no obligation of this plan extends to it.

1.4 Applicable Standards

The governing standard is ESS6. Screening method follows **IFC** Performance Standard 6 and Guidance Note 6 (2019), as applied in the BFS Chapter 4 screen. National requirements that bind the works include the Environment Protection and Management Law, the Environmental Protection Agency **(EPA)** procedural guidelines, Forestry Development Authority Regulation No. 113-08 on Class A and Class B species, and the Wildlife Conservation and Protected Areas Management Act (2016) insofar as workforce hunting or unauthorized taking is concerned.

ESS6 requires that, where Critical Habitat (CH) is present, the Project avoid or minimize impacts on the qualifying values and restore residual disturbance associated with the works. For this rehabilitation, that requirement is discharged by the actions in Table 3.1, the checks in Table 7.1 and the conditions in Table 6.3.

1.5 Implementing Parties

The Employer is the Infrastructure Implementation Unit (IIU) of the Ministry of Public Works (MPW). The Contractor (including all subcontractors and suppliers on the alignment) implements Table 3.1. The Supervising Engineer verifies Table 7.1 and issues Table 7.2 instructions the same day a trigger is met. The Forestry Development Authority (FDA) and the EPA are engaged under national procedure for Class A stems and for incidents the wildlife law requires to be referred. Corridor communities are informed through the Stakeholder Engagement Plan (SEP). They are not contracted as a ranger service under this plan.

1.6 BMP Revision Protocol

The BMP is version-controlled. A revision is required if: (i) a further Criterion 1 record is verified on the alignment; (ii) detailed design moves a quarry, pit, crusher, camp or laydown toward the Sensitivity Zone or a pangolin polygon; or (iii) Table 7.2 triggers are repeated on the same front. The Employer decides the revision, notifies the World Bank and the EPA, and reissues the affected sections. No revision may weaken Table 6.3 without that notification. Scheduled Year-2, Year-5 or Year-10 evaluations are not milestones of this plan.

2. BIODIVERSITY VALUES SUMMARY

This chapter states, in compact form, the values this BMP manages. Full evidence remains in the BFS (Chapters 3 and 4) and in Chapter 6 of the 85 km ESIA.

2.1 Critical Habitat Determination

Testing the five criteria of ESS6 paragraph 23 with the quantitative decision rules of Guidance Note 6, the BFS determined that **Criterion 1 (habitat of significant importance to CR/EN species) is TRIGGERED**. Criteria 2, 3, 4 and 5 are **not triggered**.

The primary trigger is the White-bellied Pangolin (Phataginus tricuspis, Endangered). Verified camera events are clustered at approximately kilometers 38–50. Two Critical Habitat (CH) polygons were delineated around those detections and contiguous suitable habitat.

The Western Chimpanzee (Pan troglodytes verus, Critically Endangered) is treated as a precautionary Sensitivity Zone on a single verified camera record at station T59 on 3 February 2026, near Sennehwein Town at approximately kilometer 19. The zone covers about 3.14 square kilometers, including a 0.78 square kilometer no-go core. The BFS does not treat that record as evidence of a resident population. Management is therefore precautionary: demarcation, hours, no blasting, a siting freeze and a sighting trigger. It is not a chimpanzee residency or monitoring program.

This Sensitivity Zone supersedes the kilometer 64–72 chimpanzee reference in the 2024 ESIA. Commitments formerly attached to that earlier reference transfer to kilometer 18–20, limited to the construction controls in Table 3.1.

2.2 Critical Habitat Polygons

Three Critical Habitat polygons are delineated, totaling 22.6 km² (Table 2.1; Figure 2.1). The Chimpanzee Sensitivity Zone (CSZ) at km 18–20, centered on the T59 detection near Sennehwein Town, **supersedes the km 64–72 chimpanzee zone of the 2024 ESIA**; all commitments formerly attached to that zone transfer to the km 18–20 zone (Earthtime, 2024; BFS, 2026).

Table 2.1: Critical Habitat polygons and Chimpanzee Sensitivity Zone

Polygon	Location	Area	Qualifying evidence	Controls under this BMP
CH-West (Pangolin)	km 38–44	8.7 km²	Verified White-bellied Pangolin camera events (stations at T16, T18)	A3 siting freeze; A2 hours; A4 walkover; A5 Code of Conduct; weekly checks while the front is in S6
CH-East (Pangolin)	km 46–50	10.8 km²	Verified White-bellied Pangolin events; Black-bellied Pangolin (VU) contributing	Same as CH-West
Chimpanzee Sensitivity Zone (CSZ)	km 18–20, centered km 19 near Sennehwein Town	3.14 km², of which 0.78 km² no-go core	One verified Western Chimpanzee camera event (T59, 3 February 2026); precautionary	Full CSZ prescription set (Table 3.1): Actions A1, A2, A3, A9 and A10; canopy retention; crossings or canopy connections only where the BFS evidence supports them (A6)
Total		**22.6 km²** (pangolin polygons 19.5 km²)		

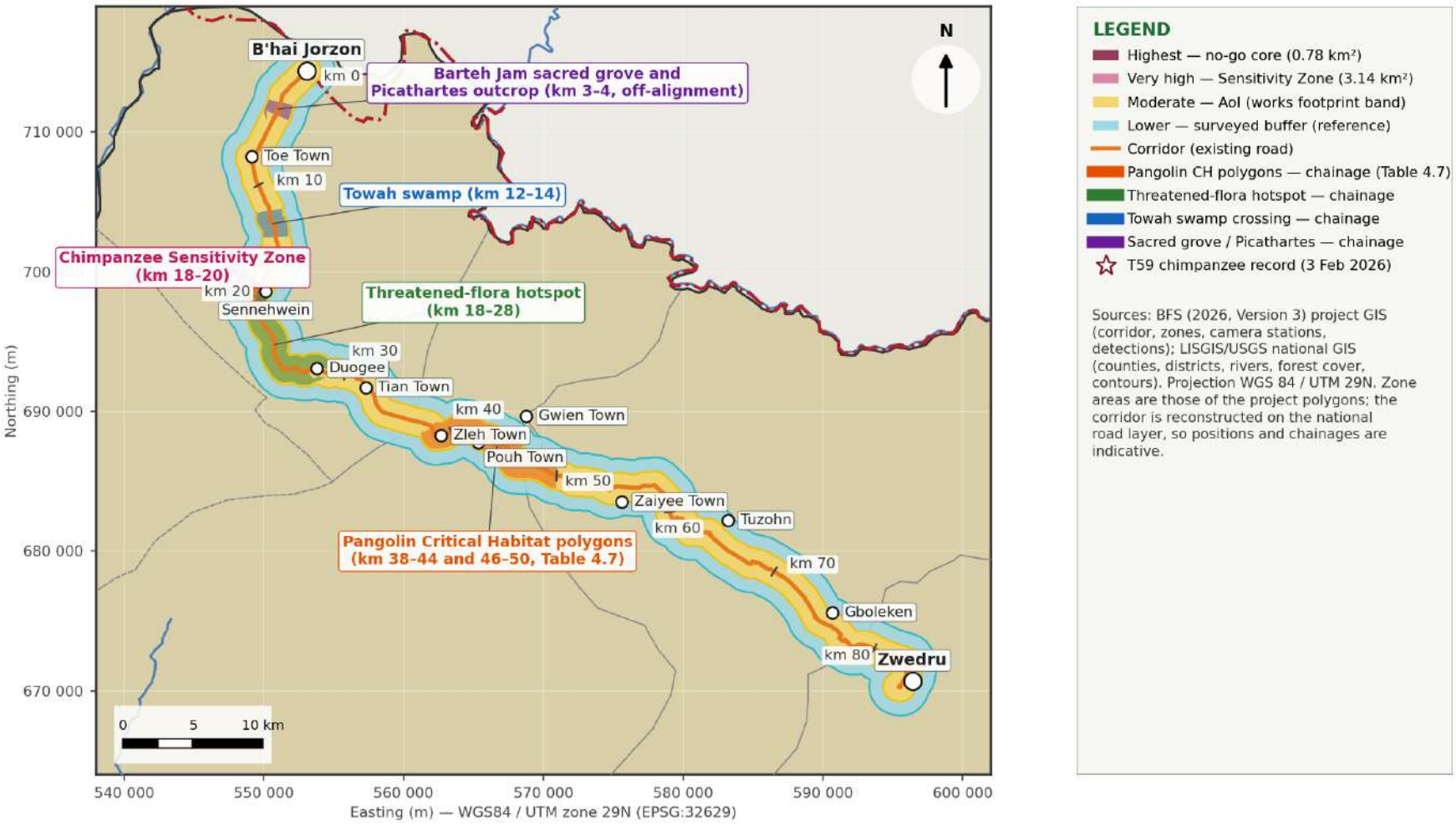


Figure 2.1: Critical Habitat polygons, Chimpanzee Sensitivity Zone and Priority Biodiversity Features along the 85 km corridor — composite sensitivity zonation by chainage (BFS, 2026, project GIS; Map Atlas Map 7).

2.3 Priority Biodiversity Features

Features that do not meet a Critical Habitat threshold but require works-period control are designated Priority Biodiversity Features. They are managed by avoidance or method, not by a separate conservation program.

Table 2.2: Priority Biodiversity Features (BFS, 2026)

Feature	Location	Why it is listed	Control under this BMP
Towah swamp	km 12–14	Crossing corridor; wetland function	A7 span or large box; silt control; low-flow method where practicable
Threatened-flora hotspot and Class A stems	km 18–28	Cluster of FDA Class A and IUCN-listed trees	A4 pre-clearance walkover and Class A protocol; 5:1 replacement if a stem must be lost
Barteh Jam sacred grove and associated Picathartes use	km 3–4	Cultural site; threatened stems; rockfowl association	No-go during the works; no blasting or quarry in the agreed buffer
Additional sacred groves (Toe Town, Kparblée, Bassa)	As mapped in BFS Table 4.8	Identified through consultation and field-checked	No-go; grievance mechanism if a further grove is declared after mobilization
White-necked Rockfowl outcrop	Buffer, approximately 2.5 km off-road near km 4	Breeding colony recorded	No-go / no-blasting / no-quarry buffer; re-screen any design change that moves an ancillary site
Other live watercourse crossings	Corridor-wide	Sediment and barrier risk during in-stream work	A7 method at live crossings; A6 only where BFS Chapter 3 documents a movement hotspot

2.4 Habitat and threat context for the works

The area of influence is a human-modified mosaic. Farm-bush and secondary growth dominate much of the right-of-way. Long-term forest-cover loss (2001–2024) is a baseline condition. It is not a Project impact to be offset under this BMP (BFS, Section 3.1.2 and Table 11.1). Hunting sign recorded on transects is likewise baseline pressure. The additional Project risk is demand created by a concentrated workforce, controlled by the Code of Conduct and camp inspection (Action A5), not by deployment of community rangers.

Construction threat is not uniform along 85 km. BFS Table 8.3 concentrates construction threats in segment S3 (Sensitivity Zone) and segment S6 (pangolin polygons). Mid-corridor farm-bush carries corridor-wide controls only. Supervision intensity follows that density: weekly checks first in S3 and S6 while a front is in those segments.

Confirmed absences. The BFS did not record forest elephant or pygmy hippopotamus. Elder accounts place last reliable sightings more than a decade before the survey. Those species do not trigger Criterion 1 on this alignment and do not generate actions under this BMP. A later verified record would be a revision trigger under Section 1.6.

2.5 Implications for Chapters 3 to 6 of this BMP

Chapter 3 lists the ten construction actions that follow from Tables 2.1 and 2.2. Chapter 4 sets the works-period checks and triggers. Chapter 5 states Contractor rules that operationalize hours, clearance and the Code of Conduct. Chapter 6 scores residual significance after those actions: Criterion 1 remains Medium, and no feature remains High or Severe through defects liability, if the six construction conditions hold: A1 (no-go core demarcated before clearance in S3), A2 (working hours, with no night work or blasting in the sensitive zones), A3 (no new ancillary site in the CSZ or a pangolin polygon), A4 (pre-clearance walkover with the Class A protocol), A5 (workforce conduct controls, including the camp checks) and A8 (footprint restoration to the certified standard). That residual finding is the ESS6 close for this rehabilitation. It does not require a Net Gain dashboard.

3. SPATIAL MANAGEMENT REGIME

This chapter converts the mapped values in Chapter 2 into rules that can be drawn on a design sheet, pegged on the ground and checked by the Supervising Engineer. The regime is a works-period zoning system. It is not a protected-area network, a geofenced tracking program, or a ranking of ranger effort by node.

Three spatial layers apply at once: (i) the approved right-of-way, within which rehabilitation proceeds under the Construction Environmental and Social Management Plan; (ii) the no-go core and the Chimpanzee Sensitivity Zone at approximately kilometer 18–20; and (iii) the two White-bellied Pangolin Critical Habitat polygons at approximately kilometer 38–50, together with the Priority Biodiversity Features listed in Table 2.2. Ancillary sites are a fourth layer: they may operate only where Action A3 is met.

3.1 Zone Rules

Table 3.1 sets out the binding rules for each management zone. The rules apply to the Contractor, subcontractors and suppliers, and all project vehicles and personnel; they are embedded in the works contract, the CESMP Biodiversity Compliance Plan and the induction regime. No new ancillary facility shall be established within the Chimpanzee Sensitivity Zone or the identified pangolin Critical Habitat polygons. Compliance shall be demonstrated through the ancillary-site overlay and verified during detailed-design review. Particular caution applies at km 19, a documented chimpanzee crossing point. That requirement is embedded in the zone rules of Table 3.1 below. The CSZ rows transcribe the BFS construction-phase restriction.

Table 3.1: Zone Rules for the Works

Zone	Chainage /feature	Rule during design, works and defects liability	What is not required
Approved right-of-way	85 km centerline; 150 ft rural / 100 ft urban unless the ESIA states otherwise	Works only inside the pegged limit. Pre-clearance walkover (A4) before each package. Progressive restoration of surfaces the Project opens (A8).	Landscape planting outside the footprint
No-go core	0.78 km² inside the Sensitivity Zone, 500	No plant, stockpile, temporary track, night	A residence study or camera grid inside the core

Zone	Chainage /feature	Rule during design, works and defects liability	What is not required
	m radius on the T59 record	lighting or blasting. Demarcate before vegetation clearance in S3 (A1). Unauthorized entry is a Table 7.2 stop-work event.	
Chimpanzee Sensitivity Zone (CSZ)	3.14 km², km 18–20 (segment S3)	Hours 08:00–16:00. No night work. No blasting. No new ancillary site (A2, A3). 20 km/h and node signs (A9). Sighting within 50 m of an active front suspends the front.	Resident-versus-transient disambiguation as a Project milestone
Pangolin CH-West	8.7 km², km 38–44 (S6)	No new quarry, pit, crusher, camp or laydown. Hours and no blasting while the front is in the node. Code of Conduct and camp inspection.	Anti-poaching patrols funded by this contract
Pangolin CH-East	10.8 km², km 46–50 (S6)	Same as CH-West.	Same
Towah swamp PBF	km 12–14 (S2)	Span or large box. Low-flow in-stream method where practicable. Silt control each week of in-stream work (A7).	A wetland offset
Flora hotspot / Class A	km 18–28 (S4 and edge of S3)	Walkover and Forestry Development Authority Class A protocol before the cut (A4).	A corridor-wide enrichment block
Sacred groves and Picathartes outcrop	Table 2.2 / BFS Table 4.8	No-go. No blasting or quarry in the agreed buffer. A newly declared grove after mobilization is logged in the grievance mechanism and checked before a drawing changes.	Community Conservation Agreements

Zone	Chainage /feature	Rule during design, works and defects liability	What is not required
Remainder of the corridor	Segments S1, S5, S7 and non-node S2/S4	Corridor-wide A4, A5, A8 and A10. A6 only where Chapter 3 of the BFS documents a movement hotspot.	Default package of crossings on every kilometer

Note to the sacred-groves row: a newly declared grove after mobilization is registered in the grievance mechanism within 48 hours by the Contractor's Community Liaison Officer (communities may also lodge it directly through any tier of the mechanism); the Biodiversity Specialist verifies the claim with the custodians, and the Supervising Engineer holds the affected drawing until the check is closed.

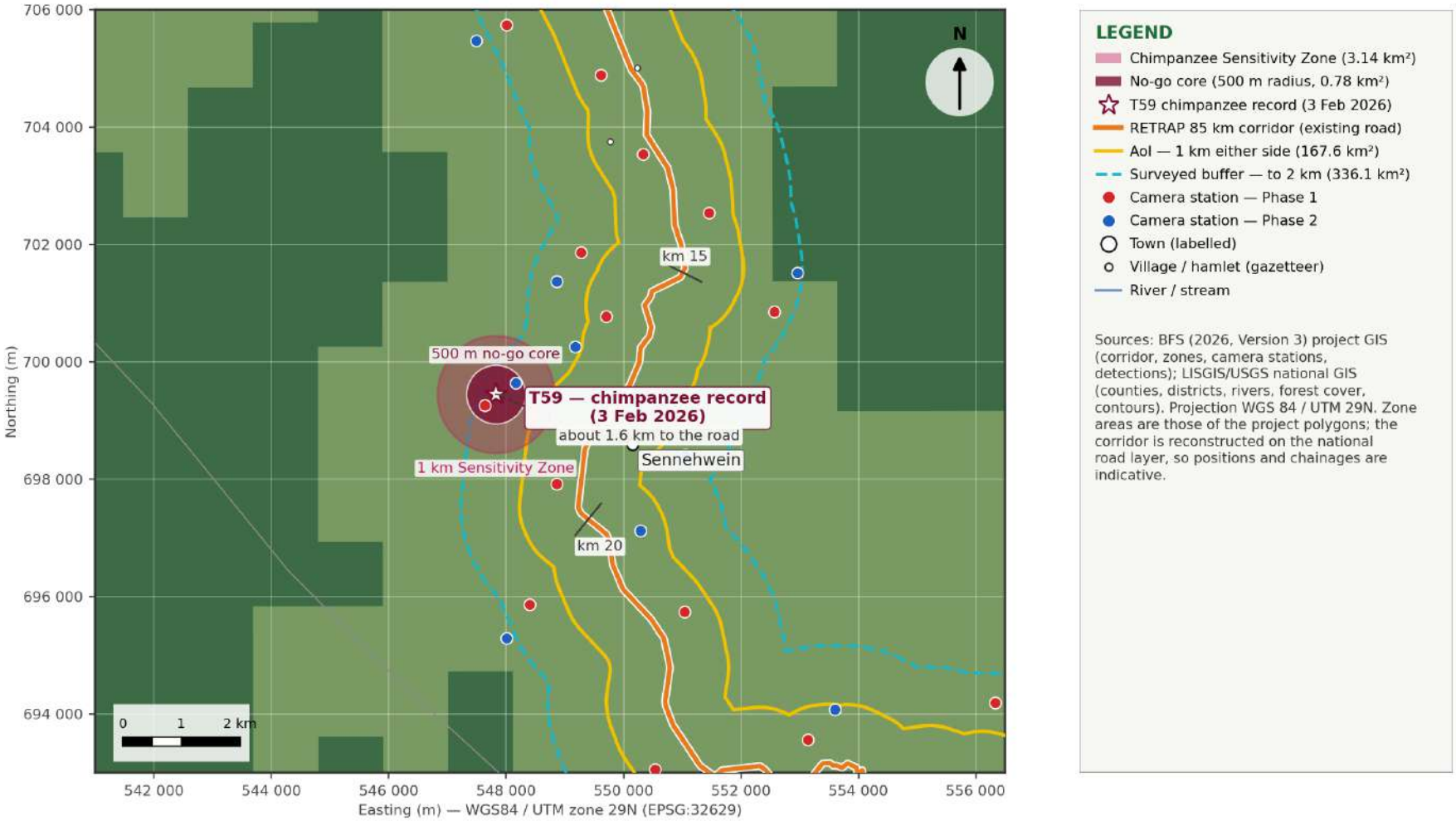
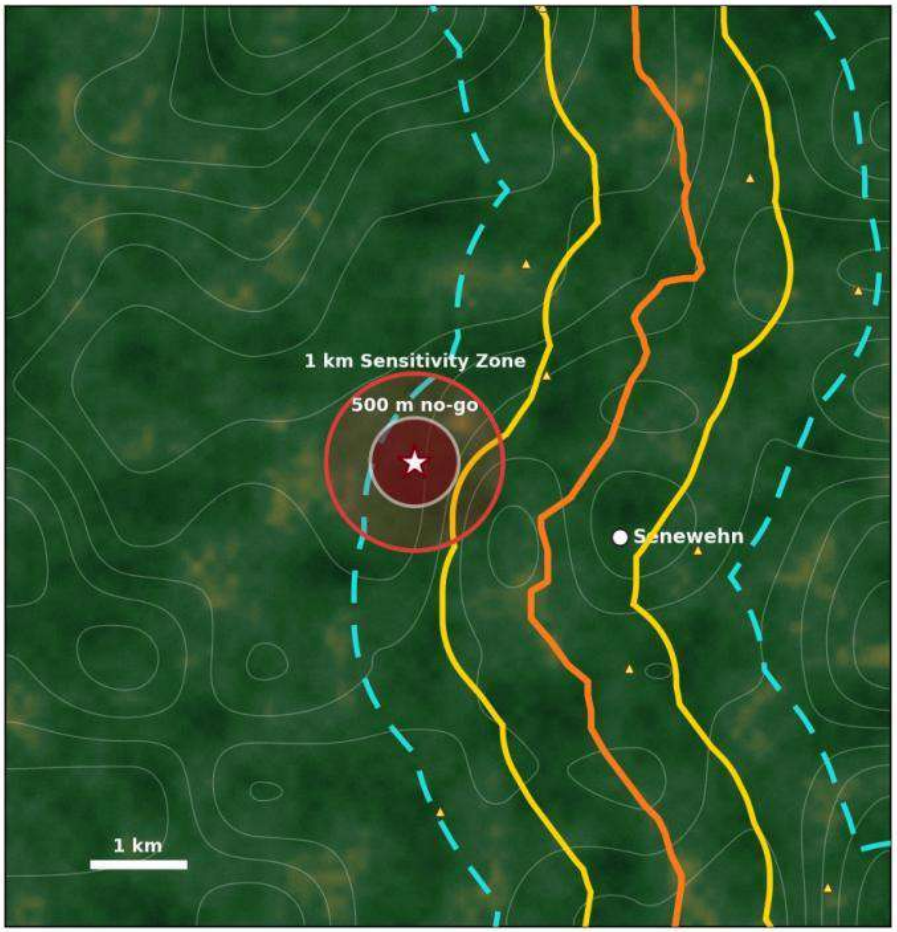


Figure 3.1: *Chimpanzee Sensitivity Zone close-up at km 18–20 near Sennehwein Town — 1 km kernel (3.14 km²) and 500 m no-go core (0.78 km²) centered on the T59 detection, with the AoI and surveyed-buffer boundaries and the camera stations (BFS, 2026, project GIS; Map Atlas Map 8).*

Figure 3.2 reproduces the BFS delineation of the CSZ's internal structure — the 500 m absolute no-go core, the 1 km kernel and the canopy-connectivity corridor (BFS, 2026).

Chimpanzee Sensitivity Zone (km 18–20): spatial delineation and zone structure



Zone structure — Chimp SZ

Core no-go zone (0.78 km²)

- 500 m radius around T59 detection
- No construction; night work absolutely prohibited
- Biologist-cleared entry only

Sensitivity Zone (3.14 km²)

- 1 km kernel around T59 (IFC PS6 GN6 §GN61)
- Speed cap 20 km/h; night work banned
- 4-station camera grid; 7-day pre-clearing sweep; signage / 500 m

Location

- Corridor km 19, near Senewehn Town
- ~1.6 km off the road alignment
- In survey Buffer, ~560 m outside AOI

Evidence base

- 1 camera event (T59, SCNL04, 3 Feb 2026, adult male)
- Habitat-suitability model (swamp / secondary-forest mosaic)
- Single detection → precautionary CH

Figure 3.2: *CSZ spatial delineation and zone structure (BFS, 2026, Figure 3.23).*

3.2 Ground Marking of Zone Designations

Demarcation is a construction control, not a telemetry system. Before vegetation clearance starts in S3, the Contractor shall:

- Survey the 0.78 square **kilometer** no-go core from the BFS coordinates and mark it with durable posts and tape or equivalent, visible from the working face;
- Peg the approved right-of-way through S3 and S6 so that creep beyond the pegs is visible to the Supervising Engineer;
- Post the A9 speed and node-warning signs at the approaches to S3 and S6; and
- Keep an entry log for any authorized crossing of the Sensitivity Zone (for example**,** a public through-road already in use). Unauthorized entry is a Table 7.2 event.

The Employer shall not accept a method statement that substitutes a software geofence or vehicle tracker for physical demarcation of the no-go core. Trackers may be used as an internal Contractor tool. They are not a substitute for A1.

3.3 Ancillary-Site Freeze

Action A3 is a spatial rule, not a later mitigation. At detailed-design review, the Contractor shall overlay every proposed or existing borrow pit, quarry, crusher, batching plant, camp and laydown on Figure 3.1. Any site that falls inside the Sensitivity Zone or a pangolin polygon shall be rejected. The Employer shall not accept a non-compliant site. Existing sites outside those polygons remain subject to the Code of Conduct, drainage and restoration rules that apply corridor-wide.

Table 3.2 below tests every named or packaged ancillary site against the CSZ (km 18–20) and the two White-bellied Pangolin CH polygons (km 38–44 and km 46–50). A “No*” cell means the site is not known to fall inside that polygon on current documents; the Contractor shall still plot coordinates on Figure 2.1 before mobilization. A “Confirm” cell means chainage is not fixed in the revised BFS and the overlay is a design-review gate.

Table 3.2: Ancillary-Site Overlay

ID	Site	Type	Location as documented	Inside CSZ?	Inside CH-West?	Inside CH-East?	A3 decision	Note for design review and CESMP
Q-1	Suaken quarry	Quarry	Suaken (confirm km on design overlay)	No*	No*	No*	**Accept if A3 overlay is No**	Restore footprint under A8 at closure.
Q-2	Ziah Town quarry	Quarry	Ziah Town (confirm km)	No*	No*	No*	**Accept if A3 overlay is No**	Blasting hours follow A2 if the site sits near S3 or S6.
Q-3 to Q-5	Three additional quarries (BFS Table 1.1)	Quarry	Not individually chained in the revised BFS	Confirm	Confirm	Confirm	**Screen before approval**	Two ancillary sites require additional EPA permitting — identify which two at design review.
BP-2	Borrow pit BP2	Borrow pit	Coordinates reported to overlap wetland IW-007	Confirm	Confirm	Confirm	**Screen before approval**	Do not open if overlay shows a mapped wetland, Towah swamp, CSZ, or CH polygon. Prefer an already-disturbed alternative.
BP-3	Borrow pit BP3	Borrow pit	Secondary forest / natural-habitat flag	Confirm	Confirm	Confirm	**Screen before approval**	Pre-clearance walkover (A4) before any cut. Reject if the pit falls in CSZ or a pangolin polygon.
BP-1, BP-4 to BP-9, BP-11 to BP-17	Remaining numbered pits (no BP10)	Borrow pit	Corridor — confirm each chainage	Confirm each	Confirm each	Confirm each	**Accept if A3 overlay is No**	Each pit is a separate A3 test. Do not treat the list as pre-approved.
CR-1	Suaken batching/asphalt/crusher complex	Plant	Suaken (with Q-1)	No*	No*	No*	**Accept if A3 overlay is No**	Keep on already-disturbed ground with Q-1. Lighting directed down. No night operation if the overlay places it inside 1 km of S3.
CR-2	RC2 candidate crusher	Crusher	Not screened in the BFS	Confirm	Confirm	Confirm	**Screen before approval**	No opening until the Figure 2.1 overlay is signed by the Supervising Engineer.

C-1	Worker camp — proposed km 12	Camp	km 12 (S2, Towah approach)	No	No	No	**Screen before approval**	Outside CSZ and CH polygons by chainage, but adjacent to Towah swamp PBF. Confirm the pad is not in the swamp or a sacred-grove buffer. Code of Conduct from first occupancy (A5).

C-2	**Worker camp — proposed km 45**	**Camp**	**km 45 (inside S6 / between CH-West and CH-East)**	**No**	**Yes - between polygons**	**Yes - between polygons**	**Reject**	**Kilometer 45 sits in the pangolin CH reach. Action A3 does not allow a new camp inside that reach. Relocate west of km 38 or east of km 50 onto farm-bush already disturbed.**
C-3	Worker camp — proposed km 73	Camp	km 73 (S7)	No	No	No	**Accept if A3 overlay is No**	Eastern farm-bush. Confirm the pad is outside any late-declared grove. Weekly unannounced camp check by the Contractor's Environmental Officer (cooking areas, waste points and stores, for bushmeat, snares or wildlife parts), with monthly verification by the Supervising Engineer (A5).
C-4	Zuoyou Town camp and mechanical site	Camp/workshop	Zuoyou Town (confirm km)	Confirm	Confirm	Confirm	**Screen before approval**	Overlay before occupancy. Mechanical yard drainage shall not discharge to a live crossing without silt control.
L-1 to L-4	Four laydown areas (BFS Table 1.1)	Laydown	Not individually chained	Confirm each	Confirm each	Confirm each	**Accept if A3 overlay is No**	Part of the 18 ha ancillary package. No laydown inside CSZ, a pangolin polygon, Towah swamp or a marked grove.
D-1	Temporary detours, about 18 km dry-season bypass	Detour	Road-edge, various	Confirm where a bypass enters S3 or S6	Confirm	Confirm	**Screen each bypass in S3 or S6**	A detour that enters the no-go core is a Table 7.2 event. Reinstatement under A8 so the trail does not remain.

How IIU should use Table 3.2:

1. The Contractor plots each row on Figure 2.1 and returns a one-page overlay with coordinates before the first site is opened.
2. Any row that becomes “Yes” in the CSZ or a pangolin column is rejected. The Employer does not accept a substitute location that still sits inside those polygons.
3. Row C-2 (camp at approximately kilometer 45) is rejected on chainage alone. Relocate it outside km 38–50.
4. Yellow rows (BP2, BP3, RC2, the unnamed quarries, camp at km 12, Zuoyou, detours in S3 or S6) are not refusals. They are not approvals either. They require the signed overlay plus, for BP2 and BP3, the A4 walkover.
5. Two sites in the BFS package require additional EPA permitting. Name those two on the overlay sheet.
6. Closed pits, pads, and detours are restored under Action A8 (70 percent cover / 60 percent survival). They are not converted to a landscape-restoration program.
7. This table does not replace the national quarry or EPA permit. It only applies to Action A3

3.4 Management Intensity by Kilometer Segment

Supervision intensity follows construction-threat density in BFS Table 8.3. Segments S3 and S6 are checked first each week a front is present. Other segments receive the corridor-wide CESMP checks.

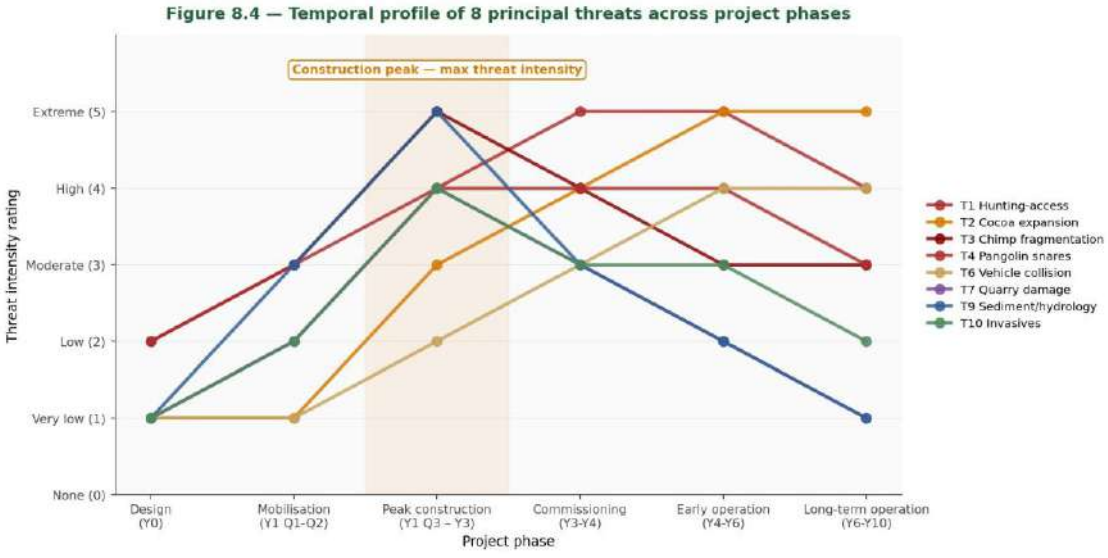


Table 3.3: Segment intensity

Segment	Approx. km	Principal mapped value	Weekly check while a front is present	Design implication
S1	0–12	Sacred groves at the western end	Corridor-wide; confirm no-go on groves	No quarry or blast in grove buffers
S2	12–18	Towah swamp	A7 silt control in any in-stream week	Span or large box at Towah
S3	18–20	CSZ and no-go core	First on the weekly list: A1, A2, A9	A1 before clearance

Segment	Approx. km	Principal mapped value	Weekly check while a front is present	Design implication
S4	20–28	Flora hotspot / Class A	A4 before each cut	Walkover file attached to the package
S5	28–38	Farm-bush mosaic	Corridor-wide A5 and A8	No default crossing package
S6	38–50	Pangolin CH-West and CH-East	First on the weekly list with S3: A2, A3, A5	A3 freeze at design review
S7	50–85	Eastern farm-bush and settlements	Corridor-wide; A10 if a node is entered	Camps remain outside CH polygons

3.5 Structures that have a spatial location

Wildlife passages, oversized culverts, spans and canopy connections (Action A6) are located only where the BFS baseline documents a movement hotspot or where Towah swamp requires a span or large box (Action A7). They are not a standard kit applied to every kilometer. Drawings are prepared by the Contractor's design engineer, reviewed by the Supervising Engineer and the Employer, and built with the works. Cost is estimated by that engineer and sits in the design and works budgets.

4. THREAT-BASED MANAGEMENT PROGRAMME

This chapter applies the mitigation hierarchy to the eleven construction threats carried in the BFS (Chapter 8). Avoidance, minimization and footprint restoration are sequenced. Offset and Net Gain are not used as a fourth step under this plan. Landscape hunting after paving is recorded as a residual landscape pressure. It is not assigned an action ID in Table 4.3.

4.1 Threat Register

Table 4.1 restates the construction threat set. Pre-mitigation ratings follow the BFS. Post-mitigation ratings assume Table 4.3 is implemented. A High residual returns if the matching condition in Chapter 6 fails.

Table 4.1: Construction threat register

ID	Threat	Principal receptor	Peak segment	Primary control
C1	Right-of-way creep and extra clearance	Flora hotspot; edge of CSZ	S3, S4	A4 pegs and walkover
C2	Breach of the no-go core or CSZ	Chimpanzee (precautionary)	S3	A1, A2, Table 7.2
C3	Night work or blasting in a node	Chimpanzee; pangolin; Picathartes	S3, S6	A2
C4	Ancillary site inside CSZ or CH	Both Criterion 1 values	S3, S6	A3 at design review
C5	Unauthorized Class A felling	Threatened flora	S4	A4 protocol; 5:1 if a stem is lost
C6	Sediment at live water	Towah; other crossings	S2	A7 method and weekly silt check
C7	Workforce hunting or bushmeat	Pangolin; general fauna	Camps/corridor	A5 Code of Conduct
C8	Collision at a documented hotspot	Mobile fauna	S3, S6, evidenced sites	A9; A6 only if evidenced
C9	Blocked or undersized crossing	Movement at documented sites	S2 and evidenced sites	A6 / A7 as drawn
C10	Failed footprint restoration	Local cover and erosion	Any opened surface	A8 70/60 percent rule
C11	Protected-species sighting on an active front	Criterion 1 individuals	S3, S6	Table 7.2 50-meter rule

Table 4.1A: Construction Threat register with Pre- and Post-Mitigation Scoring (BFS Table 8.2)

ID	Threat	Where	Pre	Control	Residual
C1	Clearance beyond the approved right-of-way	Any segment; highest at km 18–28 and km 38–50	4×4	Peg the right-of-way; pre-clearance walkover (Chapter 5)	2×2
C2	Works inside the Chimpanzee Sensitivity Zone no-go core	km 18–20 (BFS Figure 3.23)	3×5	Demarcate before clearance; Table 7.2 stop-work	1×3

ID	Threat	Where	Pre	Control	Residual
C3	Night work or blasting in the Sensitivity Zone or Critical Habitat	km 18–20; km 38–50	3×4	Hours 08:00–16:00; no blasting in those nodes	1×3
C4	New quarry, borrow pit, crusher or camp in the Sensitivity Zone or Critical Habitat	Ancillary sites in BFS Table 1.1	3×5	Siting freeze in Section 3.3 (Table 3.2)	1×4
C5	Unauthorized Class A felling	Flora hotspot km 18–28 (BFS Figure 3.30)	3×4	Section 5.4 protocol; 5:1 replacement if a stem is lost	2×2
C6	Sediment at Towah swamp and live crossings	km 12–14 and other watercourses	4×3	Span or large box; low-flow work; silt control	2×2
C7	Workforce hunting or bushmeat	Camps and corridor	3×4	Code of Conduct; weekly camp check (with monthly Supervising Engineer verification)	2×3
C8	Collision at a documented hotspot during the works	Sensitivity Zone and camera clusters (BFS Figure 3.14)	3×3	20 km/h signage; crossing only where BFS Chapter 3 supports it	2×2
C9	Blocked or poorly built crossing or culvert	Sites justified by BFS Chapter 3	2×3	Design-engineer drawings; Table 7.2 repair	1×2
C10	Invasive plants on opened ground	Disturbed right-of-way, pits, camp edges	3×2	Progressive restoration; 70 percent cover rule	2×1
C11	Sighting of a protected species at an active front	Any live front	2×4	Table 7.2 suspend-and-clear	1×3

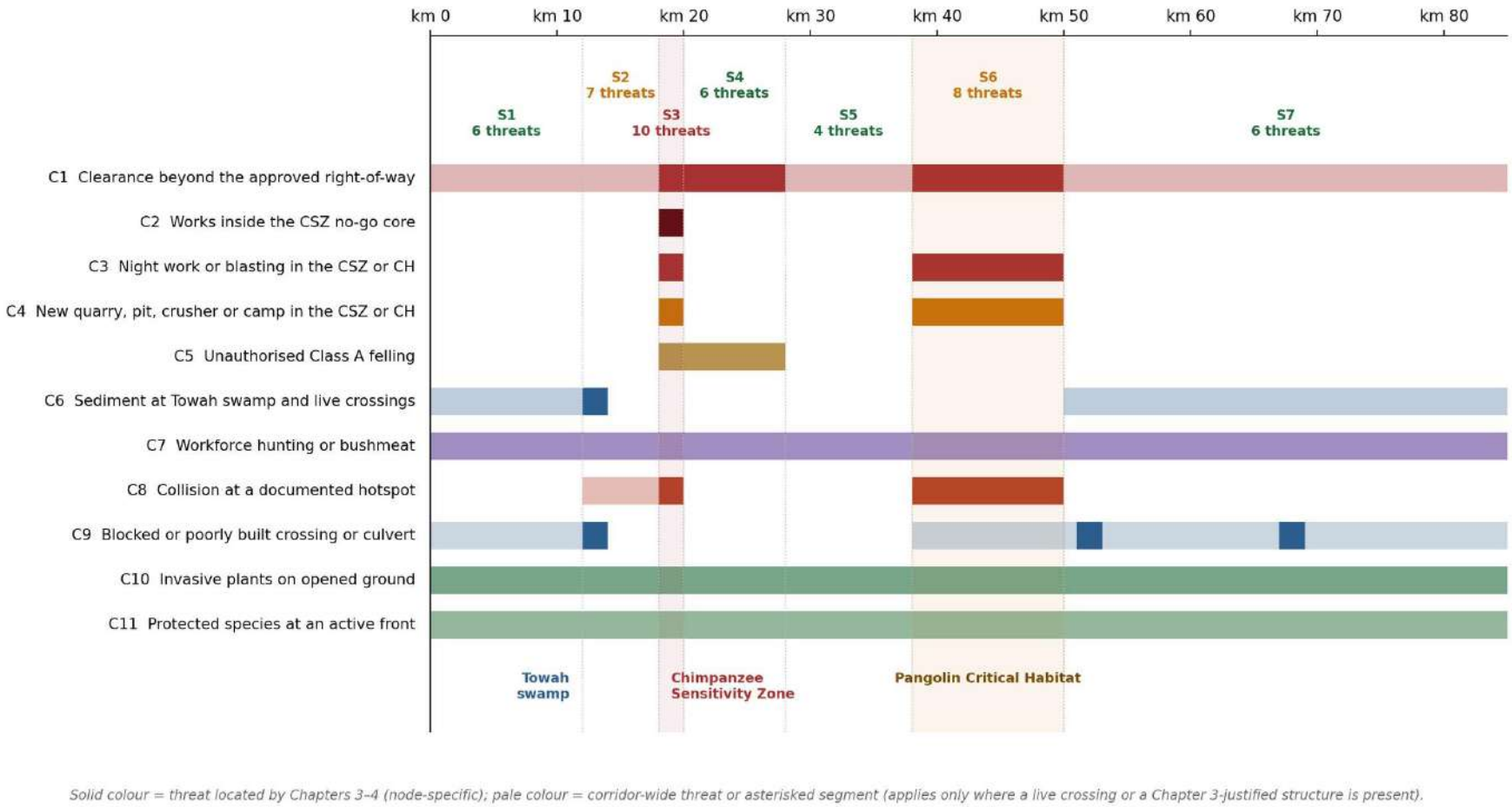


Figure 4.1: Spatial distribution of the construction threats C1–C11 along the 85 km corridor by segment S1–S7 (BFS, 2026, Figure 8.3).

4.2 Avoidance Measures

Avoidance is the first and preferred step. For this rehabilitation, it means keeping the works out of places the survey mapped as no-go or as a siting freeze, and keeping methods out of hours that the SZ cannot absorb.

Table 4.2: Avoidance Actions

Action	Avoidance content	Where it binds	Gate
A1	Physical demarcation of the 0.78 km² no-go core. No plant, stockpile, or temporary works inside the core.	S3	Before vegetation clearance in S3
A2	Working hours 08:00–16:00. No night work. No blasting in the CSZ or the pangolin polygons.	S3 and S6	Each week the front is in the node
A3	No new quarry, borrow pit, crusher, batching plant, camp or laydown inside the CSZ or a pangolin polygon.	Design overlay on Figure 3.1	Detailed-design review; mobilization
A4 (avoidance part)	Peg the approved right-of-way. Do not take extra width to avoid a design constraint.	Corridor; first in S3 and S4	Before each clearance package

4.3 Minimization

Where the works must pass a mapped node, impact is reduced by method, timing, speed and conduct. Minimization does not include a worker-funded alternative-livelihood scheme or a canopy-bridge obligation at sites the BFS did not document.

Table 4.3: Minimization Actions (BFS)

Action	Minimization content	Where it binds	Verification
A4 (minimization part)	Class A walkover. Forestry Development Authority protocol. Micro-adjustment of the working face only where a marked stem can be kept without a new alignment.	S4 and CH segments	Walkover file attached to the package
A5	Code of Conduct: no hunting, bushmeat, keeping or trading wildlife. Induction before deployment. Weekly camp check (with monthly Supervising Engineer verification).	All camps and the corridor	Signed file; monthly Supervising Engineer check
A6	Crossing, oversized culvert, span or canopy connection only at a	Evidence-led sites only	Accepted drawings

Action	Minimization content	Where it binds	Verification
	hotspot documented in BFS Chapter 3.		
A7	Span or large box at Towah swamp. Low-flow in-stream method. Silt control.	km 12–14 and other live crossings	Weekly during in-stream work
A9	20 km/h and node-warning signs.	S3, S6 and evidenced hotspots	Posted before the front enters
A10	Community notice before a front enters S3 or S6. Wildlife, grove and camp complaints through the grievance mechanism.	SEP / Chapter 9 of this BMP	Notice issued; grievance log

4.3.1 Hours and blasting

In S3 and S6 the working window is 08:00 to 16:00. Night work and blasting are prohibited in those nodes for the period a front occupies them. A single breach produces a written instruction. A repeat breach suspends the front until the Employer accepts a corrective statement. The rule protects the precautionary chimpanzee zone and the pangolin polygons during the works. It is not a permanent operational speed or blasting ban after defects liability.

4.3.2 Code of Conduct and camps

Workforce hunting is the Project increment on a baseline already hunted landscape. Control is contractual: signed Code of Conduct, induction, protein that is not wild-caught, weekly inspection of kitchens and quarters (with monthly Supervising Engineer verification), and dismissal plus referral to the Forestry Development Authority where the wildlife law requires it. Camps themselves remain outside the Sensitivity Zone and the pangolin polygons (A3).

4.3.3 Crossings and drainage

A6 is evidence-led. If BFS Chapter 3 does not document a hotspot at a chainage, the default is a hydraulically adequate culvert with a dry bench or equivalent only where the design engineer can show it is needed for drainage or for a recorded crossing. Towah swamp is the one location where a span or large box is required on habitat grounds (A7). Costs are estimated by the design engineer.

4.4 Restoration of Works Footprint

Restoration activities outlined in this plan are confined to areas directly affected by the Project, including cut slopes, unused shoulders, closed pits that have been disturbed by the works, camp pads, and temporary access tracks. The performance standard, designated as Action A8, stipulates a minimum coverage of 70 percent by the conclusion of the first rainy season following planting, along with a minimum survival rate of 60 percent. In the event that these benchmarks are not met, a replacement ratio of five-for-one will be implemented at the Contractor's expense, and the section will remain uncertified. Native species that are included in the BFS planting palette may be utilized within the specified footprint.

Table 4.4: Footprint Restoration (A8)

Item	Rule	When it is judged	If it fails
Area to restore	Only ground the works open	Progressive, not left through a second rainy season	Add to the next package; do not open further ground in that section
Cover	at least 70 percent	End of first rainy season after planting; defects liability	5:1 replanting; withhold certificate
Restoration	specification (A8).** Pl	anting covers ev	ery Project-opened surface in the site register — borrow pits, spoil and laydown areas, and the camp and plant pads, with the area taken per site from that register. Species are native framework species from the BFS botanical list (ESIA Appendix M), sourced from FDA-registered or community nurseries with provenance records. Certification is by the Supervising Engineer on the Biodiversity Specialist's written verification, with FDA witness wherever Class A stems are involved.
Survival	at least 60 percent of planted stems	Same inspection	Same
Invasives on the footprint	No seed-bearing invasive cover left on a certified section	Same inspection	Manual removal before certification

4.5 Summary of Cumulative Impacts during the Works

Applied together, Tables 4.2 to 4.4 are the mitigation hierarchy for this rehabilitation. The BFS residual assessment (Chapter 10) finds that Criterion 1 significance falls from High to Medium and that no feature remains High or Severe through defects liability, provided the six construction conditions hold.

5. CONTRACTOR BIODIVERSITY REQUIREMENTS

This chapter states the rules the Contractor shall write into the CESMP and apply from mobilization through defects liability. It operationalizes Actions A1, A2, A4, A5, A8 and A9. It does not create a Biodiversity Monitor post as a separate long-term institution, a worker-funded livelihood scheme, or a chimpanzee module delivered by an external foundation as a Project milestone.

Every obligation in this chapter is a works-contract obligation. Failure is managed through the Supervising Engineer's instructions, withholding of section certification where Action A8 fails, and, for hunting or taking, referral under the Wildlife Conservation and Protected Areas Management Act (2016).

5.1 Worker Code of Conduct

No person shall be deployed on the alignment, in a camp, or in a quarry or pit serving the works until that person has signed the acknowledgment in Annex A. The acknowledgment covers subcontractors and supply-chain drivers who sleep or eat on a Project site. The six undertakings are:

1. The worker shall not hunt, trap or capture any wild animal, and shall not purchase, possess, consume, sell or transport bushmeat, while employed on the Project.
2. The worker shall not keep wild animals as pets and shall not trade in wildlife, wildlife parts — including pangolin scales and chimpanzee parts — or protected plants.
3. The worker shall not bring weapons, snares, or hunting equipment into any camp, vehicle, or work site, and shall not fish or collect plants in mapped no-go areas.
4. The worker shall not enter any area marked as a no-go zone, Critical Habitat polygon, Sensitivity Zone core, or sacred site unless authorized in writing by the Supervising Engineer.
5. The worker shall report immediately any chimpanzee, pangolin, or other protected-species sighting within 50 meters of an active front.
6. The worker understands that breach is a dismissible offense and, where the law requires, will be referred to the Forestry Development Authority.

A signed file is a monthly inspection item (Chapter 7). An unsigned crew is not a deployed crew.

5.2 Camp Management and Food Supply

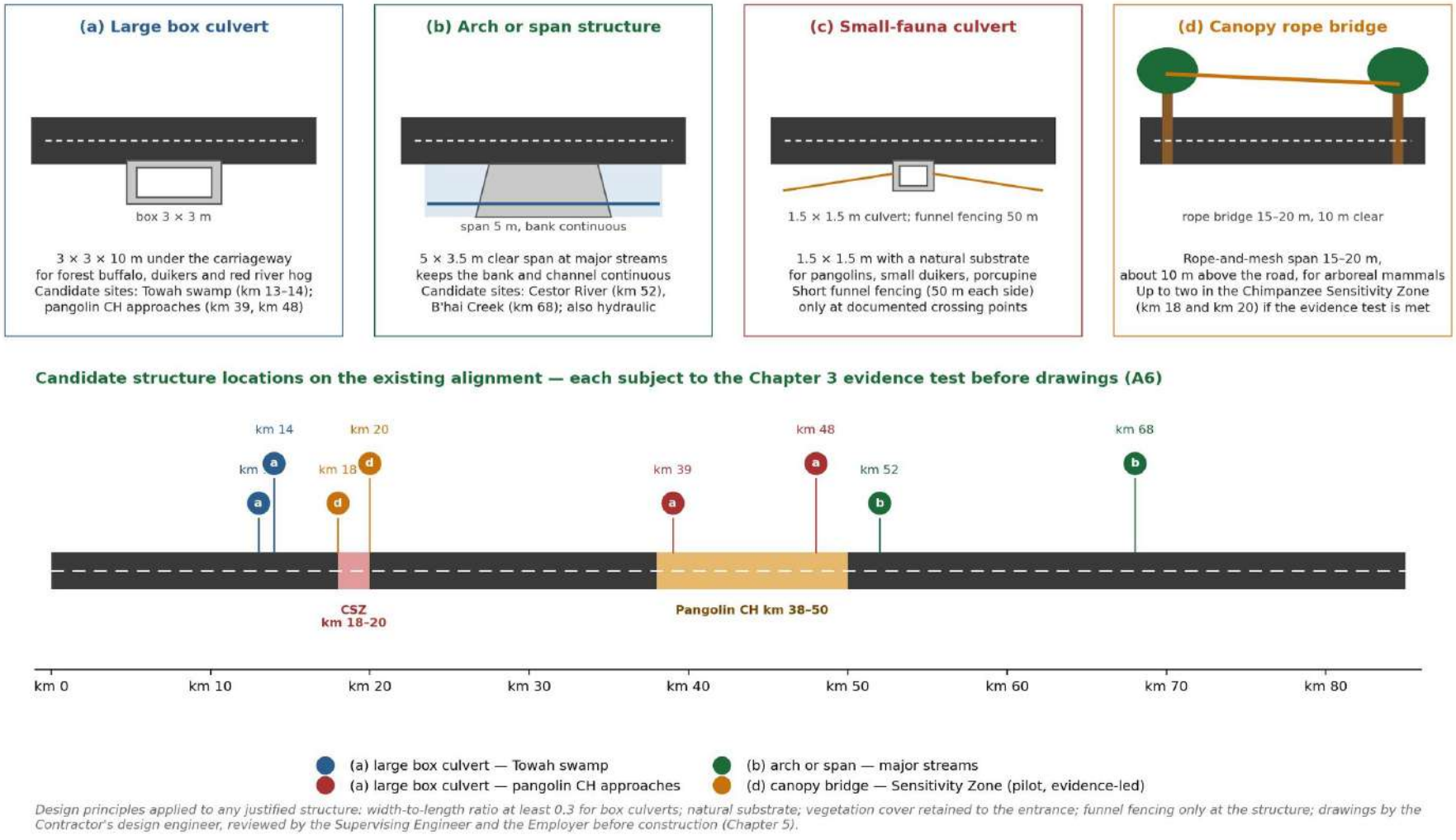
Camps, mechanical yards and kitchens shall sit outside the CSZ and outside both pangolin polygons (Action A3, Table 3.2). The Contractor shall supply protein that is not wild-caught. Weekly camp checks by the Contractor's Environmental Officer, with monthly inspection by the Supervising Engineer, cover kitchens, quarters, cold rooms and refuse. Bushmeat, snares, firearms and live wild animals found on a Project site are a Table 7.2 event and a disciplinary case.

Lighting at camps and night-time security positions in or adjoining segments S3 and S6 shall be directed downward and kept off the no-go core. Generators and noisy plant shall not be sited against the core boundary.

5.3 Speed and Driving Rules

Once Action A9 signs are posted, the speed limit is 20 kilometers per hour through segment S3, segment S6 and any other hotspot in the revised BFS documents. Off-right-of-way driving is limited to approved access. A kill of a pangolin, chimpanzee or other protected species on a Project vehicle is a serious incident: the front in that node stops, the Employer is notified within 24 hours, and the World Bank and the Environmental Protection Agency are notified within 48 hours as required by Project reporting rules.

Provided only where Chapters 3 and 4 document a hotspot or where fill would block Towah swamp (M5 / A6); ordinary hydraulic culverts elsewhere remain hydraulic



Design principles applied to any justified structure: width-to-length ratio at least 0.3 for box culverts; natural substrate; vegetation cover retained to the entrance; funnel fencing only at the structure; drawings by the Contractor's design engineer, reviewed by the Supervising Engineer and the Employer before construction (Chapter 5).

Figure 5.1: Wildlife crossing structure types and candidate locations — indicative only; a structure is built only where BFS Chapter 3 documents a movement hotspot and the design engineer's drawings are accepted (Action A6) (BFS, 2026, Figure 5.2).

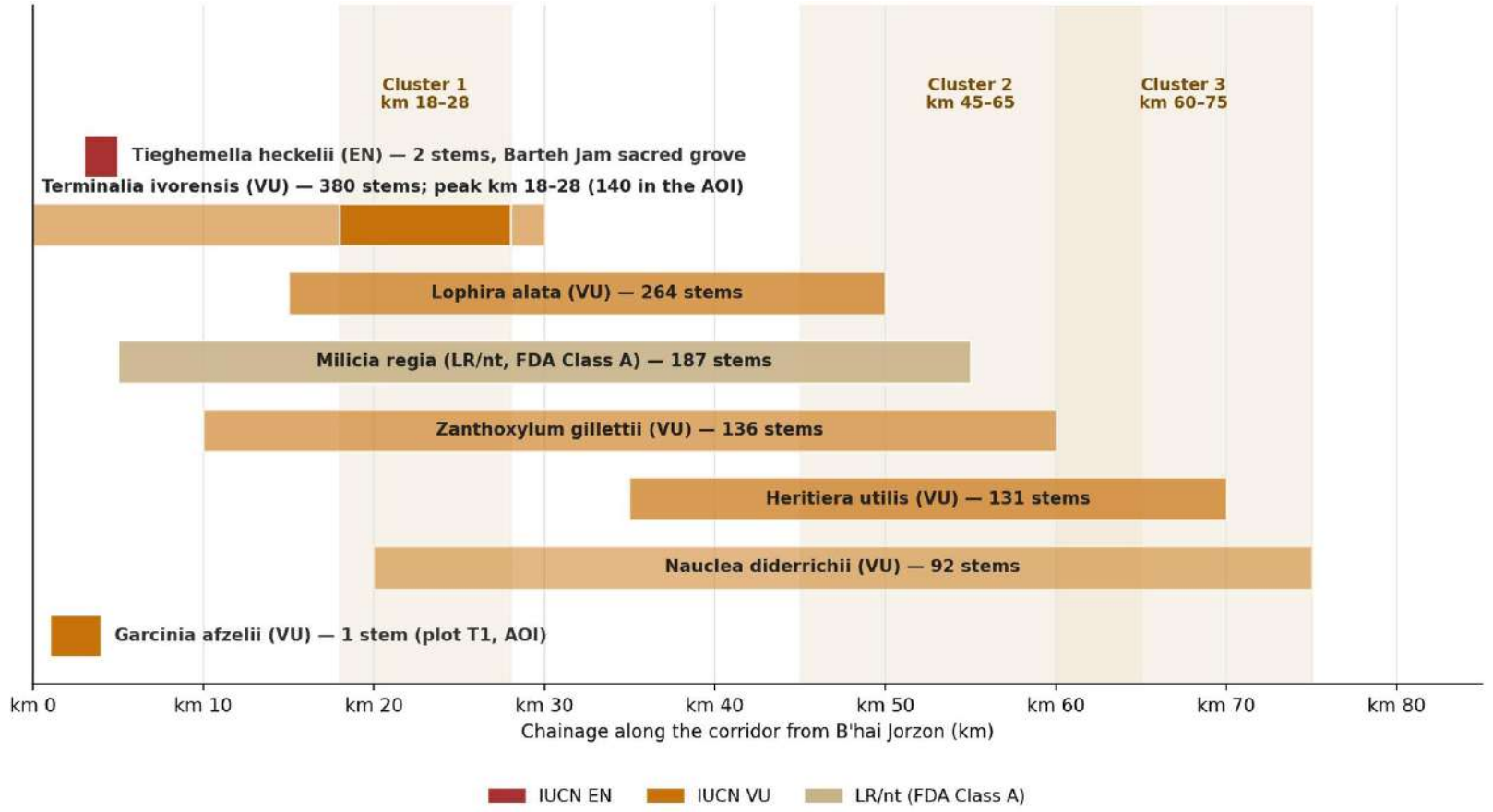
5.4 Vegetation Clearance Protocol

No package shall be cut until three things exist: (i) the approved right-of-way is pegged; (ii) the pre-clearance walkover file is attached, including Forestry Development Authority Class A markings in segment S4 and in any Critical Habitat segment; and (iii) in S3, the no-go core is demarcated (Action A1). A verified chimpanzee or pangolin within 50 meters of the working face suspends that face until the Supervising Engineer issues written clearance (Table 7.2).

Extra width taken to avoid a design constraint is right-of-way creep (threat C1). It is not permitted as informal mitigation. If a marked Class A stem cannot be kept, the stem is taken only under the national protocol and is replaced five-for-one on the works footprint or an agreed adjoining restoration strip. Ten-for-one landscape ratios from earlier drafts are not used.

Table 5.1: Class A and listed stems in the flora hotspot (BFS, Table 3.8)

Species	Scientific name	IUCN	Records	FDA class	Primary distribution along the corridor
Framire	Terminalia ivorensis	**VU**	380	A	Peak km 18–28; widespread in AoI and buffer
Ekki	Lophira alata	**VU**	264	A	km 10–55; higher density in Buffer
Iroko	Milicia regia	LR/nt	187	A	km 5–55; sacred-grove protected
African rubber	Funtumia elastica	LC	149	B	Throughout; secondary forest
East African satinwood	Zanthoxylum gillettii	**VU**	136	B	Scattered; km 15–65
Niangon	Heritiera utilis	**VU**	131	A	km 20–70; Buffer secondary forest
Kusia	Nauclea diderrichii	**VU**	92	A	km 15–75; riparian/wet forest
Abura	Hallea ciliata	LC	41	B	Swamp-forest margins
Sipo	Entandrophragma utile	**VU**	34	A	km 30–65; scattered
African mahogany	Khaya ivorensis	**VU**	28	A	km 15–70; FDA Class A — no-fell
Makore	Tieghemella heckelii	**EN**	2	A	Barteh Jam sacred grove (km 3–4) only
Garcinia afzelii	Garcinia afzelii	**VU**	1	C	T1 AoI only (km ~2)



Bar = approximate along-corridor extent of plot records; darker shading = higher stem density. Shaded bands mark the three VU clusters that set the Class A protocol and pegging rules (Chapter 5, M3–M4).

Figure 5.2: Threatened flora hotspots along the 85 km corridor (BFS, 2026, Figure 3.30).

5.5 Invasive-Species Hygiene

Plant, fill, and mulch entering S3 or S6 shall be reasonably free of seed-bearing invasive material. The test is visual and contractual, not a laboratory protocol. Invasive cover left on a restored footprint is an Action A8 failure at the rainy-season inspection.

5.6 Lighting Design

Task lighting on fronts in S3 and S6 shall be aimed at the working face and switched off when the face is idle inside the 08:00–16:00 window. Floodlighting of the no-go core is prohibited. This rule applies during the works. It is not a permanent operational lighting standard after defects liability.

5.7 Induction, Toolbox Training and the Biodiversity Monitor

Induction is delivered before first deployment and covers: the composite sensitivity map for the worker's section; hours and no-go rules; the six Code of Conduct undertakings; how to report a sighting; and the grievance mechanism. The first morning a crew enters S3 or S6, a short toolbox reminder is given. The Contractor's environmental officer (or equivalent named in the CESMP) keeps the file.

Table 5.2: CESMP Biodiversity File

CESMP item	Minimum content	Record
Code of Conduct file	Annex A signed by every deployed person	HR file; monthly SE check
S3 / S6 briefing	Hours, no-go, 50-meter rule, A9 speed	Toolbox log the morning the crew enters
Walkover file	Pegs, Class A marks, package chainage	Attached before the cut
Camp inspection	Kitchen, quarters, weapons, bushmeat	Weekly SE checklist
Sighting/incident log	Species, chainage, time, action	Feeds Table 7.2 and the 24/48-hour notice

6. RESIDUAL SIGNIFICANCE AFTER THE WORKS CONTROLS

This chapter examines the residual impacts and their significance after full implementation of works control measures. For the existing road project, compliance with ESS6 requirements is achieved by avoiding or minimizing impacts on Criterion 1 values during project activities, restoring the project footprint in accordance with the Action A8 rule, and ensuring that no features remain with High or Severe residual significance throughout the defects liability period. This assessment is derived from the BFS Chapter 10 and is reiterated here for consistency in both the CESMP and the ESIA annex.

6.1 Scoring Factors

Table 6.1: Scoring Factors (BFS, Table 10.1)

Factor	1	2	3	4 (forces High if this factor stands after controls)
Magnitude	Negligible change at the feature	Detectable disturbance inside the	Clear effect on a mapped node in Table 4.7 or 4.8	Loss of no-go core function, CH polygon function, or a Class A

Factor	1	2	3	4 (forces High if this factor stands after controls)
		approved right-of-way		stand without the Section 5.4 protocol
Duration	Days to a few weeks at one chainage	One construction season at the node	The full construction period at the node	Effect continues after defects liability because restoration did not hold
Reversibility	Reverses without intervention	Reverses with standard footprint restoration (A8)	Reverses only if a Table 7.2 instruction is completed	Not reversible within the works period
Scale	A short chainage or a single structure	One Table 8.3 segment	Both Criterion 1 nodes, or several Priority Biodiversity Features	Corridor-wide effect on a Chapter 4 value

6.2 Residual significance by feature

After Actions A1–A10, the BFS finds:

Table 6.2: Residual significance

Feature	Pre-mitigation (works)	Residual through defects liability	Depends on
White-bellied Pangolin / CH polygons	High	Medium	A3 freeze; A5 conduct; S6 weekly checks
Western Chimpanzee / CSZ (precautionary)	High	Medium	A1 demarcation; A2 hours; 50-metre trigger
Towah swamp	High / Medium	Low	A7 span or large box and silt control
Flora hotspot / Class A stems	High	Low to Medium	A4 walkover and protocol
Picathartes outcrop and sacred groves	Medium	Low	No-go and no-blast / no-quarry buffer
General farm-bush remainder	Low to Medium	Low	A8 footprint rule; A5

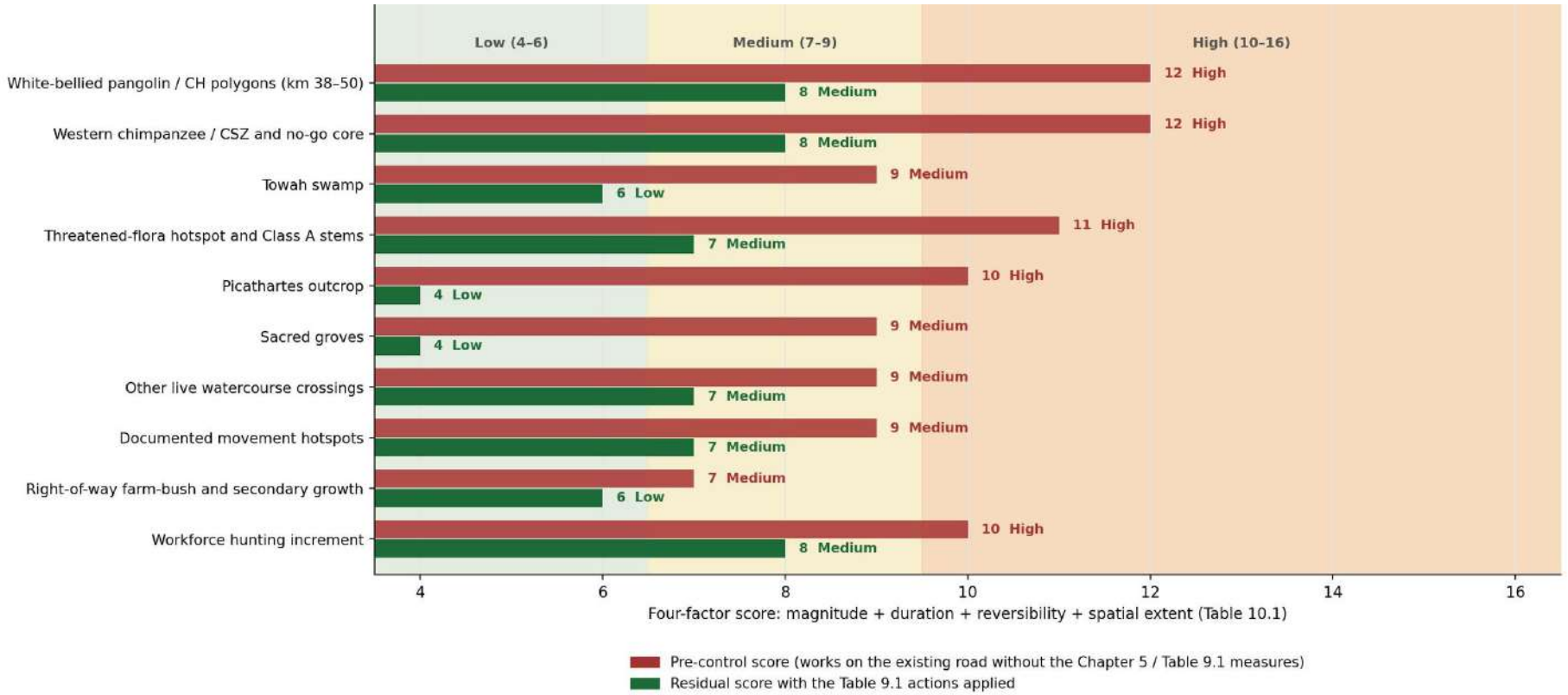


Figure 6.1: Pre-control versus residual significance after the construction measures (BFS, 2026, Figure 10.2).

6.3 Matters Outside the Scope of This Plan

This chapter does not include elements such as a multi-indicator dashboard, species-specific Net Gain action plans, Community Conservation Agreements, a partnership framework, or a long-term strategic trajectory. These components are associated with a landscape program and do not pertain to the ESS6 compliance for rehabilitating an existing road. Future activities, which may be funded separately, could utilize the BFS baseline; however, it should not be incorporated as a requirement in the CESMP for section certification.

6.4 Criteria for Identifying Residual Findings

The Medium residual on Criterion 1, and the absence of High or Severe rows through defects liability, hold only if the six conditions in Table 6.3 below are met.

Table 6.3: Conditions for the residual conclusion

Condition	Action it protects	If it is dropped
No-go core demarcated before clearance in S3	A1	Chimpanzee residual returns toward High
No new ancillary site inside the CSZ or a pangolin polygon	A3	Both Criterion 1 rows return toward High
Hours 08:00–16:00 and no night work or blasting while a front is in S3 or S6	A2	Disturbance and collision rise
Class A walkover and right-of-way pegs before the cut in S4	A4	Flora-hotspot residual returns toward High
Code of Conduct, induction and weekly camp check (with monthly Supervising Engineer verification)	A5	Workforce-hunting residual returns toward High
Footprint restoration meets 70 percent cover and 60 percent survival before certification	A8	Section is not certified; C10 residual rises

6.5 Lingering Uncertainty

The chimpanzee sighting data comes from a single verified occurrence, so a cautious approach is needed. The pangolin observations are based on a limited number of independent camera-trap events. Coverage during the rainy season was not comprehensive in certain areas, as noted in the BFS Chapter 11. These uncertainties are mitigated through a 50-meter sighting trigger, the A3 freeze mechanism, and routine weekly assessments in S3 and S6. However, this contract does not address these uncertainties by establishing a long-term monitoring program.

The residual uncertainty is owned, not orphaned: the IIU carries the follow-up surveys (the bat and Jentink's Duiker follow-ups and the ichthyological survey of the nine creeks) through the Project's E&S and monitoring provisional sums during construction and the defects-liability period; thereafter the operation-phase monitoring passes with the road to the MPW as road authority, with the EPA and FDA exercising their statutory mandates. Two of the nine creek crossings are sacred creeks — the B'hai Jorzon sacred creek (SS-003), whose fish may not be eaten, and the Kougae Creek at Nicko Town (SS-004), whose water may not be taken into the town — and the Toe Town Sacred Stream (SS-006) is treated in the same way where the works affect it. At these creeks the ichthyological survey is designed with the custodians, so that it also answers the sacred-creek concern raised in consultation: their documented consent is

obtained before any sampling; the methods are non-lethal (visual census and environmental DNA, with catch-and-release only where the custodians permit handling); no fish is removed from a creek whose fish may not be eaten and no water is drawn from a creek whose water may not be taken into the town; the findings are shared with the custodians; and the crossing design and the in-stream method at each sacred creek are agreed with the custodians before any in-stream work (ESIA Sections 6.3.2, 8.6 and 11.9.3). None of this transfers works-contract obligations to third parties.

6.6 Statement that closes this chapter

Subject to Table 6.3, the Project may proceed through construction and defects liability with Medium residual significance on Criterion 1 and with no feature remaining High or Severe.

7. SUPERVISION AND MONITORING DURING THE WORKS

This chapter outlines the procedures for verifying compliance with Actions A1 to A10 throughout the duration of construction activities and the defects-liability period. The supervision of this BMP is integrated into the ESMP oversight framework and does not constitute an independent scientific assessment. It is important to note that no new camera-trap grid will be established under this chapter, nor will there be tracking of relative abundance or snare density trajectories. Monitoring will be conducted at locations where construction activities are occurring, as well as on the restored areas, until the relevant sections receive certification.

7.1 Monitoring Overview

The following four inquiries are essential for compliance assessment:

1. Is adherence being observed regarding the no-go core designation, the SZ hours regulation, and the ancillary-site freeze within segments S3 and S6?
2. Have all clearance packages within the flora hotspot and designated CH undergone thorough examination and verification prior to any cut operations?
3. Is the workforce compliant with the Code of Conduct, ensuring that all camps are devoid of hunting activities, bushmeat, and weapons?
4. Is the footprint established by the Project progressing in alignment with the Action A8 cover and survival guidelines, and are appropriate silt control measures implemented at Towah swamp and other active crossing points during in-stream operations?

It is important to note that any sightings of chimpanzees or pangolins within a 50-meter radius of an active front are classified as incidents rather than part of a systematic population monitoring effort.

7.2 Supervision Checks

Table 7.1 serves as the checklist under the management of the Supervising Engineer. Inspections are conducted on a weekly basis for fronts operating in segments S3 or S6, and also weekly during any in-stream weeks at Towah. Inspections at camps occur monthly, in addition to assessments scheduled at the onset of the rainy season following planting. A defects-liability inspection is mandated for Action A8. For all other segments, adherence to the corridor-wide CESMP will be enforced.

Table 7.1: Supervision checks during the works (BFS, Table 7.1)

Location	What is checked	When	Who
Chimpanzee Sensitivity Zone and no-go core (BFS Fig. 3.23)	Demarcation intact; no unauthorized entry; works 08:00–16:00; no night work or blasting; 20 km/h signage in place	Weekly while the front is in the zone; monthly at other times during the works	Contractor records; Supervising Engineer verifies

Location	What is checked	When	Who
Pangolin polygons km 38–50 (BFS Fig. 3.14)	No new quarry, camp or laydown; pre-clearance walkover done; clearance inside approved ROW only	Weekly during vegetation clearance; monthly during other works in the segment	Contractor records; Supervising Engineer verifies
Crossing, culvert or canopy-bridge sites justified by BFS Chapter 3	Built as approved drawings; not blocked; drainage working	Monthly while the structure is under construction; at completion	Supervising Engineer
Towah swamp and live watercourse works (BFS Table 4.8)	Sediment contained; in-stream work in low flow where practicable	Each week of in-stream work	Contractor; Supervising Engineer
Flora hotspot km 18–28 (BFS Fig. 3.30)	Class A protocol followed; ROW pegs in place	Before and during clearance	Contractor with Supervising Engineer
Restored surfaces (Section 4.4; footprint only)	Cover and survival against the 70 percent and 60 percent rules	End of the first rainy season after planting; before section certification	Supervising Engineer
Camps and corridor	Code of Conduct records; weekly camp check (with monthly Supervising Engineer verification); grievance entries on wildlife; signage	Monthly	Contractor; Supervising Engineer; Employer as needed

7.2.1 Order of weekly work

When a front is in S3 or S6, those two segments are checked first that week. That order follows construction-threat density in BFS Table 8.3 (Table 3.3 and Figure 3.2). The Supervising Engineer does not need a second density map. Weekly priority follows Table 3.3 and Figure 3.2.

7.2.2 Monthly verification form

On a monthly basis, the Supervising Engineer shall complete Annex B and submit it alongside the environmental and social report to the Employer, ensuring compliance with established guidelines and standards.

7.3 Triggers and Response

A trigger refers to a specific event that necessitates immediate action within the same day. Refer to Table 7.2 for the detailed list of such triggers. Upon identification of the affected front, the Contractor shall cease operations accordingly. Subsequently, the Supervising Engineer will issue a formal written instruction. It is imperative that IIU is informed within the timeframe specified in the third column.

Table 7.2: Stop-work and notify triggers (BFS Table 7.2).

Trigger	Threshold	First action	Notify
No-go core or CH polygon	Any unauthorized entry or works	Stop work in the vicinity; reinstate	Employer within 24 hours

Trigger	Threshold	First action	Notify
		demarcation; record the incident	
Working hours/blasting	Night work or blasting in CSZ or CH	Written instruction; repeat event may suspend the front	Employer on repetition
Class A stem (Section 5.4)	Unauthorized felling	Halt the segment; apply the agreed protocol; replace at 5:1 if the stem is lost	Employer; FDA as required
Code of Conduct	Verified hunting, capture or bushmeat by project personnel	Disciplinary process; review induction	Employer; FDA where the law requires
Watercourse	Uncontrolled sediment beyond the approved footprint	Add silt control; correct drainage; photograph	Supervising Engineer
Approved crossing or canopy bridge	Damage or persistent blockage	Repair within the agreed time	Supervising Engineer and Employer
Restoration	Cover below 70 percent, or survival below 60 percent, at the first rainy-season check	5:1 replacement at the Contractor's cost; re-inspect after the next rainy season	Supervising Engineer before certification
Protected or priority species	Verified sighting within 50 m of an active front	Suspend the front until the Supervising Engineer clears restart	Supervising Engineer and Employer

7.3.1 Serious incidents

The following events constitute serious incidents: the injury or fatality of a chimpanzee; activities conducted within the designated no-go core; and unauthorized Class A tree felling. The Contractor, in conjunction with the Supervising Engineer, is required to inform IIU within a 24-hour timeframe. IIU must then relay this information to the World Bank and the EPA within 48 hours, in accordance with the established Project incident-reporting protocols. A detailed root-cause analysis will be included in the subsequent monthly report.

7.4 Reporting

The reporting processes will leverage the established Project chain. There is no requirement for a separate public biodiversity portal or the submission of an annual Net Gain report under this section.

Table 7.3: Reporting Requirements

Product	Who prepares	When	What it contains
Monthly environmental and social report — biodiversity pages	Contractor; Supervising Engineer verifies	Monthly while works, or defects liability run	Table 7.1 results; Table 7.2 events and close-out; camp inspection; A8 progress

Product	Who prepares	When	What it contains
Quarterly report to the EPA and the IIU	Employer	Each Project quarterly cycle	Summary of Table 7.1; open Table 7.2 items; serious incidents
Serious-incident notice	Contractor / Supervising Engineer to Employer, then World Bank and Agency	24 hours to Employer; 48 hours onward	Species or breach; chainage; immediate action
Section certification file	Supervising Engineer	When a section is offered for taking-over	Action A8 evidence; any open trigger in that section closed

7.5 Data that must be kept

The Contractor and the Supervising Engineer shall maintain comprehensive documentation throughout the duration of the works contract and the defects-liability period. This documentation includes signed Annex A forms, weekly check sheets for S3 and S6, monthly Annex B forms, walkover files, an ancillary-site overlay referencing Figure 3.1, a sighting and incident log, and photographs and counts from Action A8 inspections. The coordinates for the no-go core and pangolin polygon areas shall remain as recorded in the BFS. Sensitive locations pertaining to nests or dens shall not be disclosed at a resolution finer than one kilometer.

The BFS SMART/PostGIS geodatabase shall serve as an integral record under the IIU framework from the survey, and it is important to note that this chapter does not impose an operational obligation on the Contractor regarding this database.

8. GOVERNANCE, IMPLEMENTATION AND CAPACITY

This chapter defines who governs, implements, verifies and supports the BMP. It assigns the actions in Tables 7.1 to 7.3 and in Chapter 5 to named parties.

8.1 Institutional Roles

Table 8.1 sets out the BMP roles.

Table 8.1: Roles during design, construction and defects liability.

Party	Does	Does not
Employer (IIU, MPW)	Holds this BMP as an annex to the 85 km ESIA. Puts Table 3.1 of this plan in the works specification. Refuses an ancillary site that fails Action A3. Withholds taking-over until Action A8 is met. Reports through Table 7.3.	Does not convene a Biodiversity Task Force or appoint an independent biodiversity committee as a condition of this plan.
Contractor, including subcontractors	Delivers Actions A1 to A10. Signs and polices the Code of Conduct. Issues Action A10 notices before S3 and S6.	Does not recruit community rangers or sign conservation agreements under this contract.

Party	Does	Does not
	Reports monthly against Table 7.1.	
Supervising Engineer	Verifies Table 7.1. Issues Table 7.2 instructions the same day. Completes Annex B monthly. Does not certify a section that fails Action A8.	Does not run a camera-trap grid or a Year-2 residency study.
FDA and EPA	Receive Class A and wildlife-law referrals during the works. Receive quarterly and serious-incident notices as national procedure and the environmental permit require.	Are not assigned a long-term field program under this works contract.
Corridor communities	Receive Action A10 notice. Use the Project grievance mechanism for wildlife, sacred sites, camp conduct and tree loss.	Are not implementing agencies and are not paid as rangers under this plan.

8.2 Sequence that binds mobilization

Construction operations are prohibited from commencing in segments S3 and S6 until the following conditions are met:

Table 8.2: Gates before S3 or S6

Gate	Ready before the front enters S3 or S6	Who accepts
G1	CESMP contains Tables 7.1, 7.2 and 3.1 (Actions A1–A10)	Employer and Supervising Engineer
G2	No-go core demarcation materials on site; method statement for Action A1	Supervising Engineer
G3	Ancillary-site overlay (Table 3.2) shows no new site inside the Sensitivity Zone or a pangolin polygon	Employer; non-compliant site refused
G4	Annex A signed for the crews that will enter the node; Action A9 signs ready	Supervising Engineer
G5	Action A10 notice issued to the affected communities, with grievance contacts	Employer confirms
G6	Drawings for Action A6 or A7 exist only where the revised BFS documents a hotspot or where Towah swamp requires a span or large box	Employer and Supervising Engineer at design review

8.3 Capacity that this plan requires

Capacity under this chapter shall be limited to the explicit requirements of the works undertaken. The Contractor is responsible for appointing an Environmental Officer (or equivalent) who will maintain the Annex A documentation, oversee the sighting log, and manage the monthly biodiversity reporting pages. Crews assigned to work in segments S3 or S6 are required to complete the induction outlined in Section 5.7 prior to accessing the node. The Supervising Engineer’s site personnel will be briefed on the contents of Tables 7.1 and 7.2 and shall carry Annex C as part of their operational responsibilities. IIU will retain the

BFS coordinates along with the composite sensitivity map (refer to Figure 2.1) to serve as the spatial reference framework for the project.

It should be noted that SMART ranger training, community-monitor stipends, and external scientific retainers are not prerequisites under this plan. Should IIU decide to finance these initiatives at a later date, they shall be treated as distinct and separate activities.

8.4 Meetings

Biodiversity is incorporated as an agenda item within the existing environmental site meetings rather than being managed as a distinct task force. The Supervising Engineer addresses any outstanding events from Table 7.2 during these meetings. IIU is responsible for including a comprehensive quarterly summary of biodiversity in the standard Project report. It is important to note that minutes from a standalone Biodiversity Task Force are not considered a deliverable.

9. COSTING OF THE WORKS CONTROLS

This chapter states how Actions A1 to A10 are financed and administered through the works contract. It is written for IIU, the Contractor and the Supervising Engineer.

The Project is the rehabilitation of an existing laterite road. Biodiversity expenditure under this annex is therefore limited to the increment the works create: keeping plant and ancillary sites out of mapped nodes, controlling hours and conduct while a front occupies those nodes, building only those structures the survey documented, and restoring the surfaces the Project opens.

9.1 Governing rule

The project's funding allocation is organized into three distinct channels.

First, any physical structures that the BFS supports, such as a span or large box at Towah Swamp, and any crossings, oversized culverts, or canopy connections at hotspots identified in Chapter 3 of the BFS, are designed and estimated by the Contractor’s design engineer. These estimates are incorporated into the design and works budgets through standard contract mechanisms, including accepted drawings, billed items, and variations only when the specification requires it.

Second, the Contractor is responsible for tasks such as demarcation, signage, pre-clearance walkovers, induction, adherence to the Code of Conduct, camp inspections, and footprint restoration, all of which fall under the Contractor's obligations as outlined in the CESMP. These tasks do not constitute a separate biodiversity allocation.

Third, the checks listed in Table 7.1 involve the Supervising Engineer's time for oversight as part of ESMP supervision. Any corrective work described in Table 7.2 will be funded from the works contract contingency.

Unit rates are produced by the design engineer and reviewed by the Supervising Engineer and the IIU at bidding or variation in the normal way. Table 9.1 states, for each action, what is procured or performed, the quantity (or its measurement basis where the quantity is fixed at detailed design), the payment channel and the Bill of Quantities item or ESMP budget line that carries the cost — with the works-contract priced activity under which it is paid — and an indicative amount at 2026 prices for pricing the Bill of Quantities. The indicative Contractor-borne cost of Actions A1 to A10 is about US$224,000, plus a provisional sum of US$80,000 for the evidence-led structures of Action A6; the Action A7 structure at Towah swamp is a permanent-works item priced in the drainage and structures bill from the design engineer’s estimate. These amounts are carried in the standalone ESMP budget (ESMP Section 8: Table 8.1, line 7, and Table 8.3, biodiversity lines) and are reconciled against the accepted design schedules under the ESMP update protocol (ESMP Section 1.5). No separate multi-year biodiversity program — no ranger, monitoring-and-evaluation, independent-verification, landscape-restoration or multiple-crossing line — is part of this plan or is carried in the ESMP. An indicative ceiling discussed in earlier drafts is not presented in this BMP and

is not a contractual cap on Action A6 or A7 where those actions are justified by evidence and accepted drawings.

The works contract (ICCO/CET Joint Venture; Contract Agreement of 5 May 2026) is priced as lump-sum activities and sub-activities in its Schedule of Priced Activities, not as a measured Bill of Quantities: Activity 1, design services (US$1,200,000); Activity 2, mobilization and site establishment (US$9,428,279.63); Activity 3, construction of the 75 km road (US$46,431,114.33 — site works, bituminous construction, concrete works and incidental works); Activity 4, environmental and social management (US$520,000 — environmental and social impact assessment 45,000; stakeholder engagement 20,000; environmental and social monitoring and mitigation 430,000; grievance redress mechanism 25,000); and Activity 5, health and safety management (US$540,000); with a provisional sum of US$100,000 for specific environmental and social outcomes and a contingency allowance of US$4,000,000, both expended only at the direction of the Engineer. Table 9.1 therefore names, beside each ESMP budget line, the contract activity under which the action is paid. Measured quantities for the cross-drainage, culvert, retaining-wall and slope works — within which the A6 and A7 structures and the A8 restoration quantities sit — are produced with the design-schedule packages at detailed design (ESIA Section 3.14 and Table 3.9) and the itemized Bill of Quantities follows them; the mapping in Table 9.1 is confirmed in the C-ESMP costing and reconciled under ESMP Section 1.5.

9.2 Payment channel, quantities and Bill of Quantities items by action

Table 9.1: Payment channel, quantity basis and Bill of Quantities item or ESMP budget line, by action

Action	What is procured or performed	Quantity and basis	Payment channel; BoQ item / ESMP budget line; works-contract priced activity	Indicative amount (US$, 2026 prices)
A1	Durable marking of the 0.78 km² no-go core before vegetation clearance in segment S3	Boundary of the 0.78 km² no-go core (500 m radius; perimeter about 3.1 km): durable posts at about 50 m spacing (about 65 posts), boundary signs and survey set-out, in place before any S3 clearance and kept up while a front is in S3	CESMP preliminary-and-general items (ESMP Section 3.9; ESMP Table 8.3, line “BMP Actions A1 to A10”). Works contract: Activity 4, Environmental and Social Management (environmental and social monitoring and mitigation) or Activity 2, Mobilization and Site Establishment, as the C-ESMP costing allocates	11,000
A2	Hours 08:00–16:00; no night work or blasting in S3 and S6; lighting aimed at the face	All fronts in S3 (km 18–20) and S6 (km 38–50); method compliance — no measured quantity	No separate item: priced within works rates through the method statement; supervised under ESMP Section 4. Works contract: within Activity 3, Construction of the 75 km road	—
A3	Design overlay of every pit, quarry, crusher, camp and laydown on Figure 3.1; refusal of a non-compliant site	Overlay of every ancillary site in the register (ESIA Tables 3.4 to 3.6) and in Table 3.2 on Figure	Detailed-design task within the design fee; no works item unless a site is opened. Works contract: Activity 1, Design Services (detailed design)	—

Action	What is procured or performed	Quantity and basis	Payment channel; BoQ item / ESMP budget line; works-contract priced activity	Indicative amount (US$, 2026 prices)
		3.1, at each design review		
A4	Walkover; pegged right-of-way; FDA Class A protocol; five-for-one replacement if a marked stem is lost	Pre-clearance walkover and pegging of the works right-of-way (about 85 km) and every ancillary site — about 50 team-days, with FDA attendance for Class A marking (Table 5.1); 5:1 replacement where a stem is lost	BoQ clearance series (clearance package; ESMP Table 8.3, line “BMP Actions A1 to A10”); replacement planting in the restoration item (A8). Works contract: Activity 3 (site works), with FDA attendance under Activity 4	28,000
A5	Induction; signed Annex A; weekly camp check (with monthly Supervising Engineer verification); protein that is not wild-caught	Induction and signed Annex A for every deployed person including subcontractors (workforce about 780), with toolbox reminders; weekly unannounced check of every occupied camp, with monthly Supervising Engineer verification	Contractor overhead and camp running cost (ESMP Sections 3.8 and 3.9; ESMP Table 8.3). Works contract: Activity 2, Mobilization and Site Establishment, and Activity 4 (environmental and social monitoring and mitigation)	26,000
A6	Crossing, oversized culvert, span or canopy connection only at a hotspot documented in BFS Chapter 3	Structures only where BFS Chapter 3 documents a movement hotspot and the design review accepts the drawings (gate G6). Candidate types and locations are those of BFS Section 5 and Figure 5.2: up to two canopy connections in the CSZ (km 18 and km 20) and dry-bench or oversized culverts at documented crossing points; the count is fixed at detailed design	Provisional sum in the drainage and structures bill, drawn only against accepted drawings (design-engineer estimate; ESMP Table 8.3, line “A6 evidence-led wildlife structures”). Works contract: the provisional sum for specific environmental and social outcomes (US$100,000) and, beyond it, the contingency allowance, expended only at the direction of the Engineer (gate G6)	80,000 (provisional sum)

Action	What is procured or performed	Quantity and basis	Payment channel; BoQ item / ESMP budget line; works-contract priced activity	Indicative amount (US$, 2026 prices)
A7	Span or large box at Towah swamp; silt controls at live crossings	One span or large box culvert at the Towah swamp (km 12–14); silt control at every live crossing in each in-stream week	Structure: permanent-works item in the drainage and structures bill (design-engineer estimate). Silt control: erosion and sediment control allowance (ESMP Section 3.4; ESMP Table 8.3, line 3.4). Works contract: Activity 3 (concrete works; site works)	Structure priced in the works bill; silt control within the ESMP Section 3.4 allowance
A8	Re-grading and native planting on surfaces the Project opens; five-for-one if survival is below 60 percent	Every Project-opened surface in the site register, to the Section 4.4 specification; surveyed area per site entered in the register (planning quantity about 30 ha: sixteen borrow pits, two quarries, the plant complex, the camp and mechanical site, laydowns and about 18 km of detours); 5:1 replacement where survival is below 60 percent	Measured works item (site-restoration series; ESMP Sections 3.9 and 3.17; ESMP Table 8.3, line “BMP Actions A1 to A10”); taking-over withheld until certified. Works contract: Activity 3 (site works; incidental works)	150,000
A9	Node warning signs and 20 km/h plates at S3, S6 and other documented hotspots. During operation the signs are maintained by the MPW as road authority, and the node speed limits are enforced by the Liberia National Police traffic division with the county authorities under the Project’s road-safety arrangements, with compliance checked	Node warning signs and 20 km/h plates at the approaches to S3, to each pangolin polygon in S6 and to other documented hotspots (about 12 signs); sign schedule fixed at detailed design	Signage item in the works BoQ or CESMP (ESMP Table 8.3); the signs pass to the MPW at taking-over. Works contract: Activity 3 (incidental works — road furniture)	6,000

Action	What is procured or performed	Quantity and basis	Payment channel; BoQ item / ESMP budget line; works-contract priced activity	Indicative amount (US$, 2026 prices)
	in the operation-phase monitoring.			
A10	Notice before a front enters S3 or S6; grievance contacts on the notice	One notice per front entry into S3 or S6 (each occurrence), with grievance contacts on every notice	SEP implementation and Contractor notice costs (ESMP Section 3.15; ESMP Table 8.3, line 3.15); Community Liaison Officer time in Contractor overhead. Works contract: Activity 4 (stakeholder engagement; grievance redress mechanism)	3,000
Table 7.1	Weekly verification in S3 and S6; monthly camp file; Action A8 inspection	Weekly verification per front in S3/S6 and in-stream weeks; monthly camp file; Action A8 inspections	Supervision contract — Supervising Engineer time (ESMP Sections 4 and 8); not a works-contract item	Within the supervision contract
Table 7.2	Stop-work, re-marking, five-for-one, disciplinary case	Each event as it arises (Table 7.2 triggers); no planning quantity	Works-contract contingency: the provisional sum for contingency allowance of the contract's Grand Summary (US$4,000,000), expended only at the direction of the Engineer under Sub-Clauses 13.4 and 13.5 of the General Conditions	As arising
Total	Indicative Contractor-borne cost of Actions A1 to A10, excluding the A6 provisional sum and the A7 structure	Sum of the A1, A4, A5, A8, A9 and A10 amounts (11,000 + 28,000 + 26,000 + 150,000 + 6,000 + 3,000)	ESMP Table 8.3 (biodiversity lines: 224,000 plus the 80,000 A6 provisional sum) and ESMP Table 8.1, line 7. Works contract: the contract's own priced environmental and social lines are Activity 4 (US$520,000) and the provisional sum for specific environmental and social outcomes (US$100,000); the balance of the Contractor-borne allowances is embedded in the lump-sum works and design activities and is itemized at design finalization	224,000 (plus the 80,000 provisional sum for A6)

Basis of the indicative amounts (2026 prices). A1: 65 posts at US$60, boundary signs and tape US$2,100, survey set-out and upkeep US$5,000. A4: 50 team-days at US$450 plus FDA attendance US$5,500. A5:

780 inductions at US$20 plus toolbox materials US$10,400. A8: 30 hectares at US$5,000 per hectare (topsoil re-spreading, native planting at about 1,100 stems per hectare and two maintenance weedings). A9: 12 signs at US$350 plus installation US$1,800. A10: six notices at US$500. The amounts are RE-GROUP estimates for pricing the Bill of Quantities; the priced Bill of Quantities governs, and the amounts are reconciled with it under ESMP Section 1.5.

9.3 Structures: design-engineer estimates

Action A6 is evidence-led. A structure is drawn only where BFS Chapter 3 documents a movement hotspot. Action A7 is required on habitat grounds at Towah swamp (approximately kilometer 12–14). In both cases, the Contractor's design engineer prepares drawings and an estimate. The Supervising Engineer and the IIU review those submissions through the ordinary design-review gate (Table 8.2, gate G6). Accepted drawings become measured works. A location that the survey did not document does not receive a biodiversity structure by default; it receives a hydraulically adequate culvert if drainage requires one.

Estimates for A6 and A7 are compared with sound engineering practice on similar rural roads in Liberia. Variation is used only if site conditions discovered during excavation differ from the accepted drawing, not to restore a withdrawn five-crossing package.

9.4 Restoration: Action A8 as a takeover assessment

Action A8 is classified as a testing procedure rather than a landscape capital program. It mandates that by the conclusion of the initial rainy season following planting, a cover of no less than 70 percent must be achieved, alongside a minimum survival rate of 60 percent for the planted stems. The Supervising Engineer will only certify the section upon meeting these criteria. Non-compliance will necessitate a five-for-one replacement at the Contractor's expense, and certification will be withheld. The associated costs are incorporated within the works item and, if required, can be drawn from contingency resources, but are not allocated to a separate biodiversity budget.

9.5 Supervision time

Weekly checks in segments S3 and S6, weekly camp check (with monthly Supervising Engineer verification), and the Action A8 rainy-season and defects-liability inspections are part of the Supervising Engineer's existing environmental and social mandate. They are not a separate biodiversity consultancy. If the supervision contract must name the hours, they are named as ESMP site time, not as a camera-trap or relative-abundance survey.

9.6 Relationship to Table 6.3

The six conditions that hold the residual-significance finding are in Table 6.3, copied from BFS Table 10.4. They are construction controls. They are not a funding covenant, and they do not replace conditions C1 to C6 with a new dollar test. Failure of Action A8 is handled by withholding certification. Failure of Action A3 is handled by refusing the site. Failure of the Code of Conduct is handled as a disciplinary and, where the law requires, a referral matter.

10. REPORTING AND REVIEW

This chapter states how performance against the plan is reported to IIU, the EPA and the World Bank, and when the plan itself is revised.

10.1 Reporting Principle

Biodiversity reporting uses the chain already committed in the ESCP and in BFS Table 7.3. The Contractor writes the monthly biodiversity pages. The Supervising Engineer verifies them. IIU includes a short biodiversity section in the ordinary quarterly report. Serious incidents follow the Project's 24-hour and 48-hour rule. No parallel public dashboard is opened under this chapter.

10.2 Reporting Products

Table 10.1: Reporting products during the works and defects liability

Product	When	From	To
Biodiversity page of the monthly CESMP report, including Table 7.1 checks and any Table 7.2 event	Monthly	Contractor	Supervising Engineer
Consolidated environmental and social progress note	Quarterly	Supervising Engineer	Employer (IIU)
Quarterly project report, including node status	Quarterly	Employer	World Bank and EPA, against permit and commitment-plan items
Serious incident (chimpanzee injury or death, no-go breach, unauthorized Class A felling)	Within 48 hours, with follow-up	Contractor / Supervising Engineer	Employer, then World Bank and EPA as required

10.3 Serious incidents

Three events are always serious incidents under this plan: injury or death of a chimpanzee; work inside the 0.78 square kilometer no-go core; and unauthorized felling of a FDA Class A stem. A verified pangolin mortality caused by a Project vehicle or by Project personnel is treated in the same way. The front in the affected node remains stopped until the Supervising Engineer issues written clearance. The monthly report that follows carries the root-cause note. Repeat Table 7.2 events on the same front are a revision trigger under Section 10.4.

10.4 Review of this BMP

The plan is a version-controlled annex to the 85 km ESIA. It is revised when one of three things occurs. First, a further Criterion 1 record is verified on the alignment. Second, detailed design moves a quarry, borrow pit, crusher, camp or laydown toward the CSZ or a pangolin polygon. Third, Table 7.2 triggers are repeated on the same front. The IIU decides the revision, notifies the World Bank and the EPA, and reissues the affected sections. No revision may weaken Table 6.3 without that notification.

A chimpanzee residency study, a mid-term evaluation, and a long-term final evaluation are not milestones of this BMP. If the IIU later commissions those studies under a separate activity, their findings may inform a future instrument. They do not reopen taking-over of a section already certified against Action A8.

10.5 Disclosure

This BMP is disclosed with the 85 km ESIA, in the same manner as other environmental and social instruments of the Project. Monthly Contractor reports remain internal supervision files unless the ESCP already requires a wider release. Quarterly reports follow the Project's existing disclosure practice. Coordinates of nests, dens, or exact detection points are not published at a resolution finer than one kilometer.

10.6 Records to be retained

Through defects liability**,** the **IIU**, the Contractor**,** and the Supervising Engineer retain: signed Annex A forms; weekly S3 and S6 check sheets; monthly Annex B forms; walkover files; the ancillary-site overlay against Figure 3.1; the sighting and incident log; Action A8 inspection photographs and stem counts; and accepted A6 and A7 drawings. The **BFS** geodatabase remains an **IIU** record from the survey. The Contractor is not required to operate that database.

10.7 Closing Statement

The Project is positioned to advance through the construction phase and the subsequent defects liability period, maintaining a Medium residual significance on Criterion 1, provided that the stipulations outlined in Table 6.3 are satisfied. This assessment is corroborated by the findings of the Biodiversity Field Survey and its annex.

It is imperative to rehabilitate the existing roadway. Operations related to plant, camps, and extraction pits must be excluded from the no-go core areas and the designated pangolin polygons. A thorough examination of segments S3 and S6 should be conducted while the front is accessible. Restoration of surfaces disturbed by the Project is essential. Reporting will be managed through the standard Project communication channels. This Biodiversity Management Plan is designed to facilitate the successful execution of these obligations.

ANNEXES

The annexes are the plan's working tools, designed for field and office use by the Contractor, the Supervising Engineer and the IIU during detailed design, construction and early operation: the signable worker Code of Conduct acknowledgement and induction record (Annex A), the Supervising Engineer's monthly biodiversity compliance verification checklist (Annex B), the field trigger-and-response quick reference (Annex C) and the reference documents (Annex D). They operationalise — and do not amend — the obligations of Chapters 3 to 10 (Annexes 2, 4 and 7).

Annex A: Worker Biodiversity Code of Conduct — Acknowledgment and Induction Record

This form operationalizes Sections 5.1 and 5.7. One record is executed per worker before deployment — including all subcontracted and supply-chain personnel — and is retained by the Contractor's HR function for audit at the monthly camp and records inspections (Annex B, item 5). A worker may not be deployed until both parts are complete.

Table A.1: Core prohibitions — personal acknowledgement (to be signed by all personnel)

#	I acknowledge and undertake that:	Initials
1	I will not hunt, trap or capture any wild animal, and I will not purchase, possess, consume, sell or transport bushmeat, while employed on this Project.	
2	I will not keep wild animals as pets and I will not trade in wildlife, wildlife parts — including chimpanzee parts and pangolin scales — or plants.	
3	I will not fish or collect plants in project areas, and I will not bring weapons, snares or hunting equipment into any camp, vehicle or work site.	
4	I will not enter any area marked as a no-go zone, Critical Habitat or sacred site unless expressly authorized in writing.	

#	I acknowledge and undertake that:	Initials
5	I will immediately report any wildlife sighting inside or adjacent to active work areas to my supervisor, and I know how to use the biodiversity hotline and the grievance redress mechanism.	
6	I understand that breach of these rules is a dismissible offence and, where applicable, will be referred to the FDA under the National Wildlife Conservation and Protected Area Management Law (2016).	

Table A.2: Biodiversity induction record — minimum module content (Section 5.7)

Item	Content delivered at induction	Completed (✓)
A	Critical Habitat, the Chimpanzee Sensitivity Zone and the corridor sensitivity map for the worker's section	
B	Working-hour restrictions, no-go rules and zone discipline applicable to the worker's section	
C	Prohibition of hunting and bushmeat; disciplinary consequences and FDA referral	
D	How to report wildlife sightings; use of the biodiversity hotline and the GRM	
E	Chimpanzee module, WCF materials (mandatory for all crews working at km 18–20)	

Worker name and ID: _____ · Crew / section: _____ · Inductor (name, role): _____ · Date: _____ · Worker signature or electronic record: _____

Annex B: Supervising Engineer Monthly Biodiversity Compliance Verification Checklist

The Supervising Engineer completes this monthly and files it with the monthly report to the IIU (Section 7.2.2); the completed checklists form part of the audit record held by the Employer and kept available for World Bank supervision missions (Section 10.1).

Table B.1: Monthly biodiversity verification checklist

#	Check item	Yes / No / NA	Date checked	Initials
1	No-go core and CSZ demarcation intact and respected; entry log reviewed (100% of entries)			
2	Working-hour restrictions observed — 08:00–16:00 while a front is in the CSZ or a pangolin polygon (Action A2); no night work or blasting recorded			
3	Crossings, oversized culverts or canopy connections (Action A6) and the Towah structure (Action A7) under construction or complete in accordance with the accepted drawings			

#	Check item	Yes / No / NA	Date checked	Initials
4	Progressive restoration underway; no area left exposed beyond one rainy season; cover and survival thresholds on track (Section 4.4)			
5	Code of Conduct acknowledgments and induction records current (Annex A); weekly camp check (with monthly Supervising Engineer verification) completed; no uninvestigated breach			
6	Monthly joint site walk-through completed and minutes issued			
7	Table 7.2 triggers: any event this month; first actions and close-out documented and verified (Annex C)			
8	Non-conformance and penalty register updated; certification withheld where non-compliance persists			

Annex C: Field Trigger and Response Quick Reference

A one-page consolidation of the stop-work and notify triggers (Table 7.2) and the compliance-breach responses (Section 7.3) for site staff; the full Table 7.2 and the escalation in Section 7.3 prevail in any difference.

Table C.1: Compliance breaches and Table 7.2 triggers — immediate field response (Section 7.3)

Breach	Immediate response	Notify
Unauthorized entry or works in the no-go core or a CH polygon	Stop work in the vicinity; reinstate demarcation; record incident	IIU within 24 hours
Night work or blasting in a restricted zone	Written corrective instruction; temporary suspension on repetition	IIU on repetition
Verified protected or priority species within 50 m of an active front (Criterion 1 individuals)	Suspend the front; resume only on the written clearance of the Supervising Engineer (Section 5.4; Table 7.2)	Supervising Engineer and IIU
Uncontrolled sediment discharge at a crossing	Additional silt control; drainage correction; photographic record	Supervising Engineer
Structural damage to or blockage of a crossing or canopy bridge	Repair within agreed timeframe; interim traffic or access management	Supervising Engineer and IIU
Worker hunting, bushmeat or wildlife-trade incident	Disciplinary process up to dismissal; FDA referral; induction review	IIU; FDA where applicable
Unauthorized felling of an FDA Class A stem	Halt the segment; apply the agreed protocol; replace at 5:1 if the stem is lost	IIU; FDA as required

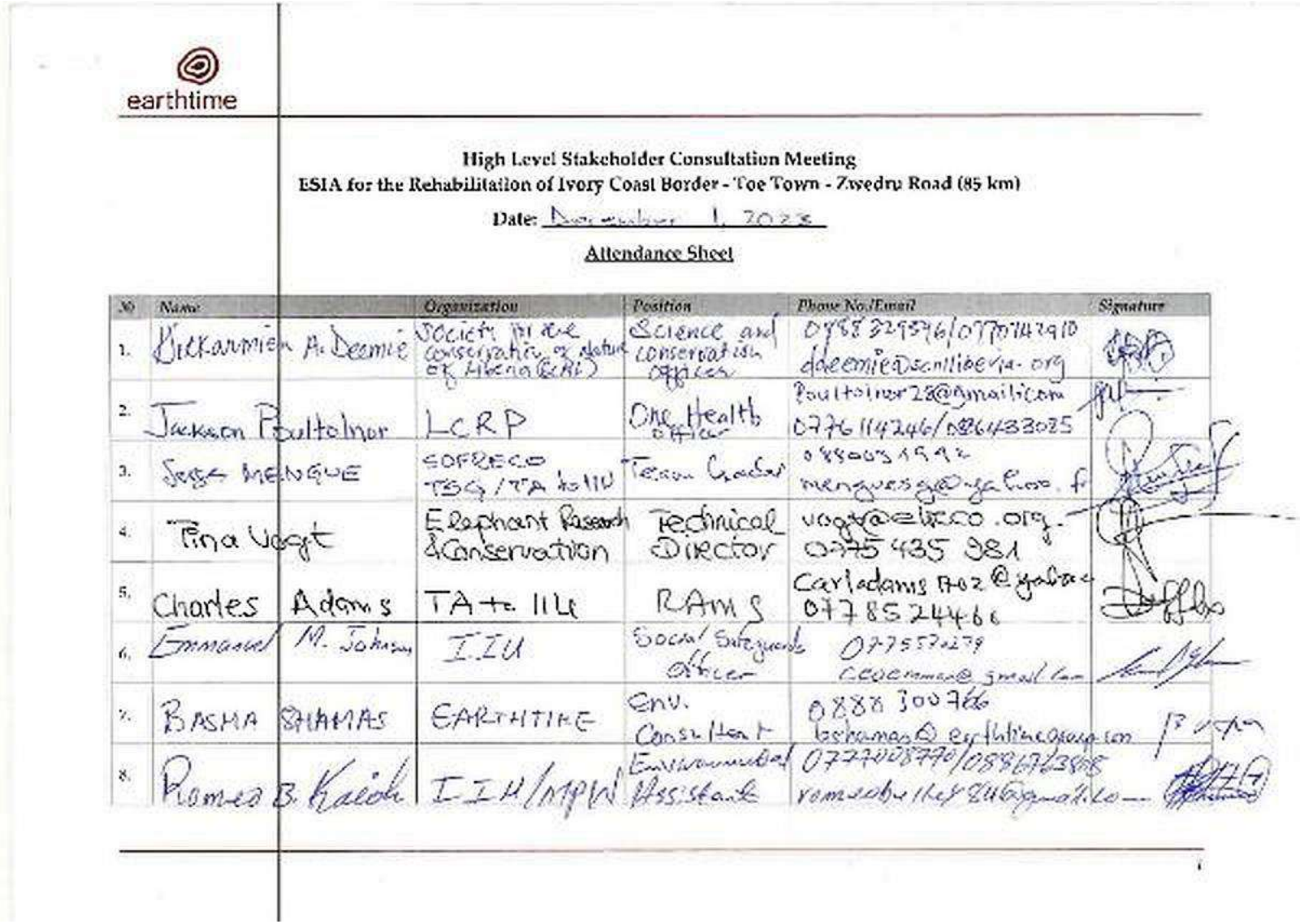
Breach	Immediate response	Notify
Restoration cover below 70 percent, or survival below 60 percent, at the first rainy-season check	5:1 replacement at the Contractor's cost; re-inspection after the next rainy season	Supervising Engineer before section certification

Annex D: Reference Documents

The instruments and sources on which this BMP relies are: the Biodiversity Field Survey of the 85 km corridor (SCNL with WCF, Fauna & Flora and Solimar International; Final Report, 30 September 2026, with its Annexes 1–9, Map Atlas and GIS geodatabase); the draft BMP for the corridor (21 August 2026), integrated at this Rev 2; this ESIA (RE-GROUP, October 2026, Final for Submission, Rev 2), Volumes I and II, with the standalone ESMP and the CESMP framework; the 2024 ESIA (Earthtime); the RAP (2025); the project-level ESCP, ESMF, SEP and LMP (P175263); the World Bank Environmental and Social Framework, ESS6, applying IFC Performance Standard 6 and Guidance Note 6 (2019) as methodology; the Environment Protection and Management Law of Liberia (2002/2003) and the EPA ESIA Procedural Guidelines (2022); the National Wildlife Conservation and Protected Area Management Law (2016), the National Forestry Reform Law (2006) and FDA Regulation No. 113-08; Liberia's National Biodiversity Strategy and Action Plan (NBSAP); and the ICCO/CET design proposal (2025).

APPENDIX U — RECORD OF THE 2026 PUBLIC PARTICIPATION PROGRAMME

This annex reproduces the complete record of the 2026 public participation programme conducted by the RE-GROUP ESIA team from 3 to 6 August 2026: the 14 community consultation meetings (471 participants — 246 men and 225 women, 47.8 per cent female), the two government engagements, the key informant interviews, the 17 postings of the republished Notice of Intent, the consolidated register of responses given, and the summary of the six women's focus group discussions. Meetings were convened through the town chiefs, elders and community leadership of each settlement, facilitated in simple English and local language, and documented with sex-disaggregated attendance sheets; the original signed sheets are held on the project file and are available to the EPA and the World Bank on request. Analysis and commitments are at Chapter 5 of this report. The same documentation discipline underpinned the preceding programme: Figure U.1 reproduces the signed attendance sheet of the high-level stakeholder consultation of 1 December 2023, documentary evidence of the continuous engagement record on which the 2026 round builds.



earthtime

High Level Stakeholder Consultation Meeting
ESIA for the Rehabilitation of Ivory Coast Border - Toe Town - Zwedru Road (85 km)

Date: December 1, 2023

Attendance Sheet

№	Name	Organization	Position	Phone No./Email	Signature
1.	Dikarmie A. Deemie	Society for the conservation of nature of Liberia (SCNL)	Science and conservation officer	0788329596/0770147910 ddeemie@scnliberia.org	
2.	Jackson Poultolner	LCRP	One Health officer	Poultolner23@gmail.com 0776114246/0826483025	
3.	Serge MENGUE	SOFRECO - TSG / TA to IIU	Team Leader	0850031992 mengueserge@yahoo.fr	
4.	Tina Vogt	Elephant Research & Conservation	Technical Director	vogt@elrcc.org 0775435981	
5.	Charles Adams	TA to IIU	RAMS	Carladams802@yahoo 0778524466	
6.	Emmanuel M. Johnson	IIU	Social Safeguards officer	0775572179 ceoemmanuel@gmail.com	
7.	BASHA SHAMAS	EARTHTIME	Env. Consultant	0888300766 bshamas@earthtimeorg.com	
8.	Romeo B. Kaiok	IIU/MPW	Environmental Assistant	0774008770/0886723885 romeobkaiok@gmail.com	

Figure U.1: Signed attendance sheet, high-level stakeholder consultation, 1 December 2023 (adopted from the 2024 ESIA (Earthtime, 2024); reproduced for this ESIA)

U.1 Community Consultation Meetings

The signed attendance registries for twelve of the fourteen meetings recorded in Table U.1, and for three of the government and key-informant engagements, are reproduced as scanned originals at Appendix V; the Toe Town and B'hai Jorzon sheets are not among the scanned registries and are held with the originals on the project file. The pictorial record of the consultation programme is at the project pictorial record (safeguard file).

Table U.1: Record of the 14 community consultation meetings, 3–6 August 2026 (RE-GROUP, 2026)

No.	Community	Date (2026)	Venue (as recorded)	M	F	Distinctive issues raised (beyond the common set)
1	Gboleyville	3 August	Open-air, roadside	16	5	Compensation for landowners without structures; rebuilding along the corridor after compensation/demolition; developer versus landowner compensation; unmarked structures near the RoW; dust, noise and surface-water mitigation; project dimensions
2	Solo Town	3 August	Community palava hut	14	20	Local versus external labour; air and water pollution; safe removal of graves; replacement of NGO-installed water pumps if damaged; GRC training
3	Gboloken	4 August	Open-air, under mango tree	23	15	Timing of works and compensation; noise/vibration disturbance to the elderly; equal, safe employment for women; worker–community disease management; structures outside the RAP later cracked by vibration; detours for vehicles and pedestrians
4	Pouh Town	3 August	Community hall	11	2	Roadside trading disruption; speeding risk to school children — crossings requested; RoW re-occupation after compensation; clear GRM procedures; dust on homes and health facilities; economic-tree compensation
5	Zaiyee Town	5 August	Community meeting ground	35	93	Start date; graves without headstones along the corridor; life-tree compensation; protection of electricity infrastructure; football-field relocation if taken

No.	Community	Date (2026)	Venue (as recorded)	M	F	Distinctive issues raised (beyond the common set)
6	Zleh City	5 August	Community meeting ground	9	7	Compensation-to-demolition interval; protection of headstone-less graves; Contractor awareness of the biodiversity assessments; cash or cheque payment; benefits for community/government structures within the 150 ft corridor; farming and market livelihoods; tree compensation; local contractors; RoW re-occupation; warning signs and speed controls
7	Duogee Town	5 August	Community town hall	29	14	Roadside trading loss; RoW re-occupation; speed breakers near crossings; local employment priority; tree compensation; worker-influx disease risk
8	Tian Town	5 August	Community meeting ground	23	1	Worker-influx disease; crop compensation; local leaders in recruitment; fate of affected structures; regular town halls; daily water trucks for dust; grave restoration; football field within the 150 ft zone — relocation; contractor renovation of the community borehole
9	Suaken Town	6 August	Open-air, under tree	16	4	Quarry host community: willing to lease the site; blasting-vibration risk to older fragile homes; extraction discussions not finalised — two Contractor meetings but no MOU signed; extraction acceptable if requests honoured and equitable benefits ensured; open to resettlement should the need arise

No.	Community	Date (2026)	Venue (as recorded)	M	F	Distinctive issues raised (beyond the common set)
10	Sennehwein Town	6 August	Open-air, settlement frontage	19	13	Roadside trading loss; speed breakers near crossings; local employment; tree compensation
11	Toe Town	6 August	Community meeting ground	11	3	Overwhelming welcome; start date; employment frameworks; protection of water sources; roadside crops; trading loss; RoW re-occupation; speed breakers; worker-influx disease
12	Nicko Town	6 August	Open community hall	23	30	Overwhelming welcome; start date; RoW re-occupation; tree compensation
13	B'hai Jorzon	6 August	Schoolroom/community hall	14	13	Overwhelming welcome; RoW re-occupation; tree compensation; valuation of structures repaired after marking; rightful recipient where an owner is deceased or travelling; advance notice to the Immigration Service (office within the 150 ft corridor); maintenance of access roads; farm encroachment; women's safety with external workers; culverts for existing drainage problems; limited working hours
14	Goyeazon Town	6 August	Thatched palava hut	3	5	Highly traditional town — cultural rules govern: no plain red shirts; no carrying of guns; a sacred tree outsiders may not see or visit; fish from a designated creek not eaten; men keep hair cut; Contractor to work with local leadership

Community attendance totalled 246 men and 225 women (471). The largest meeting was Zaiyee Town (128, 72.7 per cent women); the least gender-balanced was Tian Town (23 men, 1 woman). Recurring recommendations — the de facto commitments register — were: youth/local employment preference (all 14 communities); speed breakers at community centres (12); dust and surface-water mitigation (all); continuous awareness campaigns (8); protection of graves

without headstones (Zaiyee, Zleh, Duogee, Tian; Solo Town on respectful removal); compensation for life/economic trees (8 or more); protection of electricity infrastructure (Zaiyee, Zleh, Duogee, Toe Town); working through local leadership (Toe Town, Nicko Town, B'hai Jorzon, Goyeazon); GRC training (Solo Town); detours (Gboloken); football-field relocation (Zaiyee, Tian); borehole renovation (Tian); and honouring any Suaken quarry MOU. Figure U.2 charts the attendance of the 14 meetings by settlement, sex-disaggregated.

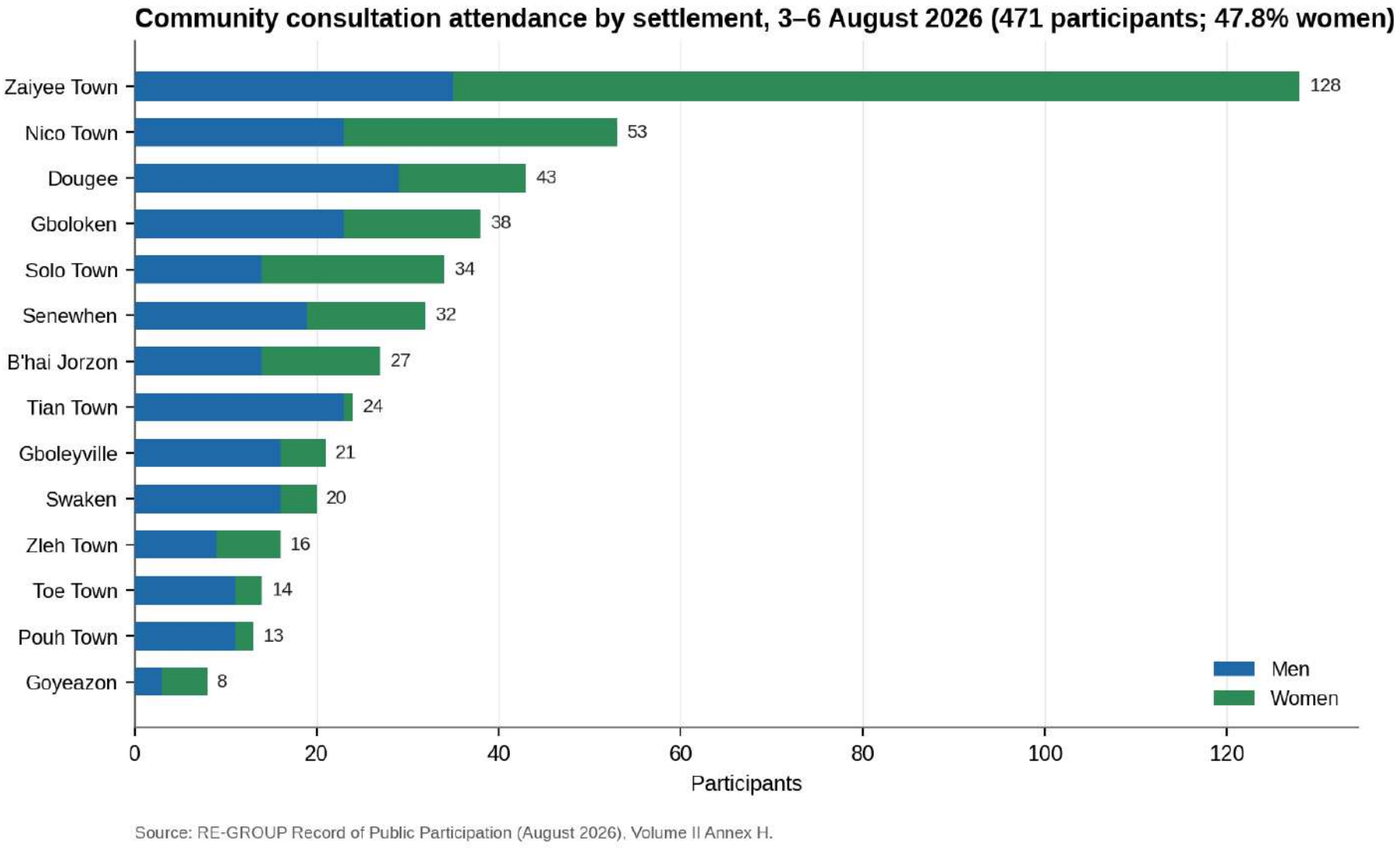


Figure U.2: 2026 community-meeting attendance by settlement, 3–6 August 2026 — 471 participants (246 men, 225 women) (RE-GROUP, 2026)

U.2 Government and Institutional Engagements

Table U.2: Government engagements, 3 August 2026 (RE-GROUP, 2026)

No.	Institution	Officials engaged	M	F	Key content and recommendations
1	County Authority, Grand Gedeh County	County Administration leadership, Zwedru	6	1	Welcomed the team; described the Project as cardinal for the county, the south-east and Liberia, pledging unwavering support. Recommendations: full community participation through free, prior and informed consultation; local electronic media for awareness; Contractor liaison with MME, Local Government and communities
2	Zwedru City Government	City Mayor and city administration	1	1	Welcome and support; enquiry into the fate of marked structures; the City Mayor sought clarification of the right-of-way

U.3 Key Informant Interviews and Supplementary Engagements

Table U.3: Key informant interviews and supplementary engagements, August 2026 (RE-GROUP, 2026)

Date (2026)	Institution / informant	Record status
3 August	Commissioner, Gbao Administrative District	KII conducted; participant numbers to be confirmed from field notes
3 August	Toe Town Local Land Administrator	KII conducted; as above
3 August	Gbarzon Statutory District authority	KII conducted; as above
5 August	City Mayor, Toe Town	KII conducted; as above
6 August	Commissioner, B'hai Administrative District	KII conducted; as above
2 August	ICC Project Manager (Contractor scoping meeting, Zwedru)	Photographed (Plate Q.3.1); meeting recorded in the programme chronology (Appendix F, Section D.1); minutes to be annexed
August	Community chairman of a major Zwedru quarter	Photographed; minutes to be annexed
August	Residents of the Sinoe Road Community, Zwedru	Photographed; minutes to be annexed
August	County Development Officer (former Assistant Superintendent for Development)	Photographed; electoral-district information used in Chapters 6–8
August	Gwein Town community meeting	Photographed; minutes to be annexed
August	Karr Town leadership focus meeting	Held; not photographed (Annex K closing note); minutes to be annexed

U.4 Notice of Intent Postings

The republished NOI (Appendix B) was posted at 17 locations along the corridor and at the county and district administrative offices.

Table U.4: The 17 NOI posting locations, August 2026 (RE-GROUP, 2026)

Date (2026)	Locations posted
3 August	Gboleyville; Grand Gedeh County Administrative Building; Solo Town; Pouh Town
4 August	Gboloken
5 August	Office of the Commissioner, Gbao Administrative District; Zaiyee Town; Zleh City; Duogee Town; Tian Town
6 August	Office of the Commissioner, B'hai Administrative District; Suaken Town; Sennehwein Town; Toe Town; Nicko Town; B'hai Jorzon; Goyeazon Town

U.5 Responses Given

The 2026 field record minuted the issues and recommendations raised; the ESIA team's responses were delivered orally at each meeting following a standard briefing (project description and timeline; the RAP entitlement and compensation-before-works framework; the RoW definition; employment principles; the

grievance mechanism; nuisance controls). The consolidated register of responses is set out in Table U.5 and carried through Chapters 9 and 10 of this report into the ESMP.

Table U.5: Consolidated register of responses given to the issues raised (RE-GROUP, 2026)

Issue theme	Response given / Project commitment	Where carried
Local and youth employment	Local-hire preference with published criteria and wage rates; recruitment through community structures; at least 30% of opportunities for women (planning target pending the CESMP); sex-disaggregated monitoring	Chapter 10; LMP; CESMP
Speed control and pedestrian safety	Traffic calming at settlement gateways, school-zone controls, signage, crossings and trained flaggers, installed before the road opens to fast traffic	Chapters 8–9; CESMP Traffic Management Plan
Dust and water-source protection	Water trucks on active fronts; covered loads; buffers and spill controls at wells, pumps and creeks; verified damage to water points repaired or replaced	Chapter 10; ESMP monitoring
Compensation for trees, crops and structures	RAP entitlements at full replacement cost; 2,185 economic trees on six farms at MoA rates; harvest window for annual crops; additional affected assets processed through the GRM	Chapter 9; RAP (2025); RAP record
Graves, including unmarked graves	Avoidance first; the 15 census graves compensated for relocation with family and traditional rites; pre-construction walkovers; chance-find procedure; unmarked graves registrable through the GRC	Section 8.6; Annex L; RAP (2025)
RoW re-occupation after compensation	The 150 ft/100 ft RoW is government reserved land; compensated structures must be removed and re-establishment within the works corridor will not be permitted; authoritative restatement accompanies RAP disclosure	Chapter 9; assumptions register
Worker influx and disease	Camp management and worker health programme; HIV/STI and disease awareness for workers and communities; local hiring to reduce influx	Chapters 9–10; LMP; CESMP
Quarry blasting and benefits (Suaken)	Signed host-community MOU as a precondition to operation; pre-blast condition surveys; vibration limits and advertised blasting times; equitable benefits	Chapters 3 and 9; Section 3.8

Issue theme	Response given / Project commitment	Where carried
Utilities and community infrastructure	Joint utility survey and relocation schedule before excavation; advance shutdown notices; safe temporary supply; reinstatement of pumps, boreholes and football fields where affected, by agreement	Chapter 10; CESMP; RAP
Cultural protocols (Goyeazon and others)	Site-specific cultural rules agreed with traditional leadership and enforced through worker induction; engagement channelled through customary authorities	Section 8.6; Annex L
GRM procedures and training	The established RETRAP GRM adopted and publicised (contacts, registers, timelines); GRC refresher training	Chapter 5; Section 5.6

U.6 Women's Focus Group Discussions

Six women-only FGDs were held in Pouh Town, Zleh City, Duogee Town, Sennehwein Town, Toe Town and B'hai Jorzon, facilitated by the SEA and GBV Officer with female team members, covering access and mobility; economic opportunity; safety, security and GBV/SEA/SH; health, water and sanitation; and participation and vulnerability. In all six PACs women proposed a common mitigation package: maintained pedestrian, household, farm and water-point access with temporary crossings; advance notice of closures in local languages; settlement speed calming, school-zone controls, trained flaggers and guarded excavations; transparent local recruitment with equal pay, women-suitable PPE and separate secure sanitation; worker codes of conduct with GBV/SEA/SH training, sanctions and survivor-centred referral; confidential grievance uptake with female focal points; dust watering and protection of wells and streams; women-only consultations at convenient times; women in liaison and monitoring structures; and grievance channels usable without fees, literacy, land title or retaliation. Table U.6 records the distinct community-specific findings.

Table U.6: Women's FGD summary by PAC — headline findings and distinct asks (RE-GROUP, 2026)

PAC	Headline findings	Distinct asks
Pouh Town	Seasonal isolation when the laterite deteriorates; walking the common mode for women and girls; jobs sought including non-traditional roles; information requested directly to women, not only through male leaders	Ramps/assisted access for vulnerable residents; safe setback vending areas agreed with traders; local procurement from women-owned enterprises
Zleh City	Delayed farm-to-market trips; girls walk to school along the road; emergency obstetric travel currently difficult; risks of adolescent-girl exploitation and unsafe camps; tenants, widows and informal users overlooked if only owners are consulted	Speed controls before road opening; written contracts and timely payment; procurement from women vendors; camps away from schools; owners and users consulted separately; GRM open to tenants and informal users
Duogee Town	Markets, farms and health unreachable in prolonged rain; head-loading physically demanding; interest in	Paths inventoried with women before works; drainage designed with local knowledge; flexible shifts; job

PAC	Headline findings	Distinct asks
	flagging, vegetation-management, catering and clerical jobs; care responsibilities constrain job take-up; middlemen risk capturing benefits	information direct to women's groups; reversing alarms; verbal complaints accepted; follow-up with vulnerable households
Sennehwein Town	Unreliable transport and high fares; maternal emergencies involve difficult, expensive travel; concern about unfamiliar workers interacting with girls; women seek a recognised role in monitoring contractor conduct	Phased works with announced schedules; access restored at each workday's end where practicable; prohibition of child labour and sexual activity with minors; limited hours near residences; emergency access coordinated with health providers; women liaison representatives and women-only feedback sessions
Toe Town	Junction trading centre with heavy pedestrian, motorcycle and market movement; congestion then higher speeds feared; rent and commodity price rises; displacement of kiosks and stalls; dust on food vending	Town-specific traffic management plan; managed loading areas; early consultation of affected traders under the resettlement instrument; safe trading spaces off the carriageway; speed humps; lighting at critical locations; different forms of evidence accepted for impact verification; women traders in traffic and market planning
B'hai Jorzon	Corridor endpoint for farm-goods movement; women seek direct information on jobs and contractor purchasing; long travel times complicate emergencies; women without title, widows and women with disabilities risk being missed by screening	Access points confirmed with women before earthworks; gateway signs; opportunities advertised through women's representatives; businesses guided to safe setbacks; a child-protection protocol; erosion controls before major earthworks; impacts screened by actual use and vulnerability, not title alone

The source FGD report did not record attendance totals, dates or verbatim transcripts for the six sessions; its matrices are structured syntheses to be validated against the signed attendance sheets, minutes and field records held on file before final disclosure (assumptions register). A women's discussion at Zai Town was additionally photographed and is being reconciled with the FGD register. The gender findings and their translation into commitments are analysed at Sections 6.16 and 7.5 of this report.

APPENDIX V — SCANNED ATTENDANCE REGISTRIES (2026)

The signed registries are reproduced at the Employer’s instruction as the verification record of the participation programme. They contain participants’ names and, in some cases, contact details given voluntarily in public meetings; in any copy prepared for public disclosure, personal contact details may be redacted by the IIU without affecting the evidential record.

This annex reproduces the signed attendance registries of the 2026 public participation programme as scanned originals — the documentary evidence behind the consultation record of Appendix U (Table U.1) and this report Chapter 5. Sheets are reproduced as captured in the field, including participants' names, roles and contact details as voluntarily recorded in the public meeting record; the registers were renumbered sequentially in this compilation (the source compendium carried a duplicated section number). The signed December 2023 high-level stakeholder attendance sheet from the original ESIA is at Figure H.1.

V.1 Attendance Registry — Gboloken



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru

Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Gboloken Town GPS Coordinates:

Date of Meeting: August 3, 2024 Venue: Gboloken Time: 12:03 pm

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Catherine Tahoe		F	Youth	0773180[illegible]	C.T
2.	Precious Gbarwee		F		0887201390	P.T
3.	Mamie G. Kpan		F		0134[illegible]137	M.K
4.	Jacob Tody		F		0776[illegible]713 20	J.T
5.	Vivian Tahoe		F		0761[illegible]36017	V.T
6.	Gordee Gaye		F		0775[illegible]5	G.G
7.	Emmanuel Tahoe					
8.	Ruth T. Harris		F		0777[illegible]679	R.T.H
9.						
10.						
11.						
12.						
13.						

Figure V.1.1: Attendance registry, Gboloken — sheet 1 of 2 (scanned original, August 2026).

ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

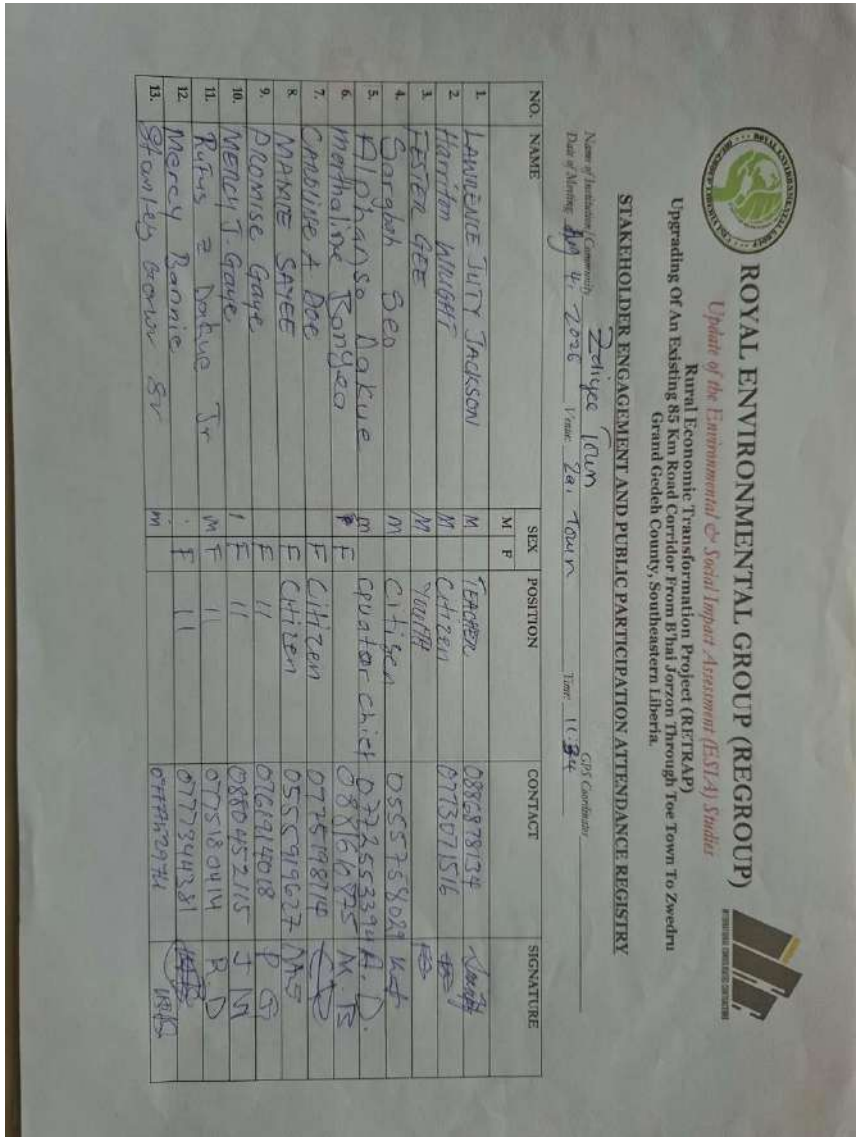
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Gbloken Town *GPS Coordinates:*
Date of Meeting: August Gbloken *Time:* 12:03

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Ellena Nimeamy		✓	Com. member	0886925464	
2.	Seweart Weeks	✓		"	0889873386	J. Weeks
3.	Blessing P. Wahplah		✓	"	0886683014	
4.	Winner S. Manger	✓		"		
5.	Doreas Dweayee		✓	"	0880378987	D. Dweayee
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						

Figure V.1.2: Attendance registry, Gboloken — sheet 2 of 2 (scanned original, August 2026).

V.2 Attendance Registry — Zaiyee Town



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinates:
Date of Meeting: 4th August 2026 Venue: Zaiyee Town Time: 11:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	LAWRENCE JUTY JACKSON	M		TEACHER	0886878134	
2.	Harrison Wright	M		Citizen	0775071516	
3.	FESTER GEE	M		Youth		
4.	Sargbeh Beo	M		Citizen	0555758028	
5.	Alphonso Nakue	M		Opinator Chief	0886878135	
6.	Martha Dr. Konjoa		F			
7.	Caroline A. Doe		F	Citizen	0775198114	
8.	MAMIE SAYEE		F	Citizen	0555919627	
9.	PROMISE Gaye		F	"	0761140018	
10.	MERCY T. Gaye		F	"	0880452115	
11.	Rufus Z Dahue Jr	M	F	"	0775180414	
12.	Mercy Bannie		F	"	0777934381	
13.	Sharleb Brown Sr	M			0777829771	

Figure V.2.1: Attendance registry, Zaiyee Town — sheet 1 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru

Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town — GPS Coordinates:

Date of Meeting: August 4 2026 — Venue: Zaiyee — Time: 11:31 am

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Vero B. Kaan		F	Citizen	0886 826956	V. B. K
2.	Ericson D. Bangbar	M		Citizen	0887851047	
3.	Harrison A Solo	M		Citizen	0555286515	
4.	Alex Kudah	M		Elder	0887139231	
5.	Sam B. Bolay	M		Citizen	0776504437	
6.	Joseph Tamba	M		Citizen	0779084182	
7.	Botdar Jones	M		Citizen	0776341108	
8.	Patricia Gorvulu		F	Citizen	0778211201	P. G.
9.	C. Nuambeu Sarkeah	M		Citizen	0772555[illegible]	C.N.S.S.
10.	Melvin Jones	M		Citizen	0779012553	M.J.
11.	Peay Jones	M		---	0772488542	
12.	Pardes Garweh	F	F	---	0778264943	
13.	Bernice Tarlue	F		---	0770583831	B. T.

Figure V.2.2: Attendance registry, Zaiyee Town — sheet 2 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinate:
Date of Meeting: August 4, 2026 Venue: Zaiyee Town Time: 11:34 AM

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Victoria W. Barnblor	✓		Member	0881493687	
2.	Grace Douayee		✓	Com. Member	0555550650	G. Douayee
3.	Rezether Gaye		✓	Com. Member		R. Gaye
4.	Dorothy S. Gee		✓	Com. Member	0886749187	D. S. Gee
5.	Francemes Jones		✓	Chairlady	0555390436	F. Jones
6.	Rebecca Joe		✓	Com. Member	0777462946	R. Joe
7.	Theresa Moore		✓	Com. Member		T. Moore
8.	Lucretia G. Gaye		✓	Com. Member		
9.	Oretha Gaye		✓	Com. Member		
10.	Theresa Gee		✓	Com. Member		
11.	Cecelia Kiright		✓	Com. Member		
12.	Betty Kerr		✓	Com. Member		
13.	Dorothy Barge		✓	Com. Member	0775447491	

Figure V.2.3: Attendance registry, Zaiyee Town — sheet 3 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru

Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Host Community: Zaiyee Town — GPS Coordinate:

Date of Meeting: Aug. 4, 2026 — Venue: Zaiyeetown — Time: 11:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	James M. Dickerson	✓		Elder	0776201254	
2.	Celestine N. Gaye		✓	Community member	0775138814	
3.	Kandolt G. Gaye	✓		Town chief	0777120490	
4.	Stephen G. Tarr	✓		Sec. Youth Zaiyee	0773026175	
5.	Amos Tokpa	✓		Elder Council	0555841037	
6.	Augustine Tuyiamie	✓		Township Commissioner	0778537892	
7.	Dorcas Leo		✓	Elder	0775179030	
8.	Madam Zwicher		✓	Elder	0555649278	
9.	Jenes Knight		✓	Youth	0775858999	
10.	Julie Dongo		✓	Community Health Volunteer	0888151414	
11.	Susannah Barr		✓	Community member	0555588681	

Figure V.2.4: Attendance registry, Zaiyee Town — sheet 4 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinates:

Date of Meeting: August 4, 2026 Venue: Zaiyee Town Time: 11:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Jenny Zaiyee	M		Citizen	0770733395	
2.	Richard Z. Teah	M		Teacher	0557461176	
3.	Smart D. Blekeh	M		Elder	0777303259	
4.	Melvina Tarlue		F	Citizen	0772293898	
5.	Susannah Gee		F	"	0886090136	
6.	Edith Kam		F	"	0555455242	
7.	Helen Gaye		F	"	0886791088	
8.	Jenama T. Gaye		F	"	0776106368	
9.	Loretta Sooh		F	"	0886335533	
10.	Felix N. Gaye	M		Mechanic Worker	0776106368	
11.	Prudence Toe		F	"	0886335533	
12.	Tefa Gbah		F	"	0778866588	
13.	Mercy Gee		F			

Figure V.2.5: Attendance registry, Zaiyee Town — sheet 5 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinate:

Date of Meeting: August 4, 2026 Venue: Zaiyee Town: 11:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Jeneboh Donzo		F	Youth	0773049070	
2.	Autrious Gaye		F	Youth	0886580626	A. Gaye
3.	Lonel Jarkoh		F	Youth	0776440962	J. J
4.	Abu M. Gaye		F	Youth	0886756911	A.M. Gaye
5.	Mark Block	M		Youth	0774306264	M. B.
6.	Aaron Glen	M		Youth	0776568899	
7.	Grace E. Harris		F		0887239868	
8.	Kurt Garwu	M		Youth	0886625205	
9.	Divine Daniel		F	Youth	0886202754	
10.	Patience Cheeya		F	Youth	-	
11.	Harrison Sklot	M			-	
12.	Eddie Kpan	M		Consultant	0770243351	
13.	Senator Dio	M		Consultant	0886811522	Senator

Figure V.2.6: Attendance registry, Zaiyee Town — sheet 6 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinates:
Date of Meeting: Aug 4, 2026 Venue: Zaiyee Town Time: 10:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	LAWRENCE JUTY JACKSON	M		TEACHER	0886787134	
2.	Hamilton WRIGHT	M		CITIZEN	0773071516	
3.	ESTER GEE	M		Youth		
4.	Sargbeh Sea	M		CITIZEN	0555258028	
5.	Alphanso Dakue	M		Equator Church	0886787534	
6.	Martha Dr Sonyea		F		0886787514	
7.	Caroline A Doe		F	CITIZEN	0775118114	
8.	MARIE SAYEE		F	CITIZEN	0555919627	
9.	PROMISE Gaye		F	"	0769414018	
10.	MERCY T. Gaye		F	"	0880452115	
11.	Rufus a Dakue Jr	M	F	"	0775180414	
12.	Mercy Bonnie		F	"	0777344381	
13.	Stanley Gonwor Sr	M			0776430781	

Figure V.2.7: Attendance registry, Zaiyee Town — sheet 7 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru

Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinate:

Date of Meeting: Aug. 4, 2026 Venue: Zaiyeetown Time: 11:24

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	James M. Dickerson	✓		Elder	0776261254	
2.	Celestine N. Gaye		✓	Community member	0775138814	
3.	Randolf G. Gaye	✓		Town chief	0777204910	
4.	Stephen G. Farr	✓		Secretary/Zoe	0778026125	
5.	Stephen G. Farr	✓		elder Council	0555584183	
6.	Amos Tarpeh	✓		Township com	0778337892	
7.	Amos Tarpeh	✓		Community Mem	0770761420	
8.	Augustine Tyimore	✓		elder	0775179050	
9.	Boaz Zeh	✓		elder	0886078636	
10.	Boaz Zeh	✓		Elder	0555944225	
11.	Moses Zuoh		✓	Youth	0775839991	
12.	Jenea S. Knight		✓	Community Member	0886151447	
13.	Julie Dorbor		✓	Ovalla Chairlady	0555886051	
	Susannah Farr					

Figure V.2.8: Attendance registry, Zaiyee Town — sheet 8 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyetown *GPS Coordinate:* _____
Date of Meeting: Aug. 4 2026 *Venue:* Zaiyetown *Time:* 11:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Precious Kaan		✓		0880247083 PR	
2.	Benedith Quiah		✓		0886496707	
3.	Victee Jones		✓		0556615807	
4.	Diamond C. Kaan		✓		0889393948	
5.	Mayamu S. Gaye		✓		0881434619	
6.	Aminata Gaye		✓		0889564314	
7.	Esther Bee		✓		0889564248	
8.	Sandra T. Sallah		✓		0775447321	
9.	Babyline Quaqoh		✓		0886552466	
10.	Annes Urelt		✓		0775368416	
11.	Sandra Jackson		✓		0880127680	
12.	Alice D. Gaye		✓		0889417287	
13.	Joyce Gbeapue		✓			

Figure V.2.9: Attendance registry, Zaiyee Town — sheet 9 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town — GPS Coordinates:
Date of Meeting: August 4, 2026 — Venue: Zaiyee — Time: 11:34

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Naomi Sackie		F		0782250665	
2.	Anthony Z. Gaye	M			0777242033	
3.	Hon. Plus G. Gaye	M			0777458330	
4.	Patience Ahza		F			P.G.
5.	Martha Jane Gaye		F			
6.	Mamie Gaye		F		0886498137	M.G
7.	Ophelie Zuben		F		0770097536	R.Z.H.G
8.	Augustine Gaye	M				
9.	Rebecca Zeh		F			R.Z.
10.	Ruth Gaye		F			R.T.G
11.	Ethel Zeo		F			E.Z.
12.	Caroline H. Boimah		F		0774288284	
13.	Lauel Gaye	M			0880233172	L.G.

Figure V.2.10: Attendance registry, Zaiyee Town — sheet 10 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinate:
Date of Meeting: August 4, 2026 Venue: Zaiyee Town Time: 11:54 a.m

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Ellenor Zaluo		✓	Com. member		
2.	Victoria Jah		✓	Com. member		
3.	D Lydia Gee		✓	Com. member	0886695194	D. L Gee
4.	Susu Toady		✓	Com. member	0775291159	S. Today
5.	Ruth Girl Farley		✓	Com. member	0888200866	R. Farley
6.	Pedro Gayeh	✓		Com. member	0887560341	P. Gayeh
7.	Mary Jones		✓	Com. Member		
8.	Susan Jones		✓	Com. Member		
9.	Elizabeth Gayee		✓	Com. Member		
10.	Lucy Jones		✓	Com. Member	0775274464	
11.	Mabel F. Greer		✓	Com. Member	0778134461	
12.	Serena Zlych		✓	Com. Member	0775194603	
13.	Apporah N. Gayee	✓		Com. Member	0773668559	

Figure V.2.11: Attendance registry, Zaiyee Town — sheet 11 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (E.S.I.A) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town GPS Coordinate:
Date of Meeting: August 4, 2026 Venue: Zaiyee Town Time: 11:34 a.m

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Ellenor Zaluo		✓	Com. member		
2.	Victoria Jah		✓	Com. member		
3.	D Lydia Gee		✓	Com. member	0886695194	D. L Gee
4.	Susu Toady		✓	Com. member	0775291159	S. Today
5.	Ruth Girl Farley		✓	Com. member	0888200866	R. Farley
6.	Pedro Gayeh		✓	Com. member	0287560341	P. Gayeh
7.	Mary Jones		✓	Com. Member		
8.	Susan Jones		✓	Com. Member		
9.	Elizabeth Gayee		✓	Com. Member		
10.	Lucy Jones		✓	Com. Member	0775274464	
11.	Mabel F. Greer		✓	Com. Member	0778134461	
12.	Serena Zlogh		✓		0775194603	
13.	Apporah N. Gayee		✓		0773668559	

Figure V.2.12: Attendance registry, Zaiyee Town — sheet 12 of 13 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Zaiyee Town — GPS Coordinates:
Date of Meeting: August 4,2026 — Venue: Zaiyee — Time: 11:34 am

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Vero B. KOON!		F	Citizen	0886 826956	V B K
2.	Ericson D. Bangblor	M		Citizen	0887851042	
3.	Harrison A Solo	M		Citizen	0555286515	
4.	Alex Kudah	M		Elder	0888113031	
5.	Sam B. Boley	M		Citizen	0776504	
6.	Joseph Tamba	M		Citizen	0779084182	
7.	BotBar Jones	M		Citizen	0776 71406	
8.	Patricia Gorulo		F	Citizen	0778211705	P G
9.	C. Mlambow Sartoh	M		Citizen	0772 55	CMSG
10.	Melvin Jones	M		Citizen	0779512553	MSJ
11.	Peay Jones	M		----	0772488542	
12.	Dorcas Gorwa	F	F	///	0778269743	
13.	Bernice Tarlue	F		//	0770-8831	B. T

Figure V.2.13: Attendance registry, Zaiyee Town — sheet 13 of 13 (scanned original, August 2026).

V.3 Attendance Registry — Nico Town

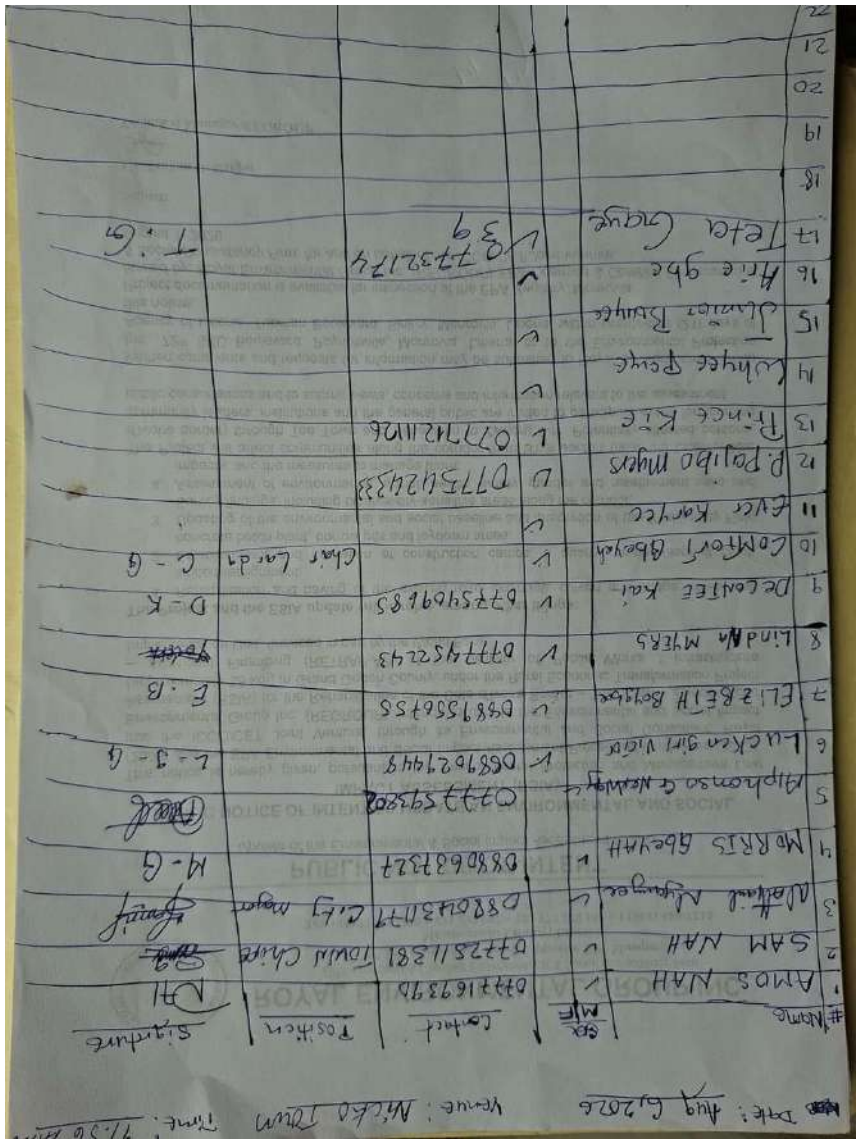
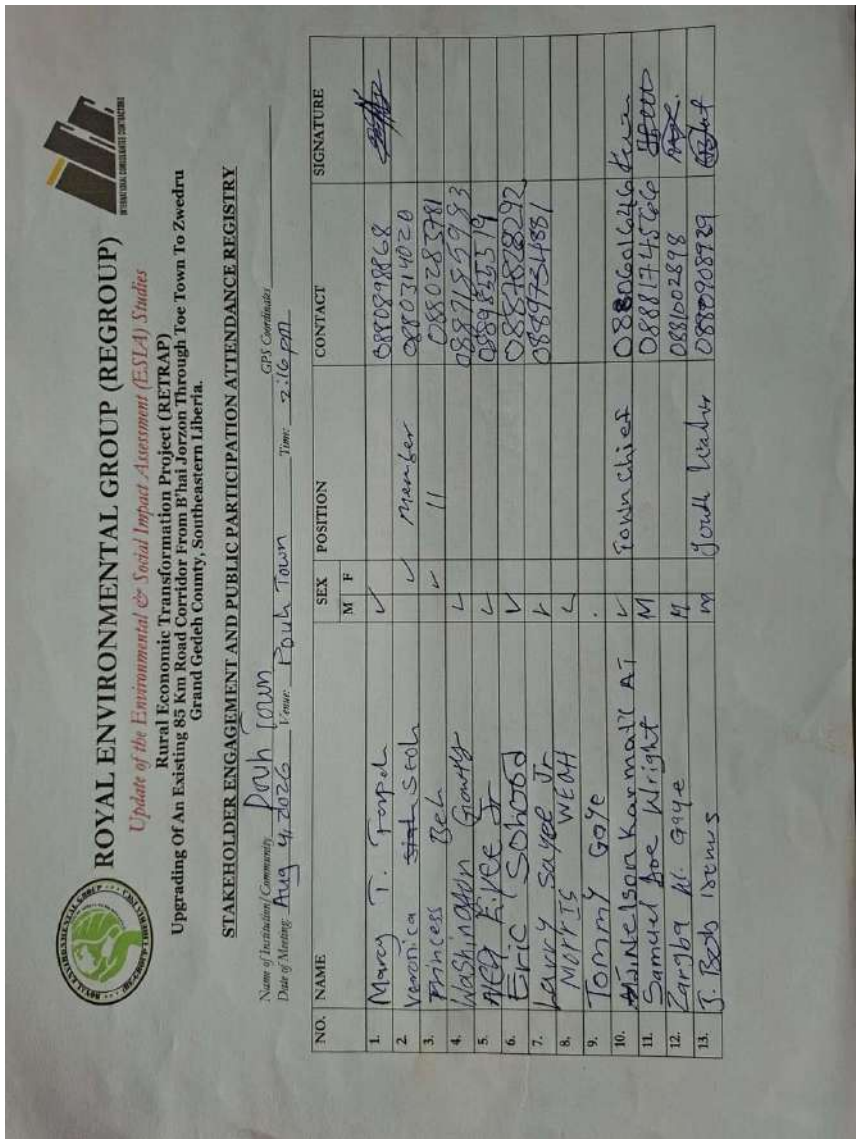


Figure V.3.1: Attendance registry, Nico Town (scanned original, August 2026).

V.4 Attendance Registry — Pouh Town



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

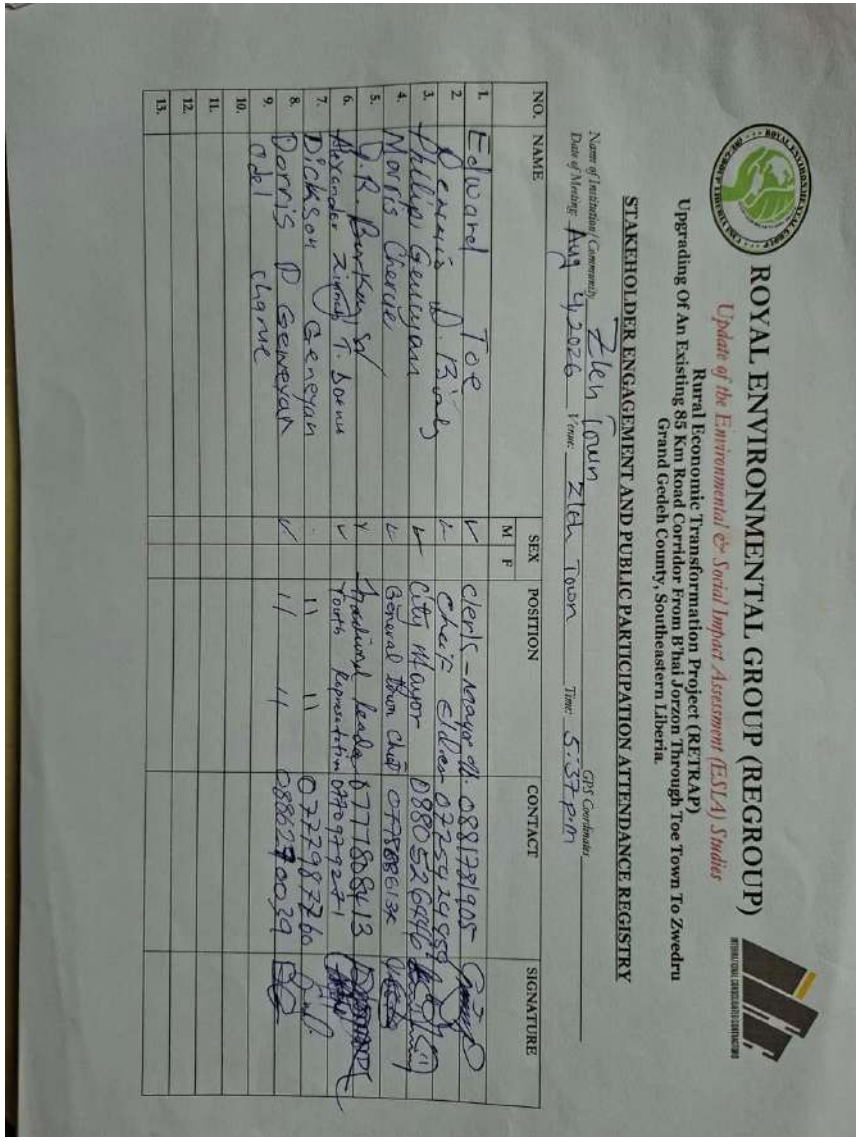
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Pouh Town *GPS Coordinates:* _____
Date of Meeting: Aug 4 2026 *Venue:* Pouh Town *Time:* 2:16 pm

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Mary T. Tonpeh	✓			0880898468	
2.	Veronica ~~Sirleaf~~ Seoh		✓	Manager	0770314020	
3.	Princess Beh		✓	11	0880285781	
4.	Washington Gontor	✓			0887455983	
5.	AGP Eric Jr	✓			0889855179	
6.	Eric Sohood	✓			0886878292	
7.	Lacy Sayee Jr	✓			0889734851	
8.	Mirrie WEAH	✓				
9.	Tommy Goye	.				
10.	Nelson Karmah AT	✓		Town Chief	0880616246	
11.	Samuel Boe Wright	M			0881744566	
12.	Zargbo M. Gaye	M			0881002898	
13.	J. Bah Isaacs	M		Youth Leader	0880908739	

Figure V.4.1: Attendance registry, Pouh Town (scanned original, August 2026).

V.5 Attendance Registry — Zleh Town



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/ Community: Zleh Town *GPS Coordinates:*
Date of Meeting: Aug 4, 2026 *Town:* Zleh Town *Time:* 5:37 p.m

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Edward Toe	✓		clerk-manager elt.	0881781905	
2.	Francis D. Biah	✓		Chief Elder	0775749999	
3.	Phillip Geeyan	✓		City Mayor	0880526446	
4.	Morris Gbarbe	✓		General Town Chief	0778086136	
5.	J. R. Burkey Sr.	✓		Traditional leader	0777805413	
6.	Alexander Zinnah T. Borma	✓		Youth Representative	0770977271	
7.	Dickson Geeyan			"	"	0777987266
8.	Dennis D. Geeyan	✓		"	"	0886177 00339
9.	Adel Gbarue					
10.						
11.						
12.						
13.						

Figure V.5.1: Attendance registry, Zleh Town (scanned original, August 2026).

V.6 Attendance Registry — Suaken Town (Proposed Quarry site PAC)



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Suyaken *GPS Coordinates:*
Date of Meeting: Aug 5/2026 *Time:* Suyaken Town *Time:* 11:32 a.m

NO.	NAME	SEX		POSITION	CONTACT	SIGNATURE
		M	F			
1.	Emmanuel T. Gbiers	✓				
2.	David Gbiers	✓			0777122029	
3.	Moses Gbiers	✓				
4.	Bernadeny Sampee	✓		Town Chief		
5.	Marbington Gbiers	✓				
6.	Mabel T. Gbiers		✓	Chairlady		
7.	Rebecca Gbiers		✓			
8.	Senkia Bennie		✓			
9.	Bernelly Gbiers		✓			
10.	Bell Sampee		✓			
11.	Prince Y. Gbiers	✓				
12.	Emmanuel Sampee	✓				
13.	Gideon Gbiers	✓				

Figure V.6.1: Attendance registry, Suaken Town (Proposed Quarry site PAC) (scanned original, August 2026).

V.7 Attendance Registry — Tian Town



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)

Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru

Grand Gedeh County, Southeastern Liberia

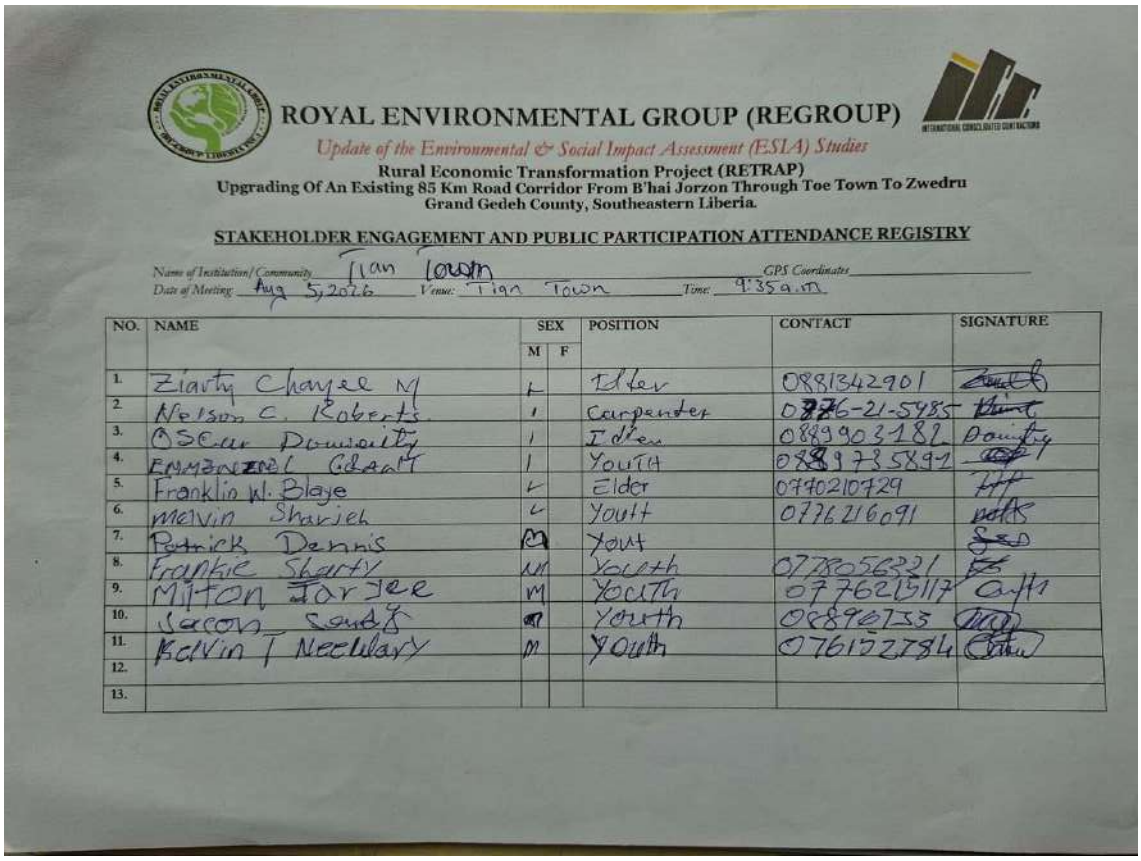
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution (Community) Tian Town *GPS Coordinates*

Date of Meeting Aug 5, 2026 *Venue:* Tian Town *Time:* 01:55 a.m

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Andrew Elonyou	M		Chief Elder	0880459721	
2.	Oscar Youngbei	M		Asst. Elder	0778533683	
3.	Edward Sandy	M		Town Chief	0886324119	
4.	Madison P. Gee	M		Elder	0887338370	
5.	George Bee	M		Elder	0778686604	
6.	Joe Beh	M		Elder		
7.	JOSEY WRIGHT	M		Community member	0776152660	
8.	JOSEY B. SUMARIY	M		Youth	0776152660	
9.	Edward SUMARY	M		Youth	0777476534	
10.	Alex T Tolo	M		Elder	0777183541	
11.	Peter T John	M		Youth	0776215197	
12.	Prosper T Juwe	M		Youth	0776463161	
13.						

Figure V.7.1: Attendance registry, Tian Town — sheet 1 of 2 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

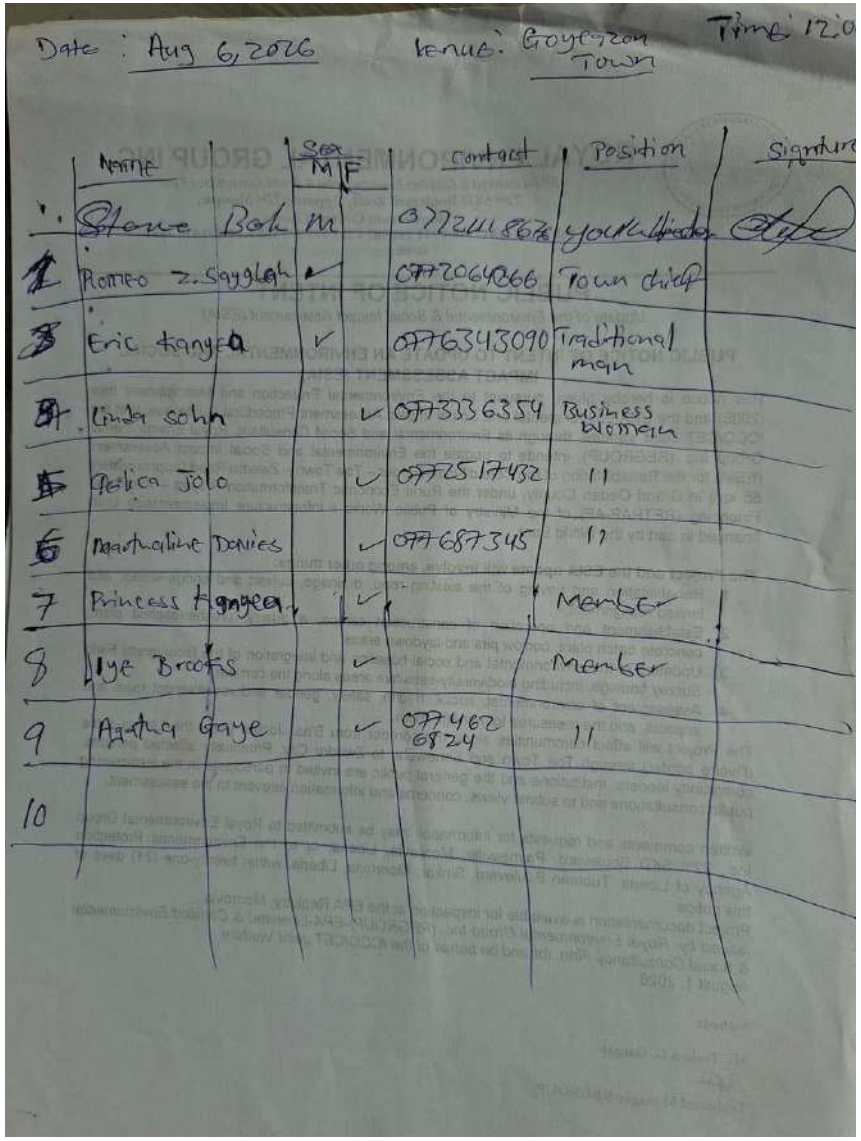
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/ Community: Tian Town — GPS Coordinates:
Date of Meeting: Aug 5, 2026 — Venue: Tian Town — Time: 9:35 a.m.

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Ziarty Chayee M			Elder	0881342901	
2.	Nelson C. Roberts			Carpenter	0886-21-5485	
3.	OSCar Dowaity			Elder	0889031812	
4.	EMMANUEL Gbaan			Youth	0889735892	
5.	Franklin W. Blaye			Elder	0770210729	
6.	Melvin Sharieh			Youth	0776216091	
7.	Patrick Dennis			Yout		
8.	Frankie Sharty			Youth	0778056321	
9.	Milton Jarjee			Youth	0776215117	
10.	Jacon Sondy			Youth	0889[illegible]33	
11.	Kelvin T Neellary			Youth	0761722784	
12.						
13.						

Figure V.7.2: Attendance registry, Tian Town — sheet 2 of 2 (scanned original, August 2026).

V.8 Attendance Registry — Goyeazon (Traditional Town & Custodian of the Largest Poro Bush in Gbarzon)



Date : Aug 6, 2026 Venue: Goyeazon Town Time: 12:0

	Name	Sex M/F	contact	Position	Signature
1.	Steve Bah	M	0772411878	[illegible]	
2	Romeo Z. Sayglah	✓	0772064866	Town chief	
3	Eric tanyea	✓	0776343090	Traditional man	
4	Linda sohn	✓	0773336354	Business Woman	
5	Felica Jolo	✓	0775517432	11	
6	Marthaline Davies	✓	0776887345	11	
7	Princess Tanyea	✓		Member	
8	Liye Brooks	✓		Member	
9	Agatha Gaye	✓	077462 6824	11	
10					

Figure V.8.1: Attendance registry, Goyeazon (Traditional Town & Custodian of the Largest Poro Bush in Gbarzon) (scanned original, August 2026).

V.9 Attendance Registry — Sennehwein Town

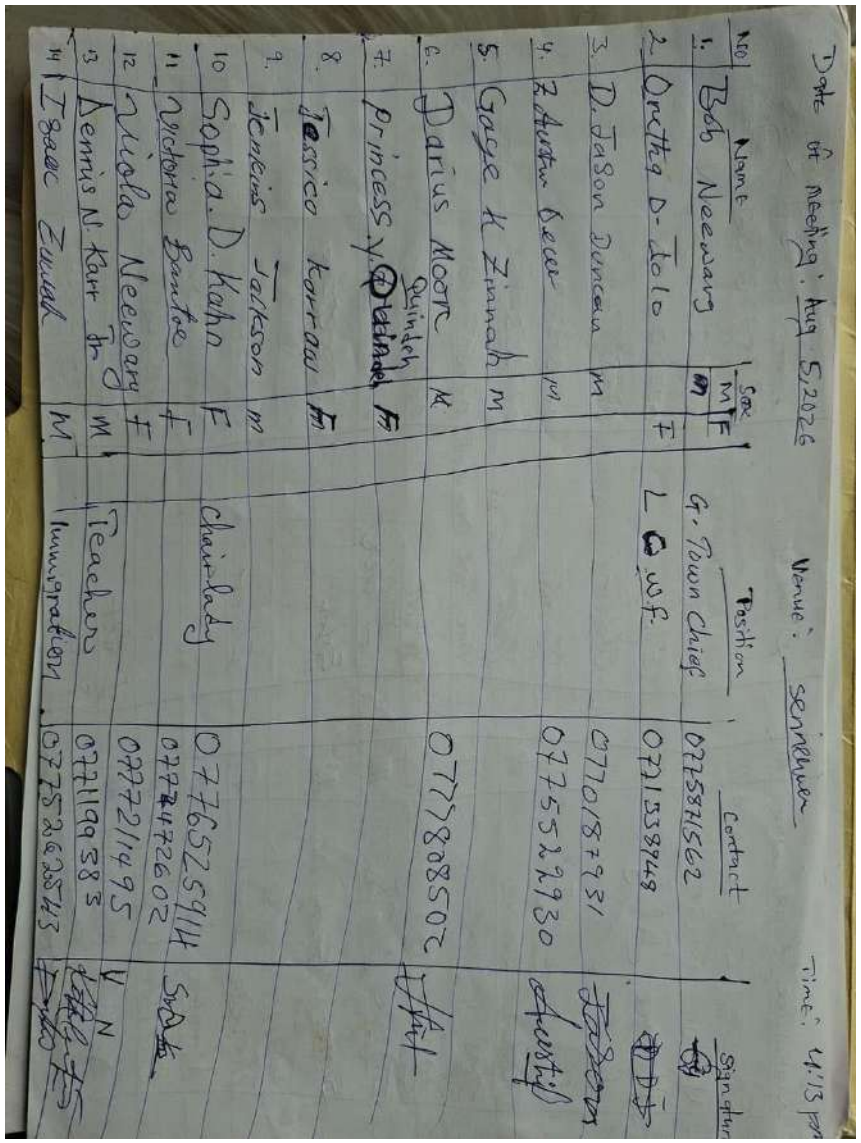


Figure V.9.1: Attendance registry, Sennehwein Town (scanned original, August 2026).

V.10 Attendance Registry — Solo Town



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
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Grand Gedeh County, Southeastern Liberia

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution (Community): Solo Town — GPS Coordinate:
Date of Meeting: Aug 4 2026 — Venue: Solo Town — Time: 12:50 pm

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Marcy T. Tarpeh	✓		[illegible]	0770527621	
2.	Bill M. Quiah	✓		Pastor	0887187761	
3.	Cecil Galey		✓	Pastor	0880431643	
4.	Martha Clatty		✓	Elder	0886141827	
5.	Patric Theo	✓		member	0886795761	
6.	~~Elijah~~ Ezekiel Morris	✓		Youth President	0880040722	
7.	Melvin Zoe	✓		Elder	0886756553	
8.	Gannon N. Gaah	✓		Chief	0888338230	
9.	Emmanuel Cheh	✓		Cpl	0886563894	
10.	Emmanuel Parnum - Dr	✓		Youth Member	0860.03.72.29	
11.	ROLAND QUIAH	✓		FAITH LEADER	0881900608	
12.	Morris Quah	✓		Asst Youth President	0555918031	
13.	Eric M. Teoh	✓		Youth	0555312071	

Figure V.10.1: Attendance registry, Solo Town — sheet 1 of 3 (scanned original, August 2026).



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Grand Gedeh County, Southeastern Liberia

Solo Town

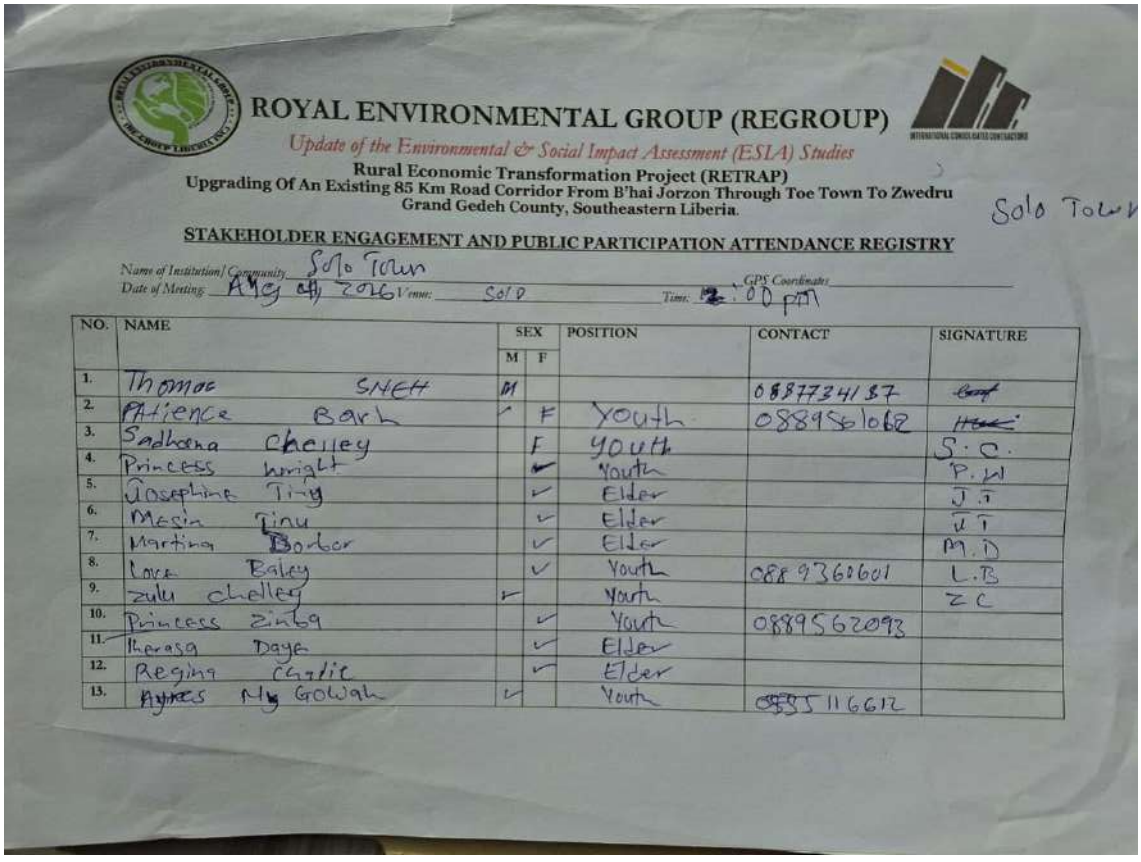
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/ Community: Solo Town GPS Coordinate:

Date of Meeting: Aug 4, 2022 Venue: Solo Town

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Nicla Camara		✓	Youth	0555119713	
2.	Fancy Bailey		✓	Elder		
3.	Oretha Bah		✓	Elder		
4.	Yau- Glenay	✓				
5.	Defendec Quish	✓		Youth	0555714410	
6.	Edna Phillips		✓	Youth	0887109083	
7.	Comfort Quiah		✓	Youth		
8.	Leding George	✓		Youth		
9.						
10.						
11.						
12.						
13.						

Figure V.10.2: Attendance registry, Solo Town — sheet 2 of 3 (scanned original, August 2026).



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
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Solo Town

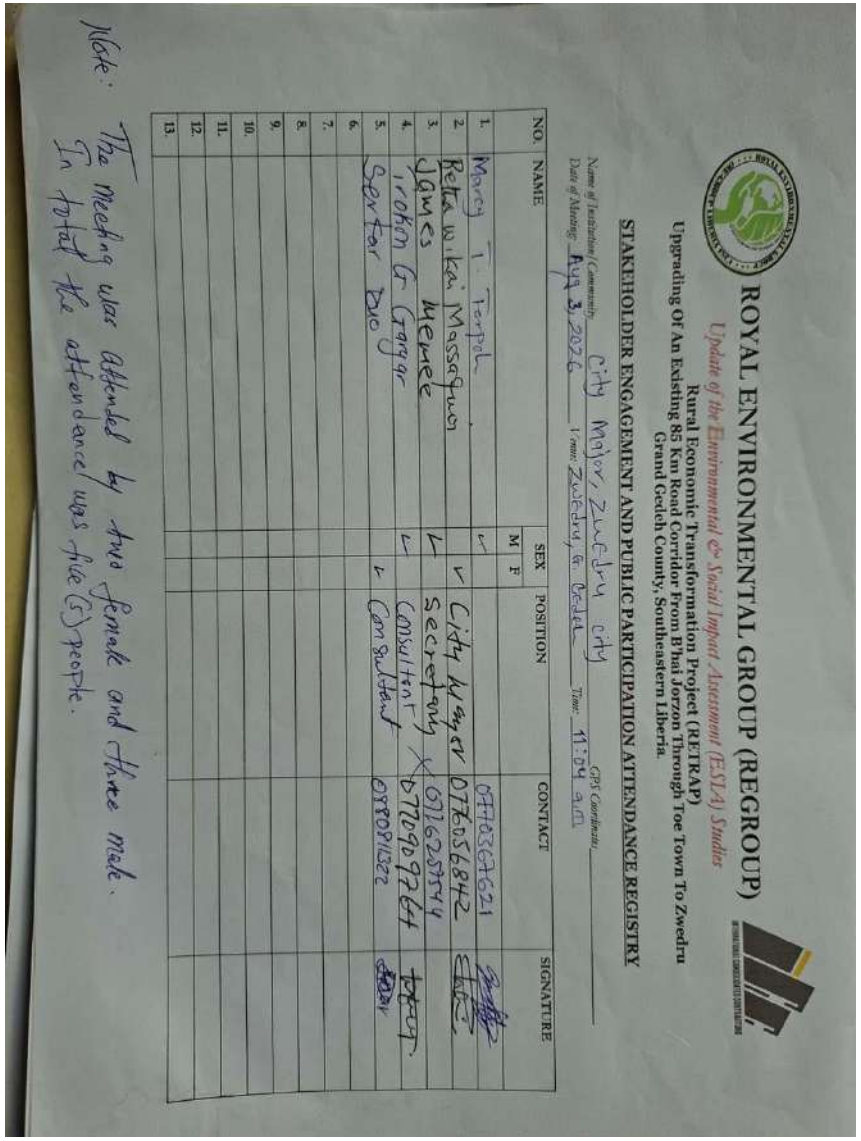
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Solo Town
Date of Meeting: Aug 4th 2026 *Venue:* Solo *Time:* 12:00 pm *GPS Coordinates:*

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Thomas SNEH	✓			0887734137	
2.	Patience Barh		✓	Youth	0889561062	
3.	Sadrena Chelley		✓	Youth		S.C.
4.	Princess Wright		✓	Youth		P.W
5.	Josephine Tiny		✓	Elder		J.T
6.	Mesia Tinu		✓	Elder		M.T
7.	Martina Border		✓	Elder		M.D
8.	Love Baley		✓	Youth	0889360601	L.B
9.	Zulu Chelley	✓		Youth		Z.C
10.	Princess Zinbo		✓	Youth	0889562093	
11.	Theresa Daye		✓	Elder		
12.	Regina Cyrlic		✓	Elder		
13.	Aymes Ny Gowah	✓		Youth	0555116612	

Figure V.10.3: Attendance registry, Solo Town — sheet 3 of 3 (scanned original, August 2026).

V.11 Attendance Registry — Local Authority (City Mayor of Zwedru)



ROYAL ENVIRONMENTAL GROUP (REGROUP)

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Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: City Mayor, Zwedru city — GPS Coordinates:
Date of Meeting: Aug 3, 2026 — Venue: Zwedru, Gr. Gedeh — Time: 11:04 a.m.

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Marcy T. Tarpeh		✓		0778367621	
2.	Rita Wiki Massaquoi		✓	City Mayor	0776568442	
3.	James Wemee	✓		Secretary	0116253544	
4.	Ironton G. Gaygar	✓		Consultant	0770997264	
5.	Sarfar Doe		✓	Consultant	0770911322	
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						

Note: The Meeting was attended by two female and three Male. In total the attendance was five (5) people.

Figure V.11.1: Attendance registry, Local Authority (City Mayor of Zwedru) (scanned original, August 2026).

V.12 Attendance Registry — Local Authority-Administrative District Commissioner



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

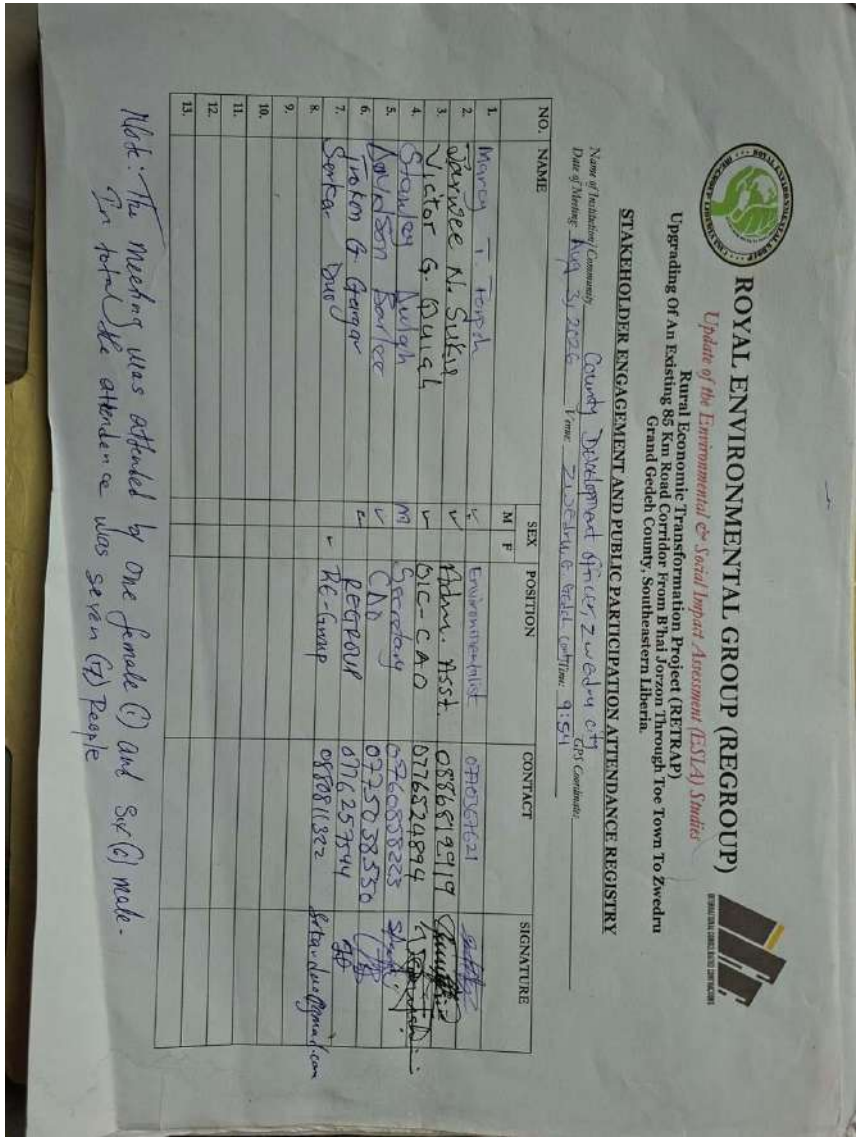
STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Gbao Administrative District — GPS Coordinates:
Date of Meeting: Aug 5, 2026 — Venue: Gbao Administrative Dis — Time: 9:00 a.m.

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Daniel M. Wondeh	✓		Commissioner	0886910750	
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						

Figure V.12.1: Attendance registry, Local Authority-Administrative District Commissioner (scanned original, August 2026).

V.13 Attendance Registry — Local Authority-Assistant Superintendent for Development



ROYAL ENVIRONMENTAL GROUP (REGROUP)

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Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

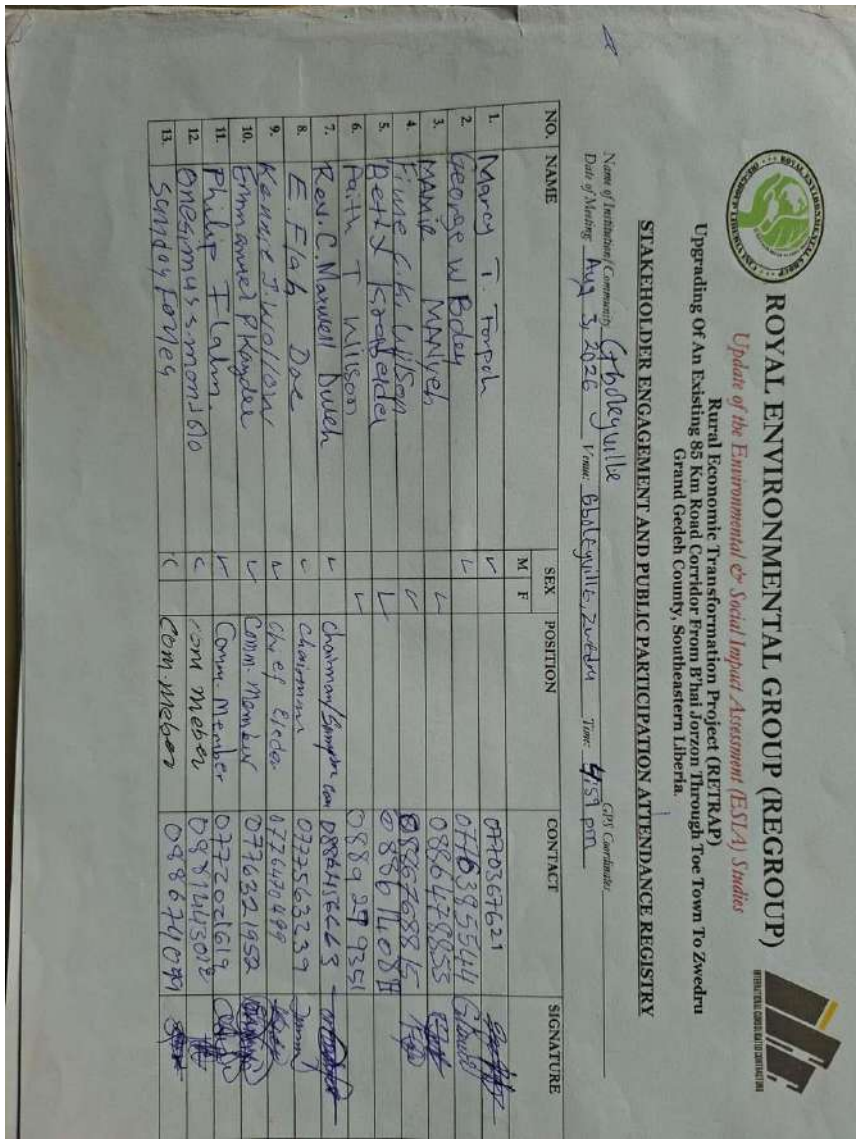
Name of Facilitation/Community: County Development Officer Zwedru city GPS Coordinate:
Date of Meeting: Aug 31, 2026 Time: Zwedru Gedeh County Time: 9:54

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Marcy T. Tarpeh		✓	Environmentalist	0770969621	
2.	Jarwee N. Sukia	✓		Admn. Asst.	0886812919	
3.	Victor G. Quiah	✓		SIC-CAO	0776524894	
4.	Stanley Nulah	✓		Secretary	0776000223	
5.	Davidson Barlee	✓		CDO	0775038530	
6.	Jacob G. Gregor	✓		REGROUP	0776253744	
7.	Sorlee Duo	✓		RE-Group	0880811382	
8.						
9.						
10.						
11.						
12.						
13.						

Note: The Meeting was attended by One female (F) and Six (6) male-
For total the attendance was seven (7) People

Figure V.13.1: Attendance registry, Local Authority-Assistant Superintendent for Development (scanned original, August 2026).

V.14 Attendance Registry — Gboleyville



ROYAL ENVIRONMENTAL GROUP (REGROUP)

Update of the Environmental & Social Impact Assessment (ESIA) Studies

Rural Economic Transformation Project (RETRAP)
Upgrading Of An Existing 85 Km Road Corridor From B'hai Jorzon Through Toe Town To Zwedru
Grand Gedeh County, Southeastern Liberia.

STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION ATTENDANCE REGISTRY

Name of Institution/Community: Gboleyville — GPS Coordinate:
Date of Meeting: Aug 3, 2026 — Venue: Gboleyville, Zwedru — Time: 4:59 pm

NO.	NAME	SEX M	SEX F	POSITION	CONTACT	SIGNATURE
1.	Marcy T. Forpeh	✓			0770367621	
2.	George W Bideh	✓			0776395544	
3.	MAMIE MANYEH		✓		0886478855	
4.	Fiume F. Kulleah		✓		0886788855	
5.	Betty Krahbeldeh		✓		0886446858	
6.	Patty T. Wilson		✓		0889297351	
7.	Rev. C. Maxwell Buleh	✓		Chairman/Secretary	0886416243	
8.	E. Flah Doe	✓		Chairman	0775563239	
9.	Kemue J. Nuolleah	✓		Chief of Elders	0776470499	
10.	Emmanuel P. Kpayeh	✓		Comm. Member	0776321958	
11.	Philip Flahn	✓		Comm. Member	0772021619	
12.	Onesimus Nimley	✓		Comm. Member	0881443018	
13.	Sando Forleh	✓		Comm. Members	0886740749	

Figure V.14.1: Attendance registry, Gboleyville (scanned original, August 2026).

V.15 Attendance Registry — Duogee

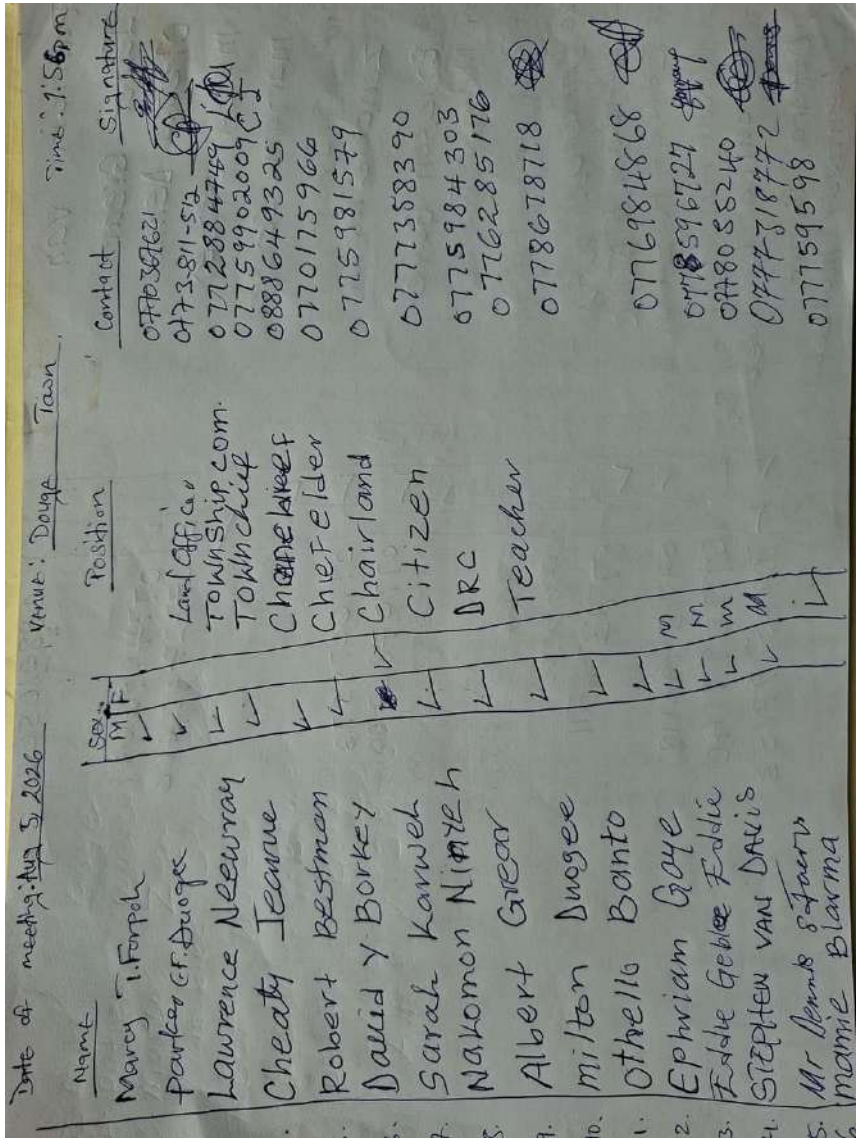


Figure V.15.1: Attendance registry, Duogee (scanned original, August 2026).

APPENDIX W — LESSONS LEARNED FROM THE CORRIDOR ROAD SECTIONS

The 85 km road of this ESIA is the final link of the approximately 225 km Ganta–Zwedru corridor. Ganta–Tappita (approximately 100 km) has been under construction since 2021 under the South-Eastern Corridor Road Asset Management Project (SECRAMP, P149279), restructured in May 2021 from a public-private partnership to publicly financed design-build contracts and supported by the Additional Financing appraised in 2025, with works continuing at the date of this edition (World Bank, 2021; 2025). Tappita–Toe Town (approximately 40 km) is delivered under the parent RETRAP project (P175263) with its own ESIA and safeguard instruments. The corridor sections share the Employer (IIU/MPW), the contracting model, the receiving environment and the adopted RETRAP grievance mechanism, and their interaction with this Project is assessed as a cumulative impact at Section 9.6.

The implementation record of SECRAMP — documented in the project's restructuring paper (World Bank, 2021) and the appraisal documentation for its Additional Financing (World Bank, 2025) — is directly relevant to this Project. Table W.1 sets out the principal lessons and where this ESIA embeds the response.

Table W.1: Lessons learned from the Ganta–Tappita (SECRAMP) construction and their embedding in this ESIA

#	Documented SECRAMP experience	Lesson	Where embedded in this Project
1	Quarry operations affected nearby communities and the environment; under the preceding LIBRAMP project, four quarries and asphalt-plant sites were left unrestored, with bitumen residues and used oil improperly disposed (World Bank, 2025)	Ancillary sites must be screened, permitted, operated and **restored** under binding, verified requirements — closure is part of the works	Section 3.8 ancillary register with per-site EPA permits; Section 3.12 decommissioning and reinstatement; ESMP ancillary-site controls; BMP geofences (Appendix T); restoration verified before final certification
2	Workplace accidents, including fatalities, were reported; an OHS audit and corrective actions were required (World Bank, 2025)	Occupational health and safety must be resourced, audited and enforced from mobilisation, not retrofitted	Chapter 11 institutional arrangements; the Contractor's OHS plan, permit-to-work and incident-reporting obligations under the CESMP; Supervising Engineer verification
3	SEA/SH risk rated high; cases were reported and investigated; workers feared reporting; the SEA/SH hotline was not operational and service providers required capacity building (World Bank, 2025)	SEA/SH prevention and response channels must be operational, trusted and tested **before** the workforce deploys	Section 5.6 (adopted GRM with confidential SEA/SH channel); signed codes of conduct covering SEA/SH; trained female focal point; survivor-centred referral; Chapter 11 monitoring of channel functionality
4	Resettlement compensation timing created claim and escalation risk; better consultation quality and a functional grievance mechanism were pressed for (World Bank, 2021; 2025)	Compensation must be completed and verified before works, and the grievance mechanism must demonstrably function	RAP (2025) conditions precedent — compensation complete and cleared, three months' notice, front-by-front handover; adopted RETRAP GRM with logged performance (Section 5.6)
5	Dust from traffic and quarries, runoff from undersized culverts into residential areas, and cracking of houses from blasting and compaction	Community-facing nuisance and damage pathways must be engineered out and monitored, not merely mitigated on paper	82-culvert drainage design for 10/50/100-year floods (Section 3.5); dust suppression and receptor-first controls; pre-blast condition surveys

#	Documented SECRAMP experience	Lesson	Where embedded in this Project
	were raised as community impacts (World Bank, 2025)		and blasting notification; complaint-responsive monitoring (Chapter 11)
6	The biodiversity covenant (field survey and management plan) experienced significant delays, holding back compliance (World Bank, 2025)	Biodiversity instruments must precede the works they govern	The BFS and BMP are completed and incorporated **before** construction in sensitive segments; the BMP's six binding conditions are conditions precedent (Appendix T; Table 11.5)
7	Thin Employer-side E&S staffing constrained supervision; technical-assistance support and contractual ESHS enforcement tools (ESHS performance security) were needed (World Bank, 2021)	Supervision capacity and contractual enforcement teeth must be in place at contract award	Chapter 11 institutional arrangements (IIU E&S specialists with TA support; Supervising Engineer); ESHS obligations embedded in the works contract with the Contractor's CESMP and penalty regime

The Tappita–Toe Town section (40 km). A consolidated lessons-learned record for the 40 km RETRAP section has not yet been published; its works were preceded by their own ESIA and ESMP, and its supervision reports sit with the IIU. Pending that record, this ESIA treats the documented sector experience from Liberia's recent road programmes (Earthtime, 2024b) as applicable to the corridor: works commencing before environmental permits were in hand; environmental monitoring that was minimal, seldom quantitative and weak on corrective-action follow-through; and limited evidence of worker and community health and safety controls being applied. Each is answered by a binding feature of this Project: the permits-in-hand condition precedent (Table 11.5, item 3), the quantified 2026-baselined monitoring programme with named standards and stations (Section 11.4), and the CESMP OHS, permit-to-work and incident-reporting regime verified by the Supervising Engineer (Chapter 11). The IIU will request the supervision consultant to compile the 40 km section's lessons as an input to this Project's first annual E&S review, and any additional lessons will be carried into the CESMP through the change-management procedure.

These lessons are not presented for completeness alone: each response is a binding feature of this Project's design, contract or management plan. On lesson 7 in particular, the position at the date of this edition is already materially stronger than on SECRAMP: the Monitoring Consultant (the Engineer), LEA Associates South Asia Pvt. Ltd., commenced services on 3 August 2026 — before any works front opens — and is mobilised for design review, contract administration and supervision of the Contractor's ESHS obligations (LEA Associates South Asia, 2026; Section 3.16).

APPENDIX X — CONSOLIDATED RISK REGISTER (UNPLANNED EVENTS AND PROJECT RISKS)

X.1 Source and Method

This appendix consolidates the Project's risk register summarised at Section 9.8. The register was compiled in the 2026 update (RE-GROUP, 2026) on a five-by-five likelihood × severity matrix, with preventive and contingency controls assigned to each head and mitigation applied to as-low-as-reasonably-practicable (ALARP). It spans forty-one risk heads; after the specified controls, no risk head remains in the Extreme class, one — community traffic accidents — is retained at High under the documented ALARP basis of Section X.3, and all others are Medium or Low. The live register is a working instrument of the ESMP: the Contractor restates it in the C-ESMP, the Supervising Engineer verifies the controls, and the register is reviewed at each quarterly report and after any serious incident.

X.2 The Register, by Risk Group

Table X.1: Consolidated risk register — groups, principal controls and residual class

Group (heads)	Principal risks	Preventive controls	Contingency controls	Residual class
Worker health and safety (8)	Excavation and slope-work collapse; plant–people interfaces; falls; electrocution	OHS plan; permit-to-work for excavations, hot work and work at height; competent-person supervision; PPE; toolbox inductions	Site first aid and medevac arrangements rehearsed under the EPRP; incident investigation and corrective action	Medium–Low
Worker health (vector/zoonotic) (4)	Malaria; Lassa fever; snake-bite; waterborne disease	Camp hygiene and vector control; anti-venom and treatment protocols; awareness training; clean water supply	Case management and referral; outbreak notification under the EPRP	Medium–Low
Hazardous materials (5)	Fuel and bitumen spills; used-oil mismanagement; hazardous-waste handling	50 m watercourse standoff for fuelling; bunded storage (110%); drip trays; licensed waste contractors; spill kits at fronts	Spill response procedure; contaminated-soil excavation and treatment; EPA notification per permit	Medium–Low
Fire (3)	Camp, plant and vegetation fire	Fire orders; hot-work permits; extinguishers and water supply at camp and plants; vegetation management around sites	Fire response under the EPRP; community alert protocol	Medium–Low
Flood and severe weather (4)	Washout of temporary works; flooding of pits and diversions; wet-season slope failures	10/50/100-year drainage design with the climate allowance of Section X.5; wet-season sequencing; dewatering and diversion protocols	Emergency reinstatement; traffic diversion management; downstream community notification	Medium
Structural and ground (4)	Borrow-pit and quarry face collapse; retaining-structure	Benching and face-angle limits; geotechnical supervision; exclusion zones; the Section 3.14 design-	Rescue arrangements under the EPRP; stop-work and redesign procedure	Medium–Low

Group (heads)	Principal risks	Preventive controls	Contingency controls	Residual class
	failure during construction; culvert works collapse	review gates for walls and cuts		
Community incidents (6)	Community traffic accidents (highest residual); children at works and haul routes; unauthorised site access; severed access during works	Traffic Management Plan from the first haul movement; school-zone measures and crossing control; 20 km/h node limits; fencing and watchmen at pits and plants; access reinstatement planning	Emergency response and medical referral; incident register; GRM-linked remedy; insurance	**High (ALARP — Section X.3)**; others Medium
Social and security (4)	Labour influx tensions; SEA/SH incidents; theft and security incidents; grievance escalation	Local-hire preference; codes of conduct covering SEA/SH; camp rules; security management aligned to proportionate-force principles; functioning GRM	Survivor-centred SEA/SH referral pathway; security incident protocol; escalation to county security council	Medium–Low
Disease outbreak and public health (2)	Camp-origin or community outbreak	Workforce health screening; camp sanitation; community health liaison	EPRP outbreak scenario; county health team notification	Medium–Low
Chance finds and heritage (1)	Damage to unknown graves or cultural material	Chance-Find Procedure in every works package; cultural-heritage register and buffers	Stop-work, custodial consultation, EPA/competent-authority notification	Low
Blasting at Suaken — conditional (and see Section X.6) (2)	Flyrock, vibration and air-overpressure affecting dwellings; blast-related house cracking claims	Adoption only under an approved blasting plan and MME explosives permit; pre-blast condition surveys; notification and exclusion radii; vibration limits and monitoring	Claims procedure anchored to condition surveys; cessation on exceedance; redesign to mechanical ripping	Medium (conditional)

X.3 ALARP Basis — Community Traffic Accidents

Community traffic accidents are retained at High because the hazard's exposure cannot be eliminated: the corridor passes through 21 settlements, markets and school frontages, and both construction traffic and faster post-rehabilitation traffic interact with pedestrians who today use the carriageway. The mitigation hierarchy has been applied in full — engineering (design geometry, school-zone treatments, raised crossings and signage at the nodes), speed management (20 km/h node limits during works; enforcement arrangements of Appendix T Section 9 for operation), administrative controls (the Traffic Management Plan from the first haul movement, driver vetting, training and disciplinary procedure, haul scheduling away from school peaks), and monitoring (the incident register, complaint-responsive checks and the pre-opening road-safety audit). Further risk reduction beyond these measures — such as grade-separated crossings or full corridor fencing — would be grossly disproportionate to the residual risk reduction achievable on a rehabilitation of this nature, and would itself sever community access. The risk is therefore managed to ALARP, with the pre-opening road-safety audit and the first-year operation review as the committed check-points.

X.4 Environmental Risk Controls

The environmental heads of the register (spills, fire, flood, ground failure) carry the controls of Table X.1 and are each anchored to a named instrument: the CESMP's hazardous-materials, emergency-preparedness and traffic plans; the EPA permit conditions for each ancillary site; and the monitoring programme of Section 11.4 (complaint-responsive dust, noise and water checks; post-storm drainage inspections). None remains above Medium after controls.

X.5 The Climate Allowance in the Drainage Design

The hydraulic design adopts the 10-year return period for longitudinal drainage, 50-year for cross-drainage culverts and 100-year for bridge waterways, applied with the design manual's freeboard requirement, as the Project's climate-adaptation allowance for the corridor's creek, river and swamp crossings (Section 3.5). Culvert sizing therefore carries headroom above the historical flood record, which is the principal pathway by which climate-intensified rainfall would otherwise propagate into washouts, community flooding and borrow-pit inundation. Post-storm inspection and clearing of structures is a standing maintenance obligation through construction and the defects period.

X.6 Sensitivity: If Blasting at Suaken Is Not Adopted

Blasting at the Suaken quarry is conditional, not assumed. If it is not adopted, the two blasting heads fall away from the register; rock winning proceeds by mechanical ripping and hydraulic breaking, whose noise and vibration are assessed within the ordinary plant-noise envelope of Chapter 10, and the pre-blast condition-survey and notification controls are not required. No other head changes class, and no conclusion of this ESIA depends on the blasting decision. If blasting is adopted, the controls of Table X.1 apply in full and the blasting plan, MME explosives permit and pre-blast surveys are conditions before the first blast.

X.7 Incident Reporting Times

Reporting times are aligned across this ESIA, the ESMP and the BMP: any serious incident (a fatality, lost-time injury of severity, serious community injury, major spill or serious biodiversity incident) is notified by the Contractor to the Supervising Engineer and the IIU **within 24 hours**, and by the IIU to the World Bank — and to the EPA where the ESCP or a permit so requires — **within 48 hours**, followed by an investigated incident report with corrective actions. The same times govern Appendix T (BMP Section 10.3) and the EPRP (Section 11.8).