



FRIEDA RIVER

Frieda River Limited
Sepik Development Project
Environmental Impact Statement
Chapter 1 – Introduction

SDP-6-G-00-01-T-084-003



1. INTRODUCTION

1.1 Project Overview

Frieda River Limited (FRL) is assessing the feasibility of the Sepik Development Project (the Project) in northwest Papua New Guinea (PNG). The Project is underpinned by two commercial projects: the Frieda River Copper-Gold Project (FRCGP) and the Frieda River Hydroelectric Project (FRHEP). These are supported by the Sepik Power Grid Project (SPGP) and the Sepik Infrastructure Project (SIP). The Project is potentially nation building and is expected to provide regional benefits to PNG by supporting its Development Strategic Plan 2010-2030.

The four key elements of the Sepik Development Project are located in the Sandaun and East Sepik provinces and comprise:

- Frieda River Copper-Gold Project.
- Frieda River Hydroelectric Project.
- Sepik Infrastructure Project.
- Sepik Power Grid Project.

FRL will operate the FRCGP on behalf of the Frieda River Joint Venture. It is anticipated that third-party entities may own and operate the remaining project elements at some stage during the life of the Project.

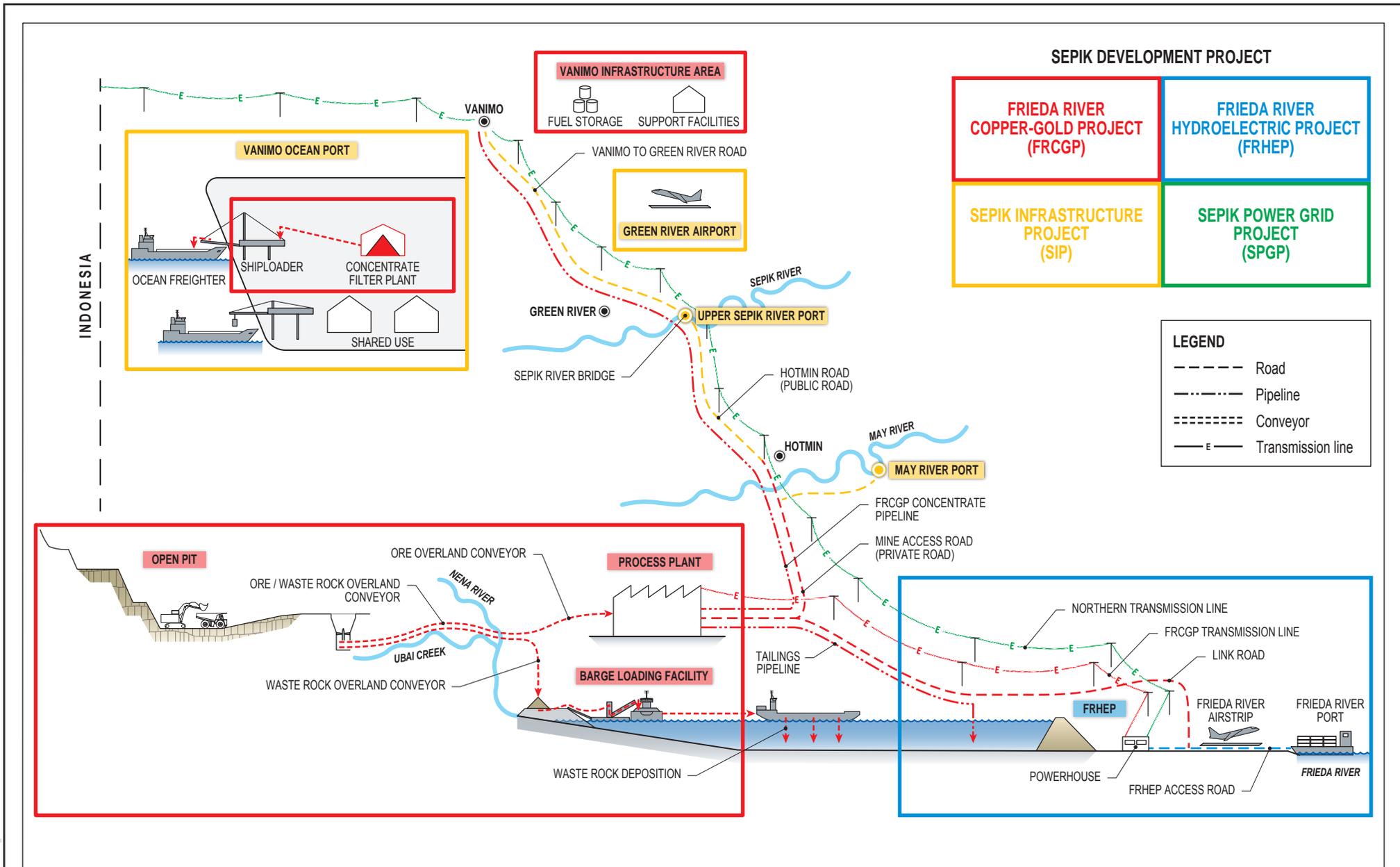
Coffey has prepared this Environmental Impact Statement (EIS) on behalf of FRL as the statutory basis for the environmental assessment of the Project. The EIS is aimed at supporting a decision for the granting of environment permits for the FRCGP, FRHEP, SIP and SPGP. Figure 1.1 shows the components of the Sepik Development Project that are being assessed in this EIS.

1.1.1 The Frieda River Copper-Gold Project

The FRCGP mine area is located in the northern foothills of the Central Range of the New Guinea Highlands in Sandaun Province. It lies in a remote area approximately 200 kilometres (km) from the northern coast and 50 km from the Sepik River. The mine area is characterised by steep terrain, very high rainfall, low population density and a near-absence of infrastructure such as road, power and communication networks (Figure 1.2).

The greenfield FRCGP is based on the Horse-Ivaal-Trukai, Ekwai and Koki (HITEK) porphyry copper-gold deposits which contain an estimated total combined Measured, Indicated and Inferred Mineral Resource (JORC classifications) of more than 2.6 billion tonnes at an average grade of 0.44% copper and 0.23 grams per tonne gold. This represents one of the largest known undeveloped copper resources in the world. Copper mineralisation was first identified at Frieda River in 1966/67 and the long history of exploration and study activities undertaken by several companies has generated a considerable body of information.

The FRCGP comprises a large-scale open-pit mine operation feeding ore to a comminution and flotation process plant producing a copper-gold concentrate for export to custom smelters. Mining inventory comprises 1,500 Mt of mill feed. The average annual copper-gold concentrate production will be 740,000 wet tonnes and the average annual metal in concentrate production will be 175,000 tonnes (t) copper and 230,000 ounces (oz) gold. The copper-gold concentrate will be transported from the process plant to a concentrate storage and export facility located at the



SEPIK DEVELOPMENT PROJECT

FRIEDA RIVER COPPER-GOLD PROJECT (FRCGP)	FRIEDA RIVER HYDROELECTRIC PROJECT (FRHEP)
SEPIK INFRASTRUCTURE PROJECT (SIP)	SEPIK POWER GRID PROJECT (SPGP)

LEGEND	
- - - - -	Road
- · - · - ·	Pipeline
- - - - -	Conveyor
— E —	Transmission line

Source: Adapted from Frieda River Project Battery Limit Diagram, FRP-2-A-00-01-T-028-001.dwg, FRL



Date: 16.10.2018
 Project: 754-ENAUABTF11575B
 File Name: 11575_11_F01.01_GRA

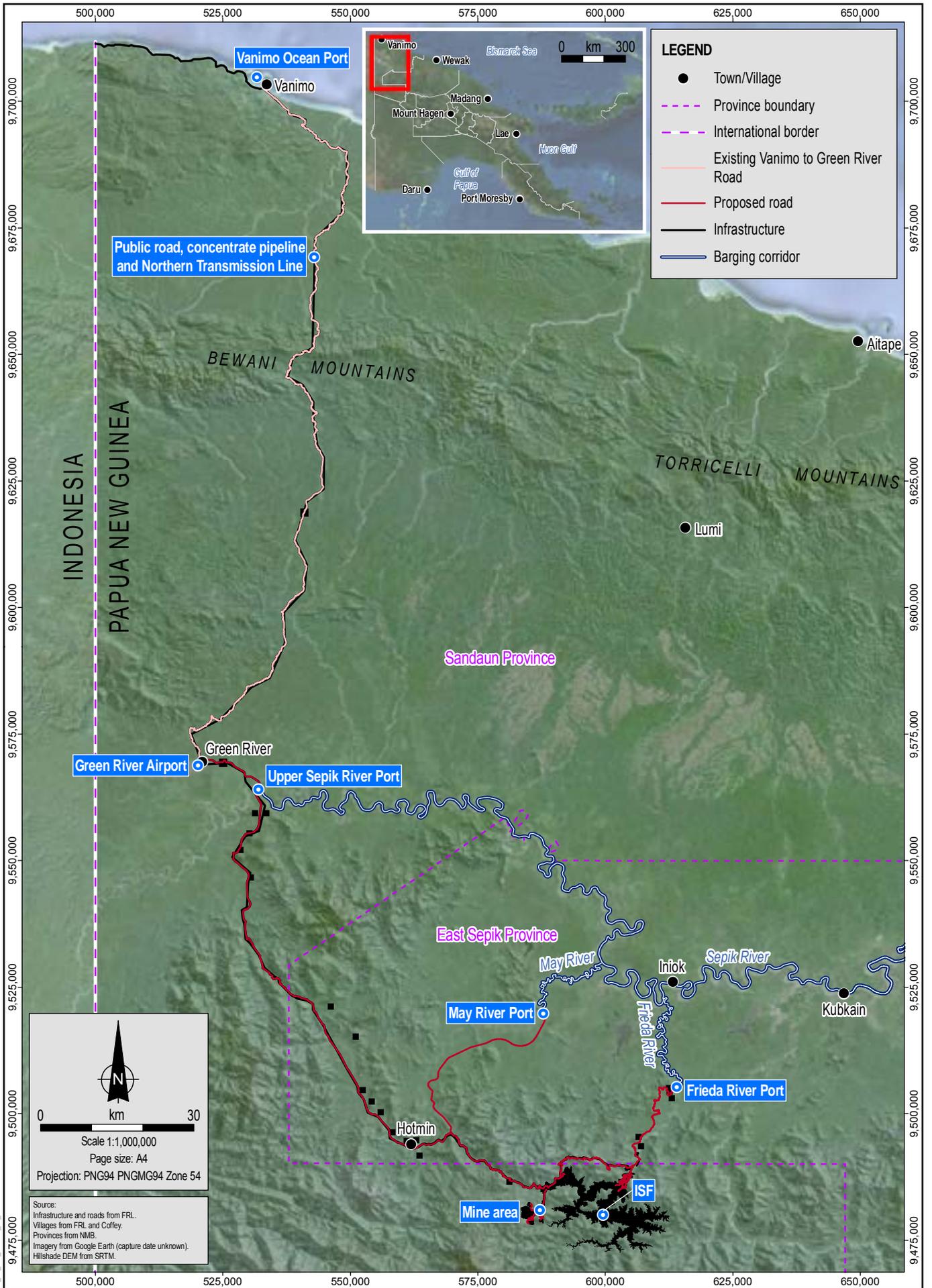
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 Sepik Development Project



Components of the
 Sepik Development Project
 assessed in EIS

Figure No:
 1.1

AI Reference: 11575_11_GRA004.a7



IMD Reference: 11575B_11_BM_GIS001_v0_13



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Frieda River Limited
Sepik Development Project



Project overview

Figure No: 1.2

Vanimo Ocean Port via a 325 km-long concentrate pipeline located within the infrastructure corridor.

The majority of the workforce will access the site from the Green River Airport which will be linked to the mine by a new public road to Hotmin and the mine access road from Hotmin to the site.

The FRCGP will have a mine life of approximately 33 years preceded by a seven-year implementation period. The large HITEK Mineral Resource together with additional known deposits, such as the Nena deposit, and exploration targets provide the potential for mine life extension. Figure 1.3 shows the general FRCGP layout around the proposed open-pit and supporting infrastructure.

1.1.2 The Frieda River Hydroelectric Project

The FRHEP reservoir will be located within the Frieda, Nena and Niar river valleys downstream of the mine site (Figure 1.3). A 600 MW hydroelectric facility will use water from the FRHEP reservoir to generate low-cost power to the FRCGP and supply excess power to other consumers via the SPGP's Northern Transmission Line. The hydroelectric power generation facility will have an annual maximum energy generation of 2,800 gigawatt hours per year (GWh/year) (up to 490 MW). The mine's power demand will reach up to 280 MW by Year 8 which provides an opportunity for the export of excess power to other customers.

The embankment will be approximately 190 m in height (RL 238 m crest elevation), creating a total storage capacity of 9.6 billion cubic metres (Bm³) with an operating water level of RL 226 m.

The FRHEP will provide an integrated storage facility (ISF) for the subaqueous storage for both process tailings and mine waste rock. This best practice waste management strategy will limit downstream sedimentation and the potential for the deposited, submerged material to generate acid and metalliferous drainage. Approximately 1,450 Mt of waste rock will be extracted and 1,500 Mt of tailings will be produced over the life of the mine.

The Frieda River Port will provide riverine access to site, predominantly prior to construction of the mine access road. Until the road is constructed, the Frieda River Port will be used to import construction materials for the FRHEP and the FRCGP via a barging corridor along the Sepik and Frieda rivers (Figure 1.4).

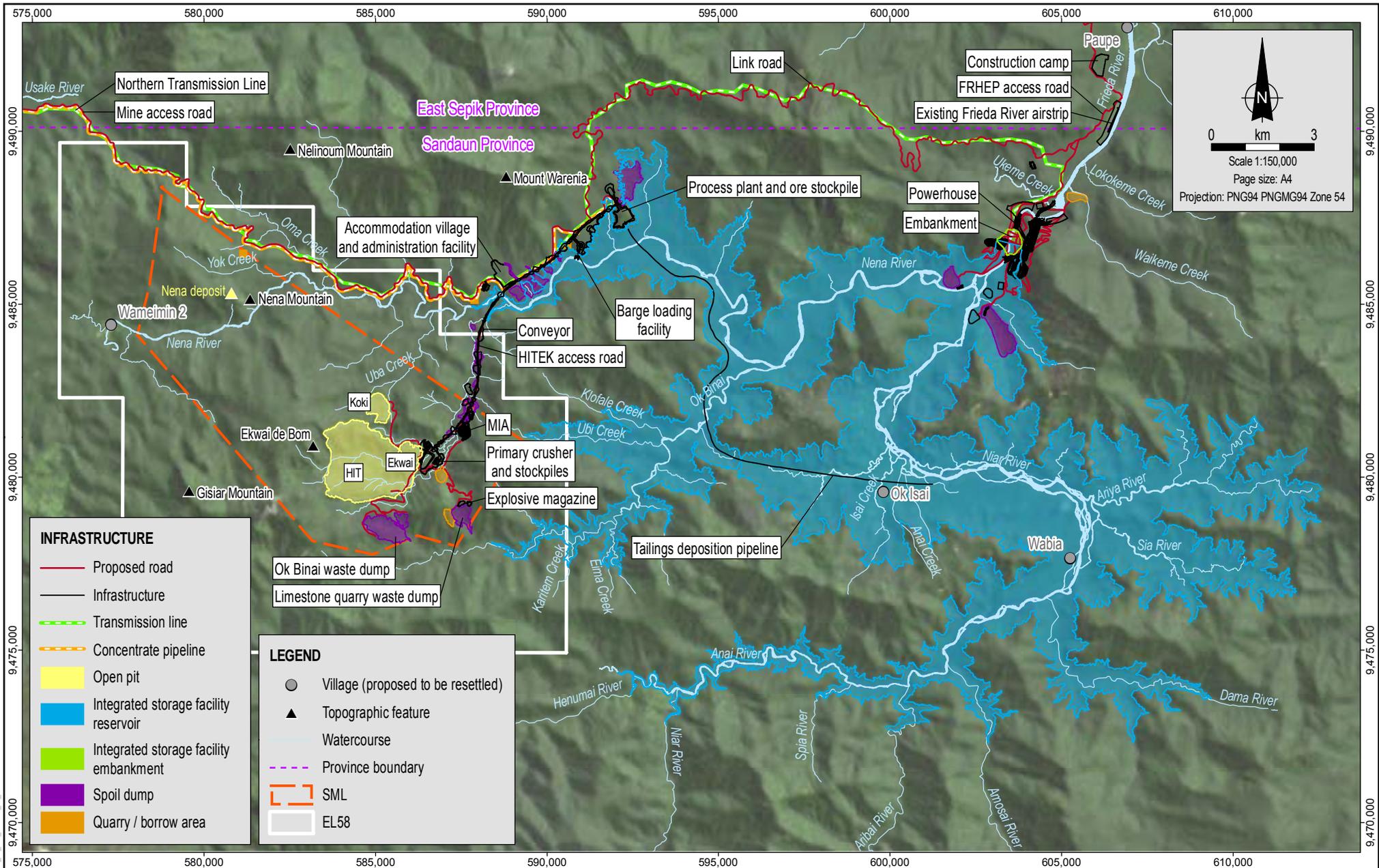
1.1.3 The Sepik Infrastructure Project

The mine site will be accessed by an existing upgraded road from Vanimo to Green River and a new road through to Hotmin. The road from Vanimo to Hotmin will be a public road and forms part of the SIP. There is an opportunity to construct a connecting road between Hotmin and Telefomin, however this is not required for development of the FRCGP and therefore is not included in this EIS.

The SIP also includes an upgraded Green River Airport and Vanimo Ocean Port.

1.1.4 The Sepik Power Grid Project

The SPGP comprises a 370-km-long 275 kV Northern Transmission Line from the FRHEP to the Indonesian border via Vanimo. The transmission line will provide power to FRCGP facilities in Green River and Vanimo. The FRHEP will have up to 270 MW of excess power available and the Northern Transmission Line provides an opportunity to distribute this excess power to potential customers in PNG and neighbouring Indonesia. This may include villages situated near the mine area and along the infrastructure corridor, as well as industries such as agriculture, fisheries, food and timber processing, mining and manufacturing, should they be developed by other parties.



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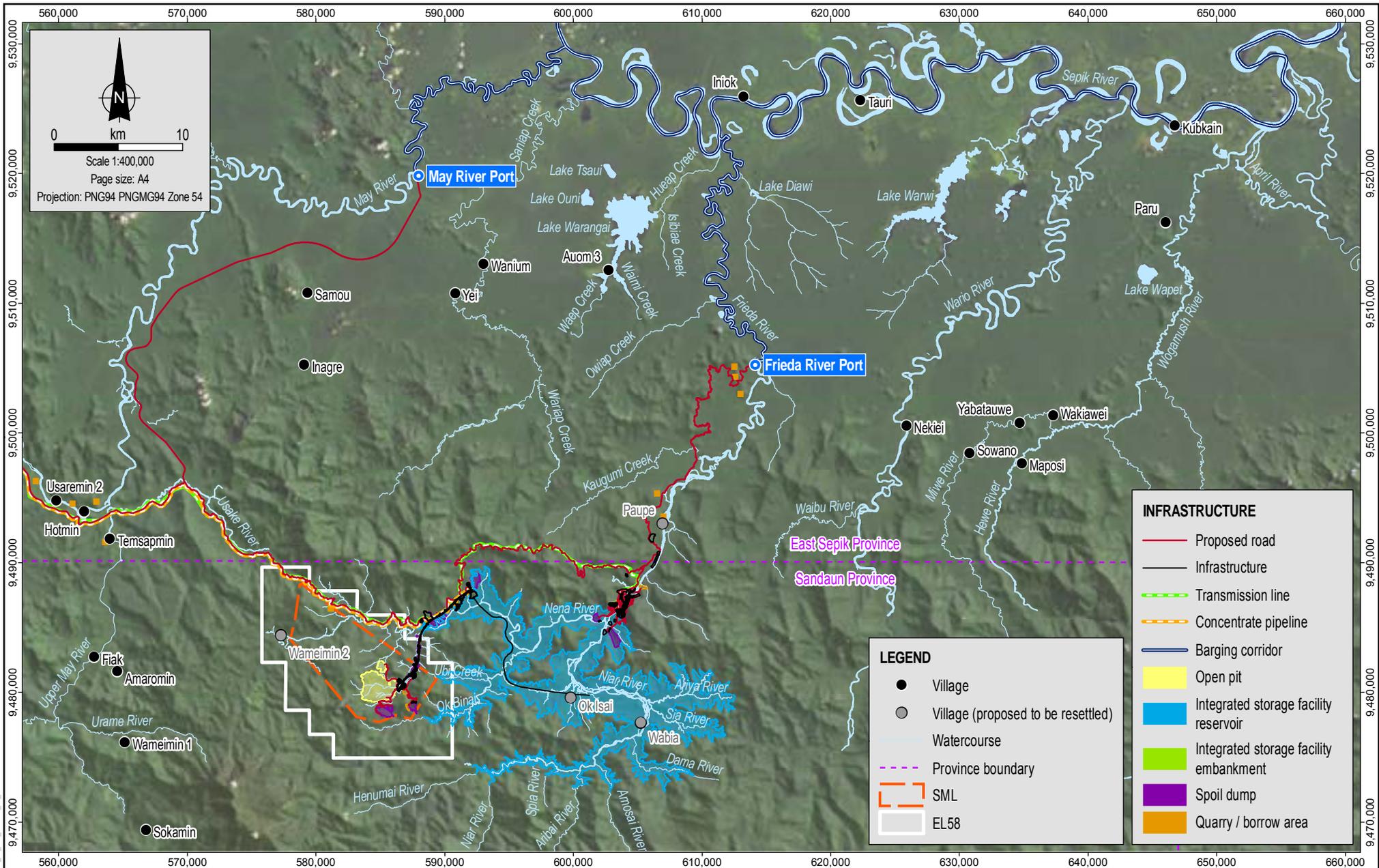
Source:
 Infrastructure, roads and tenements from FRL.
 Villages, topographic features, watercourses and water bodies from FRL and Coffey.
 Provinces from NMB.
 Landsat satellite imagery from FRL (capture date unknown).
 Hillshade DEM from SRTM.

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	Project: 754-ENAUABTF11575A
	File Name: 11575_11_F01.03_GIS

Frieda River Limited Sepik Development Project

Mine and ISF area

Figure No:
1.3



Scale 1:400,000

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 Projection: PNG94 PNGMG94 Zone 54

INFRASTRUCTURE

- Proposed road
- Infrastructure
- Transmission line
- Concentrate pipeline
- Barging corridor
- Open pit
- Integrated storage facility reservoir
- Integrated storage facility embankment
- Spoil dump
- Quarry / borrow area

LEGEND

- Village
- Village (proposed to be resettled)
- Watercourse
- Province boundary
- SML
- EL58

MXD Reference: 11575B_11_BM_GIS003_v0_10

Source:
 Infrastructure, roads and tenements from FRL.
 Villages, topographic features, watercourses and water bodies from FRL and Coffey.
 Provinces from NMB.
 Landsat satellite imagery from FRL (capture date unknown).
 Hillshade DEM from SRTM.

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Frieda River Limited
 Sepik Development Project

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Mine and FRHEP area,
 and downstream corridor

Figure No:
1.4

Figures 1.5 and 1.6 show the Sepik Development Project separated into each project component, as an overall Project overview and for the mine and ISF area respectively.

1.2 Project History

Copper mineralisation was first discovered in the Frieda River area in 1966/67 with potential commercial mineralisation identified in the early 1970s. Since that time, the area has had a long history of exploration and study activities undertaken by several companies.

Baseline environmental and social investigations for the Frieda River Project began in 1979 via a joint taskforce consisting of Frieda Copper Pty Ltd and the PNG Government. The scope of work included investigating the Horse-Ivaal porphyry copper-gold deposit as well as the nearby Nena epithermal copper-gold deposit. Various activities and investigations continued intermittently through the 1980s and into the 1990s. By mid-1993, the Nena deposit had become the focus of development activities and was subjected to renewed environmental investigations by Highlands Gold Properties Proprietary Limited. Highlands Gold Properties Proprietary Limited was acquired by Placer Dome Holdings Pty Ltd in 1997 and its interest in the Frieda River Project transferred to Highlands Pacific Limited. The evaluation studies completed up to 1997 did not define an economically viable project.

Following a period of relative inactivity in the late-1990s and early-2000s, the Frieda River Project was acquired in October 2006 by Xstrata Frieda River Limited which initiated a scoping study defining an execution model that could be taken into a pre-feasibility study. As part of that process a number of environmental and social programs were re-established. These programs were supplemented by the extensive investigations undertaken in support of an EIS that was completed in December 2011. The EIS was not submitted to the regulatory authorities as the owners decided not to proceed with the Frieda River Project at that time.

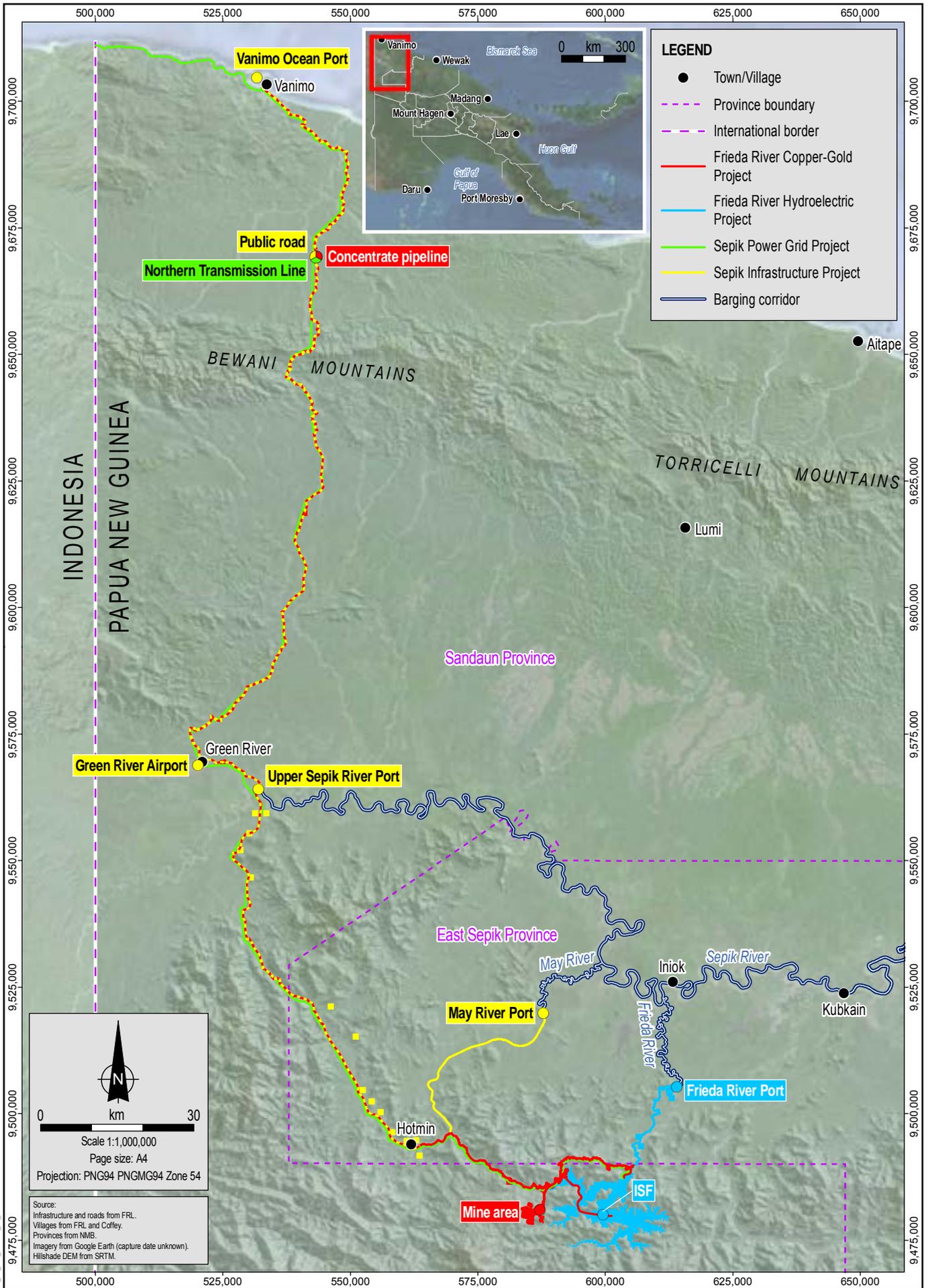
In 2013, the owner of Xstrata Frieda River Limited, Xstrata PLC, merged with Glencore International PLC to form Glencore Xstrata plc (subsequently renamed Glencore plc). On 1 November 2013, PanAust Limited (PanAust) announced it had entered into a share sale and purchase agreement with a subsidiary of Glencore Xstrata plc to acquire Glencore's interest in the Frieda River Project. On 25 August 2014, PanAust confirmed the purchase from Glencore had been completed. Xstrata Frieda River Limited was renamed Frieda River Limited and the Frieda River Project renamed as the FRCGP.

FRL completed a feasibility study on 19 May 2016 that re-assessed the FRCGP scale, scope and implementation. This included assessing mine waste storage options, refining the Mineral Resource estimate and reducing the implementation risk by having a staged mine waste management plan. This study built on the body of knowledge since 2007 and improved the work of previous studies including comprehensive environmental, socioeconomic and cultural heritage baseline data.

In 2016, Coffey prepared an EIS for the FRCGP which was submitted to the Conservation and Environment Protection Authority (CEPA) in December 2016.

In May 2017, FRL released an addendum to the 2016 feasibility study for the FRCGP. This included:

- Conversion of approximately 120 Mt of Ekwai and Koki Mineral Resource from Inferred to Indicated category.



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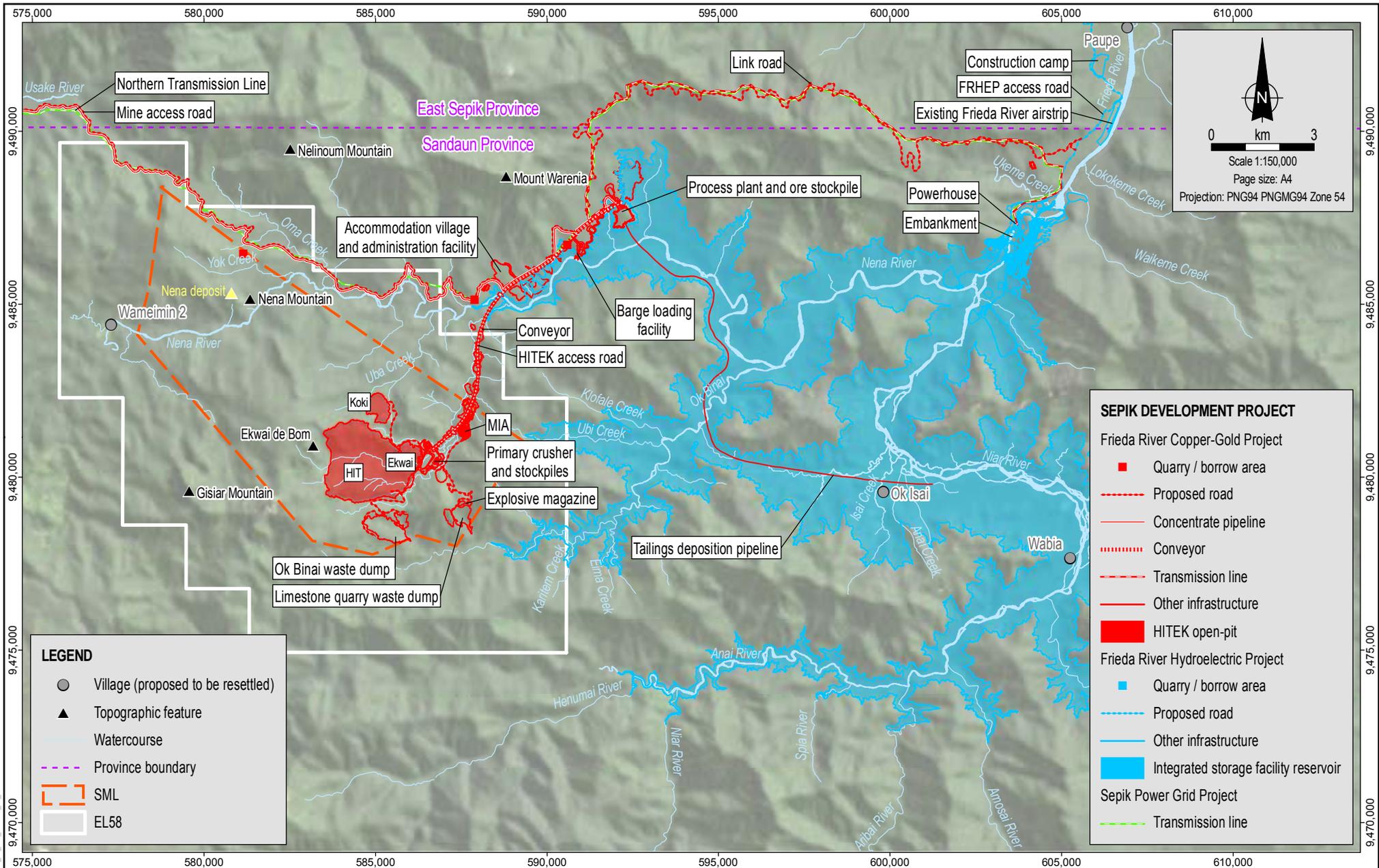
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Frieda River Limited
 Sepik Development Project



Project components -
 project overview

Figure No:
1.5



MXD Reference: 115755_11_BM_GIS002_v0_11

Source:
 Infrastructure, roads and tenements from FRL.
 Villages, topographic features, watercourses and water bodies from FRL and Coffey.
 Provinces from NMB.
 Landsat satellite imagery from FRL (capture date unknown).
 Hillshade DEM from SRTM.

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	Project: 754-ENAUABTF11575A
	File Name: 11575_11_F01.06_GIS

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Sepik Development Project

Project components - mine and ISF area

Figure No:
1.6

- The total HITEK Measured and Indicated Mineral Resource increased from 1,846 Mt at 0.44% copper to 1,860 Mt at 0.47% copper equating to an 8% increase in copper metal.
- The FRCGP Ore Reserve increased by 13% to 686 Mt at 0.5% copper and 0.28 g/t gold as a result of the conversion of Inferred to Indicated Mineral Resource at the Ekwai and Koki deposits and improvements to the open-pit design incorporating interim stage designs and water management structures.

The long history of study activities has generated a considerable body of information and a large number of reports that address both the environmental and social aspects of the Project area. Many of the studies undertaken by the previous owner remain relevant to the proposed Project and have informed this EIS. Other studies have been updated where warranted to include new information and updated baseline data.

Key changes have been made to the proposed Project since submission of the EIS in December 2016: the inclusion of a larger hydroelectric power facility in an alternative location (FRHEP), inclusion of an infrastructure corridor to Vanimo that includes a public road, together with an upgrade of the Port of Vanimo (SIP) and an extension of the mine life from 17 years to approximately 33 years. The scale and nature of these changes mean that a new EIS is required.

1.3 Project Proponent

The Project proponent is the Frieda River Joint Venture, an unincorporated joint venture between FRL and Highlands Frieda Limited.

FRL (a Papua New Guinea incorporated company owned by copper and gold producer PanAust) will operate the FRCGP on behalf of the Frieda River Joint Venture. It is anticipated that third-party entities may own and operate the remaining project elements at some stage during the life of the Project.

PanAust is an Australian incorporated company that is owned by Guangdong Rising H.K. (Holding) Limited, a wholly owned subsidiary of Guangdong Rising Assets Management Co. Ltd (GRAM). GRAM is a Chinese state-owned company regulated under the State-owned Assets Supervision and Administration Commission, the People's Government of the Guangdong Province in China.

PanAust is a copper and gold producer in Laos and has pre-development opportunities in Laos, PNG, Myanmar and Chile. The Company's producing assets are the Phu Kham Copper-Gold Operation and the Ban Houayxai Gold-Silver Operation; both are located in the Company's 2,600 square kilometre (km²) Phu Bia Contract Area in Laos.

PanAust is an internationally recognised and awarded leader in environmental management and sustainability.

Highlands Pacific Limited is a PNG incorporated company, listed on the Australian Securities Exchange (ASX) and the Port Moresby Stock Exchange (POMSoX). Highlands has been operating in PNG for more than 20 years as a minerals explorer, developer and producer.

1.4 Statutory Context

The *Environment Act 2000* is the primary legislation for regulating the environmental and socio-economic impacts of new mineral development projects in PNG. The Project involves Level 2 and Level 3 activities under the Environment (Prescribed Activities) Regulation 2002, sub-categories

5.2, 7.2 7.4, 7.5, 10.1, 11.2, 11.2, 11.4, 12.4, 12.5, 12.6, 13.1, 14.2, 17.1, 19.1 and 19.2, for which an EIS is required to be submitted to the CEPA.

This report constitutes the EIS for the Project, prepared in accordance with Section 53 of the *Environment Act 2000*. The EIS process is described in Chapter 3. The EIS is supported by a number of studies (Section 1.5, Table 1.1) and EIS documentation will be made available on the website of FRL's owner, PanAust.

The EIS is intended to enable the environmental and social implications of the proposed Project to be assessed by:

- The Project proponent in its assessment of the feasibility of the Project and in making a decision to proceed.
- The public in formulating their responses to the EIS.
- The relevant PNG government agencies in evaluating the Project's public interest credentials and in formulating conditions under which it might proceed.

It is anticipated that details of the proposed development will be progressively refined as engineering work proceeds through the detailed design phase. Variations that are considered substantive and which have the potential to require amendments to the EIS will be reported to the relevant government agencies.

A Special Mining Lease (SML) application for the Project was registered by the Mineral Resources Authority (MRA) on 24 June 2016. Subject to approval by the joint venture participants, a proposal for development will be submitted to MRA to support an amendment to the SML9 application.

1.5 This Report

1.5.1 Report Structure

The EIS is presented in three volumes:

- **Volume A – Executive Summary.** A stand-alone report, prepared in English and Tok Pisin, that provides a summary of the proposal, community consultation undertaken during the preparation of the EIS, impact assessment and management and mitigation measures.
- **Volume B – Main Report (this report).** A stand-alone document that can generally be understood without reference to the supporting technical studies upon which it is based.
- **Volume C – Appendices.** A series of technical reports generated by the various investigations supporting the EIS and appended to the main report.

Volume B, the main report, comprises 16 chapters and attachments, as well as a table of contents that outlines figures, tables and plates in the relevant chapters. The references include bibliographic details for each source cited in the main report. The format of the main report is:

- Chapter 1, Introduction – provides the background, scope and structure of the EIS, and the organisations and individuals who contributed to its preparation.
- Chapter 2, Viability and Purpose of the Development – details the viability and purpose of the Project, including the proponent's credentials and objectives, feasibility study investigations and compatibility with PNG Government objectives.

- Chapter 3, Policy, Legal and Administrative Framework – provides an overview of PNG legislative requirements, legal administration, international agreements and other guidelines applicable to the Project.
- Chapter 4, Stakeholder Engagement – describes the consultation program that has been undertaken and is ongoing for the Project.
- Chapter 5, Description of the Proposed Development – describes the proposed Project, including the timetable for implementation.
- Chapter 6, Assessment of Alternative Development Options – discusses the assessment of Project alternatives.
- Chapter 7, Description of Existing Environment – describes the existing environment within and around the Project area.
- Chapter 8, Physical and Biological Impact Assessment – documents the approach to the Project's physical and biological impact assessment including potential impacts, the approach and nature of various investigations, management measures and assessment of residual impacts.
- Chapter 9, Socio-Economic Impact Assessment – documents the approach to the Project's social impact assessment, potential social impacts, the approach and nature of various investigations, management measures and assessment of residual impacts.
- Chapter 10, Cumulative Impact Assessment – documents the assessment of the potential cumulative impacts that may result from interaction of elements of the Project with other credible future projects.
- Chapter 11, Extreme Natural Hazards and Incidental Events – outlines potential extreme natural hazards, incidental events and corresponding safeguards.
- Chapter 12, Environmental and Social Management, Monitoring, Auditing and Reporting Framework – provides a summary of FRL's proposed environmental and social management measures and an outline of the proposed monitoring, auditing and reporting activities.
- Chapter 13, Conclusion – presents a conclusion to the EIS report.
- Chapter 14, References – lists bibliographic details for each reference used in the main report.
- Chapter 15, Study Team – lists the study team involved in the production of the EIS.
- Chapter 16, Acknowledgements – acknowledgements.
- Chapter 17, Glossary – glossary and abbreviations.
- Attachments:
 - Environmental Management Commitments.
 - Environmental Management and Monitoring Plans.
 - Water Quality Criteria, Guidelines and Standards.
 - EIS Guidelines and EIR Cross Reference Table.

The supporting studies that are appendices to the main EIS report are listed in Table 1.1.

Table 1.1 Sepik Development Project EIS – supporting studies

Appendix	Appendix	Lead Author
1	Assessment of the Geochemical Characteristics of Waste Rock and Process Tailings	Environmental Geochemistry International Pty Ltd
2a	Frieda River Hydroelectric Project Selection Phase Study	SRK Consulting (Australasia) Pty Ltd
2b	Frieda River Hydroelectric Project Limnology Study, Phase 2	HydroNumerics Pty Ltd
3a	Frieda River Copper-Gold Project Conceptual Mine Closure Plan	Coffey
3b	Frieda River Hydroelectric Project Conceptual Closure Plan	Coffey
4	Sepik Development Project Regional Groundwater Assessment	Australasian Groundwater and Environmental Consultants Pty Ltd
5	Sediment Transport Assessment	Golder Associates Pty Ltd
6a	Site-wide Water Balance	SRK Consulting (Australasia) Pty Ltd
6b	Site-wide Load Balance	SRK Consulting (Australasia) Pty Ltd
7a	Water Quality, Sediment Quality and Aquatic Ecology Baseline	BMT WBM Pty Ltd
7b	Integrated Storage Facility Bioaccumulation/Biomagnification Analyses - Sepik Development Project	Tetra Tech
8a	Terrestrial Biodiversity Field Assessment for the Frieda River Copper-Gold Project and the Frieda River Hydroelectric Project	Crome, F.; Takeuchi, W.; Aplin, K.; Armstrong, K.; Woxvold, I.; Richards, S.; and Müller, C.
8b	Terrestrial Biodiversity Field Assessment in the May River and Upper Sepik River Catchments	Takeuchi, W.; Armstrong, K.; Woxvold, I.; Richards, S.; Kale, E. and Helgren, K.
8c	Terrestrial Biodiversity Impact Assessment	Francis Crome Pty Ltd
9	Desktop Assessment of Commercial Forestry and Agroforestry within the Sepik Development Project Infrastructure Corridor	University of Nottingham
10	Noise Impact Assessment	SLR Consulting Australia Pty Ltd
11	Air Quality and Greenhouse Gas Assessment	SLR Consulting Australia Pty Ltd
12a	Vanimo Ocean Port Marine Ecology Baseline Study	BMT WBM Pty Ltd
12b	Diffuser Modelling near Vanimo Harbour for the Sepik Development Project	Tetra Tech
13	Social Impact Assessment	Coffey
13.1	Study Area Social Profiles	Coffey
13.2	Archaeology and Cultural Heritage Impact Assessment	Andrew Long + Associates Pty Ltd and Social Research Institute PNG
13.3	Community Health and Nutrition Baseline Report	Centre for Environmental Health Pty Ltd
13.4	Health Impact Assessment	Dempsey Toxicology and Risk Assessment

1.5.2 Confidential Information

The majority of information sources used in the preparation of this EIS, including specialist studies, investigations, test work and reviews prepared by FRL and its consultants, have been referenced or included in this report and are publicly available.

Reference has also been made in the preparation of this EIS to confidential internal documents including, but not limited to, detailed mine plans, production cost estimates, Mineral Resource and Ore Reserve calculations and the Project's feasibility study. These were prepared for internal use by FRL and are considered to be commercially confidential. Similarly, some information concerning local villagers and some correspondence with landowners is confidential. Consistent with standard practice in EIS processes in PNG and elsewhere, this document does not disclose information that is confidential but FRL may provide the information in confidence to CEPA upon request.

1.6 Spatial Boundaries

This EIS discusses the issues and impacts associated with the Project in a range of spatial contexts.

- Mine area – includes the open-pit, process plant, mine access roads, process plant substation and other ancillary infrastructure.
- FRHEP area – includes the ISF area (ISF, powerhouse and the powerhouse substation), FRHEP access road and Frieda River Port.
- Infrastructure corridor – includes the concentrate pipeline, Vanimo to Hotmin public road, mine access road, Northern Transmission Line, Green River Airport, Upper Sepik River Port and May River Port.
- Vanimo Ocean Port – includes the Vanimo Ocean Port and Vanimo Infrastructure Area.

Where appropriate, the discussion also addresses the provincial and national context of the Project.

1.7 Report Conventions

Implementation of the Project is conditional on a number of factors, including the receipt of necessary community and government approvals that meet joint venture objectives for development, and the finalisation of funding arrangements. For reason of style the Project and related proposed activities described in this report are expressed in the active 'will' rather than conditional 'would'.