ENVIRONMENTAL IMPACT STATEMENT (EIS)
DRILLING ACTIVITY
PSC TL-OT-17-09

TR-HSE-EIA-002

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TABLE OF CONTENTS

TABLES

FIGURES

ABBREVIATIONS

AAQ	Ambient Air Quality
AASHTO	American Association of State Highway and Transportation Officials
ANPM	Autoridade Nacional do Petróleo e Minerais
API	American Petroleum Institute
AQG	Air Quality Guidelines
ASTM	American Society for Testing and Materials
AWS	Automated Weather Station
BAS	Business Activity Survey
BHA	Bottom Hole |Assembly
BOE/d	Barrels of Oil Equivalent per day
BOP	Blowout Preventer
CBL	Cement Bond Log
CFC	ChlorofluoroCarbon
CMC	Carboxy-methylcellulose
CO	Carbon Monoxide
CR	Critically Endangered
CSR	Corporate Social Responsibility
dBA	A-weighted decibels
DEM	Digital Elevation Model
DHS	Demographic and Health Survey
DNAS	Direcção Nacional das Aguas e Saneamento
DNMG	Direcção Nacional de Meteorologia e Geofisica
DST	Drill Stem Test
DTM	Digital Terrain Model
EBC	Escola Basico Central
EBF	Escola Basico Filial
EBS	Environmental Baseline Survey
ECD	Equivalent Circulating Density
ED	Eastern Drilling
EDTL	Eletricidade de Timor-Leste
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EMW	Equivalent Mud Weight
EN	Endangered
ENSO	El Nino Southern Oscillation
ERP	Emergency Response Plan
GDP	Gross Domestic Product
GDS	General Directorate of Statistics Timor-Leste

GERTil	Grupo de Estudos de Reconstrução de Timor-Leste
GHG	Greenhouse Gases
HC	Hydrocarbon
HDPE	High-Density Polyethylene
HIV/AIDS	Human Immunodeficiency Virus Infection and Acquired Immune Deficiency Syndrome
HSE-MS	Health Safety Environment Management System
IFC	International Finance Corporation
ILO	International Labour Organization
IMCI	Integrated Management Child Illnesses
IOD	Indian Ocean Dipole
IOGP	International Association of Oil & Gas Producers
IPCC	International Panel for Climate Change
IPIECA	International Petroleum Industry Environmental conservation Association
ISO	International Standard for Organization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KCl	Potassium Chloride
KPI	Key Performance Indicator
LCM	Lost Circulation Material
Leq	Equivalent Continuous Sound Level
Lmax	Maximum Continuous Sound Level
LNG	Liquid Natural Gas
LOC	Loss of Containment
LOT	Leak off Test
MAE	Municipio Administração Estatal
MAFF	Ministry of Agriculture, Forestry & Fisheries
MDG	Millennium Developments Goal
MJO	Maden-Julian Oscillation
MoF	Ministry of Finance
MSL	Mean Sea Level
MW	Mud Weight
MWD	Measured While Drilling
NADF	Non-Aqueous Drilling Fluid
NAPA	National Adaption Plan and Action
NOC-TL	Nacional Oil Company of Timor-Leste
NORMS	Naturally Occurring Radioactive Materials
NOx	Nitrogen Oxide
NPHC	National Population and Housing Census
NT	Near Threatened
NTU	Nephelometric Turbidity Unit
OCHA	Office for the Coordination of Humanitarian Affairs

OECD	Organization for Economic Cooperation and Development
OMS	Operating Managements System
OPS	Oficiais Policia Comunitaria
OSCP	Oil Spill Contingency Plan
P&A	Plug and Abandonment
PACCSAP	Pacific-Australia Climate Change Science and Adaptation Planning
PDCA	Plan-Do-Check-Act
PDM	Positive Displacement Motor
PHPA	Partially Hydrolysed polyacrylamide
PM	Particulate Matters
PPE	Personal Protective Equipment
PSC	Production Sharing Contract
PSL	Product Specification Level
RPM	Rotation Per Minute
rr	Restricted Range
SEIS	Simplified Environmental Impact Statement
SEPFOPE	Secretaria de Estado para a Política de Formação Profissional e Emprego
SISCA	Servisu Integradu Saúde Comunitária
SLM	Sound Level Meter
SMC	Safety Management Consultancy
SME	Small and Medium-sized Enterprises
SO_2	Sulphur Dioxide
SOx	Sulphur Oxide
SOP	Standard Operating Procedure
SRTM	Shuttle Radar Topography Mission
SSB	Suai Supply Base
TD	Total Depth
TDS	Total Dissolved Solids
TOR	Terms of Reference
TR	Timor Resources
TSS	Total suspended Solid
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nation for Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework for Climate Change Convention
URTI	Upper Respiratory Tract Infection
USGS	The United States Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compound
VU	Vulnerable
WB	World Bank

WFP	World Food Program
WHO	World Health Organization
WHT	Withholding Tax
WMP	Waste Management Plan
WOC	Wait on Cement

1 EXECUTIVE SUMMARY

Timor Resources proposes to drill an exploration well as follow up to the 2019 seismic acquisition program at one location within the Post Administrative Hatu-Udo, Ainaro Municipality, the well location is named as follows:

- “Rusa-1 Well” – Suco Foho-Ai-Lico

The well will occupy a site of 1 ha within an approximate 2.5 ha levelled and stabilised area during the drilling operation, for a period of approximately 2 months. In the case of an unsuccessful well, the site will be rehabilitated to its original condition or handed over to an agreed after-use. In the case of success, the well will be suspended pending further appraisal.

The drilling operations will be conducted on a 24-hour, 7 day a week basis. Driving and non-essential operations will be restricted to daylight hours as much as possible. Dust and noise will be monitored and kept within the allowable limits as required by applicable laws and/or good industry practice.

Timor Resources will minimise the impact on the neighbouring communities and environment as much as is reasonably possible. Public consultations will be conducted in concert with the authorities and any concerns that are raised by the public will be considered and a mutually acceptable solution will be sought.

Timor Resources will employ crews from the local area as much as possible, providing that they have appropriate qualifications for the position and are medically fit for the work.

1.1 PURPOSE

Timor Resources, a company registered in Timor-Leste under TIN 20032094, and Timor Gap the National Oil Company of Timor-Leste entered into Production Sharing Contract PSC TL-OT-17-09 for petroleum operations on the 7th of April 2017. The Contract made under the Law No.13/2005 enables exploration activities to be carried out for the purpose of development and exploitation of Petroleum in the Contract Area. Timor Resources is the Project Proponent and Operator who on behalf of the Contractor group seeks to drill a single exploration drilling in good oil field practice. The Contract Area defined by PSC TL-OT-17-09 is an area that covers 1,291 km^2, including 1,002.4 km^2 onshore extending along the coastline for approximately 52 km and up to 30 km inland, and 288.6 km^2 of the near offshore for an average distance of 6 km from the coastline (Figure 1-1).

Based on Article 5 (defining project scope) chapter III environmental assessment information phase under Decree Law No.5/2011 Environmental Licensing and ANPM decision on category for drilling project in PSC TL-OT-17-09 ANPM/HSE/S/20/096 dated 13th August 2020, the proposed project that falls in Category A, thus requires a formal environmental assessment. The structure of the assessment process follows that is set out in the Annex IV of the Ministerial Diploma No.46/2017 of the 2nd of August 2017. Further, Law No.5/2011 requires that full details of the project are disclosed to the public and that the public are engaged in public consultations as required in Ministerial Diploma No.47/2017 of the 2nd of August 2017 related to *Public Consultation Procedures and Requirements During the Environmental Assessment process.*

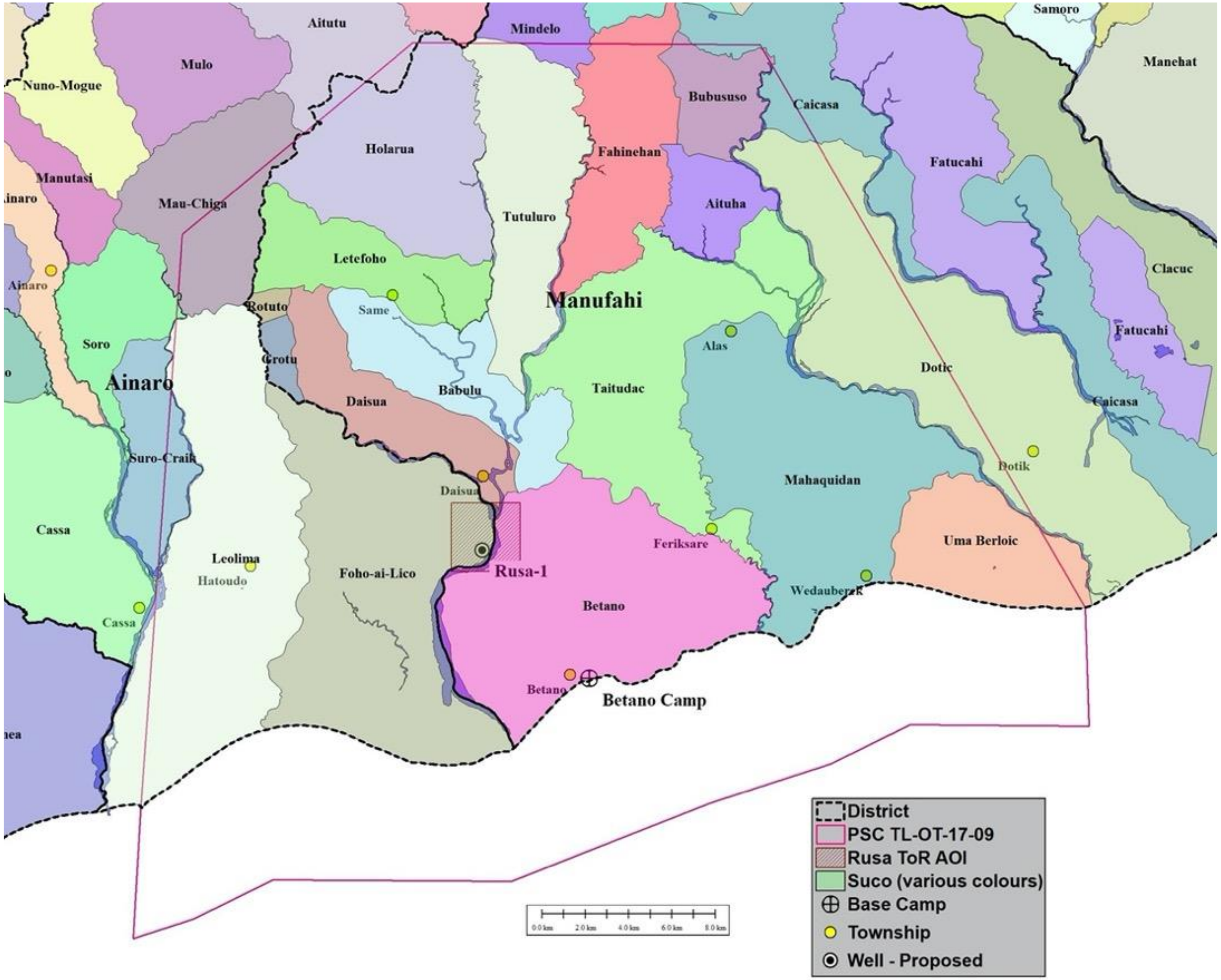

Figure 1-1. Map of Proposed Project Location and Well Area of PSC TL-OT-17-09

1.2 Summary of Activities

1.2.1 Project Description

The project activities are broken down into three phases with regard to impact assessment: Pre-drilling/Construction, drilling operations, decommissioning and project activities are summarised as follows:

Geotechnical, Geochemical and Topographic surveys - Surveys are conducted to gain understanding of the topography and soil characteristics of the wellsite and road access to undertake site design, planning and subsequent civil works. The topographic and geotechnical information is used in combination, to provide input to the civil works design for surface water management and erosion control.

Land Clearance for Road Access and Site Construction - The arable topsoil and vegetation is stockpiled on the side of the lease within the fence line or in the case of access corridors, to the side of the road. The topsoil will be used to rehabilitate the site once drilling is completed in areas which are no longer required. The access roads will have a rock pavement up to 50 cm thick, constructed on compacted sub-grade to form a road pavement 6 m wide, within a clearance corridor of 10 m to 20 m.

Road and Bridge Surveys - Surveys have been conducted on existing roads, bridges, and highways and mapped for the rig moves (Symes 2020). All options have been reviewed for transportation, loads will be managed within the appropriate allowable road load capacity. The information will be input to the rig move report.

Establish Water Supply - Daily water needs for drilling are estimated to be up to 60,000 L per day. Water will be sourced from local contractors. Water storage tanks on site will be filled and a mud system mixed prior to spud of the well. The level of offtake from the water source will be such that it is not detrimental to the supply for other users.

Wellsite - The wellsite area of 2.5 ha will be cleared of topsoil to storage then bulk earthwork to form the drilling pad that will have a rock pavement up to 50cm in thickness in the rig operating area. The wellsite incorporates: two mud pits with a combined operating volume of approximately 1908 m^3 (12,000 bbls), lined with a High-Density Polyethylene (HDPE) membrane; drainage ditches incorporating pollution control pits; diesel tank secondary containment; wellhead cellar: flare pit; and septic tank/leach field for the mini-camp sewage treatment.

Drilling Operations - The well design is based on interpreted geological and geophysical data. The Drilling operation will be conducted as per the well specific drilling program as approved by ANPM. The procedures employed will be standard onshore oilfield best practice. Drilling operations will be conducted around the clock. The time taken to drill a bore hole depends on the depth of the hydrocarbon bearing formation and the geological conditions and is expected to be in the order of 30-40 days.

Well Testing - Where a hydrocarbon formation is found, initial well tests, lasting up to a month, may be conducted to establish flow rates and formation pressure. These tests may generate oil, gas and formation water, each of which will be managed on site.

Rig Move - Rig move routes have been assessed including review of road width, intersections, bridges, community and public infrastructure.

Decommissioning - If the well does not contain commercial quantities of hydrocarbon, the site is decommissioned to a safe and stable condition and restored to its original state or to a state as agreed with landowners and approved by the appropriate authorities. Open rock formations are sealed with cement plugs to prevent upward migration of wellbore fluids.

1.2.2 EIA Activities

The main stages completed in the preparation of this EIS are as follows:

Project Description - Prepare the formal Project Description submission following Ministerial Diploma 46/2017 Annex I.

Terms of Reference - Determine the main components of the project proposal and study area, define legal requirements, environmental description, methodologies for undertaking the assessment, alternatives, identify potential significant issues, following Ministerial Diploma 46/2017 Annex III.

Consultation - Information provided to local authorities and the public about the project so that parties can make informed contributions to the project and EIA process, and take account of issues raised by consultees. Stakeholder consultation with the affected communities in the project area has been underway since before the 2019 seismic survey.

Baseline Survey - Completed baseline survey to identify existing environmental conditions.

Impact Identification and Prediction - Assessed the likely effects of the well program on the environment. Direct, indirect, short, medium and long term, positive and negative effects covered for pre-project/construction, operations and decommissioning. The assessment focused on key issues, through scoping, and the scale and significance of potential impacts were predicted.

Significance of Impacts - Following impact identification and assessment, the significance of the effects on the environment and the local community were determined by reference to an accepted criteria and standards using subjective judgement.

Impact Mitigation - The measured impact and assessment of its significance lead to the determination of mitigation measures.

Preparation of the Environmental Impact Statement (EIS) - Following Ministerial Diploma 46/2017 Annex IV.

Preparation of the Environmental Management Plan (EMP) - Following Ministerial Diploma 46/2017 Annex VI.

1.3 Alternatives

The following alternatives were assessed as part of the project:

- **“No Project”** - A “No Project” alternative was rejected.
- **Well location** - The area surrounding the optimal well location was analysed to assess the impact on the environment, community, and cost of the various alternatives. These considerations are not mutually exclusive so have been considered in terms of a risk assessment based on the location of alternatives within the viable proximity of the optimal location.

- **Project Design (vertical v directional drilling)** - An early decision was made to opt for vertical, straight holes on safety and cost grounds, however for completeness a short description of vertical versus directional drilling was provided.
- **Water Source** - Water supply will be met by local suppliers since the level of offtake is such that it is not detrimental to the supply for other users. A water well is available at Betano camp.
- **Power Supply** - There is no immediate source of mains power supply at the Rusa-1 well location, thus, power for the rig will be provided from diesel generators on site to ensure consistent supply, the Betano camp will utilise mains supply with a backup generator as required.
- **Cuttings Disposal -** Cuttings will be buried in an impermeable liner on site after dewatering.
- **Drilling Fluids** – Water-based drilling fluids will be utilised throughout the project.

1.4 ENVIRONMENT

Climate and Meteorology - The climate of Timor-Leste is characterised by extreme conditions. In the north of the island there is little or no rain for almost eight months of the year. The island has a monsoon climate, typical for the Asian tropics. From December to March northwest to southwest winds prevail, bringing the principal wet season for the year to most parts of the island. From May until October southeast to northeast winds prevail, bringing mostly dry conditions, except on the south coast and the southern slopes where the wet season persists until July. Average annual rainfall is around 1,500 mm, varying from 565 mm at Manatuto along the north coast to 2,837 mm at Lolotai in the central-western mountains. As is common in most tropical locations, extremely heavy rainfall occasionally occurs in Timor-Leste during relatively short time intervals.

There is little temperature variation on either a diurnal or a seasonal basis. Temperature variations mainly occur with altitude. Average annual temperatures decrease from 27 ºC at sea level to 24 ºC at 500 m; 21 ºC at 1 000 m; 18 ºC at 1,500 m and 14 ºC at 2,000 m. Relative humidity varies between 70 and 80 percent, which makes the climate humid in general, but pleasant (FAO, 2016).

The tropical cyclone season in the Timor Sea normally runs from November to April. Many tropical storms and cyclones originate or pass through the Timor Sea. Between 1964 and 2002, 25 cyclones were recorded (NAPA, 2010).

Geology - Within PSC TL-OT-17-09 most of the older rocks from Permian to Triassic in age are well represented in the north and southwest of the field area. Mt. Cablac is covered by Triassic Perdido Group and interpreted to be thrusted over Lolotoi Complex. southeast and southwest of Mt. Cablac is covered by syn-orogenic deposition of Batu Putih and Viqueque Group. Permo-Triassic units commonly topped by Baucau limestone are well exposed between the Belulik river (Cassa Bridge) and Caraulun river near Same. A Late Cretaceous unit of Wai Bua Formation is cropping out in central Betano and its surrounding area.

At the location of Rusa-1 the rock units range from Permian to recent in age.

Topography - Significant topographic features around the project area include:

- Mt. Cablac coupled with low to high grade Lolotoi metamorphic controls the north to northeast morphology.
- A coral limestone platform covers most of the western part of the project area with average height 300 m above sea level.
- The northeast and eastern parts are dominated by Mt. Bian and Mt. Manumera and extend to Mt. Kaitaba and Mt. Cnuamotukleten.
- Mt. Akadirukau with a height 160 m above sea level occurs to the south of the project area with an alluvial plain extending towards the sea.
- In the far northwest the landscape is controlled by recent deposition of the Batu Putih chalk that is expressed in a low relief to moderate morphology with an average height 120 m above sea level.

Air Quality - The ambient air quality data collected at the three sensitive locations for sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) and ozone (O_3) were all below 1 µg/m^3, the detection limit of the instrumentation, thus well within the WHO Standards.

The concentration of dust particulate of $PM_{2.5}$ at the three receptors are generally within the WHO 24-hour standard of 25 µg/m^3 except for peaks that occur at peak traffic hours between 06:00 and 09:00 and again at 18:00-19:00. There appears to be an anomalous reading at Aldeia Raimerlau at 23:00.

PM_{10} data at Rusa-1 drilling location are for the most part below slightly above the WHO 24-hour standard of 50µg/m^3 with a maximum at Aldeia Fatukabelak of 14086 µg/m^3 between 05:00 and 07:00 which might be attributed to cooking fires, levels are again slightly elevated from 19:00-23:00 with values between 70 and 86 µg/m^3. Similar values and patterns are observed at Aldeia Raimerlau, but remain above the WHO standard of 5086 µg/m^3 throughout the day.

PM10 levels at Aldeia Sessurai are within WHO standard at night time between 22:00 and 08:00, but are much elevated during the day reaching a maximum of 500 – 725 µg/m^3. It should be noted that the sampling location at the school in Sessurai is on the main road between Betano and Same, thus is considered to be a result of high traffic volumes during the day.

In the case of diesel generators and vehicle engines the emissions levels were calculated based on fuel usage and using recognised emission estimate methodology. The well program is expected to take 40 days and based on this the emissions were calculated at some 480 tonnes CO_2 and 500 tonnes GHG for the single well. The levels are insignificant in comparison with other operations in Timor and globally. In 2018, CO_2 emissions per capita for Timor-Leste was some 275,000 tonnes.

The total release of CO_2E during the drilling operation is estimated to be 490 tonnes of CO_2E for the well. Significant greenhouse gas (GHG) emissions occur from all oil and gas operations worldwide (>100,000 tons CO_2 equivalent per year) IFC (2007).

Timor-Leste is a minor emitter of greenhouse gases, and therefore mitigation is not currently an important issue in the country, but adaptation will be (World Bank 2009). Carbon dioxide emissions (0.2 tonnes) are low compared with Indonesia (1.4 tonnes) but at the same level as Lao PDR. The GHG emissions arising from the proposed activities are insignificant (approximately 0.2 %), and therefore will not significantly impact the environment.

Noise - As with air quality noise levels were measured in the project area and additional secondary data from the Betano Petroleum Refinery and Beaço LNG Plant EIS study and the Suai Supply Base project (Worley Parsons 2012a and 2012b) accessed with both compared against IFC Guidelines (IFC 2007a) and WHO guidelines for community noise (Berglund et. al. 1999).

Overall the noise levels measured during the baseline survey at the three sensitive receptors are between 30 dB and 61 dB, with most below the residential limits of 55 dB (day time) and 44 dB (night time). There is a marked difference between the locations with the highest levels recorded in Aldeia Sessurai at the school, which is on the main road, where maximum levels between 11:00 and 18:00 were in the range is 48-61 dB outside these hours levels are in the range 35-47 dB.

The expected levels of noise during operations will be in the region of 40-60 dB(A) at the perimeter fence falling to 30-40 dB(A) 350 m from the drilling rig.

Surface and Groundwater - A total of three water samples were collected and tested by the National DNSAS laboratory in accordance with the WHO Drinking Water Guidelines (WHO 2011). All physical test results are within the WHO/East Timor Guidelines cited by DNSAS. pH is as expected at 7.8-7.9. TDS readings were 363 mg/L in sample 01 and 03 but higher in sample 03 at 632 mg/L indicating sample 02 from the small creek may be more open to soil erosion and runoff (see Figure 6-43 above). Turbidity (NTU) was higher in sample 1 which is to be expected in the open flowing river (see Figure 6-42 above), whilst the more protected areas in sample 2 and 3 were significantly lower at 0.4 NTU.

Chemical test results are all well within the WHO/East Timor Guidelines cited by DNSAS, with the exception of Total Hardness (135-200 mg/l) and Total Alkalinity (140-205 mg/l) which is as expected given the limestone rock structure.

In terms of bacterial test sample 1 and 3 were zero, but some contamination was observed in sample 2 (the small creek) at 2 CFU/100ml which might be related to the faecal runoff from animals grazing near the creek.

Soil - Common soils found in Timor are Vertisols, Luvisols and Fluvisols (UN Food and Agriculture Organisation map based on Garcia and Cardoso (1978) data and divided soil texture into ten divisions: clay, clay loam, loam, organic, sand, sandy clay, sandy loam, silty clay, silty loam and variable. Mostly Timor island is covered by clay and loam and rarely organic soil.

Biodiversity, Flora and Fauna - four transects were observed at the well location and detail is provided of the biodiversity, flora, and fauna observed along each transect

- **Biodiversity:** the immediate wellsite includes secondary forest, primary forest, savanna, teak plantation, including agricultural farmland and landscape area. The existing natural resources at the wellsite has no critical habitat according to national legislation and per the Ramsar Site international agreement.
- **Flora:** Plants identified at the well location include: C*asuarina sp, Acasia sp, Ziziphus sp, Scleoreza oliosa*, *Corypha elata*, *Ficus sp, Timonia timun, Sterculia foetida*, *Toona sureny*, *Nauclea orientalis*, *Tectona grandis* and *Gmelina arborea*. None are classed as threatened or with limited geographical expansion in accordance with IUCN Red List. Transect 1 at a distance of 1.2 km from Rusa-1, identified *Pterocarpus indicus* as Near Threatened species (NT).

- **Fauna:** Observations from transect 1 identified a secondary ecosystem that is an important habitat for 26 bird species, particularly *Turacoena modesta* and *Aprosmictus jonquillaceus* considered Near Threatened (NT). Mammals and reptiles species identified outside the Rusa-1 location include: *Macaca Facicularis (NT)*, *Phalanger orientalis (VU)* and *Gekko gecko*, *Trimeresurus insularis, Greater reticulated phyton, Crocodylus sp, Turtle sp*, *Hydrophis sp.* Bird species of limited geographic expansion (rr) or rare species identified in centre Rusa-1 location such as: *Philimon inornata (NT) no Saxicola Gutturalis (NT),* 6 species with limited geographic expansion (rr)

The drilling activities will not cause any significant negative impact since species identified will migrate to the same type of forest in another similar area if disturbed during the short program. Their distribution is categorised as widespread residence, i.e. they can move out to other locations when drilling activities are being carried out.

Land access and resettlement

The project does not require any resettlement of people. Land use and land access have included:

- Negotiations in good faith and in a respectful and reasonable manner.
- Consultation with landowners to obtain their consent. These consultations typically covered the impact and term of the proposed use or access, employment and business development opportunities.
- A community land use agreement.
- Compensation and land rental with local landowners for land use in accordance with the Timor-Leste rates, as required by the Onshore Decree Law of Timor-Leste. Compensation payments are transparent and made in the presence of relevant community and government representatives or independent observers.

Economic - Most of the population in Suco Foho-Ai-Lico, Post Administrative of Hatu-Udo, Municipality of Ainaro consist of farmers, commercial activities and fishermen, other are official civil servant (approximately 10 %). Frequently these farmers earn their income from selling their local farming products to the customers such as corn, cassava, vegetable, banana, and teak wood. Supplementing their income supported by collecting and selling firewood, construction materials such as sand and rocks that they collected from the nearby rivers. Some small business owner established their mini stores (Kiosk); however, with only a small quantity of services provided. Due to low income or limited source of revenue, some of the local communities live under the poverty line.

The populations of Ainaro and Manufahi are two of the lowest in Timor-Leste when compared with other municipalities. The total number of population in Ainaro and Manufahi municipality are 64,615 and 53,691, respectively. A total of 4,373 live in the Suco Foho-Ai-Lico in which the Rusa-1 well will be located.

Social - Interviews were conducted in the area with stakeholders during the EBS with local government officials such as Municipality Administrators, Sub-district Administrators, Hospital Management, PNTL Commander, Chefe Sucos, Chefe Aldeias and Lia Nain. The objectives of the interviews were to obtain the local information and data for the following social components: population and communities, health profiles, existing institutions, schools and health facilities, community and family structure, land and property owners and other common or individual rights.

In the Ainaro Muncipality the most spoken language is Mambai and Tetum Prasa (National Language) and small number of the population speak Bunak, Kemak and others. Likewise, the majority of the population in the Manufahi Municipality speak Mambai and Tetum Prasa, as well as Tetum Terik. There are also small number within the population of Manufahi that speaks Lakalei, Bunak, Ismi and Idate.

Literacy in Timor-Leste is considered to be one of the major challenges, census 2015 indicates that it actually increased from 79.1 % in 2010 to 84.02 % in 2015 for the population aged 15 to 24 years of age.

There are a total of 109 schools in Ainaro and 835 schools located throughout the municipality. The highest number of students are in primary and pre-secondary, 17,737 (82.9 %) in Ainaro and 4,743 (76.2 %) in Manufahi. In Foho-Ai-Lico, 59% of the Suco's total population of 4,939 have either never attended or didn't complete school.

The poverty incidence in the affected area is high. All households have access to electrical power from the national transmission grid. Drinking water is provided from a distribution of pipes and local wells. Most of the population in Foho-Ai-Lico are farmers. Agriculture is the main source of income in the local community. Additional income is generated from breeding animals and seasonal work e.g. farming the rice paddy fields twice a year.

Cultural - Customary cultures exist in both Ainaro and Manufahi and local communities celebrate their cultural ceremony or conduct local rituals at the site such as marriage; death; birth; harvest of agricultural products (commonly for rice and corn production and harvesting); and during extended dry seasons the community will perform a ritual to increase the probability of rainy seasons. Consequently, with the purpose of the ritual and belief, the community has confidence that they have asked the permission from the sacred land and sites to allow the activity of this project to continue as planned as discussed with Timor Resources Community Team.

There were no archeological or anthropological sites identified during the socio-economic survey within the project area.

There were no major historical sites identified within the project area surveyed. There are however, general historical sites outside the study areas such as the Dom Boaventura statue which was a historical site of the Kingdom and the King of Boaventura.

There is one sacred site approximately 0.2 km from the Rusa-1 location called Nakabelis. This sacred house has been practicing several traditional skills to enhance and innovate their way of living. Here they use modern technology and key skills and experience to implement conservation practices for both sustainable forestry and animal farming with the goal to improve socio-economic values in the community. This type of practice occurs almost every year in both Ainaro and Manufahi, the aforementioned practice is performed by the *uma lisans* with the ceremony of *sau batar* during corn harvest season and farming time where surface water is diverted from the river into the agricultural irrigation system for farming purposes.

There is no unique landscape protected or conserved either by the local community or at State level at or in the proximity of the Rusa-1 wellsite.

1.5 POSITIVE AND NEGATIVE IMPACTS

Timor Resources' presence has the potential to have positive and negative impacts on the day-to-day lives of project area communities. The major benefits from a successful exploration drilling project could include increased employment opportunities for local communities both direct and indirect, improvement in livelihood of the communities, and increased revenue for the local area. In addition, the multiplier effect on the domestic economy will be substantial, by way of import duties, WHT's, as well as the potential revenue stream that would be created post any discovery for Timor-Leste by way of royalties, petroleum taxes and state participation by ANPM and Timor Gap E.P.

The impact assessment technique used has determined that the most identified impacts are classed as having a "Moderate" significance level which are reduced to "Minor" on the application of mitigation measures. Those identified as "Minor" were subsequently reduced to "Negligible" on application of residual measures. The singular exception relates to a catastrophic oil spill which would result in a "Major" impact, that is, potentially long term and affecting a larger regional area beyond the site, this mitigated by the implementation of an oil spill contingency plan and the emergency response and incident management plans, reducing the impact to "Moderate".

Positive impacts include:

Employment - 150 -180 positions will be filled by Timorese nationals during the whole of the drilling campaign across both PSC TL-OT-17-9 and PSC TL-OT-17-8. There will be a combination of skilled and unskilled positions, in the drilling crews, civil construction crews, geological teams, security teams, catering and services for the drilling contractor as well as a host of unskilled positions for labourers, cooks, cleaners and administration staff.

Employment opportunities will be advertised, and the unskilled positions will be filled by the recruitment of the local community.

Skilled positions will be filled from domestic and international markets, with a preference towards on the job training to capacity build and increase skills of the domestic work force, in Timor Resources' efforts to facilitate the employment of Timorese nationals.

The locally experienced workforce will be competitively recruited to work alongside expatriates during the drilling campaign and there will be training for the "shadow program" whereby Timorese persons can learn on the job skills, to be eligible to take over from an expatriate employee, when the level of competency has been achieved that allows for the national worker to productively contribute to the work program in the drilling crew.

Negative impacts may result such as:

Traffic - An increase in traffic may create a nuisance and potential impact on the safety of other road users, however, this is a short program temporally and the transient nature of the project limits potential effects.

Soil - Removal of topsoil and soil compaction will occur largely during the construction phase, the effect will continue through operations until sites are decommissioned and rehabilitated.

Air Quality - During construction a decrease in air quality from dust may cause nuisance and impact on the community and fauna and flora immediately near to the project site. A short construction program and low levels of diesel usage limit impacts.

Gaseous emissions during rig operations may create a nuisance and minor impact in the immediate area around the project site. A short drilling program of 40 days and low levels of diesel usage in the region 5000 L/day or 150 tonnes diesel for the duration of the well limit impacts.

As with the construction phase, dust may cause a nuisance during decommissioning, but this again will be short term and temporary. During the decommissioning period, air quality impacts are considered short term and transient.

Solid Waste - Solid wastes will arise from a project of this nature, waste management will provide the best available solution for waste management, however, the principal method of incineration will result in emissions to the atmosphere. Any emissions will be short term. A Waste Management Plan (WMP) has been completed and takes into account the processes for treating or eliminating, partly or fully, all waste generated by the project.

Noise - Drilling operations will be conducted on a 24 hour, 7 day per week basis so may cause a short term nuisance for local communities and wild life. The duration is expected to be only 30-40 days and consequently this impact is to be considered only short term and transient.

The impact assessment outlined in this EIS reflects that the project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature. Consequently, there is limited potential to cause significant or permanent impacts. Any negative residual impacts are considered inconsequential compared to the benefits generated.

1.6 Public Consultation

The Timor Resources socio-economic team has conducted a series of socialisation and public consultation within the community surrounding the project area. During the consultation process with the local communities, the different perspectives and insights, and concerns and recommendations were recorded and analysed in order to develop the social impact evaluation framework for the mitigation and control measures applied in this EIS. As planned and advertised in the social media the Environment Public Consultation for EIS /EMP was carried out at Suco Foho-Ai-Lico on 27th of April 2021 and Suco Betano on the 28th of April 2021.

Venue- Suco Foho-Ai-Lico (Outdoor)
Time : 09:00– 12:30
Subject: Environment Public Consultation in PSC TL-OT-17-09
Participants:

- Sub-District Administrator of Hatudo Mr Rogerio da Costa
- OGL Hatudo- Mr Cegres Zelino Tilman
- Police Commander of Hatudo Mr Tomas Josep
- Community leader of Suco Foho-Ai-Lico Mr Donato de Araujo Laot
- Community leader of Leolima Mr Mariano de Almeida
- Community village leaders-Ferando da Costa, Alcino Amaral, Nazario das Dores, Juliao dos Santos, Rui Tati Tilman, Crisodio da Costa, Anita Honoria, Carmelita da Costa, Domingas da Costa, Julianti da Costa
- Local Veterans- Herculano das Dores, Santiago da Costa, Carmelito da Silva
- Timor Resources: Ocky Maher, Veronica Belo and Filomeno De Andrade
- Groena Consultant: Zefimo Corbafo, Abilio Fernandes, Caniggio Quintas

Agenda:

1. Introduction by MC – Veronica Belo
2. Opening by Hatudo Representative - Mr Cegres Zelino Tilman
3. Opening by Representative of Local Authority – Mr. Rogerio da Costa
4. General Decree Law - EIS and EMP Mr. Zefimo Carbafo and Mr. Abilio Fernandes
5. General Overview of the Project Timor Resources – Mr. Filomeno de Andrade
6. Open discussion (question, suggestion, and answer)
7. Message by Policy Commander – Mr Tomas Josep
8. Closed by Hatudo Representative - Mr Cegres Zelino Tilman
9. Closed by Representative of Local Authority – Mr. Rogerio da Costa
10. Lunch Together with Participants

Total number of participants - 230 - Signed attendance list 179, unable to sign 51.

Venue: Suco Betano Community Hall (Outdoor)
Time: 09:30 – 12:30
Subject: Environment Public Consultation in PSC TL-OT-17-09
Participants:

- Police Commander of Same : Mr. Adão de Araujo
- Community Leaders of Betano Representative : Mr. Felix da Costa
- Community Villages Leaders : Aurio Francisco, Saul Seixas, Domingos Tilman, Saturnina Seixas, Manuel das Neves
- Traditional Leaders : Jose de Nascimento
- Timor Resources : Filomeno de Andrade, Octavianos Maher, Veronica Belo
- Groena Consultant : Zefimo Corbafo, Abilio Fernandes, Caniggio Quintas

AGENDA

1. Introduction by MC – Veronica Belo
2. Opening by Community Leaders of Betano Representative - Mr. Felix da Costa
3. Opening by Representative of Local Authority – Mr. Rogerio da Costa
4. General Decree Law - Environment Impact and Management Plan Environment by Groena Consultant – Mr. Zefimo Carbafo and Mr. Abilio Fernandes
5. General Overview of the Project Timor Resources – Mr. Filomeno de Andrade
6. Open discussion (question, suggestion, and answer)
7. Message by Policy Commander – Mr. Adao de Araujo
8. Closed by Community Leaders of Betano Representative - Mr. Felix da Costa
9. Lunch Together with Participants

Total Number of Participants : 78 -Signed attendance List 67, unable to sign 11.

1.7 Economic Assessment

Procurement from Timorese owned and operated businesses in the contract area goods and services include but are not limited to:

1.	Fresh Food and water	$142,344
2.	Accommodation Housing/Office Supply	$126,700
3.	Diesel Supply	$276,000
4.	Government Charges including import duties and WHT	$682,000
5.	Rental of Heavy Equipment, trucks, cranes	$172,000
6.	Environmental Consultancy Engagement	$190,000
7.	Aggregate and rock base	$42,000

In preparation for the local suppliers to be able to offer their goods and services Timor Resources has undertaken promotional workshops and engagements to educate the local suppliers as to what they can supply and in what quantities they can participate. Raising the standard of the local suppliers, to be able to participate in the tender process and to be a supplier has been an activity undertaken over 18 months already in working with the communities and the local district administrator, in preparation.

Customs Duties and taxes

Imported equipment will net greater than US$220,000 in import duties alone, as heavy equipment comes into the country. WHT will be payable and collected on the employment and contracts, providing revenue to the state exceeding US$462,000.

Positive Impact: CSR programs

Timor Resources has implemented a number of CSR programs, including horticulture that is now well established. Acreage of land owned by farming cooperative group has been gifted seeds, irrigation and financial support to increase their capacity to grow commercial crops. This reduces poverty, increase food nutrition for the community at large.

Support for the local sporting competitions, teams and local events is a CSR contribution Timor Resources intends to continue. The sponsoring of the Manufahi Cup, the Tour de Dili, the local community football and soccer federations.

During drilling there is the expectation that US$70,000 will be spent on CSR initiatives directly associated with the contract area.

Cost and Benefit of Environmental Mitigation Measures - A broad estimate of costs related to "environmental" impact mitigation for the full program in both PSCs can be summarised as follows:

- High cost capital equipment items such as blow-out preventers, diverter, emergency valves the flare line at $1,850,000
- Pressure and flow monitoring equipment $475,000
- mud chemicals which provide a key "barrier" down hole balancing downhole pressures so removing the risk of over-pressure and a blowout $110,000.
- Permitting, approvals, certification, training costs for personnel $320,000
- Environmental studies and monitoring $270,000
- Local spend - Community and cultural, education, inclusion employment, procurement of goods and services, community relations, information sharing, celebrations, local sponsorship, land and surface leasing fees. $387,500

- Civil construction $396,000
- Decommissioning, Reforestation, removal of civil constructed sites, monitoring, reporting $180,000

1.8 CONCLUSIONS AND RECOMMENDATIONS

Mitigation measures have been proposed for all the residual impacts identified aimed at protecting the physical, biological, and socio-economic environments. An Environmental Management Plan (EMP) has been developed to manage the potential impacts of the proposed activities and ensure that they remain at acceptable levels throughout the course of the program.

The EIA process has identified that the project is limited spatially and is short term and transient in nature with limited potential to cause any permanent or significant impacts. The negative residual impacts are considered inconsequential compared to the benefits generated, hence the Environment Authority is requested to license the project.

The project is viable subject to the EMP being followed and complying with all other statutory requirements that the project subscribes to.

Key recommendations are as follows:

1. Implement a Redress and Grievance Procedure that will be used throughout the project.
2. The Community Liaison Officer will maintain continuous engagement with all stakeholders and keep communities informed at all stages of the project in regard to activities, schedules and potential impacts.
3. All activities to be conducted in compliance with Timor-Leste laws including but not limited to: Law No.3 2012 - Legislative Authorisation in Environmental Matters; Law No 26 2012 - Environmental Basic Law; Decree-Law No.18/2020 - Onshore Petroleum Operations.
4. All activities to be conducted in compliance with Timor Resources HSE policy and Operating Management System Standards.
5. Consult with local administration and security agencies for support on security issues.
6. Liaise with the local community during the recruitment process.
7. Implement a Waste Management Plan and agree waste management practices and facilities in consultation with the Municipality.
8. Wastes should only be transported by an approved waste transporter agreed in consultation with the Municipality.
9. Implement a Traffic Management Plan and enforce traffic speed limits to minimise dust generation.
10. Make use of the existing access roads to the maximum extent possible.
11. Minimise vegetation clearance.
12. Prepare Rehabilitation Plan at the decommissioning stage.
13. Implement Noise and Air Quality Management Plans.
14. Implement Incident management system: Crisis Management Plan - Corporate, Incident Management Plan - National, and Site Emergency Response Plan and Oil Spill Contingency Plan - local.

2 DETAILS OF THE PROJECT PROPONENT

2.1 Details Of The Project Proponent

Operator : **TIMOR RESOURCES**
Address : Suite #303, Level 3, CBD 3, Timor Plaza
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Dili – Timor-Leste

Contact Person : Suellen Osborne
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The Company organisation structure is shown in Figure 2-1.

2.2 Company Structure

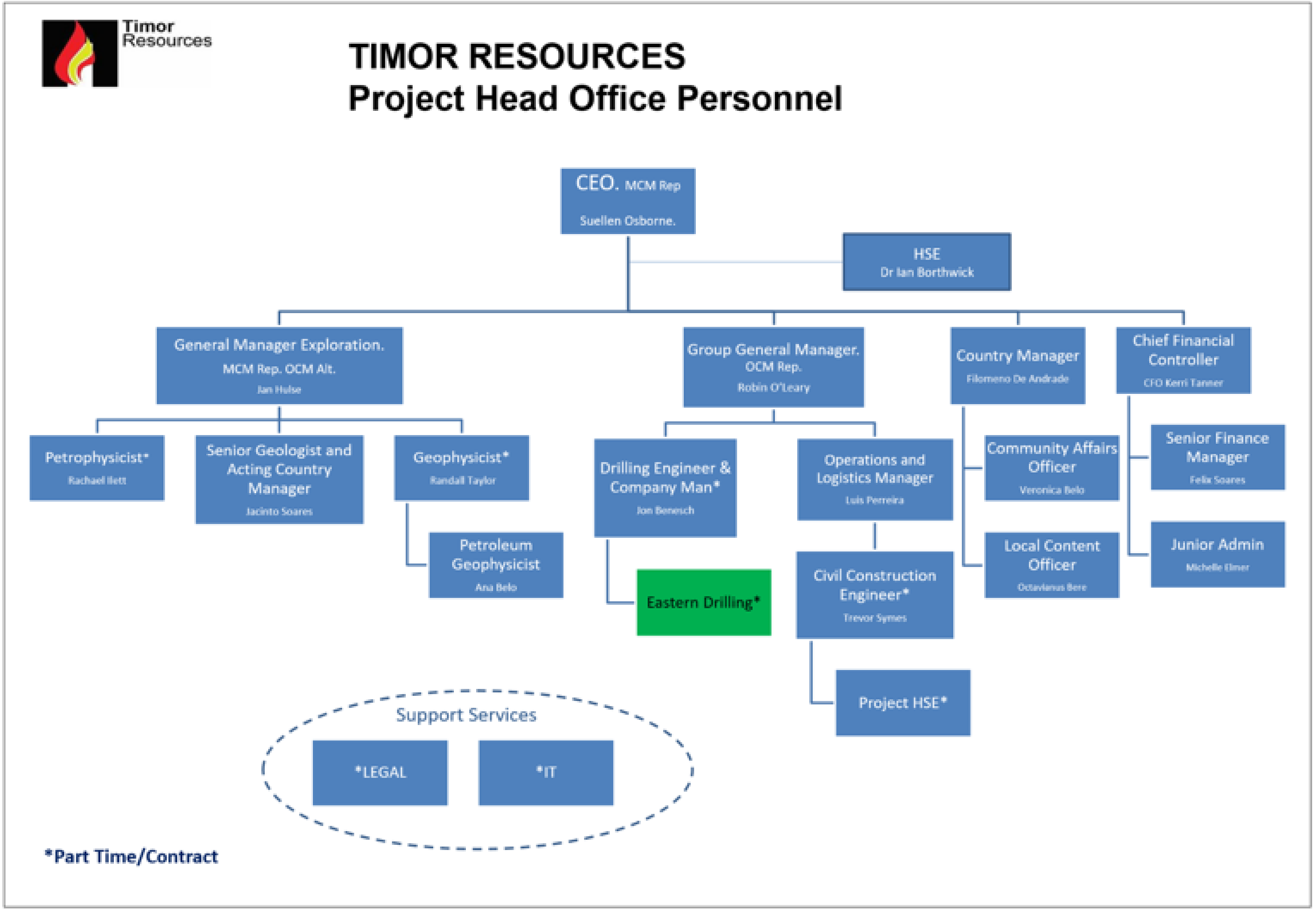

Figure 2-1. Timor Resources Organization Structure

3 DETAILS OF THE EIA CONSULTANT

Timor Resources has engaged with Groena Circoal, a Timor-Leste registered national consulting company to carry out the EIA study to produce the EIS and EMP for the proposed project. Groena Circoal has been providing services to several other domestic projects. Groena Circoal's have a number of key and highly qualified personnel. The following is the list of the proposed key personnel to be involved in this project:

Maria do Ceu Rosales
Maria is a graduate from the University of Western Australia majoring in Environmental Science and Business Law. She is an Environmental Scientist with more than 5 years' experience predominantly in the area of environmental assessment, management and public procurement.

She has led environmental studies on variety of environmental assessments and feasibility studies specifically for water resources management and has worked on a variety of projects from small-scale to large projects such as from established more than five water and sanitation projects to the rural communities and successfully completed marine environmental monitoring project for Tibar Port mega project. Maria has also involved extensively in drafting, review the laws and policy related to the procurement. She has more than 3 years of working experience in public procurement and preparation of contract and documents relating to Prequalification (PQ) of Bidders, Request for Quotation (RFQ) and Bidding Documents for the procurement of Goods and Works for ICB and NCB Contracts.

Emiliano de Oliveira
Emiliano is an Environmental Specialist with more than 8 years' experience in Environmental Impact Assessment (EIA), socio-economic and resettlement, Environmental Management Systems (ISO 14001), water-related issues, sanitation, occupational health & safety at work. He has been involved in various projects in both Timor-Leste and Indonesia, and is also a candidate for double Master's Degree in environmental science and Civil Engineering.

Pedro Pinto
Has 20 years' experience as an ornithologist and flora and fauna specialist. He has been working under Indonesian and Timor - Leste governments for Flora and Fauna Conservation. He holds a degree in Bachelor Science of Forestry.

Eufragio Xavier
Has over five years of experience in oil and gas sector, undertaking intense training and internship on HSE-related programs with ConocoPhillips Timor-Leste in Australia. He holds a degree in Petroleum Management.

Apart from the Timorese professionals, Groena Circoal also has access to highly capable international experts in various specialty areas to deliver a high-quality service within their consultancy group. In carrying out data collection and respective analysis for completing the EIA and EMP for this specific project, it is likely that Groena Circoal will only require local specialists: geologist, social scientist, flora and fauna and health and safety personal, including local guides in executing the EIA process. Analysis of primary data will be carried out in local laboratories sub-contracting local consulting company.

Reflecting on the consultant's experiences and expertise in the area, Timor Resources deems that the consultant is suitable, qualified, and competent to carry out the EIA study for the proposed project. The details of the consultant carrying out the EIA study will be also be covered in the structure/content of the EIA and EMP in the next phase of the study according to the Ministerial Diploma No.46/2017 of 2nd August 2017, Annex IV and VI regarding the minimum requirements for EIA and EMP. Hence, any additional information required regarding this section can be covered in the EIA and EMP.

4 DESCRIPTION OF THE PROJECT

4.1 SUMMARY OF THE PROJECT

Timor Resources and Timor Gap the National Oil Company of Timor-Leste entered into Production Sharing Contract PSC TL-OT-17-09 for petroleum operations on the 7th April 2017. After initial technical studies and detailed field work activities the Fafulu 2019 2D seismic survey was justified and successfully acquired in 2019. Interpretation of this new seismic data through 2020 has identified a number of promising geological structures. One of these, named Rusa-1, has been high graded to prospect status and is drill-ready. In order to confirm the presence, volume and deliverability of hydrocarbons it is considered necessary to drill the Rusa-1exploratory borehole which is also a minimum exploration work requirement in the First Period (Contract Year 3) of the PSC.

In 2020 a drilling rig and support equipment were split into modules and were shipped into Suai and moved to the Karau-1 wellsite in PSC TL-OT-17-08. The drilling rig will firstly undertake exploratory drilling in PSC TL-OT-17-08 and this is anticipated to commence in early Q3 2021, subject to easing of restrictions imposed due to Covid-19 pandemic. When this first phase of drilling is complete the rig and equipment will be mobilised to PSC TL-OT-17-09 approximately Q4 2021 to undertake the drilling of the Rusa-1exploration well. The project is to be drilled in an aggregated campaign with exploration wells in PSC TL-OT-17-08 and will bring operational efficiencies and safety benefits stemming from a consistent body of work and experience gained in-country by the crew through the program.

Wells that are drilled to discover the existence hydrocarbons are termed “Exploration” wells. The location of a drill site depends on the characteristics of the Rig equipment, the well design, and surface conditions. The location selection criteria described in this report demonstrate a balance between environmental protection, logistical requirements, and the technical factors for successful drilling.

The Rusa-1 wellsite, located approximately 3.4 km south of Daisua, is estimated to occupy 2.5 ha and is to be constructed to accommodate the drilling rig and equipment and support services as well as an allocation of space for mud pits, a flare pit and earthworks and drainage areas. The entire location is cleared of all vegetation and topsoil prior to the start of any civil works. The vegetation and topsoil are stockpiled in a cleared area within the drilling location but outside the work area. A perimeter drainage ditch and berms are constructed around the location for containment and management of surface water. The wellsite incorporates two mud pits each with a combined volume of approximately 1908 m^3 (12,000 bbls), lined with a High-Density Polyethylene (HDPE) membrane liner. New access roads will be constructed on compacted sub-grade to form a road base 6 m wide, within a clearance corridor of 10 to 20 m.

The Betano base camp at Betano, previously used by Timor Resources for acquisition of the Fafulu 2019 2D seismic survey, is the central support camp for crew during the drilling of Rusa-1-1. The camp provides accommodation for the off-duty workforce, canteen facilities and provision for the collection, segregation and disposal of waste and recyclable materials.

The existing Haemanu camp in PSC TL-OT-17-08 (formerly a Covec road construction camp) will support drilling activities as a supply base as required (Suco Labarai).

Typical drilling rig modules include the derrick, sub-base, mud tanks and pumps, power generators, cementing equipment, mini-camp, and tanks for fuel and water (Figure 4-1). The mini-camp provides on-site accommodation for the senior drilling management, communications, vehicle maintenance and parking areas, fuel handling and storage areas, and provision for the collection, segregation and disposal of waste and recyclable materials.

Once drilling commences, drilling fluid or "mud" is continuously circulated down the drill pipe and back to the surface equipment. Its purpose is to balance underground hydrostatic pressure, cool and clean the bit and flush out rock cuttings.

The risk of an uncontrolled flow from the reservoir to the surface is greatly reduced by using blowout preventers - a series of hydraulically actuated steel rams that can close quickly around the drill string to seal off a well.

Steel casing is run into completed sections of the borehole and cemented into place. The casing provides structural support to maintain the integrity of the borehole and isolates underground formations that are often unconsolidated near the surface or where water aquifers may be present.

Drilling operations will be conducted on a 24-hour, 7 day a week basis. The time expected to drill the Rusa-1borehole depends on the complexity of drilling, the depth of the hydrocarbon bearing formation and the geological conditions encountered and is expected to be in the order of 30-60 days.

If the exploratory drilling and evaluation of Rusa-1supports the likelihood of potentially commercial quantities of hydrocarbons, the well will be Cased and Suspended and a wellhead valve assembly will be installed.

If the well does not contain commercial quantities of hydrocarbon, the site will be decommissioned to a safe and stable condition and restored to its original state or to a state as agreed with landowners and approved by the appropriate authorities. Open rock formations are sealed with cement plugs to prevent upward migration of wellbore fluids. The wellhead and the top joint of the conductor and casing strings are cut below the ground level and capped with a cement plug. After securing the hole the rig is dismantled and demobilized.

Timor Resources will minimise the impact on the neighbouring communities and environment as much as is reasonably possible. Dust and noise will be monitored and kept within the allowable limits as required by applicable laws and/or good industry practice. Public consultations will be conducted in concert with the authorities and any concerns that are raised by the public will be considered and a mutually acceptable solution will be sought.

Timor Resources will employ crews from the local area as much as possible, providing that they have appropriate qualifications for the position and are medically fit for work.

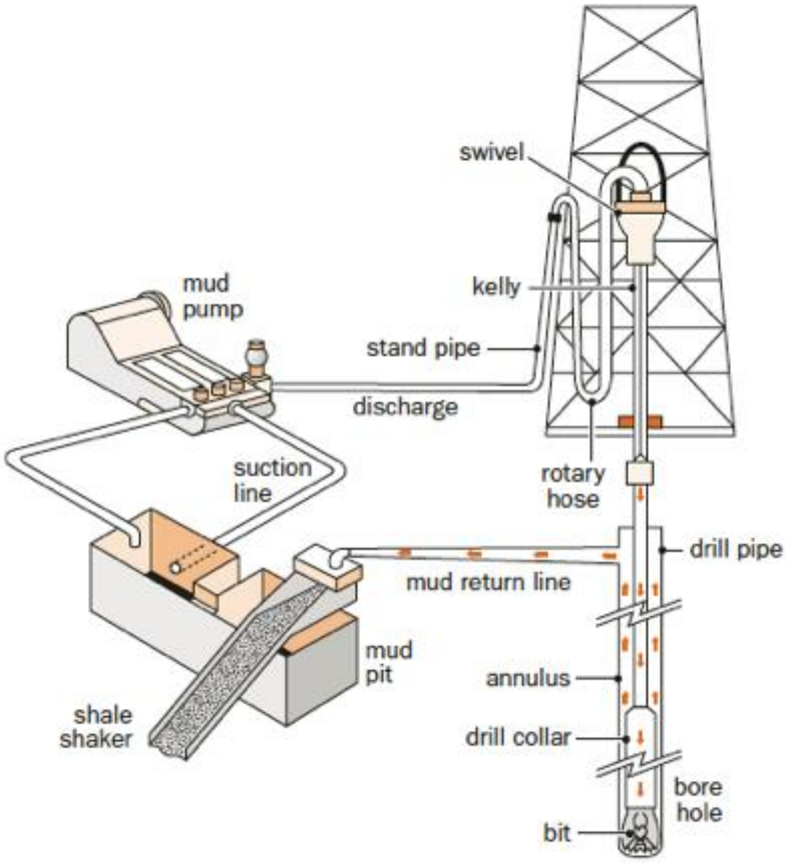

Figure 4-1. General Configuration of Onshore Drilling Rig

4.2 Identification of the Project

This project is to conduct exploration drilling of 1 identified well location, namely Rusa-1. The well is located in the Ainaro Municipality, Hatu-Udo Sub-district of Suco Foho-Ai-Lico and Aldeia Raimerlau, with some additional transit and access to the neighbouring Manufahi Municipality. The exploration drilling is planned to commence during Q4 2021, subject to easing of restrictions imposed due to Covid-19 pandemic.

The well was identified as a result of prospect evaluation carried out in PSC TL-OT-17-09 by the Timor Resources exploration team during Permit Years 1-3 which ultimately defined the targeted plays to be drilled. The project is to be drilled in an aggregated campaign with exploration wells planned for PSC TL-OT-17-08.

4.3 Project Category

The exploration drilling project was given the classification of Category 'A' by ANPM in accordance with Article 4, 1a and Annex I of the Decree Law No. 5/2011 of Environmental Licensing (13th August 2020) and this classification was based on the nature, size and technical characteristics of the project. Therefore, Timor Resources was required to submit a Terms of Reference (TOR) which was accepted on the 26th January 2021 (Timor Resources 2021a). The Environmental Impact Statement (EIS) and an Environmental Management Plan (EMP) is required to seek Environmental Authority approval in order to gain an Environmental Licence to undertake the drilling activity.

4.4 Brief Description of Nature, Size and Location of the Project

4.4.1 Nature of the Project

The exploration drilling activities will be conducted in three phases, Pre-drill, Drilling and Suspension or Abandonment.

The drilling program is designed to test multiple targets within 2 plays types within the area of PSC TL-OT-17-09, which are:

- Multiple targets in an interval of Jurassic to Triassic sediments in age and interpreted as either interbedded sands e.g. Plover or Foura member equivalents or age equivalent carbonates.
- A deeper Sub-Decollement target (possibly Triassic) which possibly represents underplated Australian continental clastic material. This deeper target remains **optional only** and is subject to a number of criteria including the presence of hydrocarbons in the shallower targets. The borehole design will allow for re-entry and deepening in the future if the prospective is warranted.

The drilling location is provided in Table 4-1 and Figure 4-2. The proposed location is 3.4 km south of Daisua and is a 7.6 km north west inland from the nearest coastline town of Betano.

Table 4-1. Well Location, subject to final survey of actual borehole centre

Well	Rusa-1-1
Seismic Line	Fafulu23
Easting (UTM 51S)	795324
Northing (UTM 51S)	8991662
Latitude	-9.11205
Longitude	125.68675
Drill Floor (mGL)	5.33
Ground Level (mSS)	-96
Total Depth (mMD)	2601m (base case) 3936m (deeper option only)

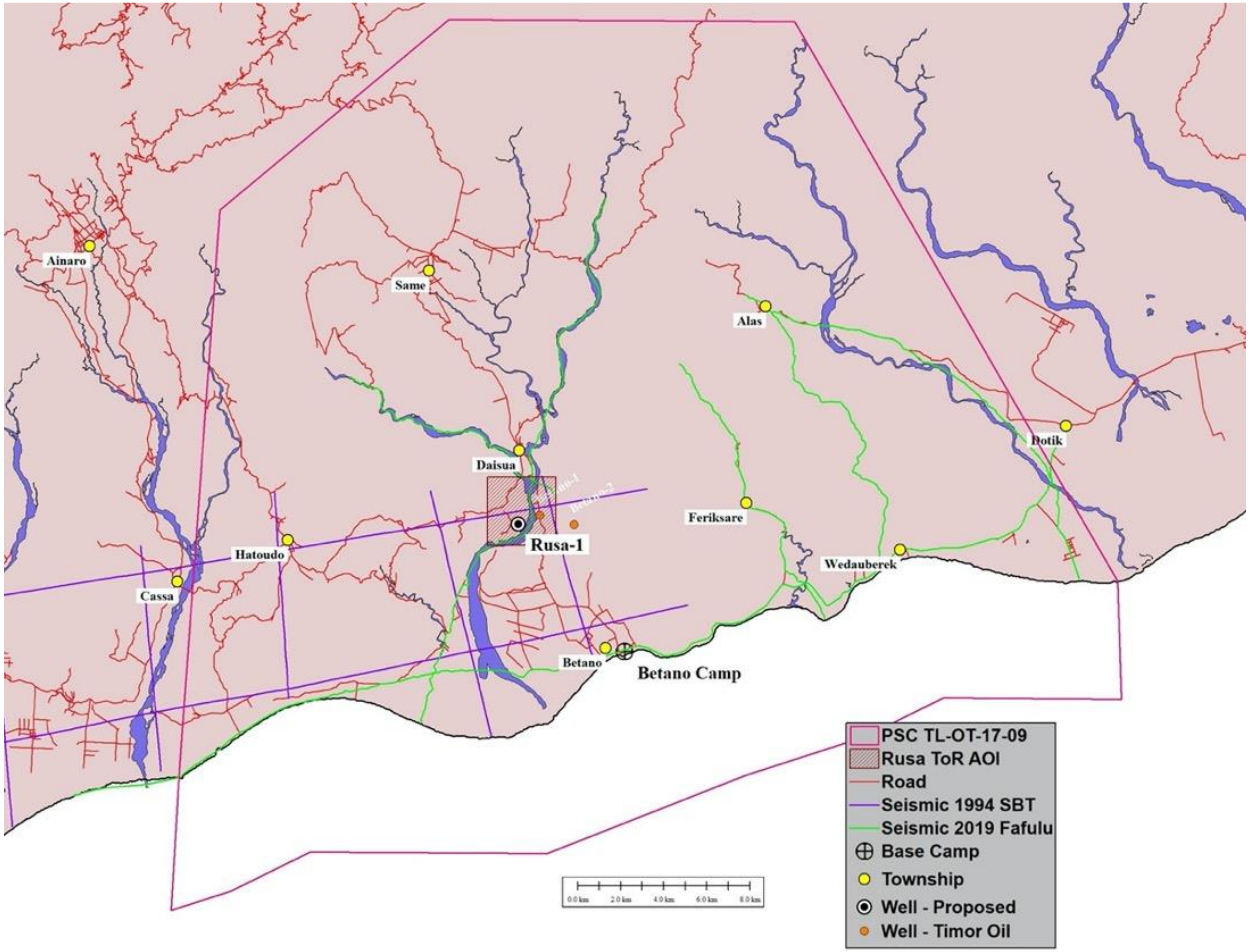

Figure 4-2. Location of Proposed Well, Betano Base Camp and Infrastructure

4.4.1.1 Pre-Drilling Operations

Pre-drilling operations include:

(1) Geotechnical, Geochemical and Topographic surveys

These surveys are conducted to gain understanding of the topography and soil characteristics of the wellsite and road access to undertake site design planning and subsequent civil works.

A geotechnical survey provides information on physical properties of soil which include structure, load bearing strength, and consistency. The geotechnical data is combined with geochemical survey results to determine environmental effects on soils, such as dispersion or expansion of clays. This data is used in planning of civil works, particularly for calculation of foundation requirements for the drilling rig and associated equipment and heavy vehicle usage on access roads.

A local topographic survey is carried out in the area of the proposed wellsite to plan the earthworks requirements for the site and access. The survey is used to calculate levels and the amount of cut and fill required. Natural and man-made features are also identified by the topographic survey for the environmental plan.

The local topographic survey is combined with a semi-regional Digital Terrain Model to delineate natural drainage patterns by watershed/catchment analysis. This analysis allows for planning of diversion of surface water within and around the wellsite. The topographic and geotechnical information is used in combination, to provide input to the civil works design for surface water management and erosion control.

(2) Land clearance for road access and site construction

The arable topsoil and vegetation are stockpiled on the side of the wellsite within the fence line or, in the case of access corridors, to the side of the road. The topsoil will be used to rehabilitate the site once drilling is completed in areas which are no longer required. Access roads will be 6 m wide with a 10 m wide road corridor clearance to allow for earthwork cut/fill slopes and drainage ditches when required. The corridor access clearance may increase locally to 20 m around tight corners or junctions.

river rock will be used as base course for the access roads. The required thickness of the river rock road pavement will be dependent on the sub-soil strength but is estimated to be in the 30 cm to 50 cm range. The wellsite area of approximately 2.5 ha will be levelled after topsoil is removed and river rocks will be used as base course up to 50 cm in thickness. If the geotechnical survey dictates, additional foundation will be used under high load bearing areas.

The wellsite design for the Rusa-1shown in Figure 4-3.

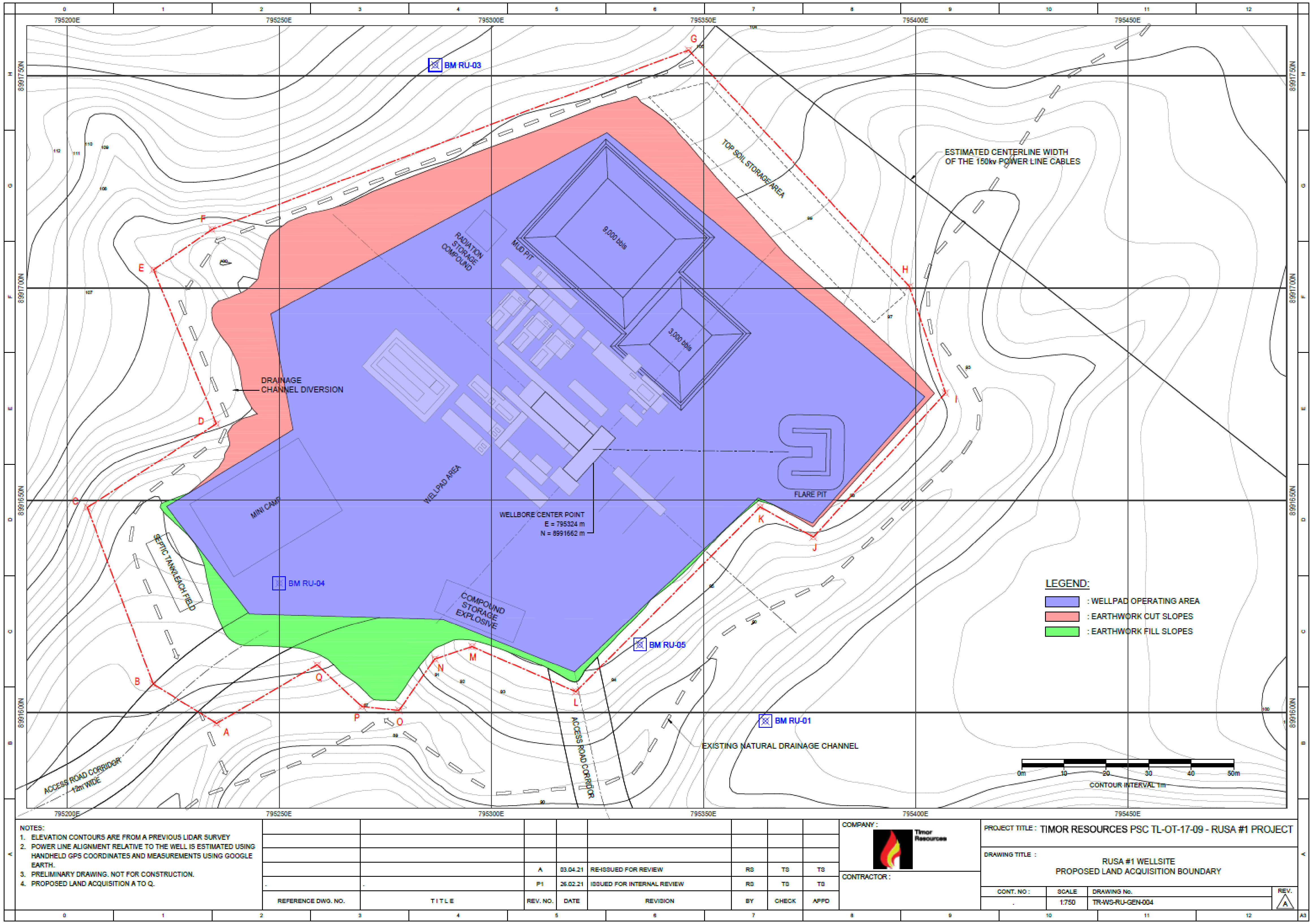

Figure 4-3. Rusa-1well layout. Subject to further surveying, civil engineering and design.

(3) Road and bridge surveys plan, including highway and arterial and local roads.

Timor Resources and Eastern Drilling have carried out extensive surveys on existing roads, bridges, and highways (Symes 2020) in PSC TL-OT-17-08 and this information will be relevant to the first section of the mobilization to PSC TL-OT-17-09. The new Tasi Mane highway has been designed and constructed using the American Association of State Highway and Transportation Officials (AASHTO) design code. Bridges and roads have been identified and mapped for the rig moves. All options have been reviewed for transportation; loads will be managed within the appropriate allowable road and bridge load capacity. Some tight corners by road from PSC TL-OT-17-08 to PSC TL-OT-17-09 may need to be modified to allow the rig trailer to pass.

(4) Establish water supply.

Daily water needs for drilling are estimated to be up to 60,000 L per day. Water supply will be met by local suppliers. Water storage tanks on site will be filled and a mud system mixed prior to spud of the well. The level of offtake from the water source will be such that it is not detrimental to the supply for other users. A water well is available at Betano camp.

(5) Wellsite

The typical wellsite consists of:

- Rig sub-base, carrier and derrick
- Mini-camp and office: set of mobile units used for accommodation, mess, storeroom and support offices for engineers and meeting spaces
- Septic field: a portable fibre glass for black water will be used for a biotreatment method of water filtration before it is channelled underground to a leach field
- Mud pits for drilling fluid
- Mud pump station
- Flare pit for well test
- Cellar around hole centre
- Parking space
- Laydown area for casing and drill pipe
- Power generator
- Perimeter fence surrounding the wellsite

The layout dimensions are specific for each type and model of rig but can be adjusted, within limits, to sites that are not of uniform shape. Whilst there is a base layout design, consideration will be given for deep draining gullies and positioning the wellsite in the optimal location with the overall lowest elevation gradient in the vicinity of Rusa-1 as shown in Figure 4-3.

(6) Cellar construction with recess for air pump.

The objective of the cellar construction is to place BOP during the drilling operation. Ground preparation for cellar area will require 2.7 m in depth. A plate steel and concrete cellar with dimension of 2.9 m x 2.9 m will then be installed.

(7) Mud Pits (sump) construction

Two 3 m deep mud pits with approximate dimensions of 22 m x 25 m and 32 m x 35 m will be prepared for mud handling and circulation. Final plan dimensions and depth will be provided in the detailed design according to the geotechnical conditions. An impermeable geomembrane will be used in the pit as barriers to prevent soil contamination in case of any presence of harmful substance. The pits will be fenced off within the compound and have floating safety ropes installed for safety reasons.

(8) Rig Move

An assessment has been carried out by Timor Resources and Eastern Drilling for the rig move route to the well location. The assessment covered road width, intersections, bridges, community and public infrastructure. An assessment by Timor Resources and Eastern Drilling was carried out to determine the risks associated with rig move. As a result, roles and responsibilities were identified to assess and manage the rig move. The truck loads will not exceed 4.75 m in height and 4.4 m in width.

4.4.1.2 Drilling Operations

It is proposed to drill 1 well with a total depth of 2601 m (base case) and an option to deepen this to 3936 m either in this campaign or at some stage in the future. The proposed well design is based on geological and geophysical interpretation.

The drilling operation will be conducted as per the well specific drilling programs as approved by ANPM. The procedures employed will be standard onshore oilfield best practice.

4.4.1.2.1 Pressure

An assessment of potential pore and fracture gradients is necessary for well control planning and protection of the targeted reservoir formations from damage. The formation pressure dictates the selection of BOP and surface control equipment pressure ratings and also the mud weights required to drill the well and maintain a safe over-balanced system. Excessive mud weights can cause the formation to fracture and losses of the mud system which could then result in underbalance and flow. Excessive mud weights can also cause invasion of potential reservoir sections and severely reduce deliverability/production potential.

Pore pressure and fracture pressure predictions have been calculated using offset well and seismic data within both PSC TL-OT-17-08 and PSC TL-OT-17-09, specifically:

- Drill Stem Tests
- Reported mud weights for kicks, flows and losses
- Shut-in pressures of pipe and annulus
- Sonic, density and resistivity wireline logs
- Seismic Interval Velocity
- Modelled fracture and overburden gradients

The accuracy of pressure prediction is controlled by the available data. The offset well database is of variable quality and at times lacking in detail.

No Leak-off (fracture initiation pressure) or Formation Integrity (set maximum pressure) Tests were recorded for any offset wells, so the calculation of fracture pressure is limited to indirect means (predominantly modelling and wireline log data).

The Pore and Fracture pressure (in mud-weight pounds per gallon “ppg”) for the primary exploration locations are provided in Figure 4-4 and Figure 4-5.

In order to optimise wellbore control, stability and integrity, a “best case” and “high case” estimate was calculated. As per standard procedure, these limits respectively are used to determine the drilling and kill mud weights for each interval.

“Best case” and high case” pore pressure predictions for both gas and oil cases are shown in Figure 4-4 and Figure 4-5. The primary target at the Jurassic horizon and four deeper Triassic secondary targets are shown. There may be additional secondary targets below the primary target, but seismic imaging deteriorates with depth and these are not necessarily resolved in the reflection data. There are only two shallow well penetrations in PSC TL-OT-17-09, so consequently pressure prediction is loosely constrained. Whilst the presence of oil is the base case assumption in Rusa-1, the lack of offset well data in PSC TL-OT-17-09 makes it difficult to rule out the possibility of the presence of gas in this well. Consequently, a conservative approach has been taken and a gas case has been estimated as guide for highest case formation pressures expected and consequently a mud weight program has been designed to account for this scenario. Confidence in mapping of the deeper secondary targets is low, so whilst relatively low formation pressures are shown at these target levels these could be higher.

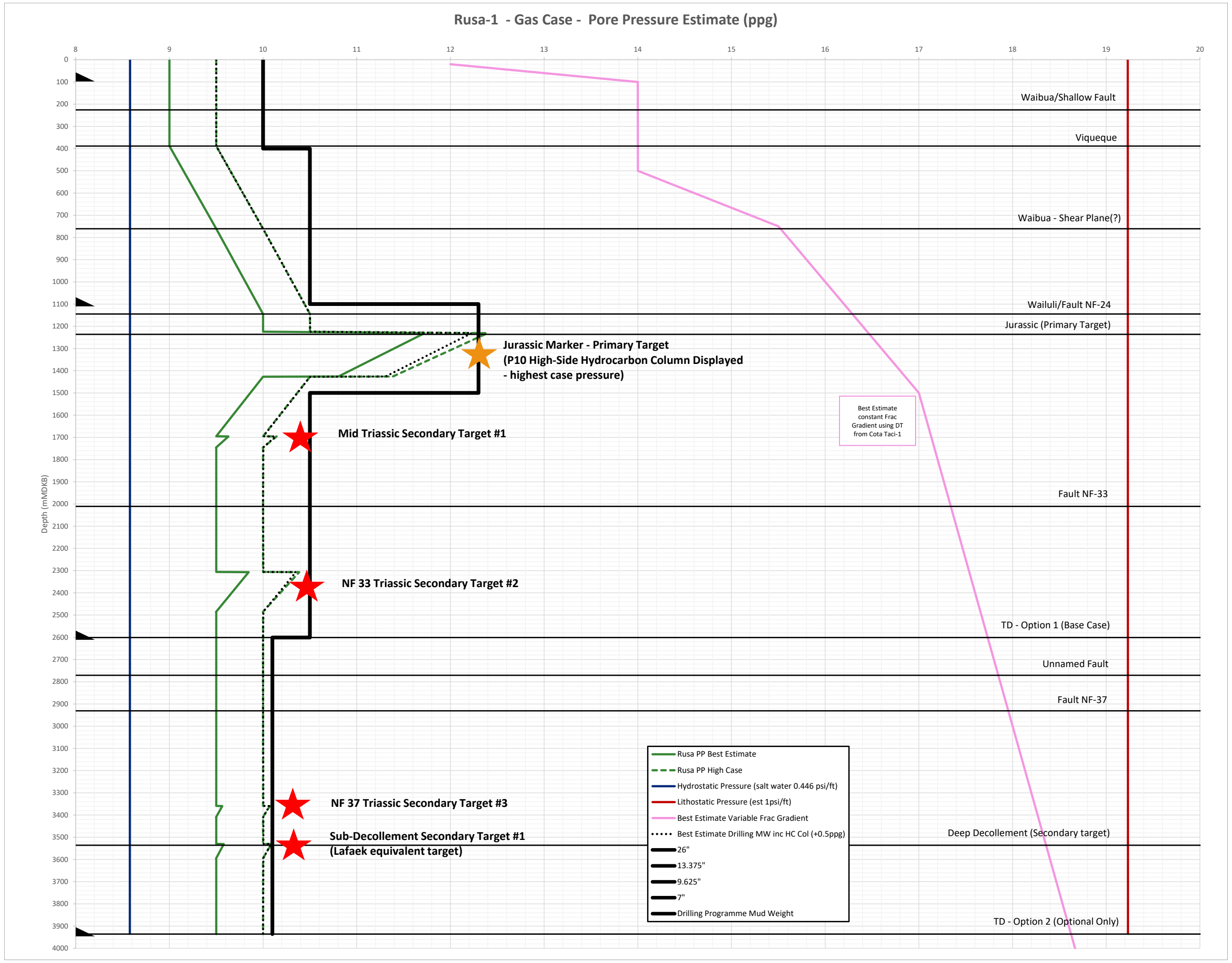

Figure 4-4. Rusa-1 Gas Case Pore & Fracture Gradient Prediction

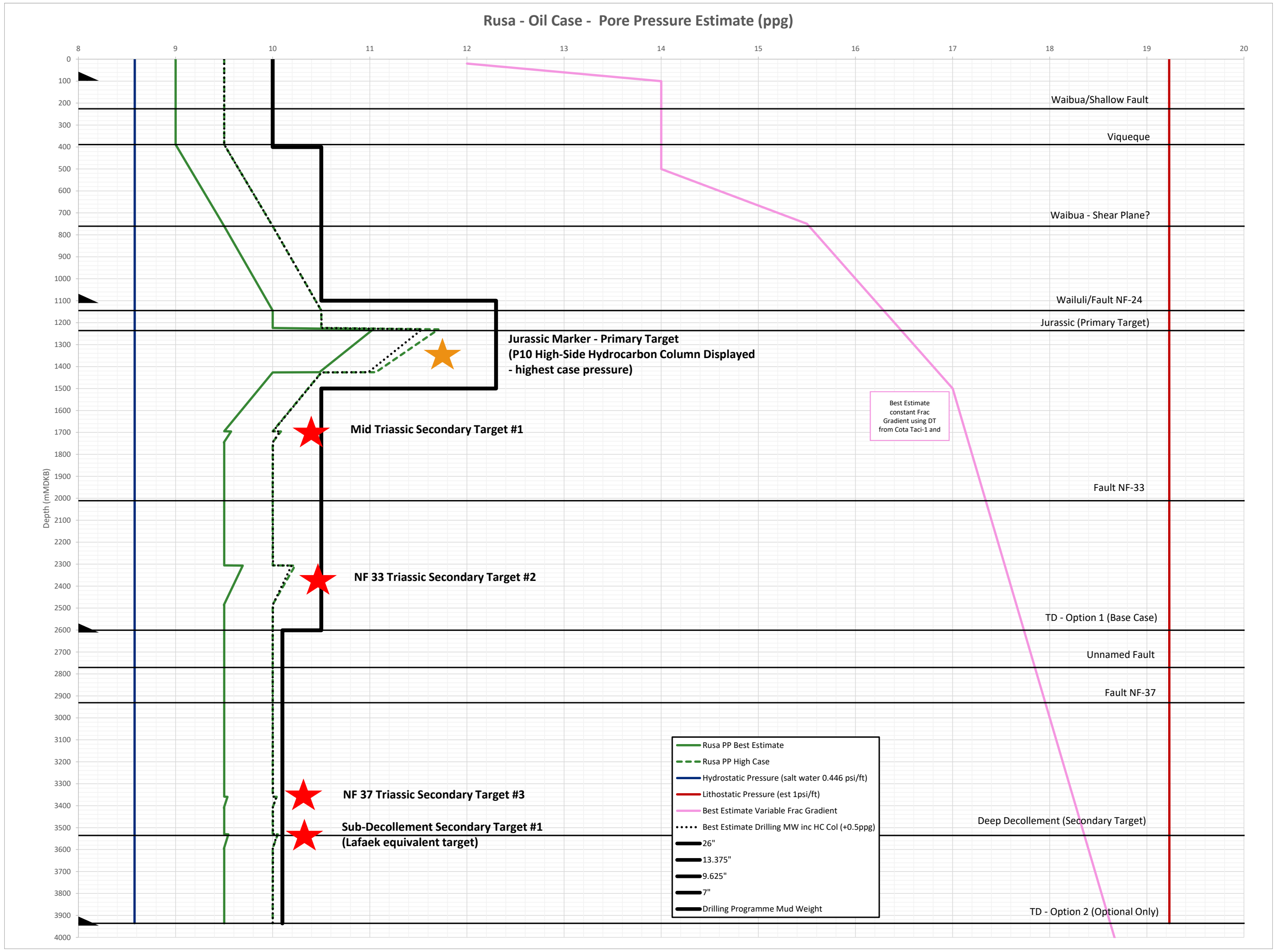

Figure 4-5. Rusa-1 Oil Case Pore & Fracture Gradient Prediction -1 Pore & Fracture Gradient Prediction

4.4.1.2.2 Mud System

In order to minimise environmental impact, non-toxic water-based muds will be utilised with typical properties as per Table 4-2 to Table 4-5. All chemicals utilised in the project were subject to strict vetting by ANPM as part of the import requirements, a comprehensive checklist was completed and approved by ANPM in May 2020, a full MSDS database is maintained.

Table 4-2: Surface Hole - 26” (0-88 m)

Mud Type	Gel based Polymer
Mud Weight	8.5 - 9 ppg

Table 4-3. Intermediate Hole – 17 ½“ (88-1100 m)

Mud Type	KCl/PHPA Polymer
Mud Weight	10-10.7 ppg
Plastic Viscosity	≤ 35 cP
Yield Point	16-24 lbs/100sq ft
Filtrate Water Loss	< 8 cc/30min
Mud cake	<1 (1/32in)
pH	9-10
Methylene Blue Test (MBT)	≤ 15

Table 4-4. Upper Production Hole – 12 ¼” (1100-2601 m)

Mud Type	KCl Polymer PHPA
Mud Weight	10.6-12.5 ppg
PV	≤ 35 cP
YP	18-28 lbs/100sq ft
API Filtrate/WL	< 6 cc/30min
API Mud Cake	<1 (1/32in)
pH	9-10
MBT	≤ 12.5

Table 4-5. Lower Production Hole (Optional Only) – 8 ½“ (2601-3936 m)

Mud Type	KCl Polymer PHPA
Mud Weight	10.1-10.3 ppg
PV	≤ 35 cP
YP	18-28 lbs/100sq ft
API Filtrate/WL	< 6 cc/30min
API Mud Cake	<1 (1/32in)
pH	9-10
MBT	≤ 10

Potassium Chloride / Polymer muds are the most widely accepted water-based mud system for drilling water-sensitive shales, with PHPA (Partially Hydrolysed Poly Acrylamide) being the polymer.

The principal additives for a KCL-Polymer mud are:

Soda Ash - Sodium Carbonate (Na_2CO_3) is used to treat calcium ion contamination in the mud and Sodium Bicarbonate ($NaHCO_3$) cement contamination. Classed as low toxicity.

Caustic Potash - Caustic potash (KOH) is added for alkalinity control in a KCl-Polymer Mud rather than caustic soda because it provides pH control. Generally, a pH range of 9.5-10.5 is considered optimum for running KCl-Polymer muds. Low toxicity, caustic, harmful if swallowed or skin and eye exposure.

Bentonite - Pre-hydrated bentonite is used to viscosify KCl-Polymer Muds. Typically, concentrations of 5-15 lb/bbl of pre-hydrated bentonite are adequate for mud viscosity and filtration control. Not programed to be used in these wells.

Starch - Starch is added for filtration control in KCl muds. A modified starch (starch treated with a biocide) is preferred, generally potato-based rather than corn-based. Low toxicity.

PAC LV - is a low-molecular weight polyanionic cellulose polymer, which is an extremely effective filtrate reducer. Low toxicity.

XCD Polymer - is a high molecular weight Xanthum Gum biopolymer, used to viscosify water-based muds and completion fluids. It is primarily a viscosity modifier. Low toxicity.

Potassium Chloride (KCl) - Potassium chloride is used to inhibit clay hydration. Low toxicity.

Barite - barium sulphate ($BaSO_4$) is a commonly used to add weight to drilling mud. Low toxicity

PHPA - Partially hydrolysed polyacrylamide (PHPA) is primarily added to encapsulate solids and provide inhibition by interacting with bentonite to improve rheology. Low toxicity.

Drilling-fluid constituents can be grouped into several categories, depending on their function in the drilling-fluid system. The major categories are weighting (density control) agents, viscosifiers, thinners, fluid loss reducers and lost circulation material. There are also several minor groups of additives used for specific control such as lubricants, detergents, emulsifiers, defoamers, foaming agents, bactericides and corrosion inhibitors.

Density Control
The main density control agent will be Barite ($BaSO_4$). Commercially produced barite normally contains 95 % barite ($BaSO_4$) along with some contaminants such as pyrite (FeS_2) and sphalerite (ZnS).

Like calcium carbonate, barite is a naturally occurring biologically inert material with an extremely low toxicity when tested in simple mud systems (Hudgins, 1991).

Viscosity Control

The additives used for controlling fluid viscosity are organophilic clays such as amine treated bentonite clay or natural organic polymers such as starch, gum, xanthan, or guar gum. Viscosifiers serve a dual purpose in providing carrying capacity to the fluid and in developing a filter cake on the borehole to reduce fluid loss to the formation. Bentonite (sodium montmorillonite) is the primary clay used for viscosity; however, several other types of clays (attapulgite, sepiolite) can be used. In some applications, bentonite is treated with a small amount of water-soluble polymer to extend the viscosity-building properties of the clay, however these inert clays and polymers have very low toxicity (Jones et al., 1986). It is unlikely that Bentonite will be used in the drilling as a significant proportion of the section (Bobonaro - if encountered, Borolalo, Viqueque and Wai Bua formations) contains naturally occurring Bentonite.

Corrosion Inhibitor and pH Control

Drill pipe corrosion and scale can be serious problems. Corrosion of the drill string and casing during drilling can be caused by entrained oxygen within the mud or by acidic gases (CO, CO_2 and H_2S) produced during drilling. Corrosion is reduced by the addition of an oxygen scavenger such as Sodium Sulphite. Oxygen corrosion can also be reduced by maintaining the drilling fluid at pH >11 or by the addition of lime ($Ca(OH)_2$). This has the added advantage of stabilising the emulsions in the muds. Sodium Sulphite is also used in the food and pharmaceutical industries, it has low toxicity at the concentrations employed in the mud system (NCBI 2020).

Fluid-loss Reducers

If properly conditioned, drilling fluids should deposit a layer or filter cake on the wall of the borehole to help prevent liquid from the mud from entering the formation. These fluid-loss reducers are primarily the clays used for viscosity control, and material such as polymers. Both natural and synthetic polymers have been utilised as fluid-loss reducers.

Starch was one of the first polymers used, followed by sodium carboxy-methylcellulose (CMC), and several varieties of polyanionic cellulosic polymers, terpolymers and polyacrylates. The earlier natural polymers were subject to bacterial decay and required a preservative. The newer modified polymer systems are less susceptible to bacterial problems, and the need for preservatives in this regard has declined. The toxicity of the major polymers used today to control fluid loss (CMC, polyacrylates, etc.) is low-to-non-measurable (Jones et al., 1986 and Leuterman, et al.,1989).

Specialty Chemicals

Many commercial chemicals are utilised for speciality functions in drilling fluids including pH control (caustics), ion balance (potassium sources, carbonates), and corrosion control (zinc compounds). Most of the elements are naturally present in the environment and are used in limited quantities during drilling.

Lost Circulation Material

Lost circulation additives are primarily water-insoluble fibrous, filamentous, granular, or flaked material, with the most common materials used being nut shells and husks, mica and paper.

These naturally occurring products have not traditionally been bioassay-tested in drilling fluid systems because they are chemically inert and considered to be non-toxic at the level used. Any detrimental effect would be related to a mechanical, abrasive smothering action rather than chemical toxicity.

Specific-Use Additives

Lubricants are frequently utilised in water-based systems to reduce friction and prevent sticking. The traditional practice when pipe stuck was to pump a spotting fluid (50 to 100 barrels of No.2 diesel) into the stuck area to help free the drill string. The oil was later removed for separate disposal or mixed into the mud system as an added lubricant. Diesel spots have declined in use, because of regulatory constraints, and are being replaced by a variety of less toxic mineral oils. Lubricants containing oils can have relatively high toxicity levels. However, if used selectively and in moderation, regulatory compliance may still be met. A number of additives (e.g. emulsifiers, defoamers, surfactants, detergents, corrosion inhibitors and bactericides) are used at low concentration to impart specific characteristics to a mud or to treat problems. The toxicity of these products varies greatly; however, such a small volume is used that the toxicity of the overall mud system is low enough to meet regulatory compliance (Jones et al., 1986, Leuterman et al., 1989 and Hudgins, 1991).

Cement Chemicals

Portland cement is the largest component of the cement chemicals and is essentially made up of materials such as sand, alumina and bentonite clay, with calcium and sodium chloride occasionally present. These basically inert materials comprise about 97-98 % of the cement usage and discharge.

Some other categories of chemicals may be used to impart special properties to cements and are often placed deeper in the well where temperatures are higher. These chemicals are not normally discharged except as minor contamination in drilling mud. Minor amounts may be discharged when mixing systems are flushed.

4.4.1.2.3 Borehole and Casing Design

Safe Operation Principle

Well design will:

- Comply with regional laws, regulations, and best industry practice.
- Be designed to avoid drilling different formation pressures in same hole section.
- Be designed to have enough overbalance pressures to control well and to mitigate possible differential sticking mechanisms.
- Be designed to consider wellbore stability and/or weak/lost circulation formations.

Casing Setting Depth Principle

The first criterion of selecting casing setting depth is the overbalance pressure without fracturing shallow formations. Kick tolerance volume is also considered for determining the casing setting depth. The formation that has been cased, needs to withstand the operation of drilling, tripping in/out, and well control for the next hole section.

Economic Principle

To deliver reduced drilling time and cost, optimize hole sizes and subsequent casing sizes. Detailed planning of operational sequence and procedures also allow for cost savings, for example, using a liner hanger in combination with production casing to allow for contiguous testing of two intervals after reaching TD.

4.4.1.2.4 Well Design and Casing Selection

A 13 $^{3}/_{8}$" or 20" external/internal flush joint conductor casing will be set at approximately 88 m below the deepest known aquifer regionally, wells near Betano township encountered water between 14 and 35 m. The surface conductor will also cover possible unconsolidated river gravels and boulders in the top 50 m.

The proposed upper production (base case) and lower production (optional only) borehole casing setting depths are provided in the Table 4-6 below. The actual setting depth will be determined during drilling and subject to actual conditions encountered. The casing depths and sizes are designed to isolate sections based on pressure, presence of reservoir, consolidation of formation, kick tolerance and hole stability.

Leak Off Tests (LOT) will be conducted at the previous section casing shoe prior to drilling ahead in new hole. Drilling mud weights will initially be based on pore pressure prediction and then adjusted to suit actual conditions. Static and dynamic (Equivalent Circulating Density) mud weights will be maintained as low as possible, whilst allowing for safety margins, to maintain overbalance without causing excessive formation damage. The upper limits of mud weight will be dictated by predicted and actual (from LOT) fracture pressure and casing strength (Table 4-7).

Kill muds of density less than the maximum fracture weight allowable for the hole section will be prepared and available should formation flow occur. Similarly, Lost Circulation Material (LCM) will be on hand to combat any downhole losses.

Table 4-6. Hole and Casing Setting Depths (target sections highlighted in green)

Hole Section	Hole	Casing	Depth (m MD)
Conductor	26"	20"	88
Surface Casing	17-1/2"	13-3/8"	1100
Upper Production Casing – Base Case	12-1/4"	9-5/8"	2601
Lower Production Liner - Optional Only	8-1/2"	7"	3936
Contingency hole	6"	4 1/2"	3936

Table 4-7. Casing Ratings Table and SF Calculated Load for Rusa-1

Hole (In)	Csg (in)	Grade	Weight (ppf)	Rating			Safety Factor Calculated Load		
				Collapse	Burst*	Body Yield	Burst	Collapse	Tension
17-1/2	13-3/8	K-55	54.5	1130	2730	853000	1.85	2.25	3.16
12-1/4	9-5/8	N-80	47	4754	6865	916000	1.11	1.03	2.45
8-1/2	7	L-80	29	7030	8160	1086000	1.16	1.01	1.60

*These are nominal burst pressures. For BTC connection

4.4.1.2.5 Well Casing Configuration

The borehole and casing design shown in Figure 4-6 has been determined by the geological interpretation and drilling engineering assessment and is subject to the down hole conditions encountered during drilling.

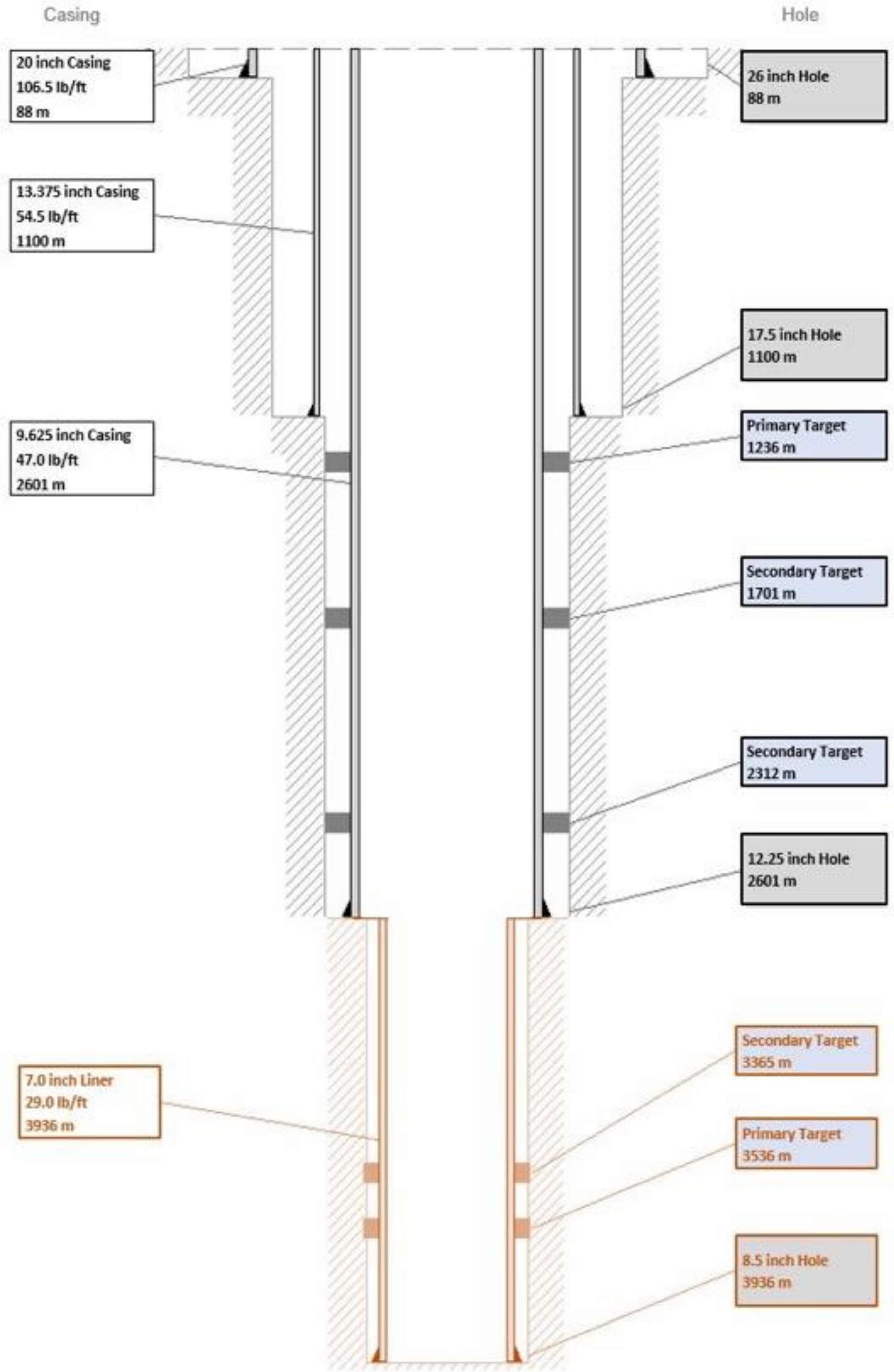

Figure 4-6. Rusa-1 wellbore and casing design schematic.

Base case borehole and casing design shown in grey and additional lower production interval (optional only) shown in orange.

Summarised Drilling Program

26" hole & 20" Conductor Casing

The objective of the conductor casing is to case the hole through the ground water, shallow aquifers, possible unconsolidated river gravels and boulders and altered limestones of the Borolalo Formation that are found in the near surface. Based on water well data for aquifer depths in PSC TL-OT-17-08, the deepest regional aquifer was-found at 82 m.

Casing used for conductor will have external and internal flush joint and comply with API 5L, PSL-2 (Specifications for Line Pipe). A remedial cementing job (top up job) will be performed if there are no cement returns to surface.

17 ½" Hole & 13 $^{3}/_{8}$'' Intermediate Casing

The objective of intermediate casing is to isolate possible loss zones e.g. faults and the unstable clays of the Wai Bua and Viqueque formations, which are also likely to contain elevated pressures, before entering the target reservoir and to provide sufficient LOT and kick tolerance to safely reach next section TD.

There is limited offset well data in PSC TL-OT-17-09 (only 2 shallow wells), but these wells show that the shallow formations contain shale and/or clay. KCl will be added to the drilling fluid to inhibit swelling and bit balling.

The objectives for formation logging can be achieved by using electric line logging suites (electric logs, sidewall cores and pressure and fluid sampling), Directional surveys will be obtained with a combination of General-Purpose Inclinometry Tool (GPIT) and magnetic single-shot surveys for inclination and azimuth measurements. A mud motor will be available to correct for any significant deviation from a vertical hole.

Wiper trips and circulation ensure clean hole conditions prior to the logging operation. If necessary, the mud weight will be increased prior to logging, to maintain overbalance.

Casing grade is chosen to withstand the worst burst and collapse load scenario. Setting the casing seat as low as possible is required to provide an acceptable kick tolerance volume for well control operations.

Quality cementing operations will provide good isolation of well bore to surface. Cementing sequence and slurry weight are designed to prevent loss circulation during the cementing operations. The integrity of the cement will be confirmed by a wireline Cement Bond Log (CBL).

12 ¼" Hole & 9 $^{5}/_{8}$'' Upper Production Casing

The objective of the 12 ¼" hole section is to drill both the primary Jurassic reservoir target and possible Triassic secondary targets and run 9$^{5}/_{8}$'' casing to surface. Two possible production hole sections are programed to isolate the primary target interval (9$^{5}/_{8}$'' casing) ahead of potentially drilling for deeper secondary targets - optional only (7" Liner- see below). The two production intervals are designed to reduce the risk of loss circulation into a formation with relatively lower pressure and to provide sufficient kick tolerance for the deeper targets.

Conventional cores will be acquired during the drilling of the interval. After reaching section TD wireline GR-Sonic-Resistivity-Neutron-Density-SP-Caliper log, Sidewall Cores and Pressure, tests will be run for formation evaluation. Fluid flow and sampling may be undertaken with a Wireline Formation Tester e.g. MDT in open hole or when this section is cased.

The casing will be cemented to surface and a CBL run to confirm integrity.

Further well testing operations may be considered in the event of a discovery.

8 ½ " Hole & 7" Lower Production Liner (Optional Hole Section Only)

The objective of the 8 ½" hole section is to drill the lower Triassic and Sub-Decollement reservoir target(s) and run a 7" liner with hanger set inside the 9$^5/_8$'' casing shoe. The rationale for this configuration is to allow for the possibilities of perforation of both the upper and lower production intervals after reaching the deeper TD. If a full casing string was run to surface there would be two casings across the upper target which would preclude perforation and necessitate perforating and testing the upper target prior to drilling and casing the lower target.

Conventional cores will be acquired during the drilling of the interval. After reaching section TD wireline GR-Sonic-Resistivity-Neutron-Density-SP-Caliper log, Sidewall Cores and Pressure tests will be run for formation evaluation. Fluid flow and sampling may be undertaken with a Wireline Formation Tester e.g. MDT in open hole or when this section is cased.

The Liner will be cemented back to the hanger inside the 9$^5/_8$'' casing.

Further well testing operations may be considered in the event of a discovery.

6" Hole & 4 ½" Liner – Contingency Only

Contingency is planned for a 6" hole section in the case where an additional primary casing size is required due to drilling conditions. The 6" hole section can be completed with 4 ½" Liner. The objective of using a liner hanger instead of long string casing is to minimize the wellhead sections.

After reaching section TD, wireline investigation will commence for the full suite of electric logs and pressure and fluid sampling will also be undertaken if required. Sidewall coring will not be achievable in the 6" hole size.

If the secondary target is proven to not be hydrocarbon bearing, the 6" hole can be plugged and permanently abandoned without running the Liner.

4.4.1.3 Suspension or Abandonment

After the well has been evaluated and tested a decision will be made to either Plug and Abandon (P&A) or Case and Suspend the well at the TD of 2601 m for further testing, or for future conversion to a production well, or to consider future re-entry and deepening of the well for the evaluate the deeper secondary targets identified down to 3936 m (if not drilled in this program).

If the well is deemed to not contain hydrocarbons cement plugs will be set to isolate any porous units, either in open hole or casing if perforated. The composition and length of the plugs will comply with industry standards and the P&A program as approved by the Regulator. After the well has been abandoned the wellsite will be rehabilitated, with a permanent marker placed at the surface hole location.

In the case that the well contains hydrocarbons that are commercial or could be commercial with further testing or appraisal well drilling, a suspension procedure will be carried out. The suspension will be approved by the Regulator and may consist of temporary plugs, surface cap or wellhead ("Christmas Tree"). If future operations are not envisaged to require the full exploration drilling pad the wellsite area may be scaled down and the immediate area of the wellhead fenced off and secured.

4.4.2 Size of the Project

PSC TL-OT-17-09 has an area that covers 1,291 km^2, including 1,002.4 km^2 onshore extending along the coastline for approximately 52 km and up to 30 km inland, and 288.6 km^2 of the near offshore for an average distance of 6 km from the coastline.

The area required for the drilling campaign is 2.5 ha in total which includes an allocation of land for the well pad (approximately 1ha), mud pits, flare pit and areas allocated for earthworks drainage. In addition, Timor Resources will also build access roads from the nearest existing arterial or local road. The Betano base camp at Betano, previously used by Timor Resources for acquisition of the Fafulu 2019 2D seismic survey, is the central camp for crew during the drilling of Rusa-1 and occupies 1.3 ha. The existing Haemanu camp in PSC TL-OT-17-08 will support drilling activities as a regional supply base (Suco Labarai) and occupies 1.8 ha.

4.4.3 Location of the Project

The locations of the Rusa-1 wellsite and the Betano base camp are shown in Figure 1-1 and Figure 4-2 with the location access options shown in Figure 4-7.

The Rusa-1 well is located in the Ainaro Municipality, Hatu-Udo Sub-district of Suco Foho-Ai-Lico and Aldeia Raimerlau. The proposed location is 3.4 km south of Daisua and is a 7.6 km northwest inland from the nearest coastline town of Betano (Figure 4-2). The exploration drilling campaign requires the building of a wellsite and access roads from the nearest public roads at this location. A short-term rental payment will be negotiated with the landowner for the wellsite, where on private land

Timor Resources considered alternative surface locations based on the optimal subsurface target location for the well. Suitable alternatives required that the area be relatively level to reduce the impact of environmental impact of volumes of cut and fill in civil works operations, land use for cultivation and habitation, ownership dispute resolution. Viable alternatives were very few and based on these criteria there was no comparable alternative identified as part of this process.

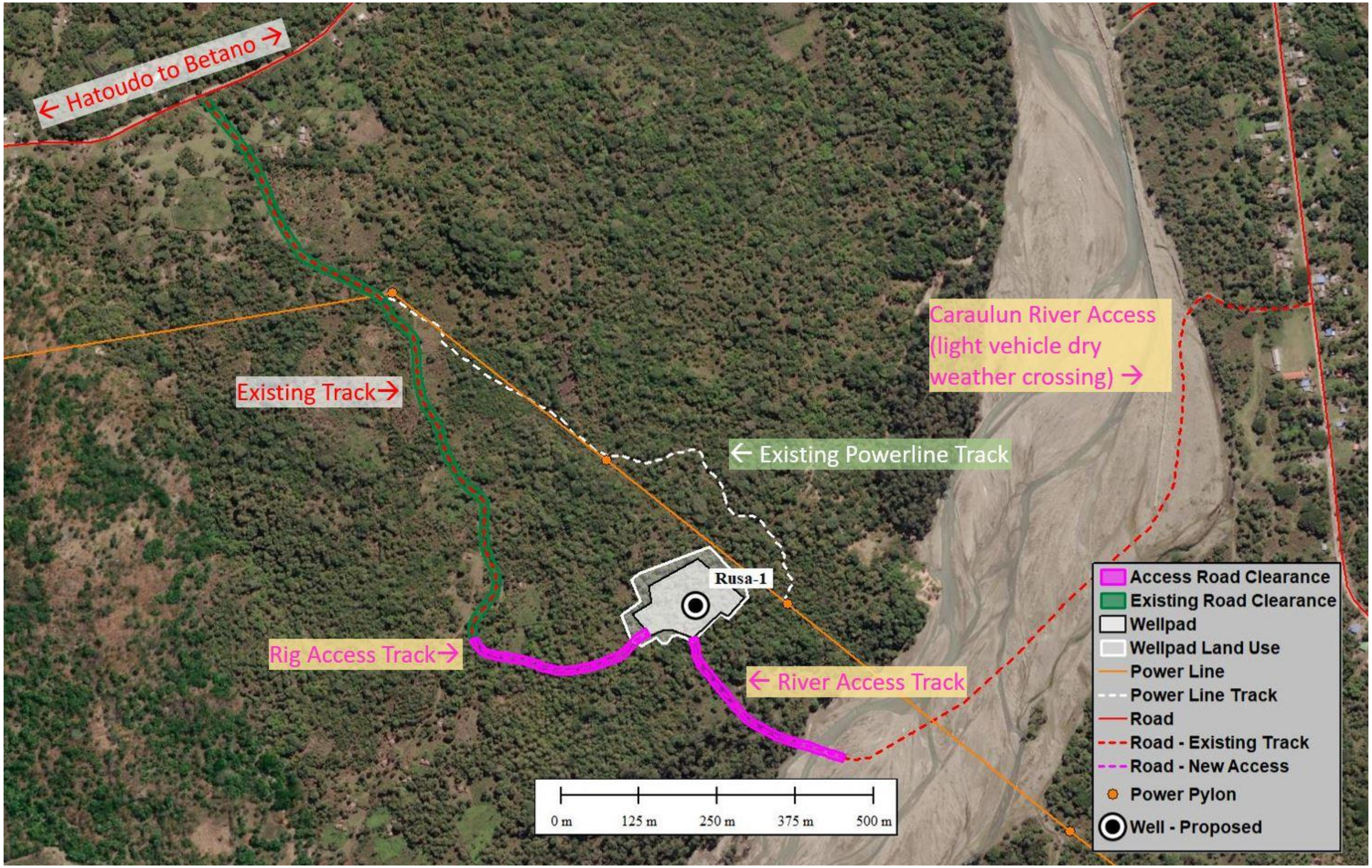

Figure 4-7. Rusa-1 wellsite and base case access routes

The Betano base camp is currently leased and located adjacent to the shoreline at Betano, it is the central camp for the Rusa-1 drilling operations and will provide accommodation for the off-duty workforce, canteen facilities and provision for the collection, segregation and disposal of waste and recyclable materials.

The Proponent will consider all aspects including aesthetic, socio-economic, environmental, safety and health issues when conducting the project activities. Infrastructure and operation requirements will be designed to comply with the legislation and industrial best practice.

Project Location Maps

Project maps covering the Rusa-1 drilling location, the Betano base camp and Haemanu supply base are provide in Figure 4-8 above and in Section 9.3.7 Noise Figure 9-4 and Figure 9-5. Figure 4-8 covers an area of approximately 3 km radius from the well location.

The 350 m extent maps include road networks, the wellsite perimeter, urbanised areas and individual buildings and other infrastructure. An indication of the potential for the noise impact within the area is also shown. Air quality impact is not included as it is subject to ambient levels and environmental conditions such as wind speed and direction, this is covered in more detail in subsequent sections of this report.

The two map scales were chosen after assessment of zones of potential impact for the drilling program.

Drainage

A 30 m Satellite DTM was used to compute a watershed analysis for the wellsite (shown in Figure 4-8). The analysis provided the catchment area upstream of the wellsite and the direction of flow(s) away from the site. The drilling location will have berms to distribute surface water run-off around the site and minimize disruption of natural flow patterns. Surface water that falls on the site will be diverted to a watercourse on the downstream side of the wellsite. Catchment areas and downstream flow extent are provided . Table 4-8.

Table 4-8. Catchment Areas and Outflow Length

WELLSITE	CATCHMENT (m^2)	DIVERTED OUTFLOW LENGTH (km)	NATURAL OUTFLOW LENGTH (km)
RUSA-1	2,551	0.052	11.24

Access

The primary access to Rusa-1 wellsite will likely be from the northwest along the Hatu-Udo Road and then south along an existing track towards the wellsite.

Timor Resources is seeking approval for the access roads captured in Figure 4-7. Additional civil engineering and landholder discussions will form the basis of the most appropriate access for the project, when selected this land will be leased in the same manner as the wellsite. The access immediately west of the wellsite and veering northwest is 1000 m of existing track (minimal additional clearing) and 750m of new track to get to the gate at the wellsite and to access gravel for site construction from the Caraulun river immediately south of the wellsite (see Table 4-9), from this point a riverbed track to the northeast can be used to access the Betano-Same road. The river crossing is restricted during heavy rainfall periods when the river may swell in capacity and is likely to be restricted to light 4WD vehicles only. The clearance access roads will be 6 m wide and each clearance access route option will be +/- 50 m to allow for any change during clearing. Existing public infrastructure such as highways and local roads, bridges and underpasses have been assessed. If required, they will be upgraded or modified with approval of the relevant authorities to allow for the safe mobilization of the equipment to the project locations.

Table 4-9. Length and Areas of Access Roads

LOCATION	ACCESS ROAD LENGTH (m)	APPROXIMATE AREA (m^2)
RUSA-1 EXISTING TRACK	1,000	6,300
RUSA-1 NEW ACCESS TRACK	750	1,866
RUSA-1 WELL ACCESS TO CARAULUN RIVER		1,944
BETANO BASE CAMP	7	70
HAEMANU SUPPLY CAMP	8	80

Observations at Specific Locations

Rusa-1: The wellsite lies on a flat area, between two small natural watercourses on a generally south-easterly dipping slope. The catchment area draining to the wellsite is of limited extent (2,551 m^2) and will be diverted to the adjacent watercourses. Two knickpoints in the watercourses have been identified as suitable locations for spill containment of approximately 25,000 bbls if required.

The area surrounding the site has a low habitation density, noise and air quality impacts will be low and will be monitored.

The location is susceptible to access issues if operations were to be conducted in the wet season. The gradients on the Hatu-Udo road are high in places and could preclude movement of heavy equipment if on unsealed sections and wet.

Betano Base Camp: The camp at Betano has been operational from 2018 to the present day, during the seismic acquisition in 2019 the accommodation at the camp was more than 100 people. There has been no significant impact on the surrounding community since the camp was installed, this is expected to continue through the drilling operation.

Haemanu Warehouse and Yard: The noise levels from the yard will be low, the main contributions being from heavy vehicle movement (daylight hours only) and a small generator to provide camp power if the EDTL supply is interrupted.

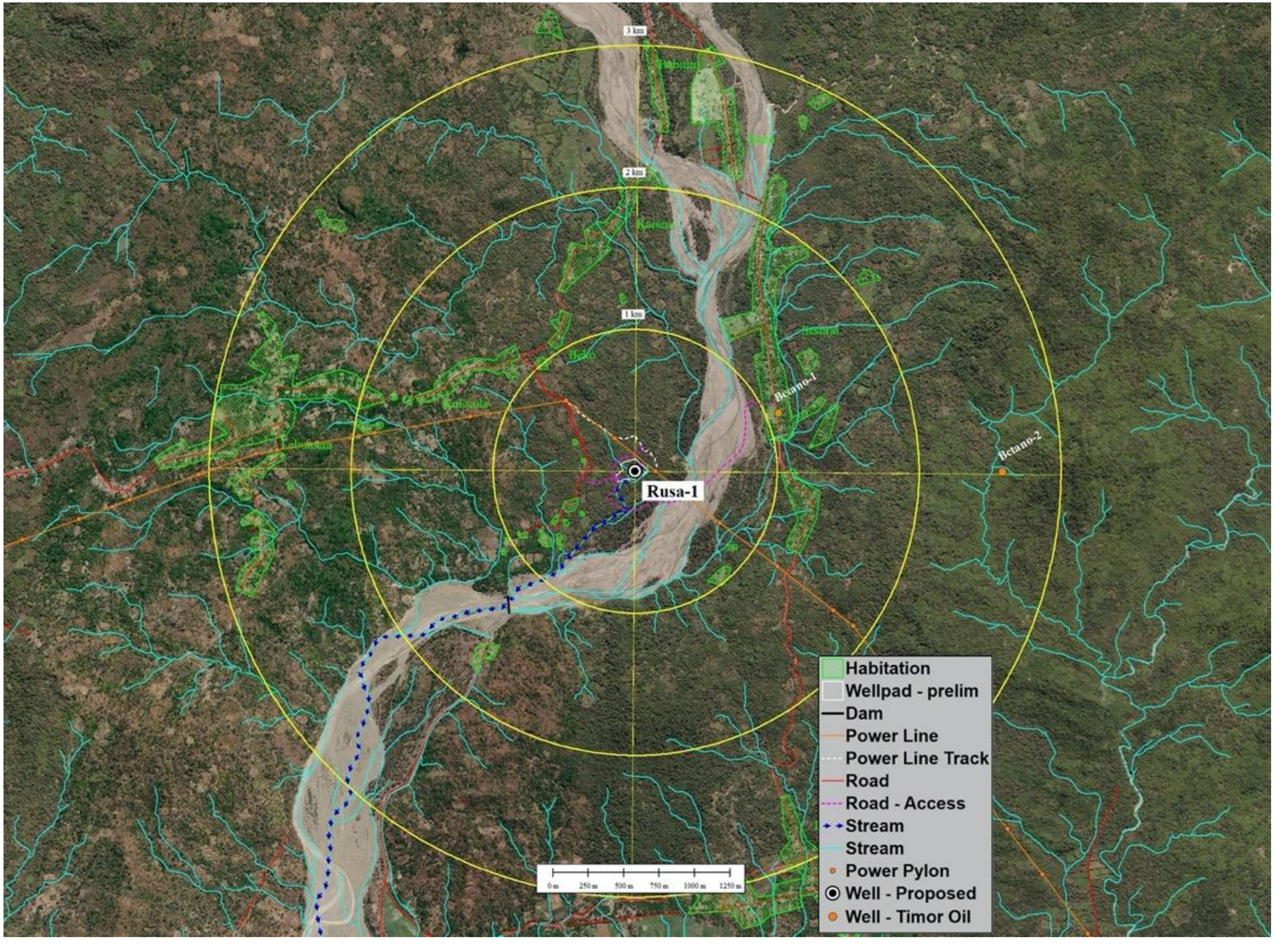

Figure 4-8. Rusa-1 Regional Area of Potential Impact

4.5 Justification of Project

Timor Resources is a privately-owned Timor international oil and gas company that is in joint venture with TIMOR GAP, the National Oil Company of Timor-Leste . On the 7th of April 2017, Timor Resources engaged an agreement with the Timor-Leste Government permitting the company, with its partners, to begin the process of exploration, development, and exploitation of petroleum resources in the onshore contract area, identified as PSC TL-OT-17-09.

In assessing the petroleum prospectivity within the contract area Timor Resources has conducted extensive geological, geophysical and engineering studies including successfully acquiring two new 2D seismic surveys across PSC TL-OT-17-08 and PSC TL-OT-17-09 in 2018 and 2019, respectively. The interpretation of this data has led to the identification of number of leads, one of these Rusa-1 has been high graded to prospect status and is deemed drill ready. The next step is to drill the Rusa prospect with an exploration well to test the presence of hydrocarbons. In the event of success, the exploration drilling will need to be followed by later stage of appraisal drilling, likely multiple wells, in order to delineate the volume of the potential resource and assess its producibility i.e. how many wells and what type of completions will actually be required to produce a field to its maximum potential. These two phases of exploration and appraisal drilling are critical ahead of any final investment decision regarding a possible development future development. The exploration drilling of the Rusa-1 well will assess the presence of hydrocarbons in the Rusa prospect and will collect numerous data from the penetrated section including both physical and geophysical properties of the rocks and any hydrocarbons potentially encountered.

The Rusa-1 exploratory borehole is a minimum exploration work requirement for the joint venture for the First Period (Contract Year 3 – current year) of PSC TL-OT-17-09.

Success in this phase of exploration drilling is a critical next step on the path to realise value for the joint venture, Timor-Leste Government, and the people of Timor-Leste. Timor Resources has invested time and effort in building local team capability and has already demonstrated the associated value in terms of local employment related to Timor Resources' activities, but also community projects that Timor Resources has committed to since country entry in 2017.

Timor Resources is committed to exploration drilling in PSC TL-OT-17-08 and PSC TL-OT-17-09 in 2021 and believes that these efforts made by Timor Resources will bring significant value to Timor-Leste well beyond the boundaries of these two PSCs and as such is recognised as project of national significance.

4.6 The Proponent's Approval of the EIA

Timor Resources management approves the contents of this report and is committed to implement the controls, to the best of their ability, as contained herein.

Name	Position	Signature
Suellen Osbourne	Chief Executive Officer	Suellen Osbourne
Robin O'Leary	Group General Manager	Robin O'Leary

4.7 EIS STRUCTURE

The EIS is prepared in accordance with the template provided in Annex 4 of the Diploma Ministerial No.46/2017 of the 2nd August. Hence, this EIS contents contain:

1. Executive Summary.
2. Details of the Project Proponent.
3. Details of the EIA consultants.
4. Description of the Project.
5. Policy, Legal, and Institutional Framework
6. Description of the Environment.
7. Climate Change.
8. Alternatives.
9. Impact Assessment and Mitigation Measures.
10. Social Impact Assessment.
11. Economic Assessment.
12. Summary of Environmental Management Plan.
13. Public Consultation and Information Disclosure.
14. Difficulties encountered.
15. Conclusions and recommendations; and
16. Non-Technical Summary.

5 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 LEGISLATION

Applicable national legislation and industry guidance are referenced in Table 5-1 which provides a summary of the principal legislation and regulations applicable to the project, in addition the table includes relevant International and Industry Guidance that has been consulted in the course of the study.

Compliance will be met with the two key regulatory instruments relating to environmental management, that is Law 5/2011 on Environmental Licensing and Law 18/2020 on Onshore Petroleum Operations, particularly in regard to Chapter XVII on Environmental Affairs Articles 138 to 160. Timor Resources approach to compliance is demonstrated in Table 5-2 which provides an illustration of how compliance is met through the Timor Resources Operating Management System (OMS) as described in Section 5.2.2 below

Table 5-1. National Legislation and International and Industry Guidance Documents

TITLE	DESCRIPTION	RELEVANCY TO THE PROJECT
Timor-Leste National Legislation and Regulation		
Constitutions of the Republic Democratic of Timor-Leste Article 61 (Environment)	The article specifies provisions for state including the proponent shall undertake to defend, and safeguard the environment recognizes the right of all citizens to a humane, health and ecologically balances environment while also specifying the duty of everyone to preserve and protect the environment for the benefit of future generation	Provide the basis for environmental protection and safeguarding in the Country
Environmental (Licensing) Decree Law No.5/2011	The procedure for directing the environmental assessment, the review of application for environmental license, issuance and renewal of license. • Categorization of the project category according to severity of the environmental impacts. • Procedures and information requirement for Category A project • Organization and composition of the review committee and its duties and responsibilities. • Specific provisions for public consultation and the protection of the traditional customs and cultural practices. • The issuance of the decision by the Environment Authority on the review of the application and the rights of the project owner to appeal the decision.	Provides the Environmental Licensing procedure to regulate actions to encourage and protect the nature as an important instrument for sustainable development of economy of Timor-Leste
Decree-Law No. 6/2020, of 6 February 2020	Complements the Protected Areas National System, and the Environment General Framework sets forth the legal framework applicable to conservation of biodiversity and sustainable use of its components. The main goal of this statute is to promote the conservation of biodiversity and the sustainable use	Promotes the conservation of biodiversity and the sustainable use, and sets the principles which stakeholders must

	of its components and the fair and equitable distribution of the benefits generated from genetic resources, as a fundamental component of family subsistence, food safety and the welfare and health of present and future generations. For this purpose, the statute also sets forth the principles which the various stakeholders must comply with and the rules on interaction between public entities.	comply with and the rules on interaction between public entities.
Decree Law No. 5/2016 – National System of Protected Areas (Annex 1 – List of Timor-Leste Protected Areas)	This Decree Law defines the norms and principles for the creation of the national system of terrestrial and marine protected areas, for the classification of protected areas and for the approval of the applicable management instruments, according to the international best practices, in the matter, duly adapted the national reality, without forgetting the important role of community authorities and existing customs.	Provide the basis for the protection of the terrestrial and marine protected areas without putting aside the important role communities, authorities and existing customs.
Decree Law No. 3/2012 on Basic Environmental Law	The Decree Law identifies the protection of the environmental life and wildlife protection, including the basic principles for the conservation, preservation and sustainable use of natural resources in order to improve the quality of life of the local populations.	Communicate to the communities by providing information on the basis for the protection of environment and wildlife protection and sustainable use of natural resources through public consultation
Diploma Ministerial No.44/2017 – Impact Benefit Agreement	The article specifies the process for the agreement between the project proponent and the local community regarding the advantages and disadvantages of the project	As this is a category A project, the IBA will be implemented if it proposed by a member of community to ensure local or community's interest is considered and agreed proposal shall be implemented
Diploma Ministerial No.45/2017 – Rules and Procedures of the Evaluation Committee for Project with Category A	The article specifies the importance of establishing rules and procedures for the evaluation committee for the management of the environmental evaluation process for projects in category A	Establishment of a committee in order to review the project that categorise into category A.

Diploma Ministerial No.46/2017 – Detail requirements of Classification, Initial Assessment and Terms of Reference, Environmental Impact Statement and Environmental Management Plan	The article specifies the necessary of establishing a regulation to regulate projects that may have significant impacts on the environment, while also specifying the procedures and requirements to select projects that classified into category A, B and C.	Provides the environmental licensing and classification of the project into category A.
Diploma Ministerial No.47/2017 – Public Consultation Procedure and Requirement during Environmental Baseline Process	This Diploma Ministerial specifies the procedures and requirement of involvement of public and communities into different stages of the environmental assessment process through public consultation.	Provides information and communicate to the communities by providing information on the basis for the protection of environment and wildlife protection and sustainable use of natural resources through public consultation
Decree Law No 27/2020 dated 19 June Organic Law of VIII	Constitutional Article 33 (c) (Minister of Petroleum and Minerals) responsibilities item (o) Considering the complexity and technical expertise of the oil and mineral resources sector, conduct the respective environmental licensing procedures and approve the corresponding environmental licenses in that sector	Provides a description of legal framework that empower Ministry of Petroleum and Minerals to issue environmental license.
Decree-Law No.18/2020 Onshore Petroleum Operations	Applies to Onshore Petroleum Operations including transportation, processing and storage of Crude Oil and Natural Gas with direct impact on any reservoir. In addition covers a broader scope of issues related with onshore activities, notably a legal statute that also addresses environmental and technical aspects related with the carrying out of onshore Petroleum Operations, such as rights of way through, on or over the land destined for Petroleum Operations, installation of pipelines, rules on geological, geophysical or geochemical surveys, environment. This Decree-Law No.18/2020 of 13 May also stipulated on matters pertaining to means and ways of intervention, expropriation, nationalization and privatization of means of production and land on grounds of public interest, as well as criteria for the establishment of compensations in such cases,	Provides the fundamental legal framework for all oil and gas operations onshore Timor-Leste

	including the appeal to the Government in case of any land dispute occurred.	
Forestry, Aquaculture and Fishing Legislation: Law No. 14/2017 – General Regime of Forestry	The article outlines the basic principles and standards for the management, protection, conservation and sustainable use of forestry and river basin resources. Moreover, it describes the importance of communities that utilise the forests to their need and prosperity and promoting sustainable development	Provide legal framework of the fundamental norm of the environmental protection and preserving the natural resources existence in the forests for sustainability of the economic development
Labour Legislation Law No. 4/2012 – Timor-Leste Labour Code	This law describes the rights between employers and workers in regard to the working hours, leaves, remunerations, compensations and health and safety welfares	Provide basis for the project proponent to set up a working condition and contracts between employer and employee
Land legislation Law No. 13/2017 - Especial Regime for the Definition of Land and Property	This law provides legal jurisdiction of the owners of lands and the individual rights of their private properties according to the Article 54 (1) of the RDTL Constitution	As the legal basis for the project proponent to identify, access and compensate for any land used during the project activities
Waste Management Decree Law No.33/2008 – Hygiene and Public Order Decree Law No. 2/2007 – Urban Residual Waste Management	This law provides legal framework to manage the urban solid waste and ensure promoting the hygiene in the workplace	As the legal basis for the project proponent to manage solid waste are produced during any project phase. This to be set as the minimum criteria for the Timor Resources to establish its own waste management system
Cultural Heritage Legislation: Government Resolution No.25/2011 – Protection of Cultural Heritage (Annex 4)	This Government Resolution is used to protect and preserve Timor-Leste's cultural heritage until the Cultural Heritage National Law is made available. The resolution defines the type of the cultural heritages; archaeological heritage, architectural heritage, ethnographic and traditional heritage and intangible heritage	The resolution provides scope or boundary of the cultural heritage which has to be considered by project proponent.
International and Industry Guidance Documents		
Western Australian Department of Mines and Petroleum "Guidelines for the	Provide Guidelines for the development onshore OSCP Provide mitigation measures to oil impacts sourced from the drilling activity.	Provide Guidelines for the development onshore OSCP Provide mitigation measures to oil impacts sourced

Development of an Onshore Oil Spill Contingency Plan 2016”		from the drilling activity.
International Finance Corporation Environmental, Health and Safety Guidelines for Onshore Oil and Gas Development; April 30th, 2007	The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice. The guidelines are industry specific for onshore oil and gas and are designed to be used together with the General EHS Guidelines document (see below), which provides guidance to users on common EHS issues potentially applicable to all industry sectors.	Provide guidance on the application of good environmental practice.
International Finance Corporation Environmental, Health and Safety General Guidelines; April 30th, 2007	The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice.	Provide guidance on the application of good environmental practice.
United Nations Convention on Biological Diversity (UNCBD)	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives: 1. The conservation of biological diversity 2. The sustainable use of the components of biological diversity 3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources	Timor-Leste is rich of the biodiversity with significant ecosystem and endemic species. The country signed the convention in 2001. As the project could have impacts on the flora and fauna or risk to the loss of the biodiversity, it is fundamental principle for the project proponent to prevent or minimise the risk of biodiversity loss during the project implementation
United Nations Framework for Climate Change Convention (UNFCCC)	The United Nations Framework Convention on Climate Change (UNFCCC) provides a framework for intergovernmental efforts to reduce greenhouse gas emissions and adapt to the expected impacts of climate change. It also provides guidance to member states on developing and implementing national climate change strategies, incorporating both adaptation and mitigation actions. Timor-Leste became a signatory to the UNFCC in October 2006.	The project activities release GHG emissions which could be one of the contributing factors to the country’s climate change issue. Minimisation climate change risks by reducing the GHG emissions are an

		essential part of the project environmental objective and target. This convention is the principle guidance for the project proponent to prevent the air pollutions and reduce the GHG emissions as much as possible.
IOGP Guidelines	The International Association of Oil & Gas Producers (IOGP) is the voice of the global upstream industry. Oil and gas continue to provide a significant proportion of the world's energy to meet growing demands for heat, light and transport. IOGP Members produce 40 % of the world's oil and gas. They operate in all producing regions: the Americas, Africa, Europe, the Middle east, the Caspian, Asia and Australia. IOGP serve industry regulators as a global partner for improving safety, environmental and social performance and act as a uniquely upstream forum in which Members identify and share knowledge and good practices to achieve improvements in health, safety, the environment, security and social responsibility.	Provide oil and gas industry specific guidance on the application of good environmental practice.
IPIECA Guideline	IPIECA is a not for profit association that provides a forum for encouraging continuous improvement in industry performance. IPIECA is the only global association involving both the upstream and downstream oil and gas industry. It is also the industry's principal channel of communication with the United Nations. IPIECA develops, shares and promotes good practice and knowledge to help the industry and improve its environmental and social performance. Timor Resources do this with the understanding that the issues that dominate the sustainable development agenda – climate and energy, environmental and social issues – are too big for individual companies to tackle alone. The industry must work together to achieve improvements that have real impact. IPIECA helps to achieve this goal.	Provide oil and gas industry specific guidance on the application of good environmental practice.
Forestry, Aquaculture and Fishing Legislation:	This international convention is and international organisation focus on the nature conservation and sustainable of utilising the natural resources. The IUCN works in the field to promote ecological	Timor-Leste is a signatory member of the IUCN convention which has responsibility to protect its ecological

International Union for Convention of Nature (IUCN)	conservation in order to ensure the sustainable development concepts.	components to ensure the economic sustainable development. Therefore, baseline survey is used to identify all species categories listed under the IUCN red list which can be impacted by the project activities
Cultural Heritage Legislation: UNESCO Convention on Natural and Cultural Heritage	The convention mandates each signatory party to identify, protect, conserve, transmit and present to the future generations of the cultural and natural heritage	As the Timor-Leste is a signatory member of this convention therefore this project activities ensure the protection and conservation of any cultural and natural heritage around the project locations
Noise and Vibration Standards and Regulation: WHO guideline for community noise	This WHO guideline is used to measure the noise level around the community areas and ensure the protection of people from discomfort environment and potential noise induce hearing loss	This guidance is used to ensure the noise levels arising from the project activities are contained or maintained between the WHO set values to protect everyone at or near the project locations are affected by unwanted sound caused by the project activities.
Air Quality Guidelines: WHO Air Quality Guidelines	WHO Air Quality Guidelines (AQG) offer guidance on threshold limits for key air pollutants that pose health risks and provide a reference for setting air pollution targets at regional and national levels to improve air quality. Air quality guidelines have been published by WHO in 1987 and they were revised in 1997. The 2005 update represents the most current assessment of air pollution health effects, based on an expert evaluation of the scientific evidence. The guidelines offer recommended exposure levels for particulate matter (PM10 and PM2.5), ozone, nitrogen dioxide and sulphur dioxide, as well as a set of interim	The air quality benchmark is used as reference by the project proponent is the WHO air quality guidelines.

	targets to encourage a progressive improvement in air quality.	
Climate Change Kyoto Protocols Government Resolution of National Action Plan for Climate Change	Kyoto Protocol is an international treaty which extends the UNFCCC parties commitment to reduce the greenhouse gas according to the scientific consensus. The protocol implements the objective of reducing the global warming potential gas in the atmospheres. The Government resolution of national action plan for climate change (NAPA) is the first national document that identifies urgent and immediate climate change adaptation needs of the most vulnerable groups. It provides a starting point from which climate change adaptation can be mainstreamed into development plans as a key strategy for attaining sustainable development and poverty reduction (MDG, 2010).	Timor-Leste is the signatory party of the Kyoto Protocol which shall ensure the implementation of the protocol in order to reduce the GHG emissions.
Water Resources WHO 2008 Guideline for Drinking Water Quality	These guidelines is used as the reference for the Timor-Leste to ensure drinking water quality according to the WHO drinking water quality standard	As the guidance for the project proponent to test and ensure water quality around the proposed project locations before any drilling activities are taken place

Table 5-2. How Timor Resources Manages Compliance OMS with Law 5/2011 and Law 18/2020

Reference Article	Compliance Achieved Through OMS and Industry Best Practice
Law 18/2020	
136 - Management System	Timor Resources Operating Management System (OMS) Operating Management System (OMS) Manual: TR-OMS-001 Policies, Expectations and Legal Requirements Standard: TR-GEN-STD-00-000-003 IOGP Operating Management System Framework Report 510 June 2014
138 - Risk Management	Risk Assessment and Control Standard: TR-GEN-STD-00-000-002 Objectives, Targets and Planning Standard: TR-GEN-STD-00-000-004 Chemicals - Transport Risk Assessment 20200717 Haemano Warehouse Temporary Chemical Storage Risk Assessment Rev21 20200701 Drilling Program - Schedule 2 - Drilling Contract - with Risk Assessment
139 - Environmental Part of Management System **141 - Environmental Assessment** **144 - Environmental Management Plan**	Health, Safety and Environmental Management Standard TR-GEN-STD-00-000-007_1 Risk Assessment and Control Standard: TR-GEN-STD-00-000-002 Objectives, Targets and Planning Standard: TR-GEN-STD-00-000-004 IOGP (E&P Forum) and UNEP (1997). Environmental Management in Oil &Gas Exploration and Production 1997. IOGP Report No. 254 IFC. (2007a). Environmental Health and Safety (EHS) General Guidelines. Washington DC: International Finance Corporation. IFC. (2007b). Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development. Washington DC: International Finance Corporation. EIS TL-OT-17-09 TR-HSE-EIA-002 EMP TL-OT-17-09 TR-HSE-PLN-015
145 - Environmental Monitoring Program	Inspection and Audit Standard: TR-GEN-STD-00-000-010_1 Performance and Compliance Standard: TR-GEN-STD-00-000-011 EMP Appendix F - Inspection Schedules Plan TR-HSE-PLN-011
146 Oil Spill Contingency Plan	Health, Safety and Environmental Management Standard TR-GEN-STD-00-000-007_1 Crisis and Emergency Management Standard: TR-GEN-STD-00-000-009

Reference Article	Compliance Achieved Through OMS and Industry Best Practice
	EMP Appendix D - Oil Spill Contingency Plan TR-HSE-PLN-004a IMO/IPIECA (2012). Sensitivity Mapping for Oil Spill Response. IMO/IPIECA, July 2012. IPIECA/IOGP (2014). Incident Management System. IOGP Report Number 517. Nov 2014. IPIECA/IOGP (2015). Contingency Planning for Oil Spills on Water. Report No. 519. Jan 2015. IPIECA (2004). Guidelines for oil spill waste minimization and management. IPIECA 2004. IPIECA (2007). Guide to tiered preparedness and response, IPIECA, 2007. OSRL (2013). Inland Operations Field Guide - an operational guide to the containment and recovery of oil spills in the inland environment. Version Number: 1. Oil Spill Response Limited September 2013.
147 - Environmental Performance	Objectives, Targets and Planning Standard: TR-GEN-STD-00-000-004 Inspection and Audit Standard: TR-GEN-STD-00-000-010_1 Non-Conformance: Corrective and Preventative Action Standard: TR-GEN-STD-00-000-010_2 Incident Reporting and Investigation Standard: TR-GEN-STD-00-000-010_3 Performance and Compliance Standard: TR-GEN-STD-00-000-011 Addressed in the EMP TL-OT-17-09 TR-HSE-PLN-015
149 - Waste Management	Health, Safety and Environmental Management Standard TR-GEN-STD-00-000-007_1 EMP -Appendix A - Waste Management Plan Appendix A Rev1 29-12-20 IOGP Guidelines for Waste Management. Report No. 413March 2009
150 - Chemicals Use	Full Compliance with ANPM Chemical Approvals Master Register. Chemicals Approved by ANPM. Risk Assessment and Control Standard: TR-GEN-STD-00-000-002 Health, Safety and Environmental Management Standard TR-GEN-STD-00-000-007_1

Reference Article	Compliance Achieved Through OMS and Industry Best Practice
	Contractor and Purchasing Management Standard: TR-GEN-STD-00-000-007_4 Rev4 Chemical Approvals Master Register Chemicals - Transport Risk Assessment 20200717 Haemano Warehouse Temporary Chemical Storage Risk Assessment Rev21 20200701 EMP -Appendix A - Waste Management Plan Appendix A TR-HSE-PLN-007 IOGP Guidelines for Waste Management. Report No. 413March 2009
151 - Noise	Risk Assessment and Control Standard: TR-GEN-STD-00-000-002 Health, Safety and Environmental Management Standard TR-GEN-STD-00-000-007_1 EMP Appendix G - Noise Management Plan TR-HSE-PLN-012
152 Explosives	Responsibility rests with specialist contractor Schlumberger: Contractor and Purchasing Management Standard: TR-GEN-STD-00-000-007_4 Addressed in Safety Case PSC TL-OT-17-08 and 09 TR-HSE-SCE-001
153 Soil and Groundwater	Risk Assessment and Control Standard: TR-GEN-STD-00-000-002 Health, Safety and Environmental Management Standard TR-GEN-STD-00-000-007_1 EIS TL-OT-17-08 Reformulation Rev 2_03-05-21 EMP TR_10032020_Rev_1_28-12-20 EMP Appendix B - Rehabilitation Plan TR-HSE-PLN-008
157 - Liability **158- 3rd Party Liability** **159- Restitution** **160 - Unauthorised Activities**	Timor Resources carries requisite insurance including, but not limited to, Control of Well Insurance, Redrilling/Extra Expense Insurance, Seepage and Pollution, Clean-up and Contamination Insurance. Details of Timor Resources insurances are registered with ANPM.
Law 5/2011	
Chapter II - Licensing System **Chapter III - Information Phase**	Project Document prepared following Ministerial Diploma No.46/2017. Approved - Category A Project Terms of Reference prepared following Ministerial Diploma No.46/2017. Approved

Reference Article	Compliance Achieved Through OMS and Industry Best Practice
Chapter IV - EIA and Licence	Environmental Impact Statement and Environment Management Plan prepared following Ministerial Diploma No.46/2017 and Ministerial Diploma No.47/2017 EIS TL-OT-17-09 TR-HSE-EIA-002 EMP TL-OT-17-09 TR-HSE-PLN-015 Appendix A - Waste Management Plan Appendix A TR-HSE-PLN-007 Appendix B - Rehabilitation Plan TR-HSE-PLN-008 Appendix C - Redress and Grievance Appendix TR-HSE-PLN-009 Appendix D - Oil Spill Contingency Plan TR-HSE-PLN-004a Appendix E - Traffic Management Plan TR-HSE-PLN-010 Appendix F - Inspection Schedules Plan TR-HSE-PLN-011 Appendix G - Noise Management Plan TR-HSE-PLN-012 Appendix H - Incident Reporting and Investigation Standard TR-GEN-STD-00-000-010_3 Rev 0 22-9-20 Appendix I - Community Consultation Plan TR-HSE-PLN-013 Appendix J - Air Quality Plan TR-HSE-PLN-014 Appendix K - Soil Erosion Management Plan TR-HSE-PLN-017 Appendix L - Surface Water Management Plan TR-HSE-PLN-018

5.2 Timor Resources HSE Policy and Operating Management System

5.2.1 Timor Resources HSE Policy

Timor Resources

Health, Safety & Environment Policy

Timor Resources is committed to achieving incident free operations through the provision of effective Health, Safety and Environmental (HSE) Management across all of its operations and worksites for the benefit of employees, contractors and the community. The Company is committed to:

- Promoting HSE objectives, leadership, responsibilities and behaviour as an integral part of the duties of management and all employees;
- Complying with applicable laws and other obligations and requirements that the company subscribes to, and where adequate laws do not exist, adopting and applying standards that reflect Timor Resources commitment to HSE outlined in this policy;
- Reporting and evaluating risks, threats, hazards and impacts to company operations that have the potential to adversely affect the environment or the health and safety of employees, contractors or the community;
- Implementing appropriate control and contingency measures to prevent pollution and minimise and manage these risks, threats, hazards and impacts to an acceptable level;
- Establishing and ensuring that standards are followed, and effective practices promoted to ensure that the environment, people, property and information are protected from harm;
- Selecting and engaging contractors whose management systems are acceptable to Timor Resources and whose commitment to this policy is clearly and continuously demonstrated;
- Providing competent human resources to manage relevant aspects of health, safety or environment;
- Communicating openly with all stakeholders on HSE related issues;
- Providing training, instruction and supervision to personnel to enable them to attain the knowledge and skill levels necessary to perform their work incident free;
- Maintaining appropriate contingency arrangements;
- Continually monitoring, reviewing and improving HSE performance and associated management systems so that our activities can continue without interruption;
- Ensuring that oversight of accident, incident and near miss investigations is assumed by the appropriate executive manager and that those investigations are conducted to a level of detail that is appropriate to the event's actual and potential severity, and;
- Ensuring a consistent and equitable approach to the management of the health of the employees and the communities.

Every employee and contractor working for the Company has a responsibility to promote a culture whereby their actions and those of their colleagues are consistent with this Policy.

Suellen Osborne
Chief Executive Officer
2nd April 2020

HSE Policy TR-GEN-POL-00-000-001 — Updated 2nd April 2020

5.2.2 Timor Resources Operating Management System (OMS)

The following section describes Timor Resources Operating Management System and demonstrates how the company will comply with such laws and regulations referred to in Table 5-1 above.

Timor Resources is committed to achieving incident free operations through the provision of effective HSE management across all of its operations and worksites for the benefit of employees, contractors and the community, this is achieved through application of the Company's Operating Management System (OMS). The eleven Elements of the OMS are shown in Figure 5-1 and is based on the international standard **PLAN-DO-CHECK-ACT** PDCA cycle, and the Eastern Drilling HSE MS is gap assessed against the OMS requirements below.

Timor Resources will follow the OMS and PDCA cycle throughout the project and ensure performance through the Environmental Management Plan (EMP) which is appropriate to the nature and scale of the project and the impacts identified and summarised in this EIA by:

- Adopting a mitigation hierarchy to anticipate, avoid, minimise and, where residual impacts remain, offset impacts to the environment and affected communities.
- Ensuring that all grievances from the community are responded to and managed appropriately.
- Promoting and providing adequate engagement with communities throughout the project on issues that could potentially affect them and ensuring that relevant information is disclosed and shared.

The EMP will outline the actions and outcomes required to address the issues raised in the EIA, and include performance standards, targets and time frames, and assigning responsibilities for implementation.

The mitigation measures identified for the management of potential environmental impacts will be integrated into the project design through the OMS. Implementation will follow Timor Resources HSE Policy and the OMS and meet Timor-Leste legislation and regulations, in particular, Environmental Basic Law No 26/2012, Environmental Licensing Decree Law 5/2011 (and supporting Ministerial Diplomas 45/46/47) and Decree-Law No.18/2020 Onshore Petroleum Operations.

Timor Resources ensures compliance with the legislative and regulatory regime in Timor-Leste through the implementation of the OMS, in particular Timor Resources will fully implement Law 5/2011 in regard to the Environmental Licensing requirements and the subsequent implementation of the approved Environmental Management Plan. Simultaneously through the OMS Timor Resources will comply with all elements of Law 18/2020 on Onshore Petroleum Operations, particularly in regard to Chapter XVII on Environmental Affairs Articles 138 to 160.

Compliance and assurance are managed through implementation of the following elements:

- Element 7 Operational Controls:
  - Health, Safety and Environmental Management
  - Management of Change
  - Contractor and Purchasing Management
  - Asset Integrity, Engineering and Project Management
- Element 9 Crisis and Emergency Management
- Element 10 Assurance
  - Inspection and Audit
  - Non-Conformance Corrective and Preventative Action
- Element 11 Performance and Compliance

Full details are provided in the EMP and a summary of the key elements are included in Section Figure 5-1.

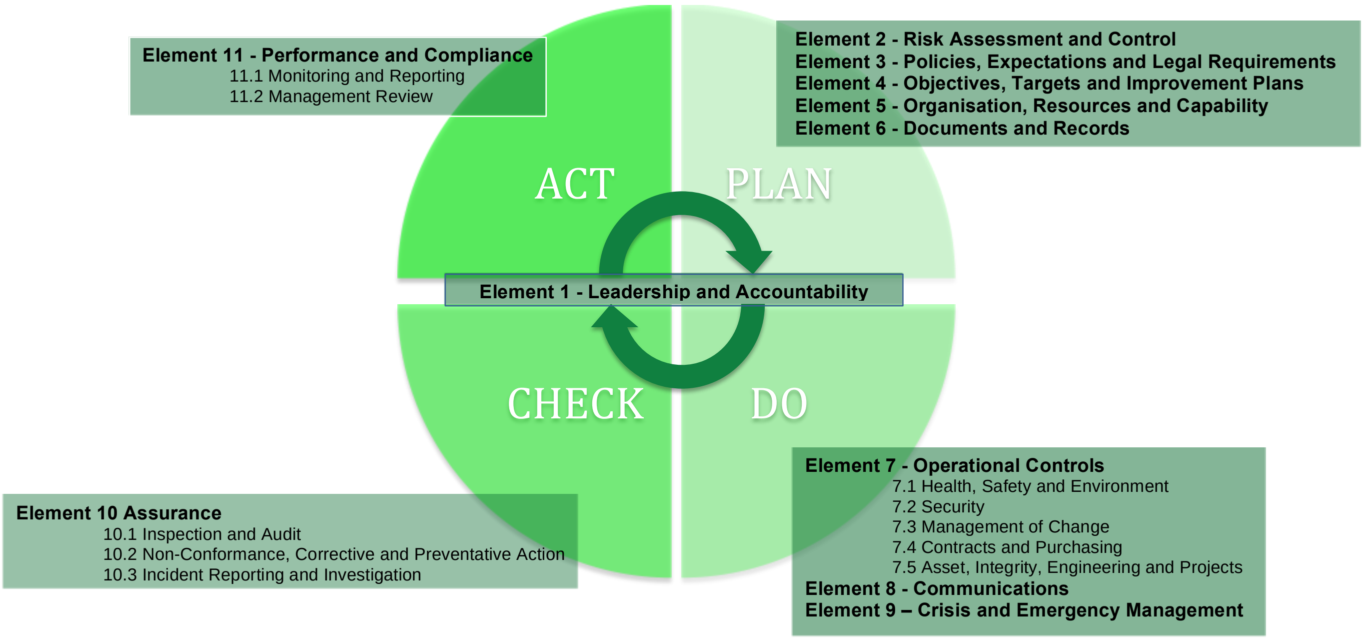

Figure 5-1. Timor Resources Operating Management System (OMS)

6 DESCRIPTION OF THE ENVIRONMENT

This section provides the description of not only the related environmental components, but also economic, social and cultural aspects that could be potentially impacted by the proposed project development. The description will also provide the method of study, the literature review used for the study and the scope and limitations of the environmental aspects studied during the EIA.

6.1 PHYSICAL COMPONENTS

6.1.1 Climate

6.1.1.1 Literature review

There is limited climatic literature to describe the climate condition of the drilling area.

The following are the documents or information sources used for the assessment:

- Climate change knowledge portal – Average monthly temperature and rainfall in Timor-Leste from 1901 – 2016 (World Bank Group, 2020)
- Country Report: Climate Risk Management in Timor-Leste (UNDP, 2013)
- Historical monthly weather data – www.worldclim.org/data/monthlywth.html
- Tasi Mane Project - Betano Petroleum Refinery and Beaço LNG Plant– EIS study (WorleyParson, 2012a)
- Tasi Mane Project - Suai Supply Base – EIA report (WorleyParson, 2012b)
- Map of annual rainfall and temperature in Timor-Leste: Seed of life organization http://seedsoflifetimor.org/wp-content/uploads/2013/01/Rainfall-Map-With-Graphs.pdf
- Australia Bureau of Meteorology Australian Tropical Cyclone database: http://www.bom.gov.au/clim_data/IDCKMSTM0S.csv
- Country Report Presentation: Southeastern Asia-Oceania Flash Flood: http://www.wmo.int/pages/prog/hwrp/flood/ffgs/saoffg/presentations/scm1/Countries/TimorLeste.pdf (DNMG, 2017)
- Country Report: Strengthening the resilience small scale rural infrastructure and local government system to climatic variability and risk (UNDP & GEF, 2013): https://www.undp.org/content/dam/timorleste/docs/reports/ENV/Prodoc_UNDP%20GEF_SSRI.pdf
- Timor-Leste, Agro-Climate outlook: WFP (2020): https://docs.wfp.org/api/documents/WFP-0000113397/download/

6.1.1.2 Study Scope and Limitations

The study area extends beyond the immediate drilling area, due to the lack of local climatic data sources, in order to obtain greater resolution of the data accuracy, most of the data have gaps in between a recording period.

6.1.1.3 General Description

Timor-Leste is typical tropical country with every part of the regions experience monsoonal climate with distinct wet and dry seasons. The wet season typically runs from December to April, and dry season is from May to November and within the regions, seasonal temperature is varied with diurnal temperature often greater than seasonal. The average high temperatures range from

24°C in dry season to 26.3°C in wet season (World Bank Group, 2017). Figure 6-1 below shows the temperature ranges over the twelve months periods, which runs from dry to wet seasons.

The climate temperature in Timor-Leste is driven by the West Pacific Monsoon and its rainfall largely regulated by the Asian Monsoon, such as El Niño, La Niña, Indian Ocean Dipole (IOD), Maden-Julian Oscillation (MJO), altitudinal and coastal effects; and these Asian-West Pacific Monsoon have been associated with the variability of inter-annual rainfall and dry season rainfall as well as the huge temperature difference between the land and ocean (UNDP, 2013). The effect of this Asian-West Pacific Monsoon is varied within every part of the region within the country.

Figure 6-1 also show the rainfall conditions over the twelve months recording period, this rainfall information however, would not be further detailed or elaborated under this section of this EIS document. As this is in accordance with the Timor Resources approved Terms of Reference for the proposed project.

Timor-Leste's climate is affected by the West Pacific Monsoon November to April Figure 6-2 which is driven by large differences in temperature between the land and the ocean. It moves north to mainland Asia during the Southern Hemisphere winter and south to Australia in the Southern Hemisphere summer. Its seasonal arrival usually brings a switch from very dry to very wet conditions. The normal south-easterly trade winds in Dili are replaced by westerly winds from the monsoon onset until the end of the monsoon season. The arrows show near surface winds, the blue shading represents the bands of rainfall convergence zones, the dashed oval shows the West Pacific Warm Pool and areas denoted with the letter H represent typical positions of moving high pressure systems

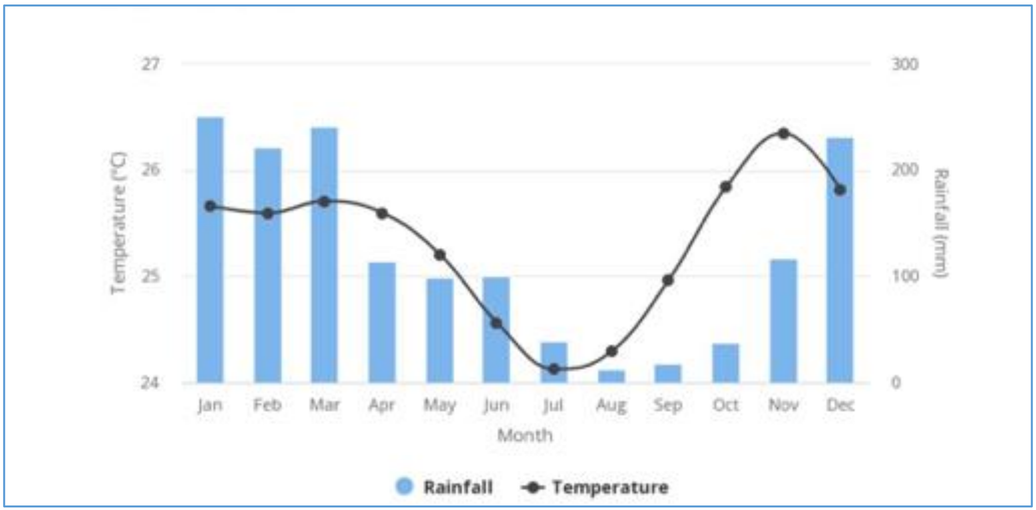

Figure 6-1. Temperature reading over 12 months of the year in Timor-Leste

Source: (World Bank Group, 2017)

The Timor-Leste monsoon climate has a differential effect between the north and south of the country. The northern part of the country, influenced by the northern mono-modal rainfall pattern, has a 4-6 months wet season from November to April or June. The southern part experiences the southern bi-modal rainfall pattern leading to a seven to nine month wet season with two peaks, one in December and the other in May (Figure 6-2) (Barnett et al. 2007).

6.1.1.4 Temperature

Temperature data was collected at the same points as the sensitive receptors where the air quality and noise samples were taken, these are shown in Table 6-3 and Figure 6-32 below.

Based on the survey results the temperature measured at the drilling area, were shown to be between 31 ºC and 33 ºC on average. This survey temperature results are consistent with the UNDP (2013) annual mean temperature of the country at the flat and highland areas see Figure 6-3 shows the mean temperature ranges from less than <21 ºC to >27 ºC across the country of Timor-Leste. The map also indicates that the temperature increases towards the flat area and decreases towards the highland area.

Furthermore, in accordance with the UNDP (2013), the minimum temperature is usually occurred during the month of July and August; and the maximum temperature would be generally experienced during the month of October to December.

These temperature presented in the map above are also consistent with the World Climate Data (2020) graphs that show a similar pattern of temperature reading for all the drilling area. The global climate has maximum and minimum temperature reading of the drilling area from the year 2010 until 2018.

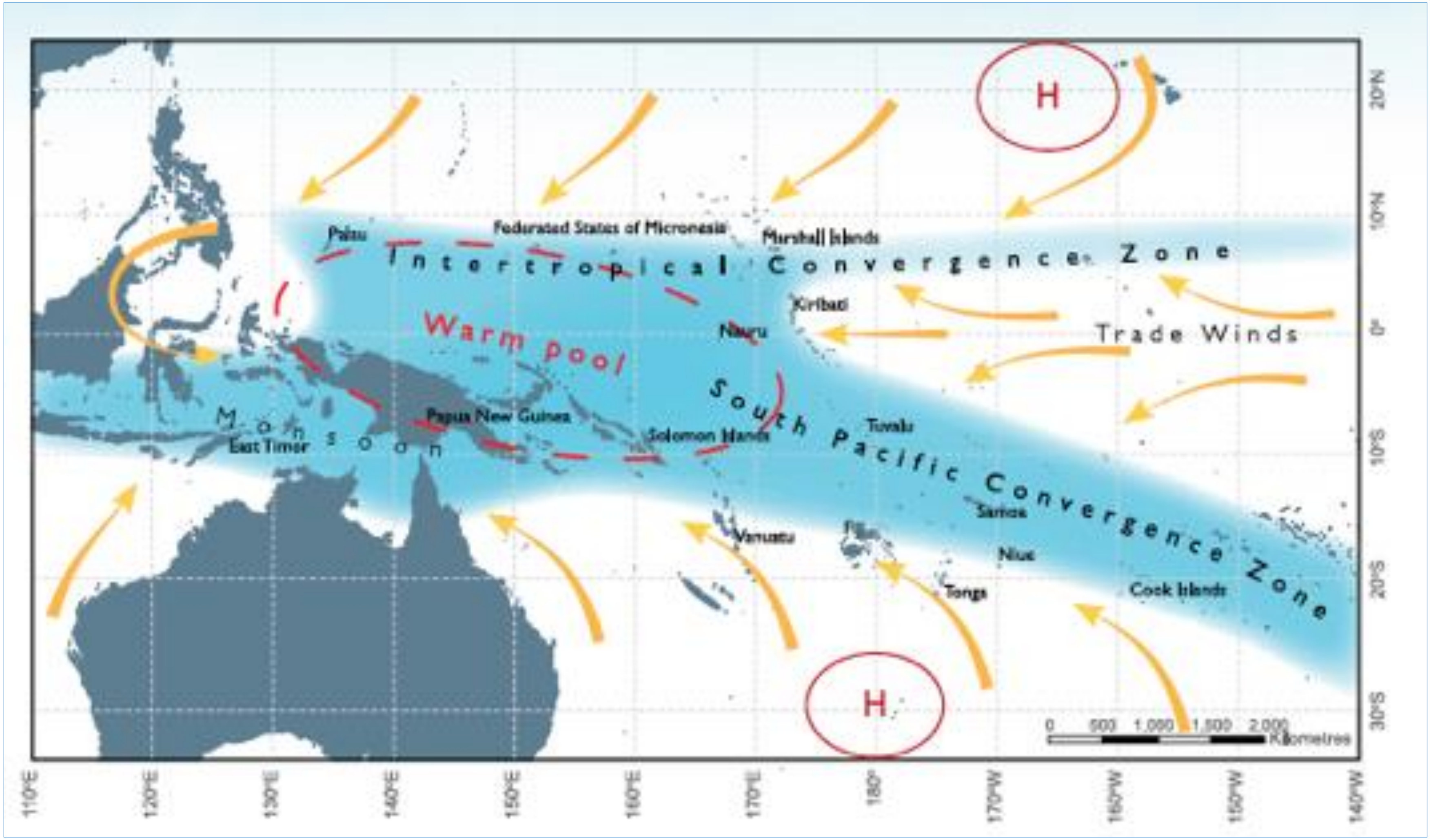

Figure 6-2. Average positions of the major climate features in November to April

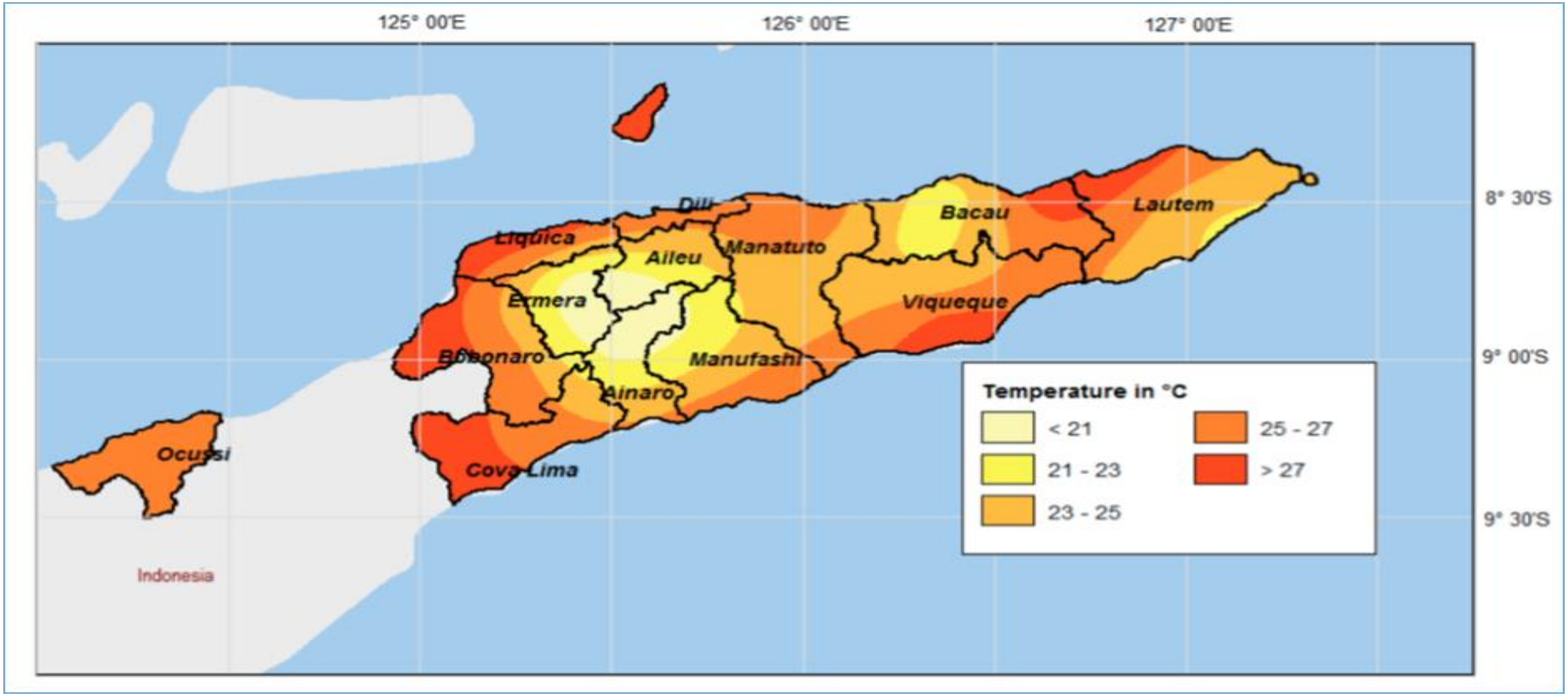

Figure 6-3. Annual Average Temperature of Timor-Leste (UNDP, 2013)

Temperature records from the Betano Refinery and Beaço LNG Plant Strategic EIS (Worley Parsons 2012a) are shown in Figure 6-4 and show typical temperatures between 25 ºC and 35 ºC. Temperature readings for the south coast area over an eight year period (after WorldClim, 2020) are presented in Figure 6-5 and Figure 6-6 similarly show the maximum temperature has been constantly between over 25 ºC and below 35 ºC; and the minimum temperature stays within the range of 20 ºC to 25 ºC. The figures further show temperature variations between wet season (normally from October, November and December) and dry season (usually occurs from June, July and August).

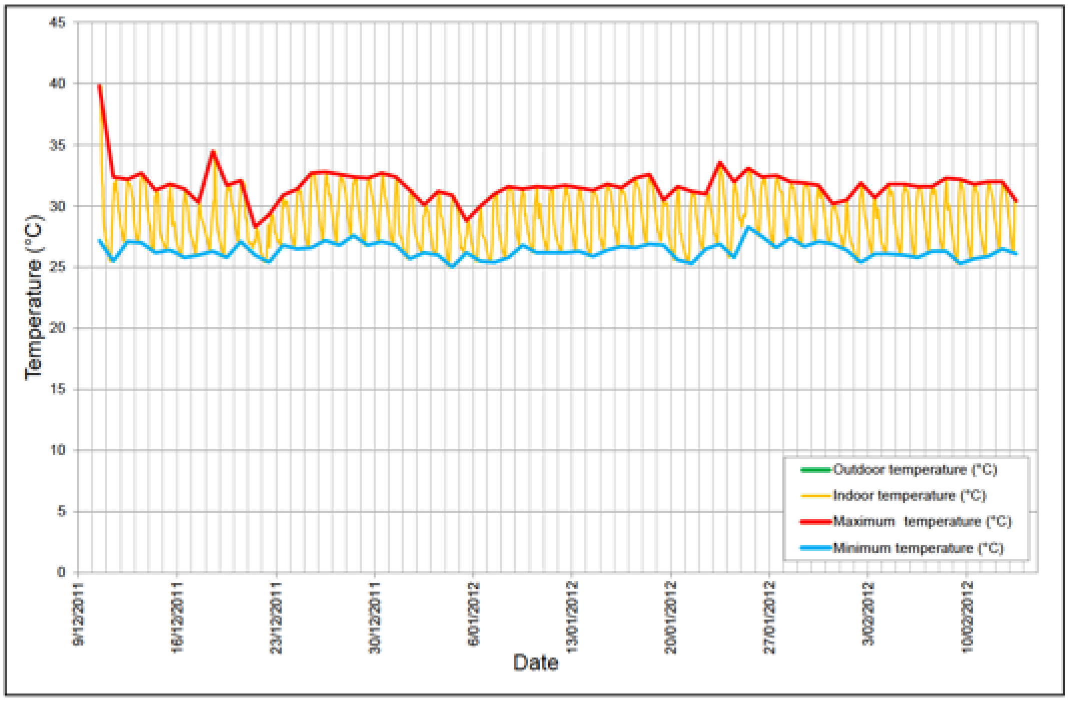

Figure 6-4. Temperature Records at Betano (after Worley Parsons 2012a)

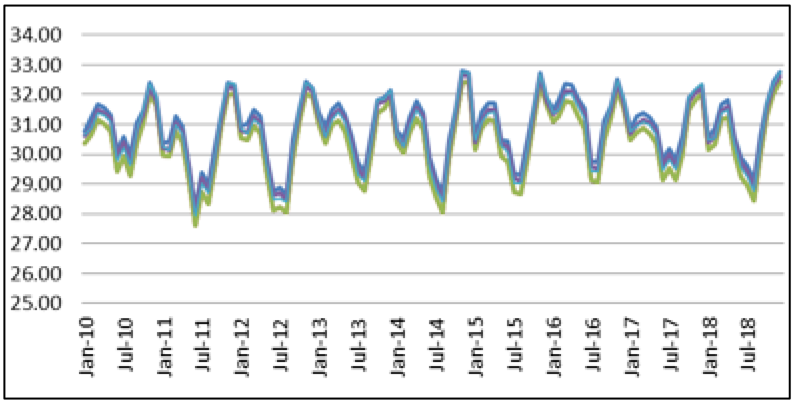

Figure 6-5. Maximum temperature recorded in the south coast area from 2010 – 2018

Source: (WorldClim, 2020)

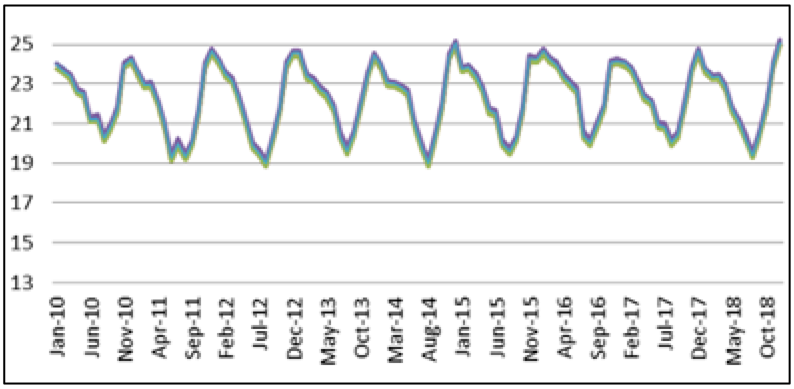

Figure 6-6. Minimum temperature reading in the south coast area for from 2010 – 2018

Source: (WorldClim, 2020)

These temperature data are also consistent with other secondary source data provided by the local National Directorate of Meteorology and Geophysics (DNMG) for the south coast region. The data is presented in Figure 6-7 below.

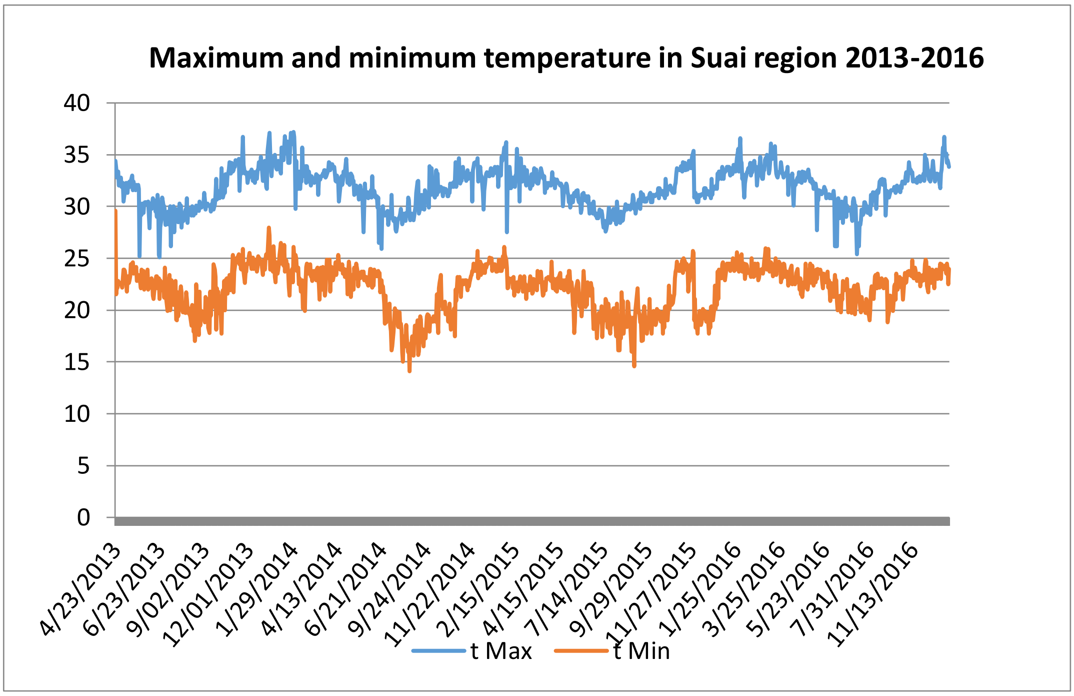

Figure 6-7. The maximum and minimum local temperature in Suai region from 2013 - 2016

Source: DNMG (data accessed on 2019)

The maximum and minimum temperature data given by the DNMG shows similar patterns over the four years recording period (from 2013 – 2016). Both maximum and minimum were low during the dry season and high during wet season. The maximum temperatures in the region are within the range of over 25 ºC to less than 40 ºC. Likewise, the minimum temperature also ranges from less than 15 ºC to higher than 25 ºC.

6.1.1.5 Relative Humidity

Relative humidity is one of several measures used to describe the amount of moisture in the atmosphere, and is the ratio of the actual amount of moisture in the atmosphere to the Maximum amount that could be held, at a given temperature.

The Betano EIA study (Worley Parsons, 2012a) states that the south coast of Timor-Leste is marginally more humid than the north coast and that with increasing altitude, humidity decreases. Betano was observed to have a marginally less humid climate than coastal regions to the southwest (Suai). Very little seasonal variation is evident from analysis of the Ministry of Agriculture data (2012). The maximum daily relative humidity is frequently above 90 % throughout the year. The minimum daily relative humidity varies considerably more than the maximum and is on average in the range of 45 % to 73 %.

The daily profile (Figure 6-8) and the time series data (Figure 6-9) show that the measured indoor relative humidity varies less than the Ministry of Agriculture data (2012). The indoor humidity does not fall below 45 % over the entire monitoring period and ranges up to approximately 85 %. On average, the humidity would fall to a minimum slightly below 70 % at 14:00 to 03:00 and then steadily climb to approximately 80 % by 06:00 the following day.

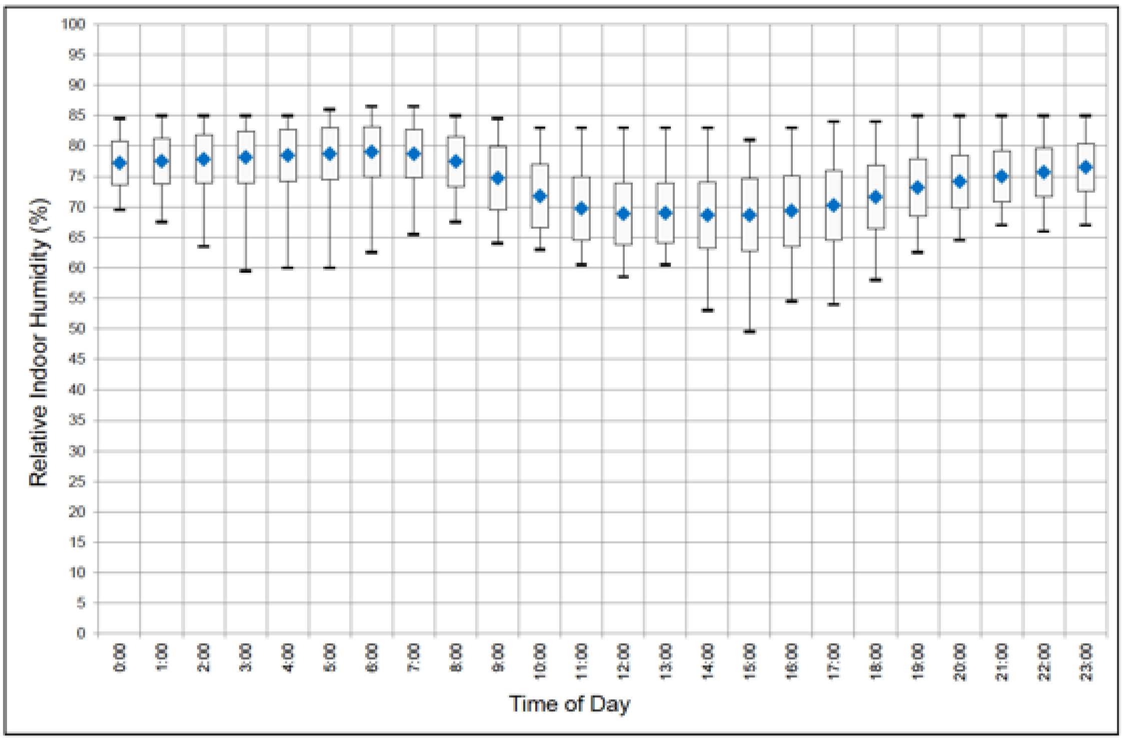

Figure 6-8. The Relative Humidity (%) Daily Profile at Betano

Source: Worley Parsons, 2012a

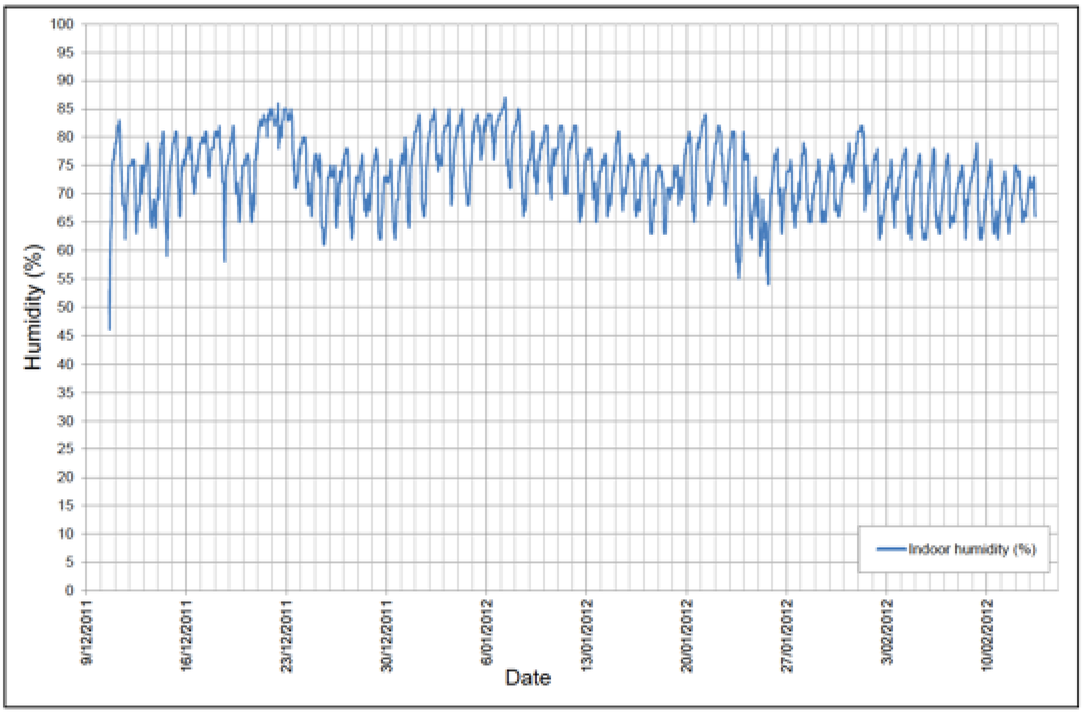

Figure 6-9. The Relative Humidity (%) Time Series at Betano

Source: Worley Parsons 2012a

The graphs shows that over the recording period from 2008 to 2014, the relative humidity has always been high at the Suai region, which always measured between less than 60 % as the minimum, and reached up 100 % for the maximum value. It further shows that the Relative Humidity reading pattern has been consistent or no changed throughout the recording period.

6.1.1.6 Wind Speed and Direction

A major factor that influences local wind speed and direction trends is the topography and land use of the region (Worley Parsons 2012a). The Betano development area and the surrounding coastal region is low-lying and has reasonably flat terrain with elevations at approximately 20 m and local peaks located around Nova Betano up to 250 m above sea level. Inland, approximately 10 km, the foothills begin with elevations approximately 400 to 500 m above sea level.

The wind rose for the Betano area is presented in Figure 6-10 represents data collected from the monitoring period only (December 2011 to February 2012). Due to the failure of the meteorological station, only 6 % of the monitoring period produced valid wind speed and wind direction data. The wind rose shows that for the recorded data, a majority of the winds blew from the northwest at reasonably low speeds (less than 3.0 m/s). Currently, there is insufficient data to be able to determine prevailing wind patterns.

Figure 6-11 presents wind roses for the Dili airport, Baucau and the south coast study area (Suai, Betano and Beaço) after Worley Parsons Betano Refinery and Beaço LNG Plant Strategic EIS (2012a).

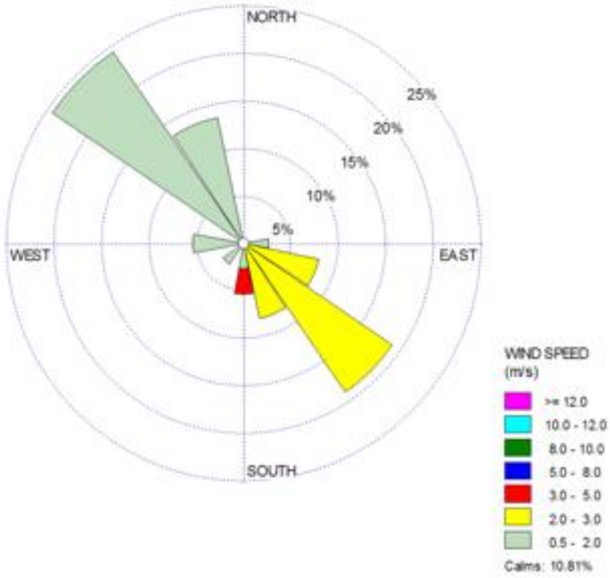

Figure 6-10. Wind speed and direction Betano region December 2011 to February 2012

Source: Worley Parsons, 2012a

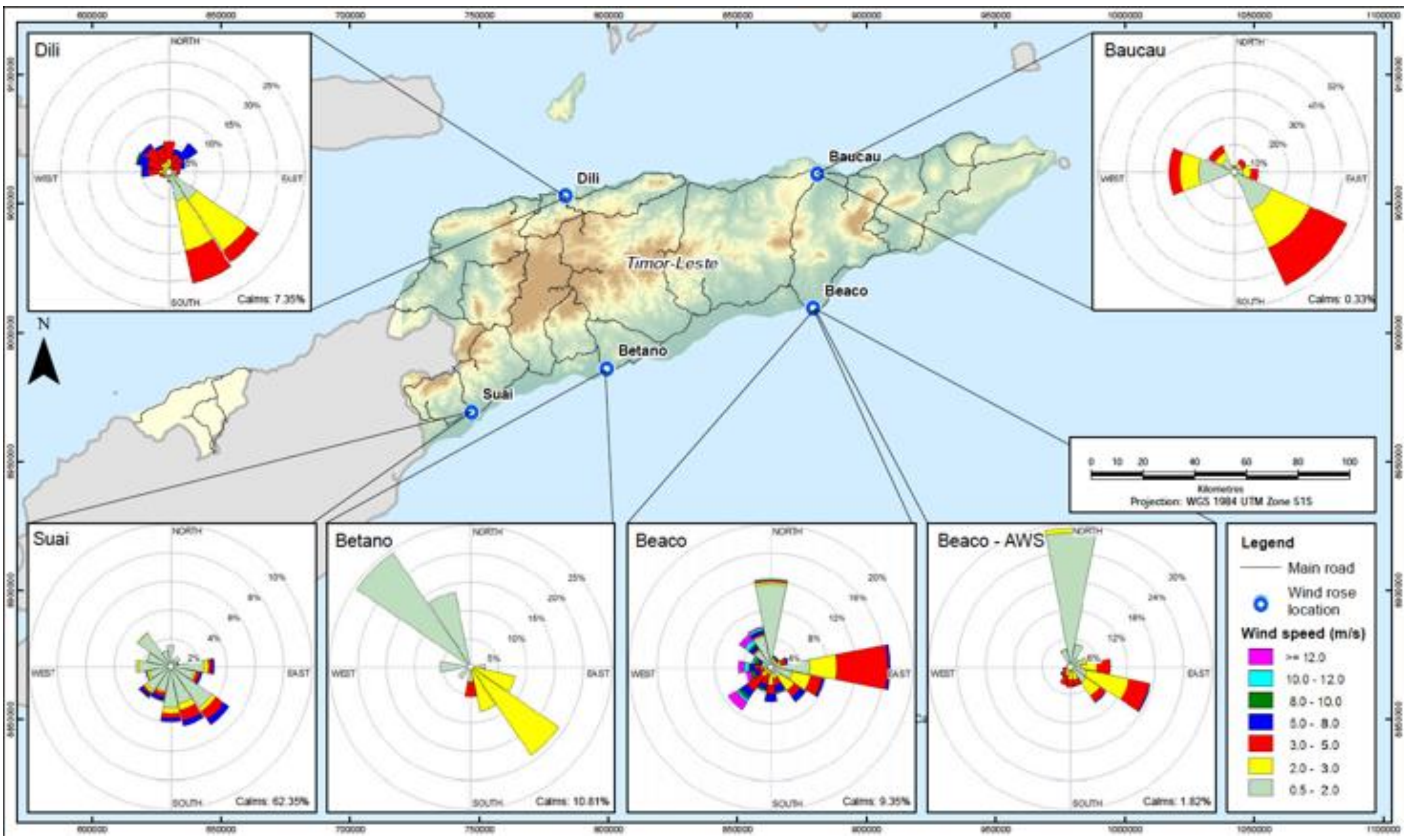

Figure 6-11. Wind speed and direction Suai region December 2011 to February 2012
Source: Worley Parsons, 2012a

6.1.1.7 Rainfall

In general Timor-Leste rainfall trends are influenced by the Asian monsoon, which has its rainfall distribution varied within the country. the northern side of the country experiences northern mono-modal rainfall pattern, which has about 4-6 wet months start from the month of December to April or June; and the southern side rainfall influences by the southern bi-modal rainfall pattern, which has a rainfall for 7-9 months duration with two peaks within, one occurs at the month of December to January and the other one at the month of May to June (UNDP & GEF, 2013). Figure 6-12 below shows the rainfall distribution within the country. It indicates that northern side receives rainfall less than 1000 mm per year; central and elevated area receives 1,500-2,000 mm; and western with high elevation a receive relatively high rainfall of more than 2,500 mm per year.

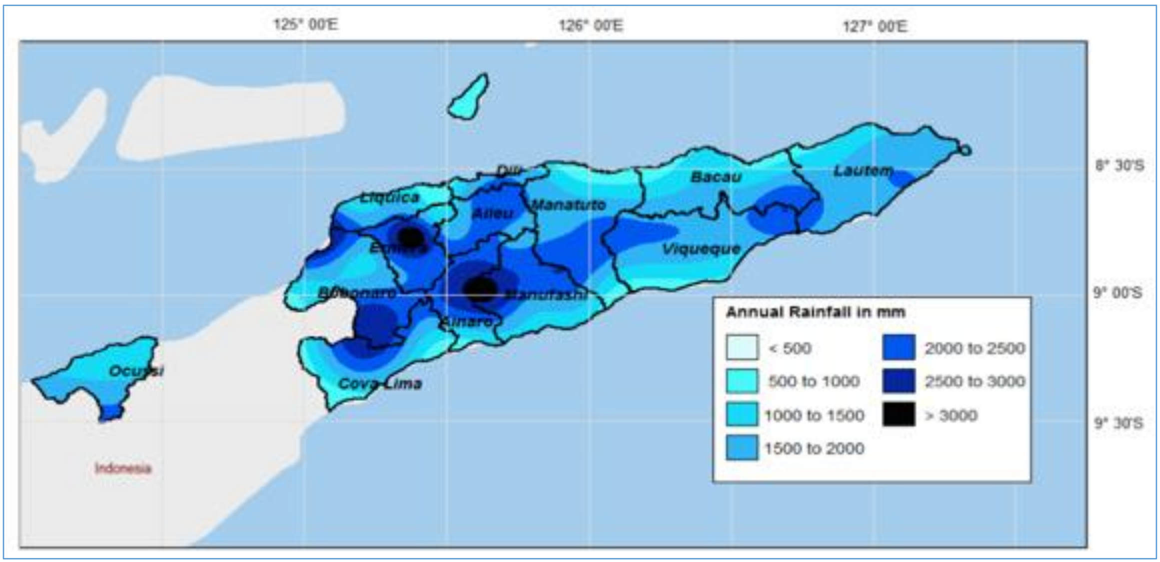

Figure 6-12. Timor-Leste annual rainfall distribution (UNDP, 2013)

Furthermore, in particular to Manufahi/Ainaro region, it can be seen that the central parts have high rainfall ranges from 2,500 mm to >3000 mm per year; and the southern region experiences rainfall of less than 500 mm to 1000 mm per year. The coastal areas clearly are dryer than those in the central areas with high altitude mountainous.

The rainfall analysis given by the UNDP (2013) is consistent with the Seed of Life (2013) rainfall data collected and analysed for the south coast region. Accordingly, it shows that Suai region has high rainfall period in the month of January – February, May – June and December annually. The rainfall recorded during these months are usually between 150 mm and 250 mm per year. See Figure 6-13 below for the rainfall level and period in recorded

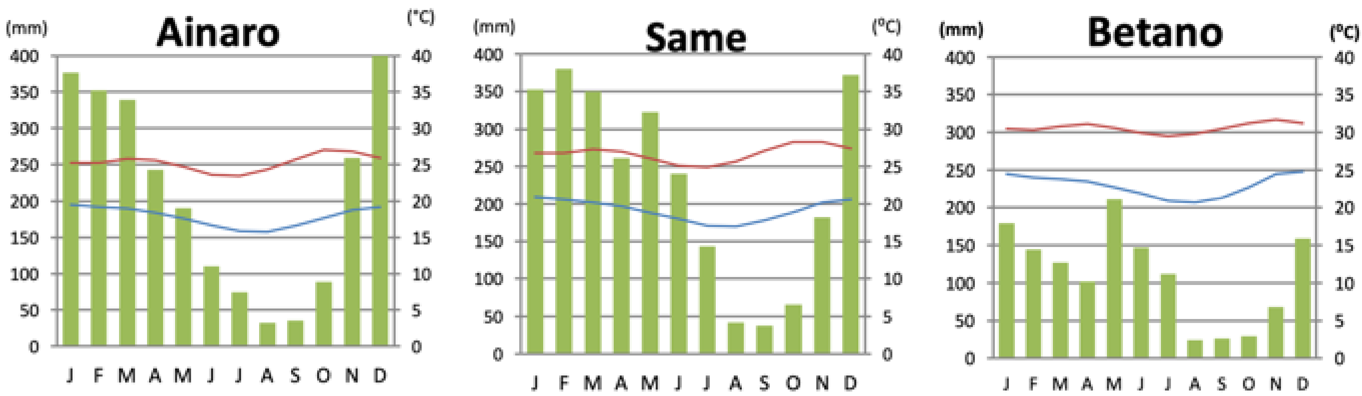

Figure 6-13. Annual rainfall level recorded in Ainaro, Same and Betano regions

Note: The red and blue lines are temperature measurement at the location, which is not part of rainfall analysis given to the intended region under this section.

The latest rainfall data collected for agro-climate by WFP in 2020 still consistent with both the UNDP (2013) and Seed of Life (2013) see Figure 6-14 rainfall data. Figure 6-15 below shows the rainfall data recorded for the month of February 2020 for all the municipalities within the country.

According to the WFP rainfall data recorded in February 2020, it shows that during that month most of the Municipalities, including Covalima (Suai) still experiencing high rainfall intensity above 120mm. This rainfall period however is lower in Dili, Manatuto and Bazartete (of Liquica Municipality), which have rainfall measured at less than 120mm.

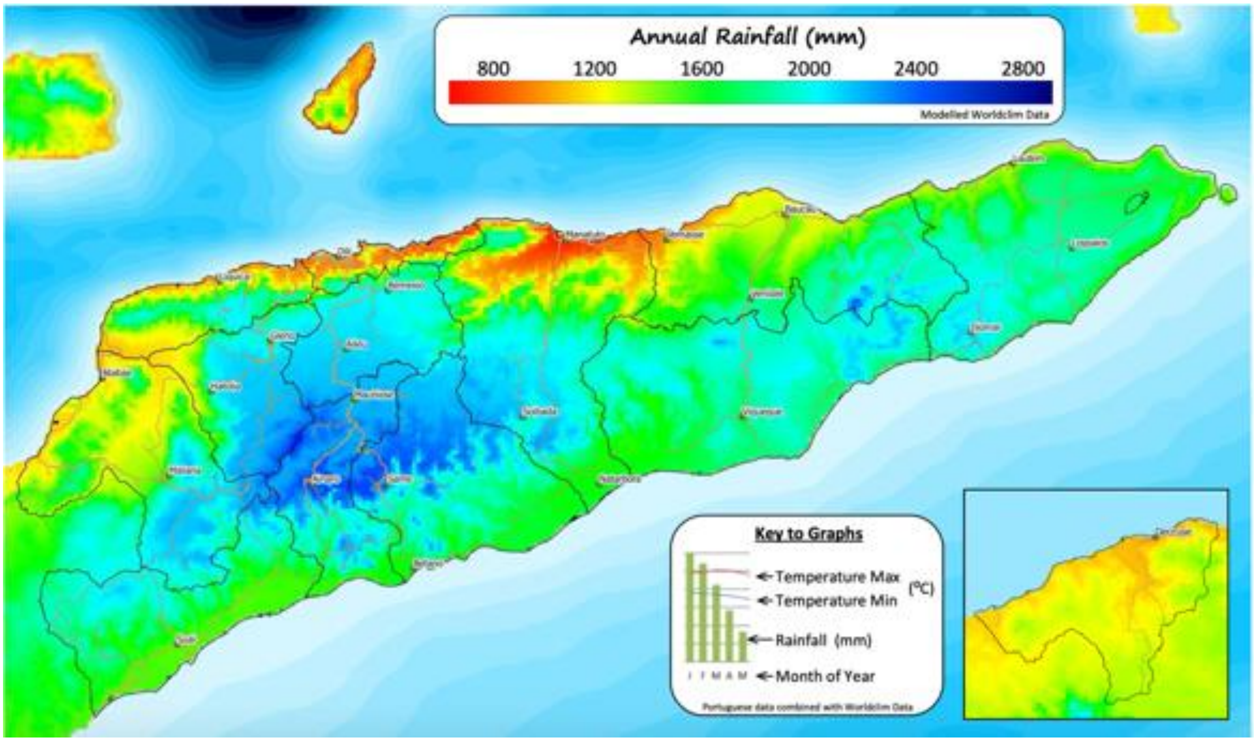

Figure 6-14. Annual Rainfall for Timor-Leste
(Source: Seed of Life 2013)

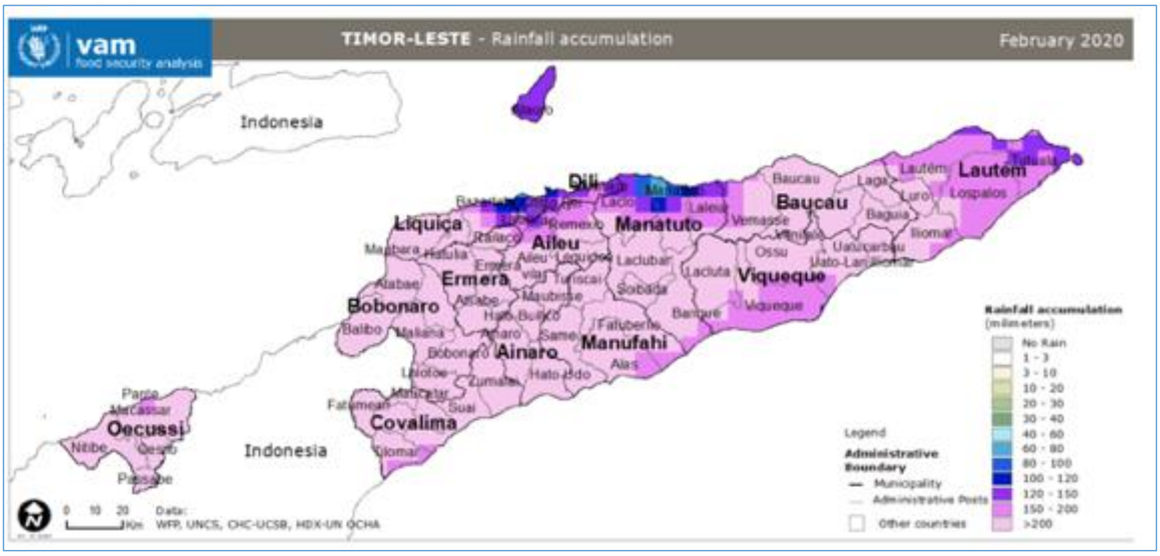

Figure 6-15. Rainfall accumulation for the month of February 2020 of Timor-Leste
(Source: WFP 2020)

6.1.1.8 Cyclones

Timor-Leste has tropical cyclone effects that usually occurs in the Timor Sea from November to April. Most of the tropical storms and cyclones originates or passes through the Timor Sea. These tropical cyclones are characterised by very strong winds and driving rain with high waves and storm surges. Accordingly, many studies shown that tropical cyclones activity at the Timor Sea is lower during El Niño period and higher during La Niña years (NAPA, 2010). This study of tropical cyclone is further recorded and analysed by the Australia Bureau of Meteorology Australian Tropical Cyclone database (*http://www.bom.gov.au/clim_data/IDCKMSTM0S.csv)*, which shows the number of Southern Hemisphere tropical cyclones from year 1906 until 2018.

Within the mentioned period there are six tropical cyclones events recorded between the years 1983 and 2014 at 100 km radius passing through the Suai region and going towards the Timor Sea. The six tropical cyclones occurrence and direction can be seen in the Figure 6-16 below.

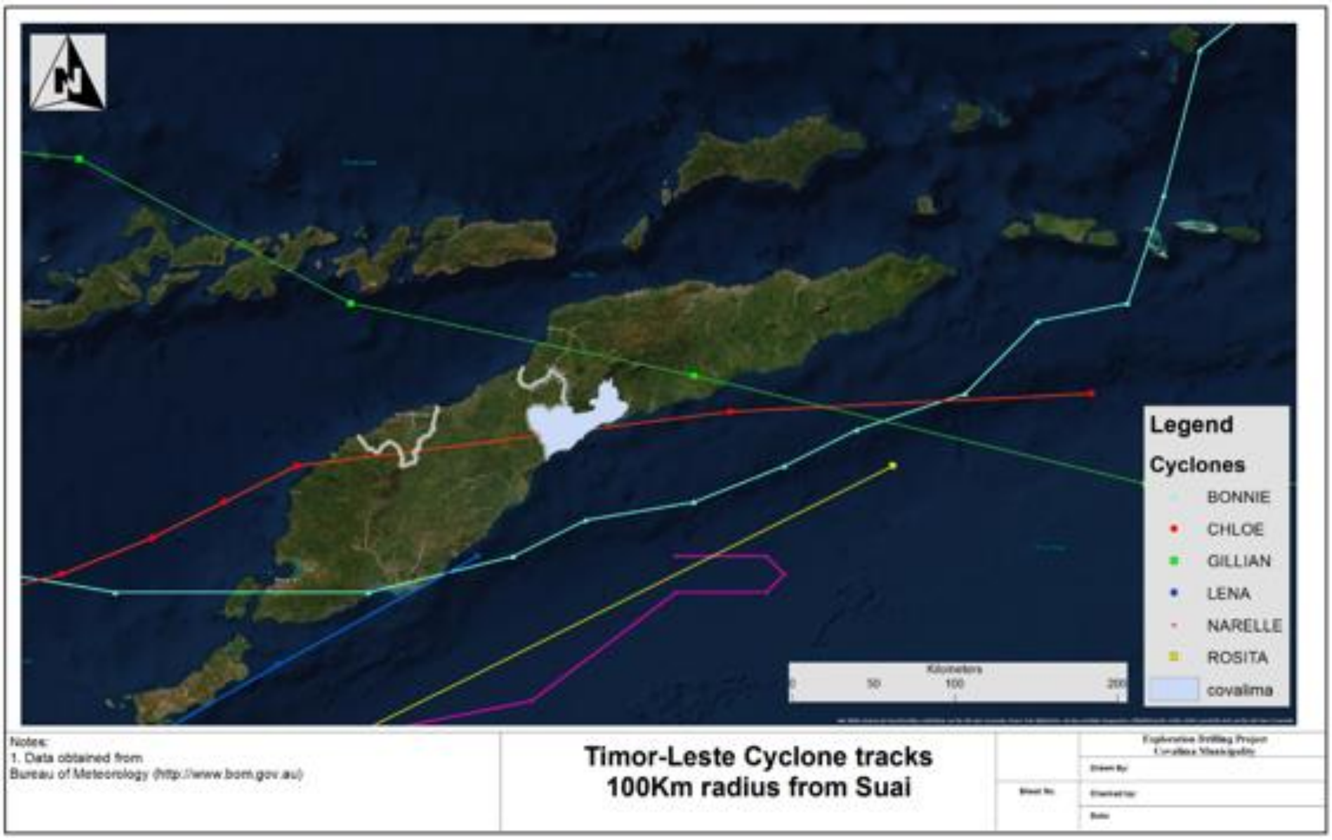

Figure 6-16. Tropical cyclones passing through to the Timor Sea recorded at 100 km from Betano

Further, Table 6-1 below shows the tropical cyclones' month of occurrence between 1983 and 2014; and the name of the tropical cyclones recorded at 100 km radius from the Betano region towards the Timor Sea.

Table 6-1. Tropical cyclones month of occurrence and names recorded at 100 km

Cyclone tracks 100 km radius from Suai	
Data Range	**Cyclone Name**
6 - 25 March 2014	Gillian
5 - 15 January 2013	Narelle
7 - 15 April 2002	Bonnie
14 - 20 April 2000	Rosita
3 - 8 April 1995	Chloe
2 - 9 April 1983	Lena

According to DNMG Country Report (DNMG, 2017) during the tropical cyclones of El Niño cycle, the country experiences less rainfall, short wet season (usually cause drought) and rainfall is concentrated on February – March; in contrast, the tropical cyclone of La Niña cycle causes the country to have more rainfall annually, longer wet season and more rainfall on dry season, which sometimes result in flooding and landslide.

6.1.2 Topography

About one third of Timor–Leste's topography is mountainous with a range of heights from 100 m to almost 3,000 m above sea level (Figure 6-17). The central and eastern parts of Timor-Leste contain several low plateaus and coastal lowlands fringed by the narrow coastal plain in the north and a wide coastal plain in the south.

The geography of Timor exhibits four significant mountain ranges: limestone mountain Mt. Matebean at a height of 2,100 m above sea level dominating the east part of the island and including Lospalos, Baucau and Viqueque. In the central region the limestone Mt. Cablac and volcanic Mt. Ramelau cover most of the area, and the western part of the island is controlled by Mt. Taroman.

Deep Valleys, plateaus and low relief mountains are formed within the mountains. Generally, the slope of the north coast of the country is very steep toward the sea, on the southern side the slope from the mountains is a gradual decrease toward the sea.

Significant topographic features around the project area are shown in in Figure 6-18 and include:

- Mt. Cablac coupled with low to high grade Lolotoi metamorphic controls the north to northeast morphology.
- A coral limestone platform covers most of the western part of the project area with average height 300 m above sea level.
- The northeast and eastern parts are dominated by Mt. Bian and Mt. Manumera and extend to Mt. Kaitaba and Mt. Cnuamotukleten.
- Mt. Akadirukau with a height 160 m above sea level occurs to the south of the project area with an alluvial plain extending towards the sea.
- In the far northwest the landscape is controlled by recent deposition of the Batu Putih chalk that is expressed in a low relief to moderate morphology with an average height 120 m above sea level.

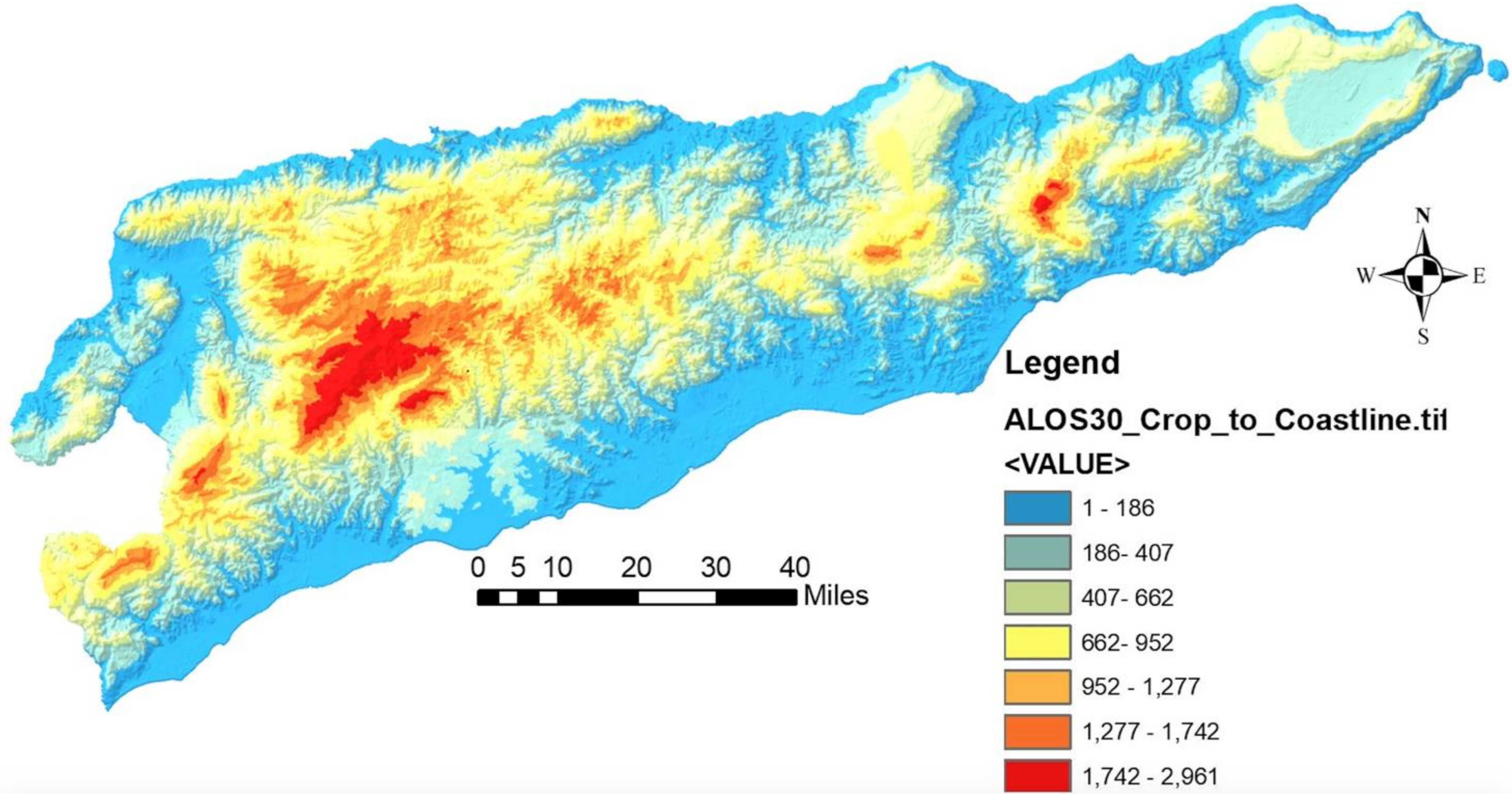

Figure 6-17. Topography of Timor
(SRTM, 2020)

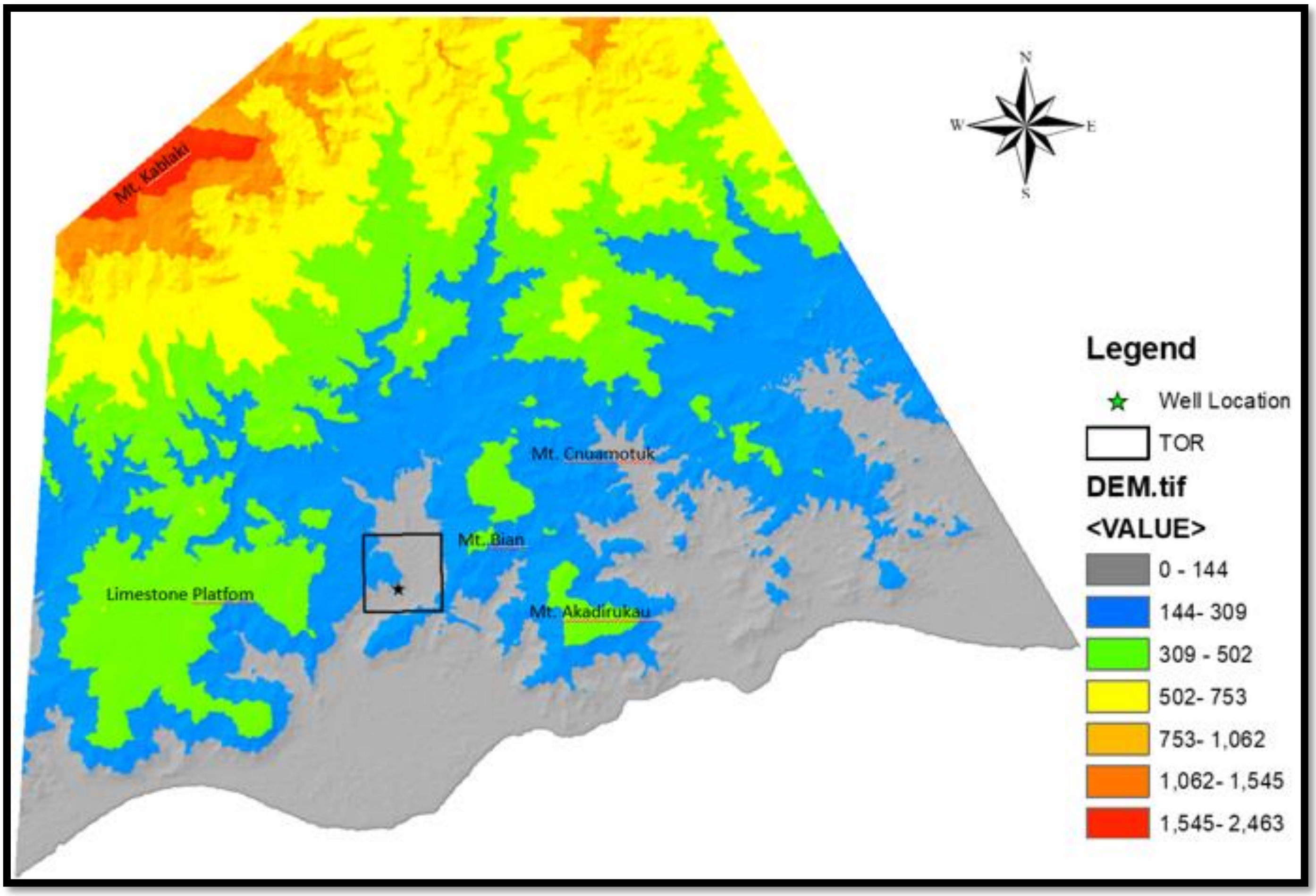

Figure 6-18. Topographic map of the project area.

Red box is the perimeter of the project area and star dot is indication of well locations.

6.1.3 Geology

6.1.3.1 General Geological Overview

The chaotic and highly deformed Permian – Triassic, Jurassic and Cretaceous rocks lead to dispute of Timor tectonic history. Several hypotheses have been introduced by various geological researchers to describe tectonic and rock formation history (Audley-Charles 1968, Hamilton 1979, Harris 2006, Keep and Haig 2010), however these theories are all consistent that onshore Timor is composed of rocks from the Gondwana Megasequence, Australian Megasequence and Banda Terrane affinity.

Rocks in Timor-Leste range in age from Late Carboniferous to recent. The following are the main tectono-stratigraphic units that are recognised in Timor-Leste:

1. Gondwana Megasequence: Latest Carboniferous to Middle Jurassic succession. This sequence is represented by carbonates, siliciclastics and Permian volcanics that were deposited within the interior of the East Gondwana rift system (Harris et al 1998, Harris 2006, Haig and McCartain 2007 & 2010, Davydov et al 2014).

2. Australian Margin Megasequence: Late Jurassic to Early Late Miocene units dominated by pelagic calcilutite and subordinate radiolarian rich accumulations in middle bathyal water depths during the Early Cretaceous on the Australian passive margin (Haig and McCartain 2007).
3. Indian Ocean deposits: Middle – Late Jurassic. Dominated by siliceous argillites and radiolarites (Haig and Bandini 2013)).
4. Banda Terrane: Late Cretaceous to Early Miocene. Asiatic units, shallow water and upper bathyal strata, metamorphic units, and other sedimentary strata. Emplaced during collision (Audley-Charles & Harris 1990, Harris 2006, Haig et al 2008). Alternatively, the metamorphic units have been attributed to the Australian Continental Margin basement (Grady 1975, Grady & Berry 1977, Chamalaun & Grady 1978, Charlton 2001 & 2002)
5. Synorogenic Megasequence: Latest Miocene- Pleistocene to recent (Haig & McCartain 2007; Roosmawati & Harris 2009). Shallowing – coarsening up succession composed of deep-water chalk/marls passing through turbidites sands to marginal marine, then fluvial deposits.

From these tectonostratigraphic units, combine with field observation and palynology analysis Timor Resources has simplified a stratigraphic column that adapted from Duffy 2017 (Figure 6-19).

6.1.3.2 Geology PSC TL-OT-17-09

Within PSC TL-OT-17-09 most of the older rocks from Permian to Triassic in age are well represented in the north and southwest of the field area. Mt. Cablac is covered by Triassic Perdido Group and interpreted to be thrusted over Lolotoi Complex. Southeast and southwest of Mt. Cablac is covered by syn-orogenic deposition of Batu Putih and Viqueque Group. Permo-Triassic units commonly topped by Baucau limestone are well exposed between the Belulik river (Cassa Bridge) and Caraulun river near Same. A Late Cretaceous unit of Wai Bua Formation is cropping out in central Betano and its surrounding area.

At the location of Rusa-1, rock units that range from Permian to recent in age. The following is the physical description of all the rock units that occur in the vicinity of the wellsite in order from oldest to youngest.

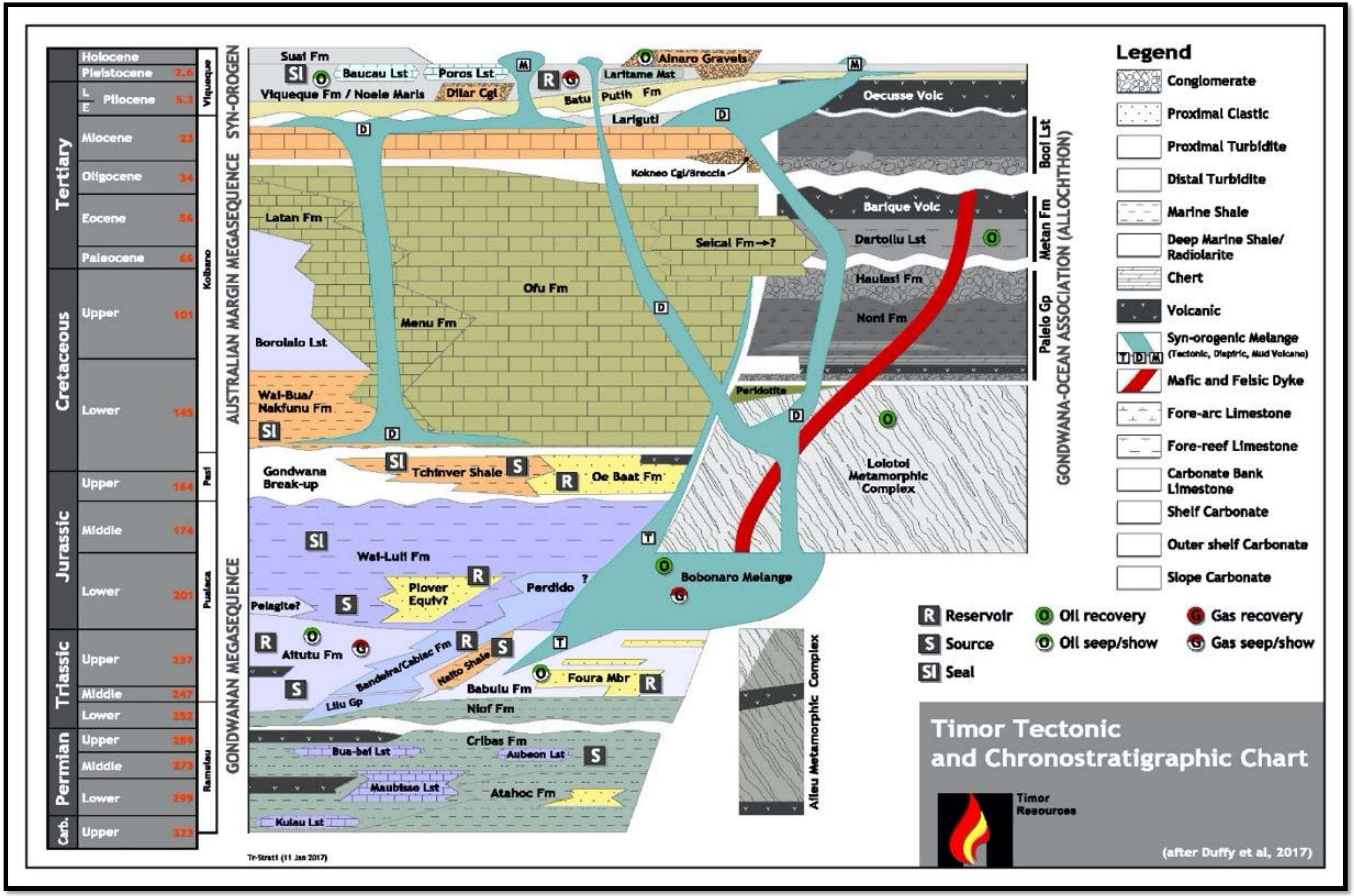

Figure 6-19. Tectono-chronostratigraphic column of Timor

6.1.3.2.1 Maubisse Formation

This Formation is named after large cliffs of thick bedded red limestone associated with volcanics to the southwest of Maubisse village. The limestone comprises abundant Crinoid stems, Bryozoa, Brachiopods, Ostracods, Tubiphytes (Audley-Charles 1968 and Haig 2014). This Formation is predominantly a carbonate succession with minor volcaniclastics which occur together in some outcrops.

At the type locality Maunlai ridge it is estimated to be 180m thick (Haig et al 2014). Massive to thick-bedded bioclastic limestone, mainly packstone, were described at the Maunlai ridge. From microfacies analysis (Nogami 1963, Audley-Charles 1968 and Haig 2017) the Maubisse section is assigned as Late Permian Guadalupian. Presence of crinoidal, brachiopod packstone indicate Permian shallow carbonate-mound-platform deposits.

The Maubisse outcrop in the area of the Rusa prospect location covers approximately two square kilometres in the west and northwest. From field observations near the proposed wellsite, this formation is composed of massive, red and sometime orange limestone, commonly occurring as blocks and boulders. It is very indurated and rich with Crinoid stems, and from acetate peels analysis it contains at least three type of Bryozoans (fenestrate, cryptostominid and trepstone). Brachiopods and Fusulinids are also found in samples in other locations (Figure 6-20).

Figure 6-20. abundance of Maubessi limestone in Rusa-1 wellsite vicinity.
Blocks of Crinoid limestone. Inset photo showing bryozoan from acetate peel analysis (A). Close up view of crinoid limestone with bivalve (B).

Permian volcanics are associated with the limestones, in this locality they commonly occur close to red limestone. They are exposed as highly weathered volcanic basalt, sometimes as pillow lava and occasionally as volcanic breccia (Figure 6-21).

Stratigraphically the Maubisse Formation is overlain by the Triassic Aitutu and Babulu Formations though the contact is rarely seen in the field.

Figure 6-21. Highly weathered Permian volcanic block

6.1.3.2.2 Babulu Formation

The Babulu Formation was first mapped in West Timor by Gianni 1971 at Babulu river. This Formation is composed mainly of shales, that alternate with sandstone and siltstone layers. Shales are usually black or dark grey, occasionally micaceous, and bituminous and sometimes laminated. In Timor-Leste, this Formation was mapped by Monteiro in 2005 in the Manatuto area where organic rich fine-very fine-grained sandstone is categorised as both potential reservoir and source rock.

The Babulu Formation was mapped as a member of Wailuli and the flysch types were mapped as Aitutu Formation by Audley-Charles 1968. Monteiro 2003 described two members of Babulu Formation in Timor:

1. Shales; are usually black to dark grey, sometimes micaceous, bituminous. The thickness ranges from laminae – several meters thick, sometimes chaotic, and some shales contain *Halobia*.

2. Thick bedded sandstone: the bed thickness ranges from (1-7m) sandstone interbedded with paper thin shale. Occasionally exotic limestone beds occur within the sandstone succession.

At the Rusa-1 proposed well location the Babulu Formation is well exposed to the southeast around the Betano irrigation area. It is predominantly green-grey, medium-fine-very fine grained sandstone, which is, from visual examination it appears to be porous and permeable. Bed thickness range from 2 cm – 1m thick, it contains burrowing structures (chondrites) in sandstone and is interbedded with paper thin grey shale. It is commonly highly deformed with very steep dips, well sorted, overall fining-up/thinning-up sandy succession overlying grey silty shales. Most of the riverbank cuttings contain metre-decimetre beds. The sandstones are rich in carbonaceous fragments and have clay chips which possibly indicate the base amalgamated bed (Figure 6-22).

Figure 6-22. (A) Very indurated fine-grained sandstone overlying by grey thin shale layers. (B) Very thick bedded sandstone cropping out in the middle of the river

(Insert photo A showing close up of clay chips tracks in sandstone.. Insert photo B is closeup of thick beds.)

The Babulu Formation is one of the Gondwana Megasequence units that is well distributed at surface in the onshore. From palynology the Formation is assigned as Ladinian – Carnian (Middle – Late Triassic) in age, it is overlain by the Jurassic Wailuli Formation.

6.1.3.2.3 Bobonaro Formation

Stratigraphically Audley Charles (1968) divided the Bobonaro Melange into two principal units; scaly clay matrix and the exotic material. Ron Harris (1998) added one more unit called Broken Formation. Most of the melange fragments are derived from the older known rock units. The qualitative field criteria for Classification of Bobonaro melange is shown in Table 6-2.

In more recent research the Bobonaro Melange is genetically classified into three categories; diapiric melange, tectonic melange and broken formation based on internal structure and relationship with nearby rocks.

The name of Bobonaro melange is derived from the Bobonaro scaly clay that is well exposed beside the Loumea river in east of Bobonaro village where the outcrop is almost 8 km long.

Table 6-2. qualitative field criteria for Classification of Bobonaro melange

Classification	Matrix rich	Mixed Block in clay	Broken Formation
Range of block type	Narrow - wide	Very wide (most units)	Narrow (1-2 formations)
Most common source	Australian affinity units	Mixed both Australian and Asian affinity	Australian affinity units
Block size	Mostly granular and blocks <1m	Typical bimodal >m Maubisse Formation and Banda Terrane	Mostly <10m
Matrix characteristic	Well-developed flow and scaly fabrics	Well-developed flow and scaly fabrics	Well-developed flow and scaly fabrics
Matrix to block	>5:1	1:2 to 5:1	1:3 to 3:1
Contact relations	Both cross cutting and concordant intrusive	Locally transitional with broken Formation, cross cutting and fault related.	Varies but transitional with nearby units
Bedding	Absent	Mostly absent	Mostly retained
Structural correlation and distribution	Diapirism and mud volcanism throughout orogenic wedge	Surrounding high-level nappes of Maubisse Formation and Banda Terrane	Close to decollement and in diapirs of southwest Timor

At the proposed well location, the Bobonaro melange occupies most of the western part with some contact with Maubisse Formation. In the Rusa-1 area the Bobonaro grey, and rarely red, clay, mostly muddy, with fragments of other lithologies such as Lolotoi Complex, Perdido Limestone, Babulu Sandstone and blocks of Maubisse Formation (Figure 6-23). From field observations the melange near the Rusa-1 wellsite is categorized as tectonic melange.

Figure 6-23. (A) Exotic blocks of limestone within mud. (B) Sandstone block of Babulu within mudstone.

Stratigraphically the Bobonaro was first dated as the youngest syn-collisional melange of Miocene age by Audley-Charles (1968), however in recent studies Benincasa 2009 assigned it as Triassic in age based on well preserved palynomorphs, rare acritarches and nodsariid foraminifera.

6.1.3.2.4 Wai Bua Formation

Wai Bua Formation is an autochthonous unit that is well exposed in the Betano area particularly well cropping out along the Caraulun river. This Formation is characterised by a well bedded radiolarian succession, white and sometimes pink in colour, predominantly calcilutite and occasionally calcarenite, frequently manganese occurs as nodules, as do bright coloured cherty radiolarite.

Audley-Charles (1968) defined the type locality of this Formation in an area of poor outcrop about 5 km northeast Betano. Photogeological and field observation suggested a thickness of at least 500 m. Presence of fossil fauna and very fine grained pelagite carbonate with radiolarian shale are indications that this sediment accumulated in open marine and deep sea.

At the proposed Rusa-1 wellsite, this Formation is well exposed to the east and northeast of the well location. It is well exposed along the downstream extent of the Sui river and outcrops in the eastern part of Riatu village. It is very light pink in colour, highly fractured, occasionally faulted and at least 18 m thick. Sometimes it is exposed as massive and chaotic and locally well bedded successions with no shale in the lower part of outcrops (Figure 6-24 and Figure 6-25).

Figure 6-24. Well bedded radiolarian succession with chert as nodules.
Exposed in the north of Rusa-1 well location.

Figure 6-25. Highly fractured carbonate pelagite at Caraulun river west of Sesurai Village.
(GPS Coordinate Latitude: -9.112094° and Longitude: 125.690177°)

Audley-Charles (1968) assigned the Wai-Bua as Campanian – Maastrichtian or Late Cretaceous based on radiolarian identification.

6.1.3.2.5 Batu Putih

The oldest synorogenic deposit was mapped as part of Viqueque Formation by Audley-Charles (1968) in his reconnaissance report. He defined it as the lower part of the Viqueque Group and was comprised of a series of distinctive white calcilutites and tuffs with subordinate marls. Planktonic foraminifera are the dominant fossils, particularly with abundant *Globigerina*. Benthonic forams occur as accessories as well as molluscs, ostracods, fish debris and pyritized organic matter.

The Batu Putih as a separate Formation was firstly introduced by Kenyon (1974) in West Timor, as the oldest lithology in the syn-orogenic deposit of the central Basin Succession. In onshore Timor-Leste, Haig and McCartain (2007) reported the carbonate chalk as the lower section of Viqueque Formation. In the PSC TL-OT-17-09 permit area, the Batu Putih is well distributed in the eastern part of block, from the Dotik area and extending to the northern contact with the Lolotoi complex. The Formation is also well exposed along the road between Same and Daisua (Figure 6-26).

From field observation this Formation is characterised by white, chalky, friable, mostly massive but occasionally bedded, with woody material. In some areas the Batu Putih is conformably overlain by younger Formations.

A sample of pale argillite with abundant of planktonic foraminifera examined by Timor Resources contains Globorotalia Tumida, Sphaeroidellopsis kochi, Globorotalia limbate and Globorotalia tumida. Based on these fossils Batu Putih is assigned as (N18-N19) or early Pliocene. Haig's (2012) examination of planktonic foraminifera recognises it as Early Pliocene deposition in the syn-orogenic Megasequence.

Figure 6-26. Broken, massive Batu Putih. well exposed on the roadside between Same and Daisua.

6.1.3.2.6 Baucau Formation

The Formation is characterised by karst morphology and a dark red soil. It is a hard, vuggy, cavernous, massive white coral reef limestone. Four lithologies were described by Audley-Charles (1968):

1. Coral reef limestone. These are massive, dense, in situ growths of coral with subordinate amounts of calcareous algae.
2. Calcirudite. Massive - poorly bedded conglomerates, composed of reef debris cemented by micrite and sparry calcite from lenticels within situ coral limestone.
3. Calcarenites. Interbedded with in situ reefs, almost entirely composed of sand grains, coral fragments, bryozoans, foraminifera and calcareous algae with minor molluscs and echinoderms.
4. Sub-mature greywacke - pebble sandstone.

The Bacau Formation is named after the series of terraced reefs outcropping around the Baucau town. In the Baucau town area it forms karst morphology. Good exposures of this formation occur at Fatumean Suai, and at the top of Mt. Laritame, 1300 m above present sea level (Gilsel 2010).

Generally, in PSC TL-OT-17-09, good exposures occur in the Hatu-Udo (Figure 6-27), Betano and Dotik areas. In the Hatu-Udo area the Baucau limestone lies conformably on Viqueque Formation. From the presence of coral-algal-foram limestone in the Formation it is assigned as Early Pleistocene (Audley-Charles 1968 and Borges, 2010).

Figure 6-27. Contact between Baucau limestone and Viqueque Sandstone. Hatu-Udo.

6.1.3.2.7 Ainaro Gravel

The type section of Ainaro Gravel is based on exposed terrace deposits at 800 m above sea level in Ainaro village. In the Ainaro river the terraces have been left behind by the present river that has cut a gorge more than 40m deep. Similar outcrops are found in Laclubar, Cribas, Same, Aileu and Railaco on the present riverbanks.

The Ainaro Formation comprises of boulders, pebbles and gravel, sand, and silt, all are lenticular and strongly cross-bedded. Generally, this formation is friable, but locally it is calcite cemented.

At the proposed well location particularly Rusa-1 well, the Ainaro Formation is cropping out to the north of well location (Figure 6-28). It is characterised by boulders, pebbles, and gravel of older lithologies such as fragments of Lolotoi complex, boulders of Triassic units and sand.

Figure 6-28. Good exposure of Ainaro Gravel to the north well of Rusa-1 Well location.

6.1.3.2.8 Alluvial Deposits

Quaternary alluvium is well deposited along the coast and riverbanks. These sediments are transported and deposited by rivers in last few thousand years. Alluvial sediments overlie the native bedrock and often form rich soils. These deposits are characterised by clay and silt mixed with fragments and boulders of other lithologies.

Generally, in PSC TL-OT-17-09 the river deposits are well distributed in the Same area, even at high altitudes. In the Rusa-1 well location they occur to the east and southwest (Figure 6-29).

Figure 6-29. Loose, sand, clay and silt with fragments of other lithologies overlie Triassic Babulu sandstone. (Photo taken in southwest of Betano irrigation (Rusa-1 area))

6.1.3.3 Petroleum System

Occurrences of a large number of oil and gas seeps in onshore Timor-Leste indicate an active petroleum system. Elements of the petroleum system onshore have been identified by various researchers such as: (Audley-Charles,1968), (Charlton,2002), (Monteiro,2003), (Ferreira, 2011), (Timor Resources, 2017). Source rocks range from Triassic Aitutu Formation and Babulu shale– Jurassic Wailuli shale. From field observation Babulu Sandstone, Aitutu Fractured limestone, Jurassic Wailuli sandstone, and Viqueque Formation are categorized as potential reservoirs. Shale of Viqueque and Wailuli are potential seals. The stratigraphy column (Figure 6-19) denotes Source as "S", reservoir as "R" and seal as "Sl". There has been little study of migration pathways, due to lack of sub-surface definition by seismic. The Main objective of this exploratory drilling is to test two type of plays within the area of PSC TL-OT-17-09:

- A primary Jurassic-Triassic Marker target and secondary intra-Triassic targets interpreted as either being more proximal clastic equivalents of Babulu and Wai Luli clastics and carbonates.
- A deeper Sub-Decollement target which possibly represents underplated Australian continental clastic and carbonate units (optional deeper target only).

6.1.4 Air and Noise

Clean air is considered to be a basic requirement of human health and wellbeing, however, air pollution continues to pose a significant threat to health worldwide according to the World Health Organisation (WHO, 2005). This section reviews the air quality in the drilling area as a baseline against which any potential impacts associated with the PSC TL-OT-17-09 drilling project can be assessed.

6.1.4.1 Sensitive Receptors

The locations of sensitive receptors relative to the drilling area were identified from aerial photography, on-site visual inspection during the TOR surveillance visits and in a desktop assessment of the local area. Based on the assessment, the sensitive receptors identified for collection of air quality and noise measurements are shown in Table 6-3 and shown in Figure 6-32 note the letters in the Table reflect the legend in Figure 6-32.

Table 6-3. Sensitive Receptors for Air Quality and Noise

Sample Site	Location	Sensitive Receptor	Distance (km)	Centroid Coordinates	
				Latitude	Longitude
01 - b	Aldeia Fatukabelak	Resident Settlement	0.93	09º 07’ 05” S	125º 41’ 33.8 “E
02 - a	Aldeia Sessurai	School area	1.06	09º 06’31.1” S	125º 41’44.8” E
03 - c	Aldeia Raimerlau	Resident Settlement	0.47	09º 06 ’52.5” S	125º 41” 00” E

6.1.4.2 Air Quality

The study method adopted for this assessment is as follows:

- Identify and present available secondary data sources.
- Identify air quality sensitive receptors (i.e., residences, schools) in the study area (see Table 6-3).
- Collect baseline primary ambient air data in the study area.
- Air Quality and noise data was collected and analysed by identified and experienced local laboratory in accordance with internationally recognised standard, using calibrated hand held instruments as follows using hand held instruments as follows:
    - Particle Counter AMT18 and HTI HT-9600 measuring during 24 hour nonstop.
    - Gas Analyzer Model/type BH-4S to knows the O_2, H_2S measuring 2 times for one day (morning and afternoon).
    - Gas Detector Model/type BH-90A to knows the parameter of NO_2, SO_2 and O_3 measuring 2 time for one day (morning and afternoon).
    - Anemometer Model/type Benetech GM 8901
- Assess the baseline ambient concentrations of particulates and gas pollutants against the assessment criteria.
- Calculate levels of gaseous emissions from diesel generators, plant and vehicles during the project See Section 9.3.3
- Examine management measures to minimise air emissions See Section 9.3.3.
- All the data were compared with international guidance published by International Finance Corporation (IFC, 2007a) and the World Health Organisation (WHO, 2005).

Sampling Equipment Standards

Descriptions of the sampling equipment including standard references for each are shown below and summarised in Table 6-4.

Table 6-4. Sampling Equipment Standards

Parameter	Sampling Method	Sampling Duration	Equipment
PM_{10}	Light Scattering	24 hours	Optical particle counter HT - 9600
$PM_{2.5}$	Light Scattering	24 hours	Optical particle counter HT - 9600
Sulphur Dioxide	Amperometric	24 hours	Electrochemical gas sensor Bosean BH-90A
Nitrogen Dioxide	Amperometric	1 hour	Electrochemical gas sensor Bosean BH-90A
Ozone	Amperometric	1 hour	Electrochemical gas sensor Bosean BH-90A

<u>PM_{10} and $PM_{2.5}$</u>

Particulate matter was measured using an optical particle counter, which its detection method is based on the principle of light scattering from particles. As illustrated in Figure 6-30 , the particles crossing the illumination zone, collimated from a laser diode, produce a photoelectric impulse, which is proportional to the size of particle to be measured (Agranovski, 2010).

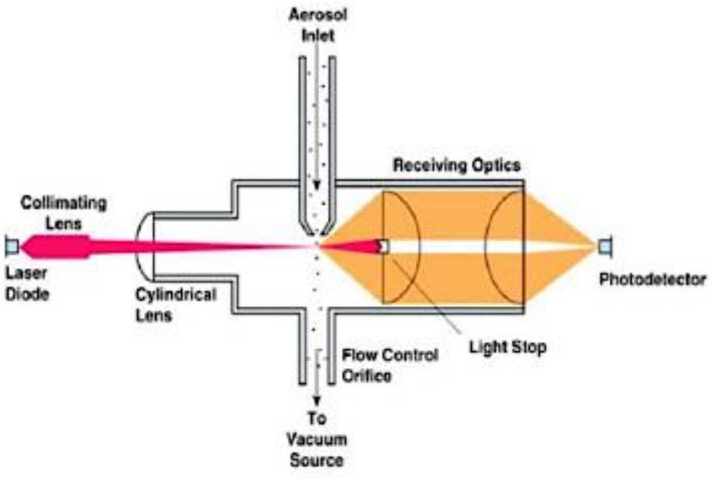

Figure 6-30. Schematic design of an optical particle counter.

<u>Sulphur dioxide</u>

Sulphur dioxide was measured using an Amperometric sensor, which uses a porous membrane or capillary system to allow the gas to diffuse into the cell containing electrolyte and the electrodes. When the gas reaches the sensing electrode, an electrochemical reaction occurs; either an oxidation or reduction depending on the type of gas, resulting in the flow of electrons from the sensing electrode to the counter electrode through the external circuit. This flow of electrons generates electrical current, which is proportional to the concentration of an analyte present outside the sensor and gives a direct measure of its concentration, as illustrated in Figure 6-31 (Cretescu et al., 2017).

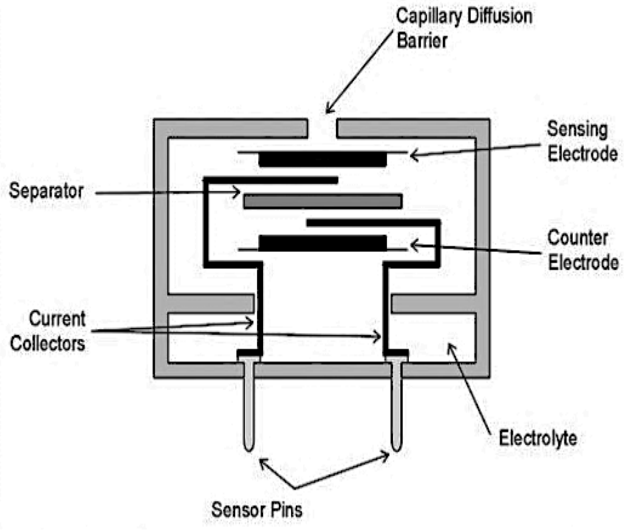

Figure 6-31. Amperometric sensor schematic design.

Nitrogen Dioxide

NO_2 was also measured using an Amperometric sensor. A reduction reaction occurs that disassociates it to form nitrogen and oxygen, resulting in the flow of electrons from the counter electrode to the sensing electrode and generates electrical current.

Ozone

O_3 was measured using an Amperometric sensor.

Assessment Criteria

In the absence of air quality legislation or regulations, recognised international guidance from IFC and WHO is used in this study (see Table 6-5). Regarding air quality IFC refers to the WHO guideline values for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. In this project the principle potential impacts relate to dust arising from construction activities and emissions from diesel engines both for power generation and in plant and vehicles. As such this study focuses on particulates ($PM_{2.5}$ and PM_{10}) and NO_2 and SO_2, utilising available secondary data and the primary data collection as comparisons. In the case of engine emissions, the levels are calculated using recognised emission estimate methodology applicable to diesel engines.

Table 6-5. WHO Ambient Air Quality Guidelines 2005

	AVERAGING PERIOD	GUIDELINE VALUE $\mu g/m^3$
Sulphur dioxide (SO_2)	24-hour mean 10-minute mean	20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	Annual mean 1-hour mean	40 (guideline) 200 (guideline
Particulate Matter PM_{10}	Annual mean 24-hour mean	20 (guideline) 50 (guideline)
Particulate Matter $PM_{2.5}$	Annual mean 24-hour	10 (guideline) 25 (guideline)
Ozone	8-hour mean	100 (guideline)

Study Scope

The scope of this study incorporates the drilling project area as described in Section 4. The project has the potential to produce the air emissions during facility and road construction mainly related to dust and from equipment burning diesel as identified in Table 6-6. Emissions will be calculated using accepted industry guidelines related to diesel generators and engines (see Section 9.3.3).

Table 6-6. Emission Sources during exploration Drilling

Emission source	Purpose	Treatment	Point of Emission	Emission Gas
Diesel fuel	Engine for power production drilling rig, vehicles	Combustion	Engine exhaust	CO_2, NO_X, CH_4, CO, N_2O, Particulates
Well testing	Testing of wells	Combustion	Burner	CO_2, NO_X, CH_4, CO, N_2O, Particulates
Other direct hydrocarbon emission	Drilling fluid Well clean-up Fugitives and leakages Produced water Storage tanks	None None None None None	Evaporative Vent stack/tanks BOP Vent stack Vent stack	VOC, CH4 VOC, CH4 VOC, CH4 VOC, CH4 VOC, CH4
Dust	Construction activities	None	Ground level	Particulates

Figure 6-32. Rusa-1 Sensitive Receptors - Air Quality and Noise Locations

Secondary Data

The following secondary data sources were accessed:

- World Bank (2009). Timor-Leste: Country Environmental Analysis. Sustainable Development Department, West Asia & Pacific Region. July 2009.
- Japanese International Cooperation Agency (JICA) (2016). Timor-Leste: National Road No. 1 Upgrading Dili - Baucau. Simplified Environmental Impact Statement/Initial Environmental Examination. Project No.: 50211-001. August 2016.
- Worley Parsons Tasi Mane Project - Betano Petroleum Refinery and Beaço LNG Plant Strategic EIS. Final Report No. 301012-01504-EN-REP-0005. June 2012. (Worley Parsons, 2012a)
- Worley Parsons Tasi Mane Project - Suai Supply Base Environmental Impact Assessment. Final Report No. 301012-01504-EN-REP-0003. May 2012. (Worley Parsons, 2012b)
- Timor-Leste Employment and Environmental Sustainability Fact Sheet 2019 – (ILO, 2019)
- PM2.5 and weather information for Dili: https://www.iqair.com/timor-leste/dili

Summary of Secondary Air Quality Data

The World Bank Timor-Leste Country Environmental Analysis July 2009 summarised air quality as follows:

- At present, outdoor air pollution is a minor problem and is mainly limited to Dili.
- Emissions of greenhouse gases and other pollutants from road transport are modest, given the small number of motor vehicles in use in Timor-Leste.
- Industrial emissions are also limited since the industrial sector represents a small proportion of the economy of Timor-Leste.
- Open burning is also contributing to outdoor air pollution. Open burning of small amounts of waste lowers urban air quality.

The JICA simplified EIA (JICA, 2016) describes air quality as generally acceptable with the exception of dust. Dust arises owing to the poor condition of the roads and dust arising when vehicles pass over unsealed shoulders of roads in many places.

Worley Parsons report baseline air quality data in the Betano Petroleum Refinery and Beaço LNG Plant Strategic EIS (Worley Parsons, 2012a) and the Suai Supply Base EIA (Worley Parsons, 2012b). As part of the EIA studies the assessments showed that most existing sources of air pollutants (dust particles such as $PM_{2.5}$ and gases such as nitrogen dioxide, sulphur dioxide and carbon monoxide) originate from human activities such as dust from roads, vehicles exhaust, power generation exhausts, smoke from cooking stoves and the removal of vegetation. Although, aspects such as total suspended particulates are likely to vary widely during the year due to seasonal effects.

The carbon dioxide (CO_2) emission levels for Timor- Leste have increased sharply by an average of 12 % from 2005 to 2014 (Figure 6-33). The increase was due primarily to the energy sector (power generation and transportation). Other sources are: industries; land use change and forestry; and waste. The level of emissions is so much lower than the Asia-Pacific and ASEAN averages that it appears negligible.

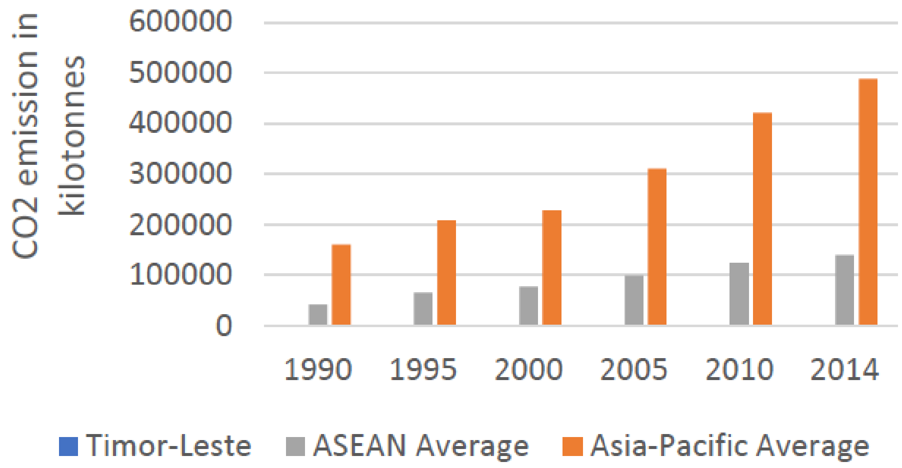

Figure 6-33. CO_2 Emissions for Timor-Leste, 1990- 2014

(after ILO 2019)

Nitrogen dioxide and nitric oxide are formed primarily during the combustion of fuels at high temperatures. In an air quality context, the primary sources of oxides of nitrogen are motor vehicle and power generation exhausts. Sulphur dioxide is also produced by combustion of fuels that contain sulphides, for example diesel or 'sour' natural gas.

Worley Parsons (2012a and 2012b) demonstrated that concentrations of NO_x and SO_x were below the threshold limit of reporting, that is, <1 µg/m^3. In general, the principal gaseous pollutants from traffic $CO/SO_x/NO_x$ are well dispersed in open terrain and there is potentially adequate dispersion in the wide main thoroughfares of the towns and villages. Across the study area most pollutants originate from vehicular traffic and, to a lesser extent, smoke produced from refuse disposal. Current air quality indicators were well below the referenced air quality benchmarks.

Worley Parsons (op cit) noted that in the Suai region, the primary observed sources of air pollutants are vehicular traffic and smoke produced from burning vegetation for agricultural clearing. To a lesser extent, bulk refuse burning and operation of electricity generators also contributes to air pollutants.

Sources of particulate matter can be widespread, ranging from mechanical grinding of materials, wind-generated dust from stockpiles of material, to salt crystals from sea spray. Primary sources of particulate matter are likely to be combustion exhaust from vehicular traffic, smoke from the burning of vegetation and dust generated from agricultural activities (e.g., ploughing fields, livestock movement, grading of roads and paths). Vehicle wheel-generated dust was not observed during the site inspection to be a significant contributor to airborne particulate matter due to the moisture content of the roads and soil although this is likely to be subject to seasonal variation.

The studies concluded that exposure of areas of soil (e.g. vegetation clearing) accompanied by vehicular traffic, will cause localised increases in airborne dust particles ($PM_{2.5}$ and PM_{10}). These dust emissions will diminish and the emission of pollutant gases arising from fixed or mobile plant and equipment (power generation and vehicles) will take on a greater significance; however, these will still be relatively minor at a regional scale.

During construction, air emissions will mainly arise from combustion products resulting from diesel engine exhaust, both the rig and vehicles, occasional gas flaring during well testing.

Particulate Matter (PM) is a common proxy indicator for air pollution (WHO, 2018). It affects more people than any other pollutant. The major components of PM are SO_x, NO_x, ammonia, sodium chloride, black carbon, mineral dust and water. It consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. While particles with a diameter of 10 microns or less, ($\leq PM_{10}$) can penetrate and lodge deep inside the lungs, the even more health-damaging particles are those with a diameter of 2.5 microns or less, ($\leq PM_{2.5}$). $PM_{2.5}$ can penetrate the lung barrier and enter the blood system. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer.

Air quality measurements are typically reported in terms of daily or annual mean concentrations of PM_{10} particles per cubic meter of air volume (m^3). Routine air quality measurements typically describe such PM concentrations in terms of micrograms per cubic meter ($\mu g/m^3$). When sufficiently sensitive measurement tools are available, concentrations of fine particles ($PM_{2.5}$ or smaller), are also reported.

The $PM_{2.5}$ atmospheric particulate matter emission levels for Timor-Leste decreased slightly from 2000 to 2016 (Figure 6-34). Overall $PM_{2.5}$ emission levels exceeded the World Health Organization's Air Quality Guideline threshold level, thus indicating high emissions. Timor- Leste shows lower levels of emission than both the ASEAN and the Asia-Pacific averages

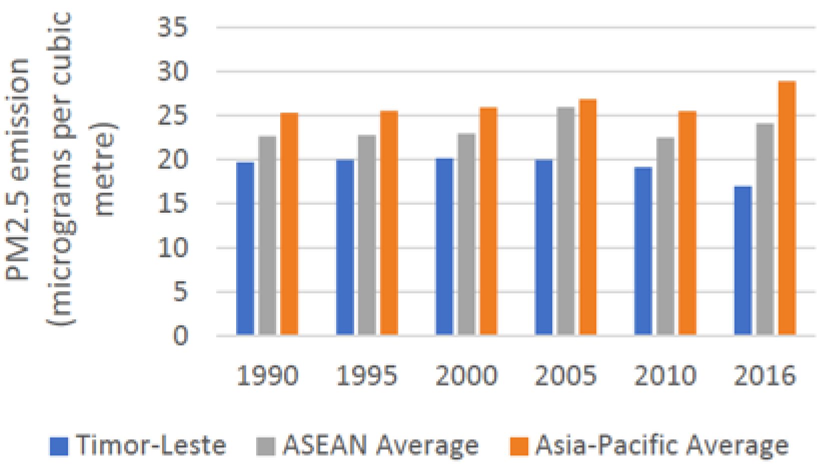

Figure 6-34. PM2.5 emissions for Timor-Leste, 1990-2016 (after ILO 2019)

The Worley Parsons EIA studies (Worley Parsons, 2012a and 2012b) measured average PM_{10} values between 29 $\mu g/m^3$ and 34 $\mu g/m^3$ which is less than the 24-hour average WHO guidelines of 50 $\mu g/m^3$ (see Table 9-13). Both studies indicated a consistent increase in concentrations in the evening between 18:00 and approximately 20:30.

The mean annual exposure value for PM $_{2.5}$ in Timor-Leste was 19.26 µg/m^3 as of 2017 which exceeds the recommended WHO annual mean of 10 µg/m^3. Figure 6-35 shows that over the past 27 years this indicator has decreased from a maximum value of 23.76 µg/m^3 in 2011 to a minimum value of 19.26 µg/m^3 in 2017. As a result, in accordance with the World Health Organization's guidelines, the air quality in Timor-Leste is considered moderately unsafe as PM$_{2.5}$ is 19 µg/m^3.

Year	Value
1990	23.06
1995	23.26
2000	23.50
2005	23.25
2010	23.49
2011	23.76
2012	22.47
2013	21.96
2014	20.45
2015	20.62
2016	20.02
2017	19.2

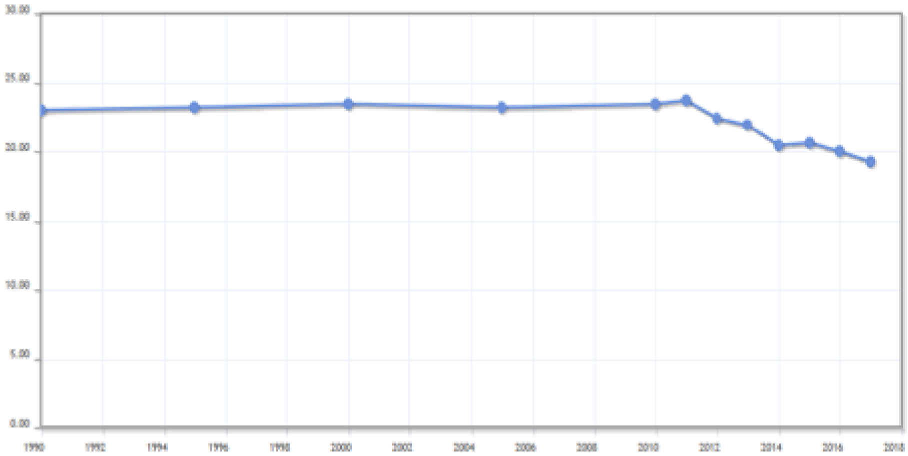

Figure 6-35. Mean Annual Exposure Value for PM2.5 in Timor-Leste. Source: (Index Mundi, 2017)

Summary of Baseline Air Quality Results

Baseline ambient air quality data is summarised in Table 6-7,
Table 6-8 and Table 6-9, with 24 hour continuous Particulate data presented in Figure 6-36 and Figure 6-37 and Figure 6-38 and in Appendix 6.5

The ambient air quality data for sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) were all below 1 µg/m^3, the detection limit of the instrumentation, thus well within the WHO Standards.

The ambient air quality data collected at the three sensitive locations for sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) and ozone (O_3) were all below 1 µg/m^3, the detection limit of the instrumentation, thus well within the WHO 24-hr Standards.

The concentration of dust particulate of PM$_{2.5}$ at the three receptors are generally within the WHO 24-hour standard of 25 µg/m^3 except for peaks that occur at peak traffic hours between 06:00 and 09:00 and again at 18:00-19:00. There appears to be an anomalous reading at Aldeia Raimerlau at 23:00.

PM$_{10}$ data at Rusa-1 drilling location are for the most part below slightly above the WHO 24-hour standard of 50µg/m^3 with a maximum at Aldeia Fatukabelak of 140 µg/m^3 between 05:00 and 07:00 which might be attributed to cooking fires, levels are again slightly elevated from 19:00-23:00 with values between 70 and 86 µg/m^3. Similar values and patterns are observed at Aldeia Raimerlau, but remain above the WHO standard of 5086 µg/m^3 throughout the day.

PM10 levels at Aldeia Sessurai are within WHO standard at night time between 22:00 and 08:00 but are much elevated during the day reaching a maximum of 500 – 725 µg/m^3. It should be noted that the sampling location at the school in Sessurai is on the main road between Betano and Same, thus is considered to be a result of high traffic volumes during the day.

Table 6-7. Ambient AQ Aldeia Fatukabelak (PM01)) 24-hr Average

Air Quality Measurements Data Form
Aldeia Fatukabelak 01

Project Details

Sample No TRRW01 | Project Title | Date, 25/04/2021 | Type of Device

Geo-Reference | Latitude | Longitude | Altitude 76m | Unit

Collected by | Reviewed by

Time	Temperature (ºC)	Humidity (%)	Wind Speed (m/s)	Wind direction	Carbon Monoxide (CO)	Hydrogen Sulfide (H2S)	Oxygen (O2)	Ozone (O3)	Nitrogen Dioxide (NO2)	Sulphur Dioxide (SO2)	Particulate Matter (PM10)	Particulate Matter (PM2.5)
9:40AM	21.2	66.3	1.961.	NS	1	0	20.9	0	0	0	66	3
10:40AM	30.8	64.1	0.112	NS	2	0	20.9	0	0	0	65	2
11:40AM	29	67	0.113	NS	0	0	20.9	0	0	0	40	1
12:40PM	31.6	61	0.146	NS	0	0	20.9	0	0	0	62	3
13:40PM	32	59.1	1.114	N	0.03	0	20.9	0	0	0	40	1
14:40PM	30.9	63	0.115	N	0	0	20.9	0	0	0	31	1
15:40PM	31.1	62	0.117	NS	0.05	0	20.9	0	0	0	76	2
16:40PM	30.4	63	1.23	NS		0	20.9	0	0	0	60	3
17:40PM	30.1	62	0.108	N	0	0	20.9	0	0	0	46	3
18:40PM	26.5	81	0.526	NS	0	0	20.9	0	0	0	67	4
19:40PM	26	80	0	NS	0	0	20.9	0	0	0	46	3
20:40PM	25	80	0	NS	0	0	20.9	0	0	0	94	10
21:40PM	24.3	81	0	NS	0	0	20.9	0	0	0	84	12
22:40PM	24.2	87	0	NS	0	0	20.9	0	0	0	89	6
23:40PM	23.7	86	1.02	N	0	0	20.9	0	0	0	65	3
00:40AM	23.3	80.4	0	N	0	0	20.9	0	0	0	68	6
01:40AM	22.4	84.1	0	N	0	0	20.9	0	0	0	74	8
02:40AM	22.2	84.3	0	N	0	0	20.9	0	0	0	78	9
03:40AM	21.7	0	0	N	0	0	20.9	0	0	0	56	10
04:40AM	21	85.7	0	N	0	0	20.9	0	0	0	58	7
05:40AM	21.2	87.7	0.02	NS	0	0	20.9	0	0	0	92	9
06:40AM	21.5	87.5	0	NS	0	0	20.9	0	0	0	58.9	180
07:40AM	21.5	88.2	0	NS	0	0	20.9	0	0	0	46	25
08:40AM	24.2	72.2	1.9	NS	0	0	20.9	0	0	0	59	7
09:40AM	26.7	73	0	NS	0	0	20.9	0	0	0	61	5

Table 6-8. Ambient AQ Aldeia Sesurai (PM02) 24-hr Average

Air Quality Measurements Data Form
Aldeia Sessurai PM02

Project Details

Sample No TRRW02 | Project Title | Date, 27/04/ | Type of Device

Geo-Reference | Latitude | Longitude | Altitude 84 m

Collected by: Pedro & Aureo G Toto | Reviewed by

Time	Temperature (ºC)	Humidity (%)	Wind Speed (m/s)	Wind direction	Carbon Monoxide (CO)	Hydrogen Sulfide (H2S)	Oxygen (O2)	Ozone (O3)	Nitrogen Dioxide (NO2)	Sulphur Dioxide (SO2)	Particulate Matter (PM10)	Particulate Matter (PM2.5)
10:50AM	29.2	57.2	0	EW	0	0	20.9	0	0	0	66	2
11:50AM	32	54.8	1.116	EW	5	0	20.9	0	0	0	15.27	15
12:50PM	32.2	60.2	1.117	EW	0	0	20.9	0	0	0	38.5	8
13:50PM	37	43.6	2.76	EW	0	0	20.9	0	0	0	21	19.6
14:50PM	31.7	61.7	1.26	SN	0.03	0	20.9	0	0	0	177	4
15:50PM	29.7	69.2	1.183	SN	0	0	20.9	0	0	0	1080	77
16:50PM	29.3	71.49	1.961	SN	0	0	20.9	0	0	0	48	5
17:50PM	27.5	79.8	0	SN	0	0	20.9	0	0	0	141	4
18:50PM	21.1	81.1	0	SN	0	0	20.9	0	0	0	90	8
19:50PM	23.7	82.5	0	SN	0	0	20.9	0	0	0	88	21
20:50PM	23	87	0.96	EW	0	0	20.9	0	0	0	62	9
21:50PM	22	89	0	EW	0	0	20.9	0	0	0	89	10
22:50PM	22.4	85.6	0.99	EW	0	0	20.9	0	0	0	66	10
23:50PM	21.3	89.7	0	NS	0	0	20.9	0	0	0	81	10
00:50AM	21	85.5	0	EW	0	0	20.9	0	0	0	66	8
01:50AM	20	80.8	0	EW	0	0	20.9	0	0	0	59	7
02:50AM	19.6	86.5	0	EW	0	0	20.9	0	0	0	60	8
03:50AM	19	92.7	0	EW	0	0	20.9	0	0	0	48	9
04:50AM	18.6	89.5	1.14	NS	0	0	20.9	0	0	0	60	10
05:50AM	18.2	90.7	0	N	0	0	20.9	0	0	0	79	10
06:50AM	17.6	90.5	0	NS	0	0	20.9	0	0	0	102	12
07:50AM	20.8	59.2	0	NS	0	0	20.9	0	0	0	24	20
08:50AM	27.5	47.7	1.961	NS	0	0	20.9	0	0	0	82	19
09:50AM	27.5	57.9	0.037	NS	0	0	20.9	0	0	0	137	7
09:40AM	26.7	73	0	NS	0	0	20.9	0	0	0	61	5

Table 6-9. Ambient AQ Aldeia Aldeia Raimerlau (PM03) 24-hr Average

Air Quality Measurements Data Form
Aldeia Raimerlau PM03

Project Details

Sample No TRRW03 Project Title Date, 27/04/21 Type of Device
Geo-Reference Latitude Longitude Altitude 88.4 m Unit
WGS 84 9.114583 125.683889

Collected by Aureo G Toto Reviewed by Jacinto

Time	Temperature (ºC)	Humidity (%)	Wind Speed (m/s)	Wind direction	Carbon Monoxide (CO)	Hydrogen Sulfide (H2S)	Oxygen (O2)	Ozone (O3)	Nitrogen Dioxide (NO2)	Sulphur Dioxide (SO2)	Particulate Matter (PM10)	Particulate Matter (PM2.5)
09:30AM	25.79	70.12	1.22	NS	0	0	20.9	0	0	0	12	14
10:30AM	27.5	60.6			0	0	20.9	0	0	0	10	11
11:30AM	29	47.8	1.22	NS	0	0	20.9	0	0	0	9	10
12:30PM	32	55.5	1.02	SN	0	0	20.9	0	0	0	42	6
13:30PM	36	56.3	1.146	EW	0	0	20.9	0	0	0	64	3
14:30PM	31.4	57.1	1.115	EW	0	0	20.9	0	0	0	25	3
15:30PM	31.9	62.6	1.16	SN	0	0	20.9	0	0	0	39	4
16:30PM	28.3	65	0.11	SN	0	0	20.9	0	0	0	40	5
17:30PM	27.5	70.5	0	SN	0	0	20.9	0	0	0	31.3	33
18:30PM	24.1	82.8	0	SN	0	0	20.9	0	0	0	51	5
19:30PM	25	79.3	0.96	EW	0	0	20.9	0	0	0	87	12
20:30PM	23.8	82.7	0	EW	0	0	20.9	0	0	0	90	13
21:30PM	22.9	91.5	0	EW	0	0	20.9	0	0	0	75	12
22:30PM	23	91.1	0	NS	0	0	20.9	0	0	0	72	12
23:30PM	22.5	88.9	0	EW	0	0	20.9	0	0	0	13	68
00:30AM	21.6	91.3	0	EW	0	0	20.9	0	0	0	87	14
01:30AM	21	91.5	0	EW	0	0	20.9	0	0	0	87	13
02:30AM	20.4	92.8	0	EW	0	0	20.9	0	0	0	62	11
03:30AM	19.6	94.5	0	NS	0	0	20.9	0	0	0	76	14
04:30AM	20.19	91.8	0	N	0	0	20.9	0	0	0	71	13
05:30AM	19.6	90.5	0	NS	0	0	20.9	0	0	0	64	11
06:30AM	20	9.9	0	NS	0	0	20.9	0	0	0	61	13
07:30AM	20	67	0	NS	0	0	20.9	0	0	0	98	19
08:30AM	21	58.8	1.12	NS	0	0	20.9	0	0	0	65	13
09:30AM	29.1	57.9	0	NS	0	0	20.9	0	0	0	49	8

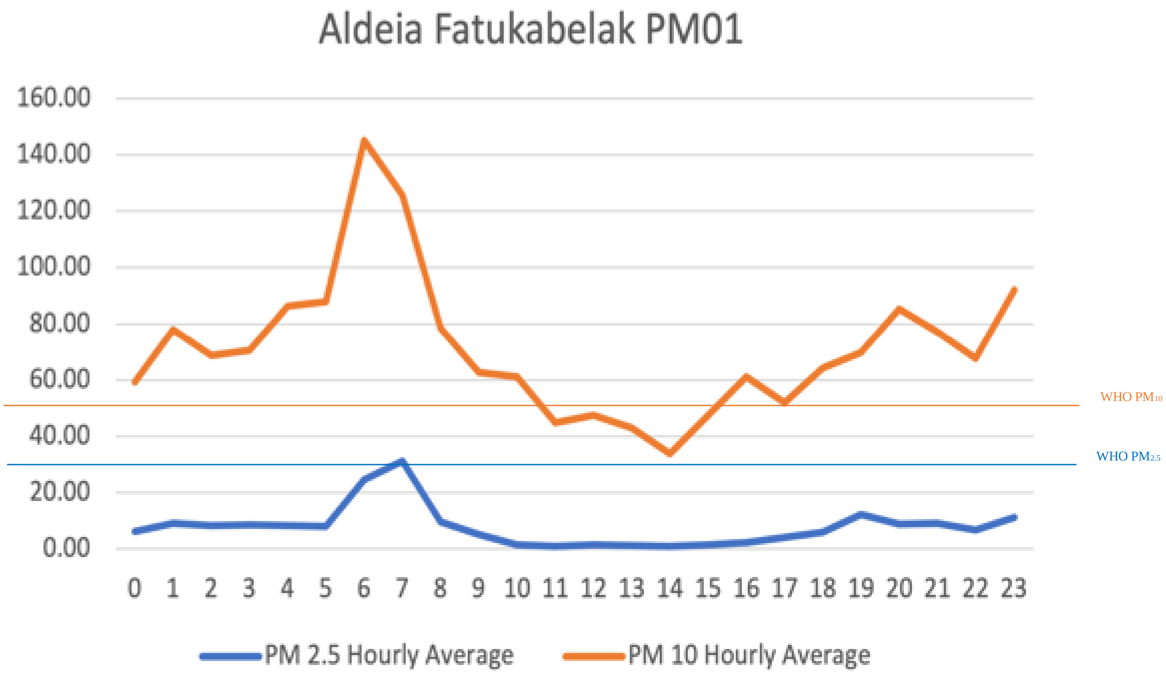

Figure 6-36. AQ Aldeia Fatukabelak (PM01) 24-hrs Data Plot.

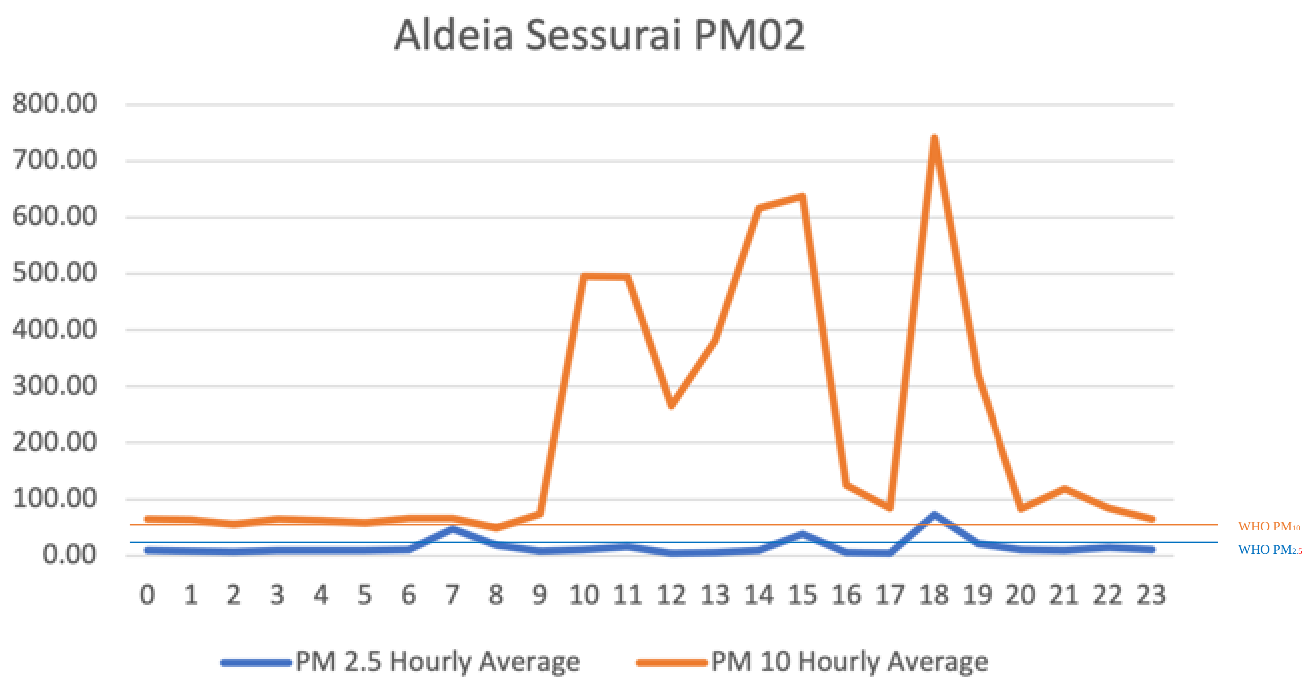

Figure 6-37. AQ Aldeia Sessurai (PM02) 24-hrs Data Plot

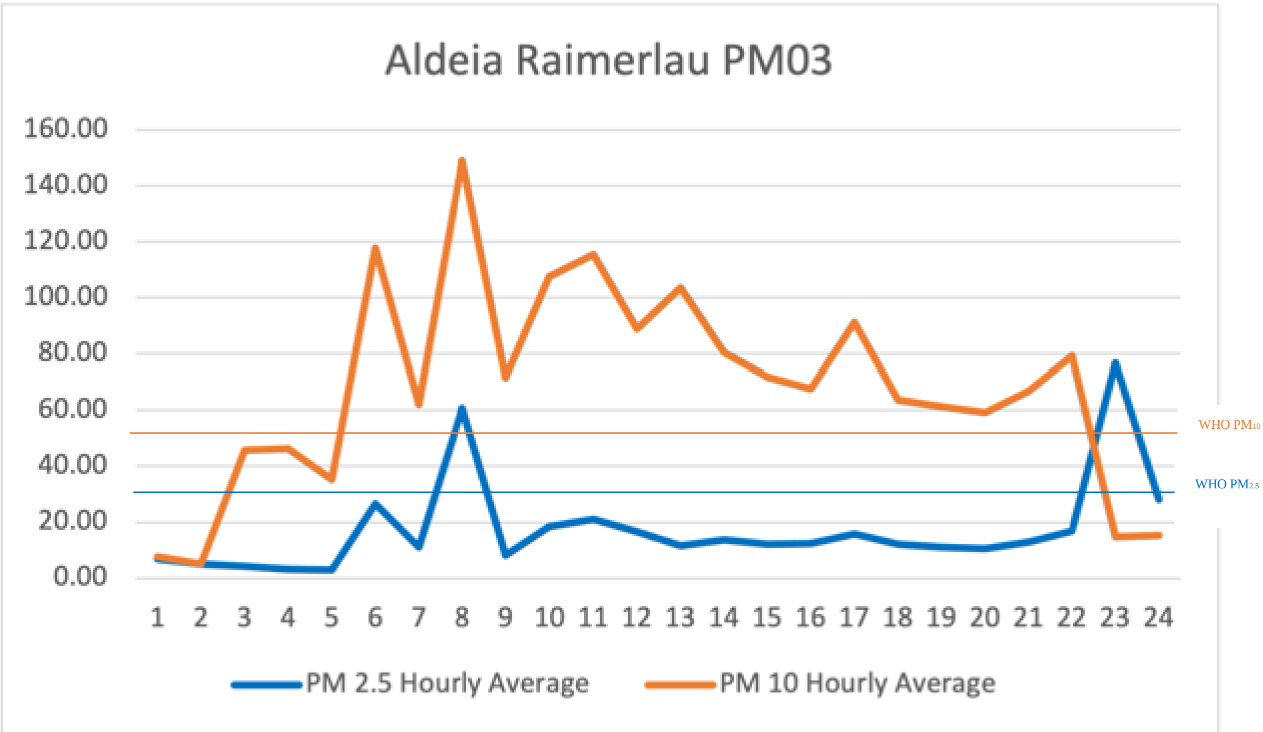

Figure 6-38. AQ Aldeia Raimerlau (PM03) 24-hrs Data Plot

6.1.4.3 Noise

The study method adopted for this assessment is as follows:

- Identify and present available secondary data sources.
- Identify sensitive receptors (i.e., residences, schools) in the study area (see Table 6-10 also Figure 6-32).
- Collect baseline primary noise data in the study area. This was completed in February 2021.
- Noise data was collected and analysed by identified and experienced local laboratory in accordance with internationally recognised standard, using calibrated hand held instruments as follows:
    - Noise meter Benetech Model: GM 1356 This unit was designed according to following standards:
        - International electrician committee standard: IEC PUB 651 TYPE2
        - US national standard: ANSI S1.4 TYPE2
    - Anemometer Model/type Benetech GM 8901
    - Data was collected for a continuous 10 minute period each hour over a 24 hour period.
- Examine management measures to minimise noise emissions See Section 9.3.7.
- All the data were compared with international guidance published by World Health Organisation (WHO, 2015).

Literature review

The following are the documents or secondary information sources used for the assessment:

- Tasi Mane Project - Betano Petroleum Refinery and Beaço LNG Plant – Strategic EIS study (Worley Parsons, 2012a)
- Tasi Mane Project - Suai Supply Base – EIA report (Worley Parsons, 2012b)
- The Timor-Leste National Road No. 1 Upgrading JICA (2016).
- WHO noise quality standard – (IFC 2007)

Secondary Data Review

Construction and operational noise associated with the proposed drilling project have been identified as a potential environmental factor with the potential to adversely impact the surrounding environment and communities.

The Betano EIA (Worley Parsons 2017a) recorded weighted average noise levels between 47 dBA and 62 dBA. The Suai Supply Base EIA (Worley Parsons 2017b) recorded weighted average noise levels between 55 dBA and 67 dBA. The Timor-Leste National Road No. 1 Upgrading (JICA 2016) recorded background noise weighted average, at various locations along the route, between 56 dBA to 65 dBA.

Primary Data

Primary data was collected from the sensitive receptors identified during the survey as shown in Table 6-10 , note the letters in the Table reflect the legend in Figure 6-32.

Table 6-10. Baseline Noise at Sensitive Receptors

Sample Site	Location	Sensitive Receptor	Distance (km)	Centroid Coordinates	
				Latitude	Longitude
01 -b	Aldeia Fatukabelak	Resident Settlement	0.93	09º 07’ 05” S	125º 41’ 33.8 “E
02 -a	Aldeia Sessurai	School area	1.06	09º 06’31.1” S	125º 41’44.8” E
03 - c	Aldeia Raimerlau	Resident Settlement	0.47	09º 06 ’52.5” S	125º 41” 00” E

Summary of Baseline Noise Results

24 hour continuous noise data was collected in April 2021 and are presented in Figure 6-39 ,

Figure 6-40 and Figure 6-41 and in Appendix 6.6. The figures also show the WHO standard for residential areas at 55 dB day time and 45 dB night time (orange line).

Overall the noise levels measured during the baseline survey at the three sensitive receptors are between 30 dB and 61 dB, with most below the residential limits of 55 dB (day time) and 44 dB (night time). There is a marked difference between the locations with the highest levels recorded in Aldeia Sessurai at the school, which is on the main road, where maximum levels between 11:00 and 18:00 were in the range is 48-61 dB outside these hours levels are in the range 35-47 dB.

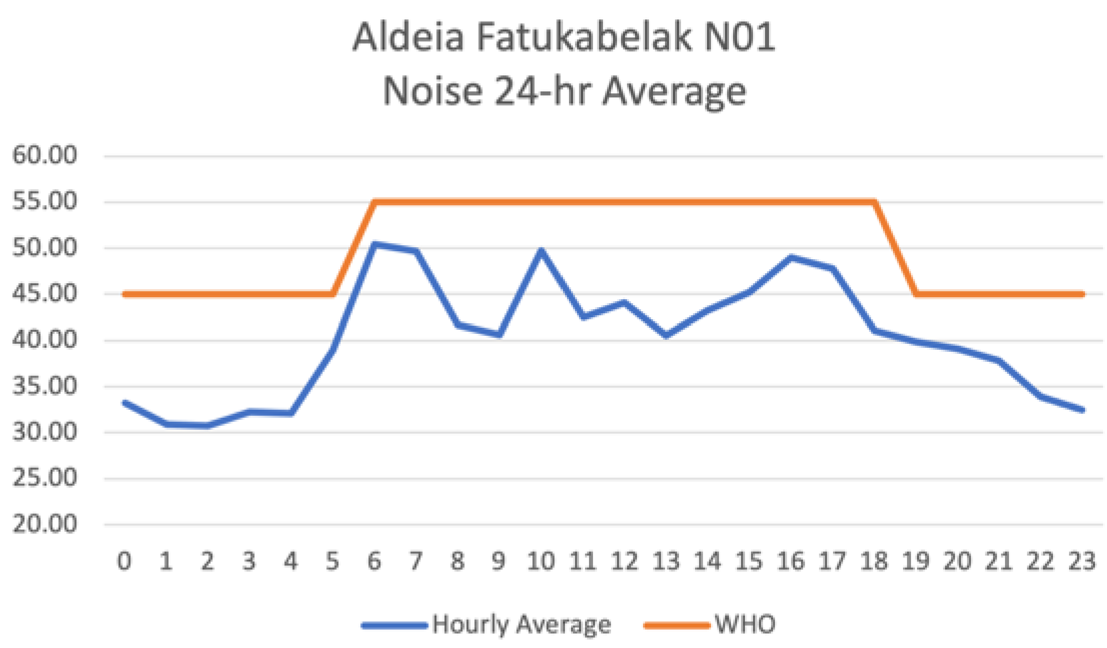

Figure 6-39. Noise - Aldeia Fatukabelak (N01) 24-hr Average.

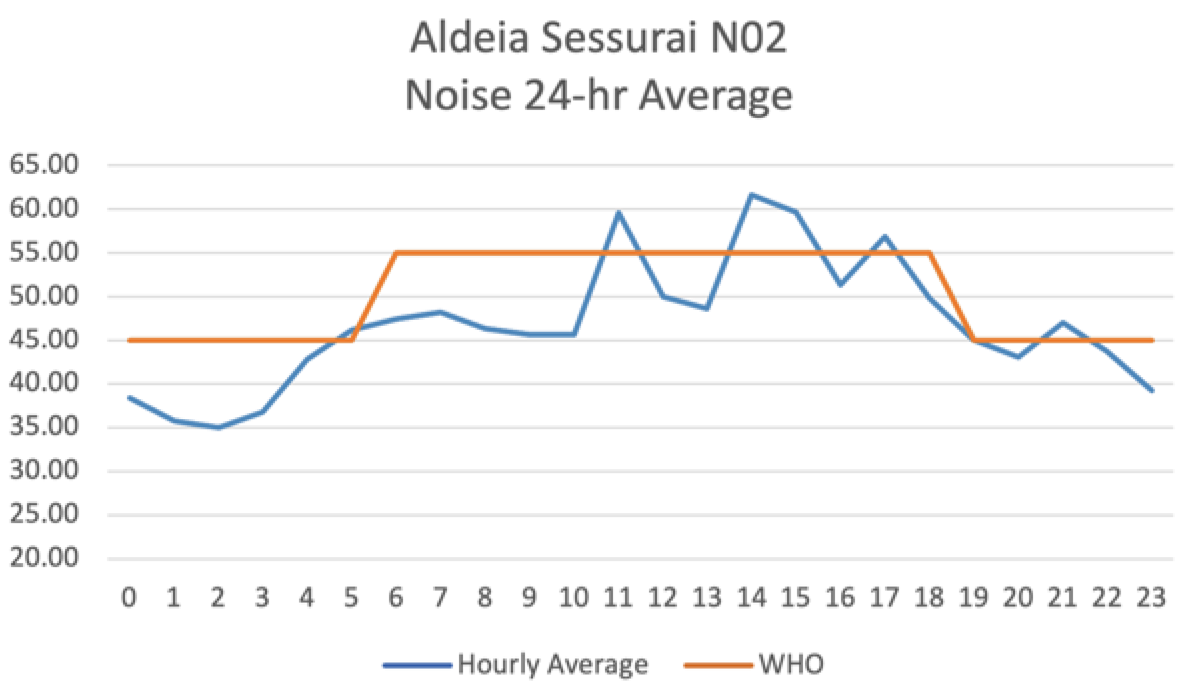

Figure 6-40. Noise - Aldeia Sessurai (N02) 24-hr Average

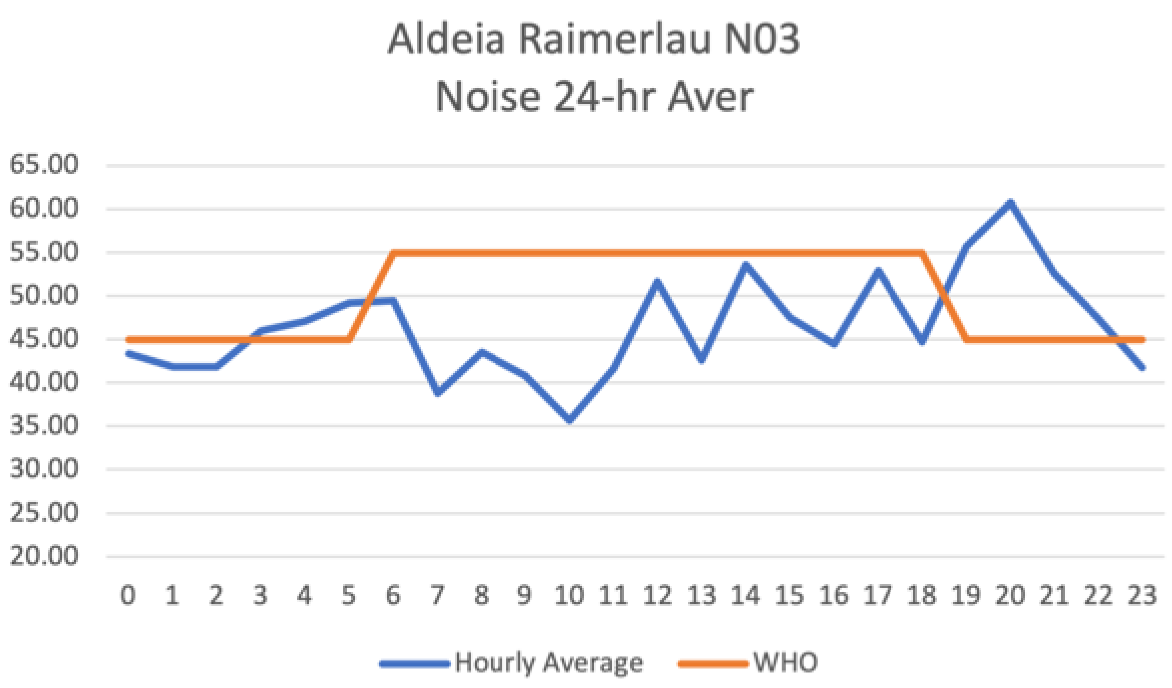

Figure 6-41. Noise Aldeia Raimerlau (N03) 24-hr Average

6.1.5 Surface and Ground Water

6.1.5.1 Standards

Timor Resources made the decision to contract the National Directorate for Water and Sanitation (DNSAS) for all surface and groundwater quality tests in order to meet National Standards for all water sampling and Analyses. DNSAS procedures are based on WHO standard for collecting and testing of the water samples. Thus the standard reference is DNSAS. Physical parameters were measured in situ by DNSAS staff using calibrated DNSAS equipment, hence all required National Standards were followed. Similarly for physical, chemical and microbiological parameters DNSAS staff collected samples following all National Sampling Standards.

Laboratory analyses were completed at the National Water Testing Laboratory and National Standards were applied throughout. (See Appendix 6-7 for Laboratory Procedures, Test Method and Checklist).

6.1.5.2 Sample Collection

Surface and ground water is used widely throughout the country including Manufahi and Ainaro Municipalities. Observations in the drilling area show that a high percentage of the population use open wells as source of water supply. During the dry season, some of the wells dry out and community turns to rivers as their source of water supply.

Water quality samples were collected at three different locations close to the proposed wellsite, see Table 6-11 and Figure 6-42 , Figure 6-43 and Figure 6-44 below, note the letters in the Table reflect the legend in Figure 6-32. Samples were collected using sterile polyethylene bottles which are then stored in ice boxes.

The collected samples are stored in a cool place (<10 °C) for transport to the DNSAS Laboratory in Dili.

Table 6-11. Water Sample Locations Near Rusa-1

Sample Site	Location	Distance (km)	Centroid Coordinates	
			Latitude	Longitude
01 - b	Caraulun river side	0.93	9° 6'41.69"S	125°41'25.08"E
02 - a	Spring flowing into a creek	1.06	9° 6'45.54"S	125°41'09.24"E
03 - c	Public water tap	0.47	9° 6'52.34"S	125°40'56.64"E

Figure 6-42. Caraulun river Sample Location - TRRWW01

Sample point

Figure 6-43. Small Creek Sample - TRRWW02

Sample point

Figure 6-44. Public Water Supply - Sample TRRWW03

6.1.5.3 DNSAS Laboratory Analytical Methods

Water quality tests were performed in situ for physical parameters by the DNSAS in Dili for physical, chemical and microbiological parameters. DNSAS as the National Water Testing Laboratory apply their own Laboratory Procedures, Test Methods and Checklist and Standards throughout.

A. Physical Parameters:

The physical tests were done onsite using equipment such as a pH Meter, Conductivity Meter, Gravimetry and Turbidity Meter. Parameters to be measured include:

- pH Level
- Electrical Conductivity
- Turbidity
- Salinity
- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)
- Temperature

B. Chemical Parameters:

The chemical tests at the DNSAS Laboratory use spectrophotometer, comparator and titration methods. Parameters measured include:

- Iron (Fe) concentration
- Manganese (Mn) concentration
- Fluoride concentration
- Free Chlorine
- Calcium Hardness
- Sulphate (SO_4^{2-}) concentration
- Arsenic concentration
- Total Alkalinity
- Nitrogen-Ammonia (NH_3-N) concentration
- Nitrate-Nitrogen (NO_3-N) concentration
- Nitrite-Nitrogen (NO_2-N) concentration

C. Bacteriological Parameters

Tests use the Membrane Filtration method to detect the presence of:

- Total Coliform
- E. Coli

Physical:

All test parameters are done according to the reference values of the WHO Drinking Water Quality Guidelines. The physical tests are conducted on site using portable HACH meters and the samples tested according to the standard methods of HACH Suspension meter and HACH 2100Q turbidimeter.

Chemical:

Chemical tests are conducted in the laboratory. The tests use HACH Digital Titrator, model 16900 for determining Total Hardness, Calcium Hardness and Total Alkalinity. This titration method uses EDTA as the titrant that reacts with the free calcium and magnesium ions which mix with the indicators (powder pillow) causing a colour change to blue.

Spectrophotometer methods use HACH DR 3900 on water samples, of no more than 100 ml, which are poured into a cuvette tube then mixed with the regents (powder pillows). While waiting for the reagent and water to be properly mixed, the blank test has to be performed using the water sample with the same volume (100 ml). The blank test is done to trace any contamination before the actual water sample is tested.

Microbiological:

The microbiological samples are analysed according to the membrane filtration method which use M-Endo Broth medium (Endo agar), this medium is normally used to grow or inoculate the gram negative bacteria such as E.coli. The inoculated bacteria are then incubated for 22-24 hours at 35 ^{o}C-37 ^{o}C for total coliform and 44 ^{o}C - 45 ^{o}C for E.Coli then the colony growth is counted in the petri-dish under the fluorescent light following the incubation period.

For each location, one sample was collected using WHO guidelines for sample collection. For the purpose of assessment, WHO (2011) guidelines or standard for drinking water is be used to measure the quality of water sample collected. Table 6-12 below shows the threshold limit value according to the WHO Guideline.

Table 6-12. WHO/Timor-Leste Water Threshold limits

PARAMETERS	UNIT	WHO/TIMOR-LESTE GUIDELINE
Physical Test		
pH value	pH meter	6.5 - 8.5
E. Conductivity	µs/cm	100 µs - 1 ms/cm
TSS	mg/L	
TDS	mg/L	1,000
Salinity	%	
Temperature	°C	
Turbidity	NTU	5
Chemical Test		
NH_3-N	mg/L	1.5
NO_3-N	mg/L	50
NO_2-N	mg/L	3
Iron (Fe)	mg/L	0.3
Manganese (Mn)	mg/L	0.5
Fluoride	mg/L	1.5
Chloride (Cl-)	mg/L	250
Free Chlorine	mg/L	5
Ca Hardness	mg/L	2.5
Total Hardness	mg/L	200
Total Alkalinity	mg/L	500
Sulphate (SO_4)	mg/L	250
Arsenic	mg/L	0.1
Bacterial Test		
Total Coliform	CFU/100 ml	0
E.Coli	CFU/100 ml	0

6.1.5.4 Baseline Surface Water Quality

The results from the three water samples taken close by the well location (see Table 6-11) are presented in Table 6-13 , Table 6-14 and Table 6-15 below.

Physical test results

All physical test results are within the WHO/East Timor Guidelines cited by DNSAS. pH is as expected at 7.8-7.9. TDS readings were 363 mg/L in sample 01 and 03, but higher in sample 03 at 632 mg/L indicating sample 02 from the small creek may be more open to soil erosion and runoff (see Figure 6-43 above). Turbidity (NTU) was higher in sample 1 which is to be expected in the open flowing river (see Figure 6-42 above), whilst the more protected areas in sample 2 and 3 were significantly lower at 0.4 NTU.

Chemical and Bacterial test results

All chemical test results are all well within the WHO/East Timor Guidelines cited by DNSAS, with the exception of Total Hardness (135-200 mg/l) and Total Alkalinity (140-205 mg/l) which is as expected given the limestone rock structure.

In terms of bacterial test sample 1 and 3 were zero but some contamination was observed in sample 2 (the small creek) at 2 CFU/100ml which might be related to the faecal runoff from animals grazing near the creek.

Figure 6-45. Water Sample Locations near Rusa-1 Well Location

Table 6-13. DNSAS Water Analyses Sample No. TRRWW01

República Democrática de Timor-Leste

Ministério das Obras Públicas

Request for Water Quality Testing

Sample analysis reference : 000009064

Requesting Organization : TR

Description of the organization: PETROLEUM

Contact Person : Mr. JACINTO SOARES — Telephon : +670 77355575

On behalf of organization, I agree to pay the cost of test request below: Signature: √

Data and time sample was taken : 28 / 04 / 2021 — Date and Time sample was received: 29 / 04 / 2021

Sample location specification : TR-RW-W-01

Water Source: River √ | Mountain stream | Spring | Well | Others

Sampled by :JACINTO — Received in laboratory by: ESTELA SALDANHA

Approved to test by: ESTELA SALDANHA

Cost (US$)	Parameter	Unit	Request test	Result	WHO/East Timor Guideline	Testing method
Physical test						
1.00	pH value	-	√	7.8	6.5-8.5	pH Meter
1.00	E.Conductivity	(µs/cm	√	645	NS	Conductivity meter
1.00	TSS	(mg/L)	√	0.01	NS	Gravimetry
1.00	TDS	(mg/L)	√	323	1000	Gravimetry
1.00	Salinity	(‰)	√	0.3	NS	Conductivity meter
1.00	Temperature	(°C)	√	20.8	NS	Conductivity meter
1.00	Turbidity	NTU	√	3.7	5 (NTU)	Turbidity meter
Chemical test						
2.00	NH_3-N	mg/L	√	0.7	1.5	Spectrophotometer
2.00	NO_3-N	mg/L	√	0.5	10 (as NO_3-N)	Spectrophotometer
2.00	NO_2-N	mg/L	√	0.007	1 (as NO_2-N)	Spectrophotometer
1.00	Iron (Fe)	mg/L	√	0.08	0.3	Spectrophotometer
2.00	Manganese (Mn)	mg/L	√	0.1	0.5	Spectrophotometer
1.00	Fluoride	mg/L	√	0.32	1.5	Spectrophotometer
2.00	Free chlorine	mg/L	√	ND	0.5	Comparator,
2.00	Ca.hardness	mg/L	√	120	NS	Titration
2.00	Arsenic	mg/L	√	ND	0.01	Comparator
2.00	T. Hardness	mg/L	√	130	200	Titration
2.00	Total alkalinity	mg/L	√	140	NS	Titration
2.00	Sulphate (SO_4^{2-})	mg/L	√	41	250	Spectrophotometer
Bacteriological test						
16.00	Total Coliform	CFU/100mL	√	4	0	Membrane filtration
16.00	E.Coli	CFU/100mL	√	1	0	Membrane filtration
Total cost **S. 61.00 USD**	Remark **Bacteriological is problem !**				Inspected by: Responsible of Laboratory	

Legend: 1. **NS**: not set; **ND**: not detectable; **NT**: not tested; **NR**: not result; **CFU**: Colony Formed Unit; **TNC:** too numerous to count.

DIRECÇÃO GERAL DE ÁGUA E SANEAMENTO (DGAS)
Direcão Nacional dos Servicos de Água (DNSA)

Table 6-14. DNSAS Water Analyses Sample No. TRRWW02

República Democrática de Timor-Leste

Ministério das Obras Públicas

Request for Water Quality Testing

Sample analysis reference : 000009065					
Requesting Organization : TR					
Description of the organization: PETROLEUM					
Contact Person : Mr. JACINTO SOARES			Telephon : +670 77355575		
On behalf of organization, I agree to pay the cost of test request below: Signature: √					
Data and time sample was taken : 28 / 04 / 2021			Date and Time sample was received: 29 / 04 / 2021		
Sample location specification : TR-RW-W-02					
Water Source:	River √	Mountain stream	Spring	Well	Others
Sampled by : JACINTO			Received in laboratory by: ESTELA SALDANHA		
Approved to test by: ESTELA SALDANHA					

Cost (US$)	Parameter	Unit	Request test	Result	WHO/East Timor Guideline	Testing method
Physical test						
1.00	pH value	-	√	7.9	6.5-8.5	pH Meter
1.00	E.Conductivity	(µs/cm	√	1.264	NS	Conductivity meter
1.00	TSS	(mg/L)	√	0.01	NS	Gravimetry
1.00	TDS	(mg/L)	√	632	1000	Gravimetry
1.00	Salinity	(‰)	√	0.6	NS	Conductivity meter
1.00	Temperature	(°C)	√	20.6	NS	Conductivity meter
1.00	Turbidity	NTU	√	0.4	5 (NTU)	Turbidity meter
Chemical test						
2.00	NH_3-N	mg/L	√	0.3	1.5	Spectrophotometer
2.00	NO_3-N	mg/L	√	0.2	10 (as NO_3-N)	Spectrophotometer
2.00	NO_2-N	mg/L	√	0.003	1 (as NO_2-N)	Spectrophotometer
1.00	Iron (Fe)	mg/L	√	0.04	0.3	Spectrophotometer
2.00	Manganese (Mn)	mg/L	√	0.1	0.5	Spectrophotometer
1.00	Fluoride	mg/L	√	0.30	1.5	Spectrophotometer
2.00	Free chlorine	mg/L	√	ND	0.5	Comparator,
2.00	Ca.hardness	mg/L	√	195	NS	Titration
2.00	Arsenic	mg/L	√	ND	0.01	Comparator
2.00	T. Hardness	mg/L	√	200	200	Titration
2.00	Total alkalinity	mg/L	√	205	NS	Titration
2.00	Sulphate (SO_4^{2-})	mg/L	√	25	250	Spectrophotometer
Bacteriological test						
16.00	Total Coliform	CFU/100mL	√	2	0	Membrane filtration
16.00	E.Coli	CFU/100mL	√	0	0	Membrane filtration
Total cost **$. 61.00 USD**		Remark **Total Coliform is problem !**			Inspected by: Responsible of Laboratory	

Legend: 1. **NS**: not set; **ND**: not detectable; **NT**: not tested; **NR**: not result; **CFU**: Colony Formed Unit; **TNC**: too numerous to count.

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Direcão Nacional dos Servicos de Água (DNSA)
Avenida 20 de Maio – Caicoli
Caixa Postal No. 194, Telp. 3311224 – Dili

Table 6-15. DNSAS Water Analyses Sample No. TRRWW03

República Democrática de Timor-Leste

Ministério das Obras Públicas

Request for Water Quality Testing

Sample analysis reference : 000009066
Requesting Organization : TR
Description of the organization: PETROLEUM
Contact Person : Mr. JACINTO SOARES — Telephon : +670 77355575
On behalf of organization, I agree to pay the cost of test request below: Signature: √
Data and time sample was taken : 28 / 04 / 2021 — Date and Time sample was received: 29 / 04 / 2021
Sample location specification : TR-RW-W-03
Water Source: River √ | Mountain stream | Spring | Well | Others
Sampled by : JACINTO — Received in laboratory by: ESTELA SALDANHA
Approved to test by: ESTELA SALDANHA

Cost (US$)	Parameter	Unit	Request test	Result	WHO/East Timor Guideline	Testing method
Physical test						
1.00	pH value	-	√	7.9	6.5-8.5	pH Meter
1.00	E.Conductivity	(µs/cm	√	726	NS	Conductivity meter
1.00	TSS	(mg/L)	√	0.01	NS	Gravimetry
1.00	TDS	(mg/L)	√	363	1000	Gravimetry
1.00	Salinity	(‰)	√	0.4	NS	Conductivity meter
1.00	Temperature	(°C)	√	20.5	NS	Conductivity meter
1.00	Turbidity	NTU	√	0.4	5 (NTU)	Turbidity meter
Chemical test						
2.00	NH_3-N	mg/L	√	0.8	1.5	Spectrophotometer
2.00	NO_3-N	mg/L	√	0.5	10 (as NO_3-N)	Spectrophotometer
2.00	NO_2-N	mg/L	√	0.008	1 (as NO_2-N)	Spectrophotometer
1.00	Iron (Fe)	mg/L	√	0.03	0.3	Spectrophotometer
2.00	Manganese (Mn)	mg/L	√	0.1	0.5	Spectrophotometer
1.00	Fluoride	mg/L	√	0.31	1.5	Spectrophotometer
2.00	Free chlorine	mg/L	√	ND	0.5	Comparator.
2.00	Ca.hardness	mg/L	√	175	NS	Titration
2.00	Arsenic	mg/L	√	ND	0.01	Comparator
2.00	T. Hardness	mg/L	√	185	200	Titration
2.00	Total alkalinity	mg/L	√	195	NS	Titration
2.00	Sulphate (SO_4^{2-})	mg/L	√	10	250	Spectrophotometer
Bacteriological test						
16.00	Total Coliform	CFU/100mL	√	0	0	Membrane filtration
16.00	E.Coli	CFU/100mL	√	0	0	Membrane filtration

Total cost: **\$. 61.00 USD**

Remark: **NO PROBLEM.**

Inspected by:

Resppnsable of Laboratory

Legend: 1. **NS**: not set; **ND**: not detectable; **NT**: not tested; **NR**: not result; **CFU**: Colony Formed Unit; **TNC**: too numerous to count.

DIRECÇÃO GERAL DE ÁGUA E SANEAMENTO (DGAS)
Direcão Nacional dos Servicos de Água (DNSA)

6.1.5.5 Rivers

There is one significant river within the proposed drilling area namely Caraulun river (Table 6-16). The river water quality is expected to vary seasonally, but during the wet season the local community fish for small prawns for consumption and sale. Rusa-1 Location is elevated above the Caraulun river as shown in Table 6-16.

Table 6-16. Distance from Drilling Area to river

Distance of Rivers to the nearest Well		Coordinates	
		Lat	Long
Caraulun river	312.78m to Rusa-1	-9.11363	125.68911

6.1.6 Coastal and Marine Water

The drilling location doesn’t border on any coastal or marine waters.

6.1.7 Soil

6.1.7.1 Literature Review

In the last sixty years not many scholars have undertaken soil studies and published scientific papers about soil of Timor. Both Seeds of Life (SoL) and Ministry of Agriculture mostly relied on the soil map that was produced by Carta Dos Solos de Timor in 1961. In 2004 Ministry Agriculture and its division ALGIS digitized, reinterpreted, and upgraded the map to reflect modern soil classification (Thompson, 2011). The soil map was referenced to the USDA soil classification for 1990. Worley Parsons did a detailed analysis of soil physical and chemical properties in the Betano area (Worley Parsons 2012a) and the Suai area (Worley Parsons 2012b). A new map of Timor soil texture was published by Seeds of Life and Ministry Agriculture in 2015 (Figure 6-46). The following are the available secondary data sources:

- MAFP, 2015 – Soils of Timor-Leste
- Worley ParsonsWorley Parsons, 2012a – EIA for Tasi Mane Project, Betano Petroleum Refinery and Beaço LNG Plant
- Worley Parsons, 2012b – EIA for Tasi Mane Project, Suai Supply Base
- S.J. Thompson, 2011 - Geology and Soils in Timor-Leste
- SoL, 2000 – 2006, Chemical and Physical Characteristic of Cassava Soils in East Timor – Seed of Life (SoL, 2006)
- J.S. Garcia and Cardoso, 1978 – Os Solos De Timor

The first study on soil was undertaken by a soil scientist from Portugal in 1950s to 1960s who did an extensive study on the mainland of Timor and produced a report named “*Carta de solos de Timor* ” (JICU 1961) in Portuguese language. Between 2002 – 2006, Seeds of Life collected soil samples from all the districts to examine its pH, phosphorus, and electrical conductivity and other relevant chemical elements. In 2015, Worley Parsons did detail analysis of physical and chemical analysis of soil, however it is not covering all the island but only in Suai, Betano and Beaço, where the Tasi Mane Project is located.

Portuguese soil classifications were amended in 2004 to adapt to USDA (1990) soil classification. The following are the USDA (1990) soil classification categories: Alfisol (soil with aluminium and iron), Andisol (volcanic ash soil), Aridisol (dry soil forming under desert), Entisol (recently formed soil), Gelisol (soil with permafrost), Histosol (organic soil), Inceptisol (young or very recent soil), Mollisol (soft, deep, dark fertile soil), Oxisol (highly weathered soil rich iron and aluminium but low silica), Spodosol (acid soil with organic layer), Ultisol (acid soils in humid Timor Resources opic), and Vertisol (clay rich soil). There are at least six USDA soil categories (Inceptisol, Mollisol, Entisol, Vertisol, Alfisol and Histosol) and 15 sub-categories that are found in Timor (Thompson, 2011).

Common soils found in Timor are Vertisols, Luvisols and Fluvisols (UN Food and Agriculture Organisation classification scheme). Vertisols are mostly found inland, Luvisols and Fluvisols are found closer to the coastal area (Thompson, 2011). Vertisol contains high clay, at least 35 % or more, and is usually covered by natural grassland or woodland. In 2012, Seeds of Life generated soil texture map based on Garcia and Cardoso (1978) data and divided soil texture into ten divisions: clay, clay loam, loam, organic, sand, sandy clay, sandy loam, silty clay, silty loam and variable. Mostly Timor island is covered by clay and loam and rarely organic soil (see Figure 6-46).

6.1.7.2 Limitation of Data and Analysis

- Lack of the secondary data specifically soils data for the Betano area, made the comparison with the primary data difficult.
- Unavailability of the laboratory facility in the country made it difficult to establish baseline data completely for all relevant parameters in relation to the impact from the oil and gas operations .

6.1.7.3 International Reference Standards Applied to Soil Sampling and Analysis

Various international reference standards are applied to soil sampling and analysis throughout the environmental assessment process and for the Safety Case and these are summarised in Table 6-17.

Table 6-17. International Reference Standards Applied to Soil Sampling and Analysis

Source	Description	Standard/Procedure
XRF Instrument	Bruker's S1 TITAN Handheld XRF Analyzer	US EPA Method 6200
SOVV	Process Industry Practices - Geotech Engineering Investigations	CVS02010
ASTM	Site Characterisation for Engineering and Construction Purposes	ASTM D 420
ASTM	Soil Investigation by Auger Boring	ASTM D 1452
ASTM	Unified Soil Classification System	ASTM D 2487
ASTM	Visual Classification of Soils	ASTM D 2488
ASTM	Plasticity Chart	ASTM D 2487
ASTM	Field Vane Shear Test in Cohesive Soil	ASTM D 2573
ASTM	Atterberg Limit Tests for Soils	ASTM D 4318
ASTM	Surface Site Characterisation for On-Site Septic Systems	ASTM D 5879
ASTM	Hollow Stem Augers for Soil Investigation	ASTM D 6151
ASTM	Particle Size Analysis of Soils Using Sieve Analysis	ASTM D 6913
ASTM	DCP in Shallow Pavement Applications	ASTM D 6951
ASTM	Mechanical Cone Penetration of Soils (DCPT)	ASTM D 3441
ASTM	Sieves for Testing Purposes	ASTM E 11
ASTM	Transporting Soil Samples	ASTM D 4220

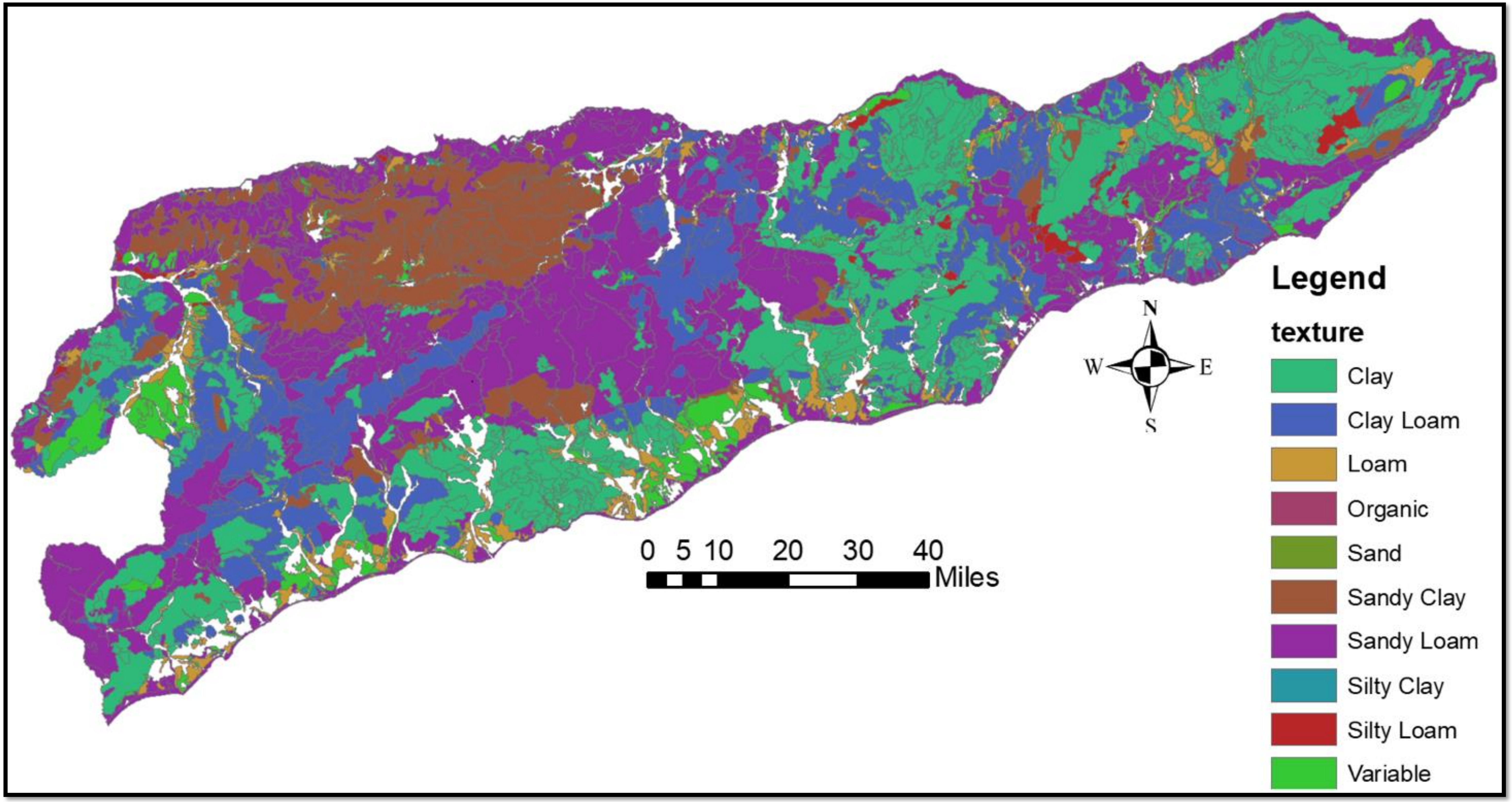


Figure 6-46. Map of Soil Texture

(Seeds of Life 2012)

Soil Chemistry

Soil chemistry data for Timor-Leste is sparse since only a few studies have been conducted over the last 50 years. Between 2000 - 2006 Seeds of Life collected and analysed at least 34 samples from seven districts: Dili, Baucau, Aileu, Bobonaro, Manufahi, Covalima and Liquica. At least seven samples were taken in proximity of the proposed well location.

Measurement of soil acidity from previous study and this study (range between 6.54 – 7.54 pH) have similar value which good indication for crop viability. From field observation the soil around the proposed drill location is fertilized for teak wood, corn, and other plantations. The level of phosphorous in the soil is acceptable for plantations. Soil moisture ranges from 70 % - 82 % which is a good for plant growth.

Soil chemistry was determined in house using a calibrated Bruker's S1 TITAN Handheld XRF Analyzer (XRF - X-ray fluorescence), the results are presented in Table 6-19 .

Field Method

Soil sampling was conducted at the drilling site during in May 2021. Soil sample locations were selected prior to field work around wellsite. Surface soils were removed, digging to 1 m deep using a crowbar. Soil samples were collected in zip lock plastic bag to avoid contamination and were labelled: Well Name; Sample Number.

Soil sample methods are illustrated in Figure 6-47. Soil analyses for Rusa-1 are summarised in Table 6-18 and Table 6-19.

Figure 6-47. Sample Methods Rusa-1

6.1.7.4 Soils Data

Table 6-18. Manufahi Municipality Laboratories Analysis Result

Location	Moisture (%)	Sunlight (%)	Soil Temperature (^{0}C)	Soil pH	Nitrogen (N) ppm	Phosphorus (P) ppm	Potassium (K) ppm
Rusa I	70	50-60	25.7 ºC	7.00 N	12 L	12 M	165 M
Rusa II	74	30-40	26.2 ºC	6.54 N	10 L	14 M	182 M
Rusa III	88	30-40	26.6 ºC	6.63 N	9 L	10 M	75 L
Rusa IV	82	30-40	26.0 ºC	7.54 N	13 L	18 H	67 L

Note: L = Low M = Medium N: Neutral H=High

Table 6-19. Soil Chemistry Assessed by XRF Titan 1 Analyser

Ba	Sb	Sn	Cd	Ag	Pd	Zr	Sr	Rb	Pb	Au	Se	As	Hg	Zn	W	Cu	Ni	Co	Fe	Mn	Cr	Ti
718793.56	3100633.75	2463328.75	1335504.88	471668.09	788695.75	0	79993.21	34793.34	73152.13	0	380765.47	3101712.5	109521.43	743607.06	0	0	0	1529841.75	1139494	3146341	14458165	40628300
252176.03	1207065	901389.25	526391.31	184370.8	217685.47	0	56856.13	16063.69	34985.49	0	196662.69	776527	0	319568.78	0	0	0	532874.56	205693.72	1012251.63	4461656	18826404
591690.25	2650978	2107949.25	1093616.38	409532.09	554219.5	0	60947.83	25240.49	57430.63	0	283547.53	2592193.25	94791.97	724972.75	0	0	0	1302355	961941.19	2159797	12648577	29803234
295960.91	1497292.25	1133628.75	645830.06	243709.53	294379.25	0	51589.22	16251.21	58308.19	0	187898.45	1238974.75	31128.08	523819.03	0	0	0	691165.63	343342.44	1135616.5	5928694	18676790

<LOD - below the level of detection

Source: Timor Resources XRF [1] Analyses 2021

[1] Bruker's S1 TITAN Handheld XRF Analyzer (XRF - X-ray fluorescence). XRF is a non-destructive analytical technique used to determine the elemental composition of materials and determine the chemistry of a sample by measuring the fluorescent (or secondary) X-ray emitted from a sample when it is excited by a primary X-ray source. Handheld XRF guns have become the instrument of choice for soils analysis when characterising, remediating and monitoring sites. Timor Resources use a Bruker's S1 TITAN Handheld XRF Analyzer that is based on the US EPA Method 6200.

6.1.7.5 Secondary and Additional Soils Data

Soil properties reported by the Seeds of Life in 2006 at Beco, Oebaba and Zumalai are presented in Table 6-20 (SoL, 2006). However, in the absence of the soil sample location's coordinates it makes it difficult for comparison to the Rusa-1 wellsite. In lacking the location information of the sample sites, it is advisable this information only be used to consider the broad picture of local chemical properties that could be encountered around the wellsite.

Table 6-20. Soil Chemistry - SoL 2006

	%	ppm	Meq/100g					%	dS/m	ppm				
pH	**OM**	**P**	**Al**	**Ca**	**Mg**	**K**	**N**	**Na**	**E.C**	**B**	**Zn**	**Mn**	**Cu**	**Fe**
7.67	4.57	4.93	0	22.48	3.01	0.79	0.44	1.6		1.55	0.01	8	0.05	0.1
7.73	4.08	0	0	29.36	3.19	1.36	0.06	0.2		1.63	0.01	2.1	0.05	0.1
7.2	4.56	58.25	0	18.09	2.35	0.91	0.11	0.5		1.91	0.9	100.4	0.38	1.9
7.6	1.97	6.17	0	24.04	3.99	0.62	1.08	3.6		0.96	0.01	9.8	0.06	0.1

Due to the impact of Covid-19 the importation of some chemicals have been affected and hence some analyses for boron is not currently possible in Timor-Leste. Timor Resources has been able to partly address this with the following research.

Boron

As stated above the analysis for boron (B) was not possible due to Covid-19 restriction delays affecting analyses. Boron is not measured using the XRF as its atomic weight is too low for the sensitivity of most XRF units, as shown in Figure 6-48 .

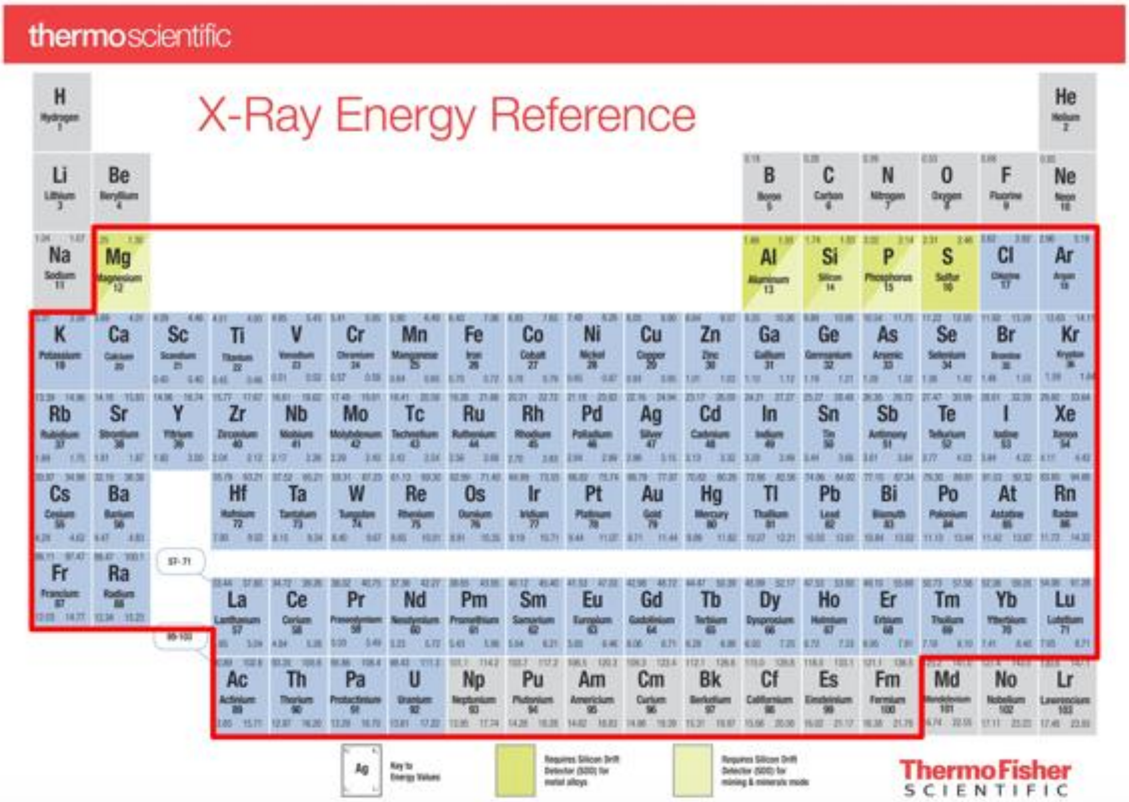


Figure 6-48. Elements Measured Using an XRF (shown within the red line)

Potential impacts from boron contamination occur from irrigation or dry climate (increasing salt accumulation), fertiliser, industrial wastewater, power generation, mining. Natural concentration of boron is through weathering of rocks, boric acid volatilisation from seawater and volcanic or geothermal activity.

To a lesser extent, boron is released to the environment from anthropogenic sources (e.g., via industrial air emissions, fertilizer and herbicide applications, and industrial and municipal wastes). Limited data are available on the quantity of anthropogenic releases (EPA 2008).

Boron is considered a beneficial trace nutrient for humans with recommended intakes between 1-13 mg/day, no data is available on adverse effects of high boron intakes from food or water. Symptoms recorded from accidental consumption of pure boric acid or sodium borate include nausea, diarrhoea, rash, headache, indigestion etc with extremely high doses possibly fatal (NIH 2021).

The prime concern for boron toxicity is plant health, it has a narrow range between deficiency (<0.2 ppm) and toxicity (>3 ppm). Boron is essential micronutrient for plant cell wall synthesis, but excess boron reduces the efficiency of plants to transport nutrients (Brdar-Jokanovic 2020).

The adsorption of borates and boric acids to soils is controlled by the presence of aluminium and iron oxides and, to a lesser extent, organic matter. The most likely source of boron production during the drilling operation is from lubricant additives in diesel engine fuel, these emissions also include barium, cobalt, copper, phosphorous, manganese, and platinum (Viskup 2020, and others).

In the absence of boron capable testing facilities in Timor-Leste, and the issue of Covid-19 related lack of reagents available in the testing laboratory for baseline measurement, Timor Resources proposes a procedure of monitoring of index elements. Where testing of soils during and after the operations indicate a significant elevation in Ba, Co, Cu, P, Mn and Pt from baseline levels it may indicate an elevation of boron also, in this event the course of action would be to conduct testing in an international laboratory.

6.2 Ecological Components

6.2.1 Wetland

There are no wetlands in the vicinity of the Rusa-1 well location however the site is bordered by the Caraulun river (see 6.1.5.5 above).

Current literature regarding wetlands in Timor-Leste includes:

- Assessment Report of the Biophysical, Ecological and Socio-Economic Conditions of Mangroves Ecosystem of Timor-Leste (UNDP & MAF, 2017).
- An Introduction to the Convention on Wetlands (previously The Ramsar Convention Manual). (Grobicki, et al. 2016)
- Timor-Leste's Fourth national Report to the UN Convention on Biological Diversity (Democratic Republic of Timor-Leste, 2011)

6.2.2 Mangroves

There are no mangroves in the vicinity of the Rusa-1 drilling area.

6.2.3 Corals

There are no corals in the vicinity of the Rusa-1 drilling area.

6.2.4 Fisheries

Fishing plays an important role as an additional source of livelihood and protein for both coastal dwellers and inland communities (FAO 2009). Rural communities engage in fishing activities seasonally, i.e. during and just after the monsoon and are predominantly carried out for subsistence. State Secretary of Fisheries promotes freshwater fish farming, with aquaculture activities focused on small-scale, “backyard” farming of Carp and Tilapia to increase fish consumption in inland areas. A third species that is promoted by the Government is Milkfish. The number of people or households engaged in such small-scale fish farming is about 2,000 and the average size of a fishpond is below 200 m^2. The Government also promotes rice-fish culture to increase local supply of animal protein. Overall, the promotional efforts by the Government have led to a steep increase in aquaculture production.

Small-scale coastal fisheries dominate the fisheries sector and there is a substantial artisanal fishery with the vessels mainly being double-outrigger canoes. A total of 20,000 fishers are estimated to be active in artisanal activities (FAO 2009). The majority of the marine capture fishing activities are carried out in nearshore waters, with the catch dominated by small Pelagics and small reef fish. Fish is traded in fresh form with very little production of dried fish. Processing takes place only when fishers estimate that they are unable to sell the fresh catch. Poor transportation infrastructure as well as topography makes distribution of fish difficult, so fishers tend to land their catch close to their respective homes and villages. There is also lack of landing, storage and processing facilities which compounds the problem of fish marketing and trade.

The domestic market for fish thus remains rather underdeveloped and for many upland communities in the country’s interior, fish is not a substantial part of their food consumption. The average domestic fish consumption is thus relatively low, with 1.96 kg per capita per year (weight of product actually consumed), with higher consumption levels in the capital Dili and coastal areas (FAO 2009).

Artisanal and subsistence fishing takes place all along the south coast and is important as a food source and a source of cash income (Worley Parsons 2012a), however, no specific fishing areas were identified during the Betano Refinery and Beaço LNG EIA study (Worley Parsons 2012b).

6.2.5 Protected Areas and National Parks

Decree Law 5/2016, March 16 on the National Protected Areas established 46 protected areas across Timor-Leste. Forty-four are located on land and two are marine parks. Protected areas located in Maubisse, Ainaro and Manufahi are Bikan Tidi, Parques Nacional Kayrala Xanana Gusmão, Ribeira de Clere, Welenas Lagoon and Modomahut Lagoon.

The closest protected areas to the Rusa-1 location in Suco Foho-Ai-Lico is Parque Nasional Kayrala Xanana Gusmão a distance of 16.5 km, coordinate: S. 0896606 and E. 125 66177 elevation 601m. See Figure 6-49.

The other protected area is Lagua Modomahut a distance of 29.5 km from Rusa-1 location, coordinates: S. 0904891 and E.125 94720 elevation 52m.

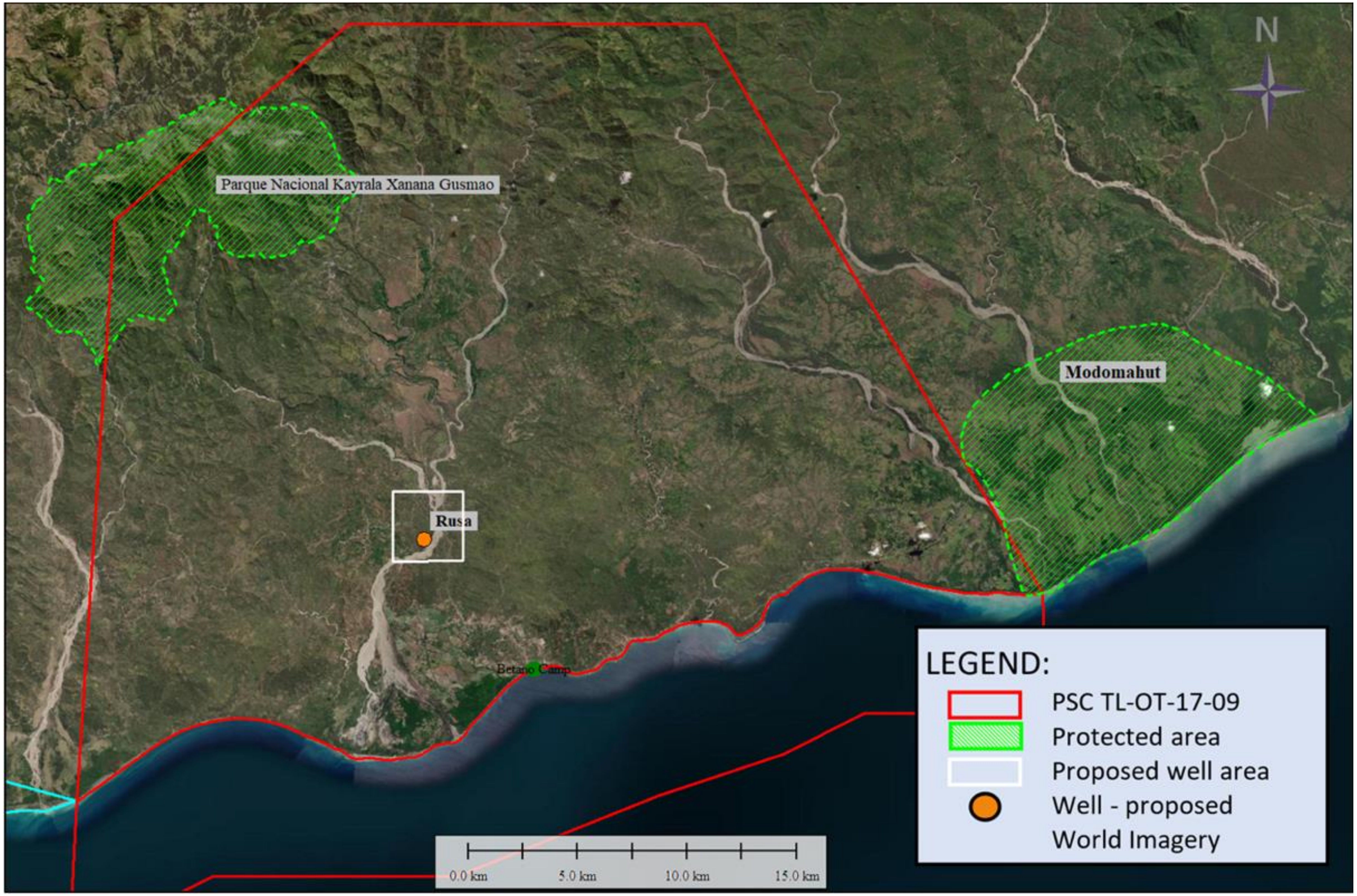


Figure 6-49. Protected Areas related to Drilling Location

6.2.6 Flora and Fauna

6.2.6.1 Study Method

During the environmental baseline survey the transect method was used to identify forest type, species of the flora and fauna that potentially could be impacted by the drilling campaign. Transect lines were drawn up to 1 km from the well location and additionally at 200 m from the wellhead point of interest. Quadrats (20 m x 20 m) were conducted every 200 m to observe and enumerate flora and fauna within each quadrat as shown by the white dots in the figure. Transect lines are shown in Figure 6-50 below.

The Flora and Fauna surveys were conducted by an experienced professional familiar with local species taxonomy (refer to Section 3.0 for consultants' experience). The methods employed in the surveys were consistent with recognised standards for flora and fauna surveys such as: - Bird Life International by CN Bibby and IUCN; the Western Australian EPA Technical Guidance for Environmental Impact Assessment Surveys for Flora and Vegetation and Terrestrial Vertebrate Fauna.

In brief, the survey methodology was applied was the line intercept method. This is a rapid and accurate method to measure both vegetation (Elzinga et al. 2001) and vertebrates (Bibby et al 2000).

6.2.6.2 Rusa-1 Well Overall Baseline Condition

Table 6-21 provides a general summary of the overall ecology component in the drilling area. Species are characterised based on the International Union for Conservation of Nature (IUCN) categories such as: Critically Endangered (CR) *Cacatua sulphurea*, four birds species as Near Threatened (NT) and eleven birds species as limited geographic expansion with restricted range (rr).

Mammal species identified and IUCN categorised as: Near Threatened (NT) *Macaca facicularis* and *Phalanger orientalis as* vulnerable (VU).

Reptiles species identified include: *Trimeresurus insularis, Greater reticulated phyton, Gekko gecko, Crocodylus sp, Turtle sp, Hydrophis sp husi family Hydropiidae.*

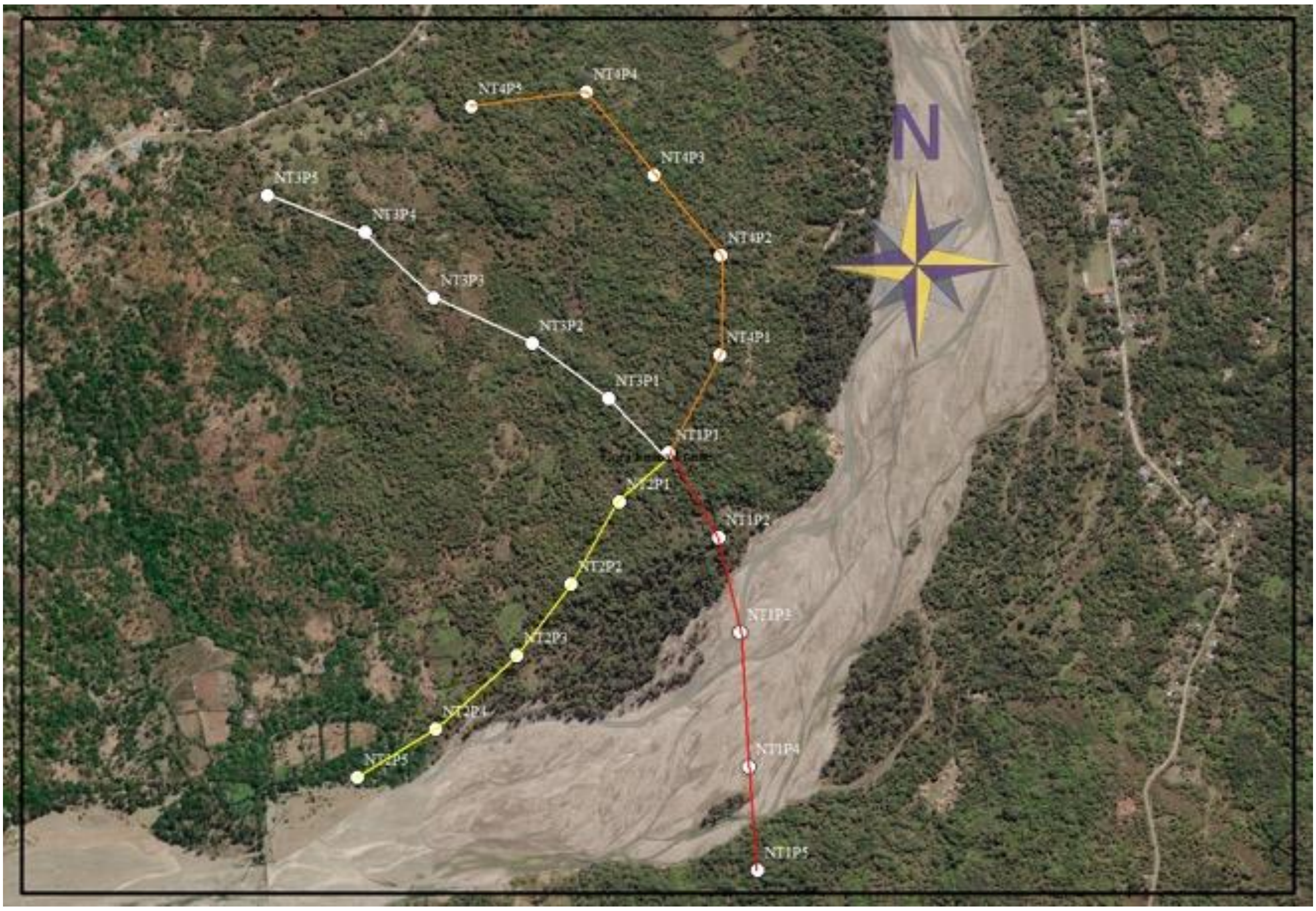


Figure 6-50. Flora and Fauna Transects across Rusa-1wellsite (red line is transect 1, yellow line is transect 2, white line is transect 3, and orange line is transect 4)

The types of plants identified at Rusa-1 location, Foho-Ai-Lico are: teak tree *Tectona grandis*, *Coryphaelata*, *Ziziphus sp*, *Scleoreza oliosa*, *Albijia chinensis*, *Ficus sp* including epiphytes.

Flora

Rusa-1 is situated in an agricultural area of farmland belonging to the community from Aldea Baha, Suco Aelico. Adminisrative Post Hatu-Udo, Ainaro Municipality. There are private owner plantations identified within the wellsite vicinity: *Tectona grandis* and natural plants and other natural growing trees such as C*oripa elata, Ziziphus sp, Albijia chinensis, Ficus sp* and *Cromolaena*.

Types of forest identified on transects 1 to 4, are secondary forest, primary forest, savanna, teak plantation, and including agricultural farmland and landscape area. Plants identified include: C*asuarina sp, Acasia sp, Ziziphus sp, Scleoreza oliosa, Corypha elata, Ficus sp, Timonia timun, Sterculia foetida*, *Toona sureny*, *Nauclea orientalis*, *Tectona grandis* and *Gmelina arborea*.

Table 6-21. General Summary on Ecological Component

1	Rusa-1 located in Suco Foho-Ai-Lico did not encounter any critical habitat as recorded by the national and also international agreement Ramsar Site.
2	The type of ecosystem identified includes as primary forest, secondary forest, savanna, agricultural production and teak plantation.
3	Other plant species identified and categorised as *limited geographical expansion* which are rare species according to IUCN Agreement.
4	The secondary ecosystem that exists at a distance of 1.2 km from Rusa-1 location on Transect1 is an important habitat for 26 bird species, particularly *Turacoena modesta* and *Aprosmictus jonquillaceus* considered Near Threatened (NT).
5	Forest segment in track 1 at a distance of 1.2 km from Rusa-1, identified trees *Pterocarpus indicus* as Near Threatened species (NT) including climbing plants/ bindweed and epiphytes species.
6	Mammals and reptiles species identified outside the Rusa-1 location include: *Macaca Facicularis (NT), Phalanger orientalis (VU)* and *Gekko gecko.*
7	Mammals and reptiles species identified outside the Rusa-1 area include: *Macaca Facicularis (NT), Phalanger orientalis (VU), Trimeresurus insularis, Greater reticulated phyton, Gekko gecko, Crocodylus sp, Turtle sp, Hydrophis sp.*
8	Other bird species of limited geographic expansion (rr) or rare species identified in centre Rusa-1 location such as: *Philimon inornata (NT) no Saxicola Gutturalis (NT),* 6 species with limited geographic expansion (rr)
9	Birds species such as: species *Meliphaga reticulata (rr), Saxicola caprata and Riphidura sp.*
10	Bird species that are originally categorised as common residence in tropical forest, woods, plantations and places, when the drilling activities take place, all species identified will migrate to the same type of forest in other area.
	Notes: *Conservation Status:*
	Vulnerable (VU) *Near Threatened (NT)* *Endangered (EN)*
	Critically Endangered (CR) *Restricted range (rr)*

Observations from transect 1 at a distance of 1.2 km from Rusa-1 location identified: *Pterocarpus indicu*, endangered species (NT) and secondary forest type as important habitat to wildlife particularly 26 bird species. The distribution of natural resources, socio-economic and cultural within the area are described in Table 6-22 below.

Table 6-22. Natural Resources: Rusa-1

No.	Name	Distance from Rusa-1 Location	Coordinate
1.	Community housing	0.160 km	S. 0911307 E. 12568783 Elevation 81m
2.	Tower Station (EDTL)	0.94 km	S. 0911196 E. 12568809 Elevation 90m
3.	Cultural Site	0.194 km	S. 0911281 E. 12568862 Elevation 78m
4.	Caraulun river	0.295 km	S. 0911422 E. 12568822 Elevation 74m
5	Intik irrigation from Caraulun river	1.4 km	S. 0912122 E. 12567881 Elevation 59m
6.	Important Birds Areas (IBA)	1.2 km	S. 0912033 E. 1256658 Elevation 98m
7.	Agricultural Farmland	0.182 km	S. 0911255 E. 12568578 Elevation 86m
8.	Agricultural Farmland	0.191 km	S. 0911337 E. 12568662 Elevation 65m
9.	Agricultural Farmland, knua and old well	0.466 km	S. 0910858 E. 12568446 Elevation 135m

Some other naturally growing trees that have been identified within an area of 100 m^2 at Rusa-1 location are listed in Table 6-23 below.

Table 6-23. Rusa-1 Privately-owned Plantations

No.	Species	Total
1.	*Tectona grandis*	261
2.	*Corypha elata*	91
3.	*Ziziphus sp*	13
4.	*Scleoreza oliosa*	5
6.	*Albijia chinensis*	1
7.	*Ficus sp*	1

Fauna:
Birds

Birds species categorised under IUCN include: *Philemon inornatus* no *Saxicolla gutturalis* limited geographical expansion (rr) includes *Meliphaga reticulata* and *Riphidura sp* identified to live throughout the area.

The primary and secondary forest section that exist 1.2 km from Rusa-1 on transect 1 are an important habitat for 26 bird species namely: *Turacoena modesta*, *Aprosmictus jonquillaceus Saxicola Guturalis* and *Philimon inornata*, registered as near threatened species (NT), and 9 bird species of limited geographical expansion (rr). List of birds that identified in Rusa-1 area and track line 1 to 4 are provided in Table 6-24 to Table 6-32 below and mammals and reptiles in Table 6-33 and Table 6-34.

Table 6-24. List of birds Identified at Rusa-1 Location

No.	English Name	Species	Status	
1	Timor Friarbird	Philemon inornatus	NT	rr
2	White-bellied Bush-chat	Saxicolla gutturalis	NT	rr
3	Streak-breasted Honeyeater	Meliphaga reticulata		rr
4	Olive-brown Oriole	Oriolus melanotis		rr
5	Plain Fairy Warbler	Gerygone inornata		rr
6	Fawn breasted Whistler	Pachycephala orpheus		rr
7	Emerald Dove	Chalcophaps indica		
8	Helmeted Friarbird	Philemon boceroides		
9	Ashy-bellied White-eye	Zosterops citrinellus		
10	Rufous Fantail	Rhipidura rufifrons		
11	Northern Fantail	Rhipidura rufiventris		
12	Pied Bush-chat	Saxicola caprata		
13	Rainbow Bee-eater	Merops ornatus		
14	Barred Dove	Geopelia maugei		
15	Sooty-headed Bulbul	Pycnonotus aurigaster		
16	Southern Boobook	Ninox novaeseelandiae		

Table 6-25. Rusa-1 List of Birds Identified at Track 1 (NT1P1-NT1P5)

No.	English Name	Species	Status	
1	Timor black pigeon	*Turacoena modesta*	NT	rr
2	Timor Friarbird	*Philemon inornata*	NT	rr
3	White-bellied Bush-chat	*Saxicolla gutturalis*	NT	rr
4	Olive-shouldered Parrot	*Aprosmictus jonquillaceus*	NT	rr
5	Streak-breasted Honeyeater	*Meliphaga reticulata*		rr
6	Olive-brown Oriole	*Oriolus melanotis*		rr
7	Fawn breasted Whistler	*Pachycephala orpeus*		rr
8	Plain Fairy Warbler	*Gerygone inornata*		rr
9	Timor Figbird	*Sphecotheres viridis*		rr
10	Rose-crowned fruit dove	*Ptilinopus regina*		
11	Emerald dove	*Chalcophaps indica*		
12	Little Pied Flycatcher	*Ficedula westermanni*		
13	Black-backed Fruit-dove	*Ptilinopus cinctus*		
14	Helmeted Friarbird	*Philemon boceroides*		
15	Ashy-bellied White -eye	*Zosterops citrinellus*		
16	Rufous Fantail	*Rhipidura rufifrons*		
17	Northern Fantail	*Rhipidura rufiventris*		
18	Pied Bush-chat	*Saxicola caprata*		
19	Rainbow Bee-eater	*Merops ornatus*		
20	Barred dove	*Geopelia maugei*		
21	Common kingfisher	*Alcedo atthis*		
22	Spotted dove	*Streptopelia chinensis*		
23	Short-toed Eagle	*Circaetus galilicus*		
24	Red Junglefowl	*Gallus gallus*		
25	Collared kingfisher	*Todiramphus chloris*		
26	Red-cheeked Parrot	*Geoffroyu geoffroyi*		
27	Broad billed flycatcher	*Myagra ruficollis*		
28	Brush Cuckoo	*Cacomantis variolosus*		
29	Sooty-headed Bulbul	*Pycnonotus aurigaster*		
30	Southern Boobook	*Ninox novaeseelandiae*		

Table 6-26. Rusa-1 - Bird Frequency Track 1 (NT1P1-NT1P5)

Species	Total Species
Turacoena modesta	2
Philemon inornata	9
Saxicolla gutturalis	8
Aprosmictus jonquillaceus	1
Meliphaga reticulata	15
Oriolus melanotis	3
Pachycephala orpeus	1
Gerygone inornata	5
Sphecotheres viridis	4
Ptilinopus regina	1
Chalcophaps indica	8
Ficedula westermanni	2
Ptilinopus cinctus	5
Philemon boceroides	2
Zosterops citrinellus	6
Rhipidura rufifrons	9
Rhipidura rufiventris	8
Saxicola caprata	3
Merops ornatus	9
Geopelia maugei	8
Alcedo atthis	1
Streptopelia chinensis	2
Circaetus galilicus	2
Gallus gallus	1
Todiramphus chloris	2
Geoffroyu geoffroyi	3
Myagra ruficollis	3
Cacomantis variolosus	1
Pycnonotus aurigaster	3
Ninox novaeseelandiae	1

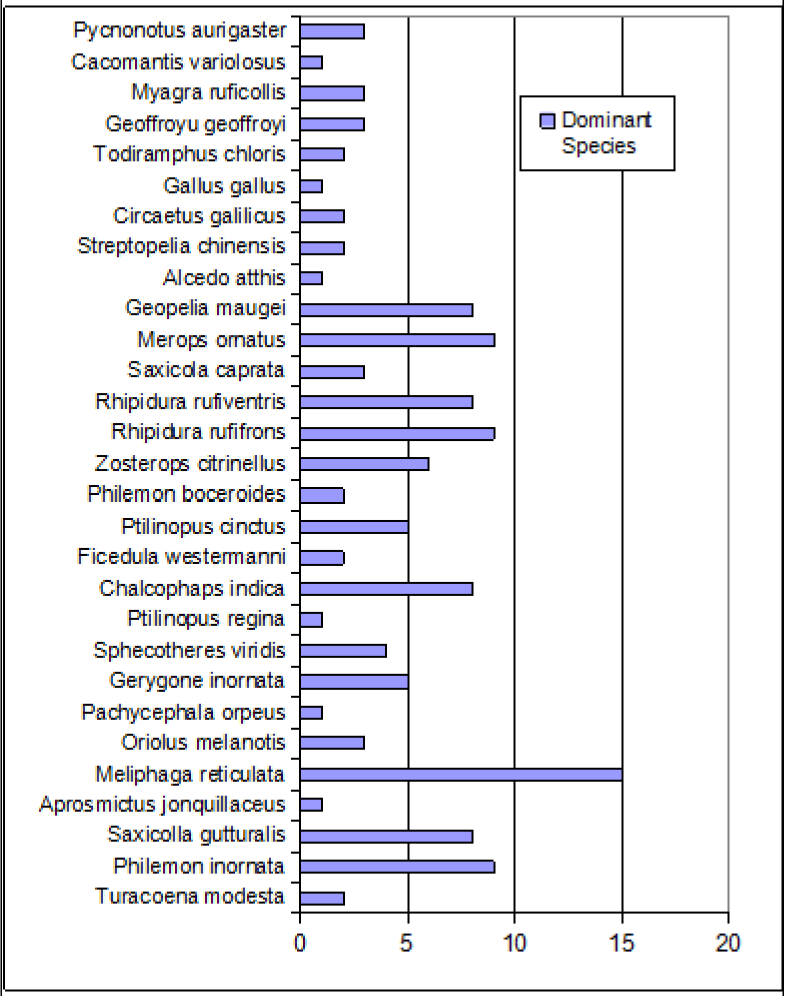


Table 6-27. Rusa-1 List of Birds Identified in Track 2 (NT1P1-NT2P5)

No.	English Name	Species	Status	
1	Timor Friarbird	*Philemon inornatu*	NT	rr
2	White-bellied Bush-chat	*Saxicolla gutturalis*	NT	rr
3	Timor Stub tail	*Urusphena subulata*		rr
4	Streak-breasted Honeyeater	*Meliphaga reticulata*		rr
5	Olive-brown Oriole	*Oriolus melanotis*		rr
6	Plain Fairy Warbler	*Gerygone inornata*		rr
7	Fawn breasted Whistler	*Pachycephala orpheus*		rr
8	Emerald Dove	*Chalcophaps indica*		
9	Helmeted Friarbird	*Philemon boceroides*		
10	Ashy-bellied White-eye	*Zosterops citrinellus*		
11	Rufous Fantail	*Rhipidura rufifrons*		
12	Northern Fantail	*Rhipidura rufiventris*		
13	Pied Bush-chat	*Saxicola caprata*		
14	Rainbow Bee-eater	*Merops ornatus*		
15	Barred Dove	*Geopelia maugei*		
16	Sooty-headed Bulbul	*Pycnonotus aurigaster*		
17	Black Faced	*Lonchura mollucca*		
18	Wallacean Drongo	*Dicrurus densus*		
19	Little Pied Flycatcher	*Ficedula westermanni*		
20	Spotted Dove	*Streptopelia Chinensis*		
21	Black-backed Fruit-dove	*Ptilinopus Cinctus*		
22	Sooty-headed Bulbul	*Pycnonoyus aurigaster*		
23	Short-toed Eagle	*Circaetus gallicus*		

Table 6-28. Rusa-1 Bird Frequency Track Line 2 (NT2P1-NT2P5)

Species	Total Species
Philemon inornatu	12
Saxicolla gutturalis	2
Urusphena subulata	3
Meliphaga reticulata	17
Oriolus melanotis	3
Gerygone inornata	3
Pachycephala orpheus	2
Chalcophaps indica	4
Philemon boceroides	2
Zosterops citrinellus	1
Rhipidura rufifrons	11
Rhipidura rufiventris	9
Saxicola caprata	8
Merops ornatus	10
Geopelia maugei	5
Pycnonotus aurigaster	2
Lonchura mollucca	3
Dicrurus densus	1
Ficedula westermanni	1
Streptopelia Chinensis	3
Ptilinopus Cinctus	1
Circaetus gallicus	3

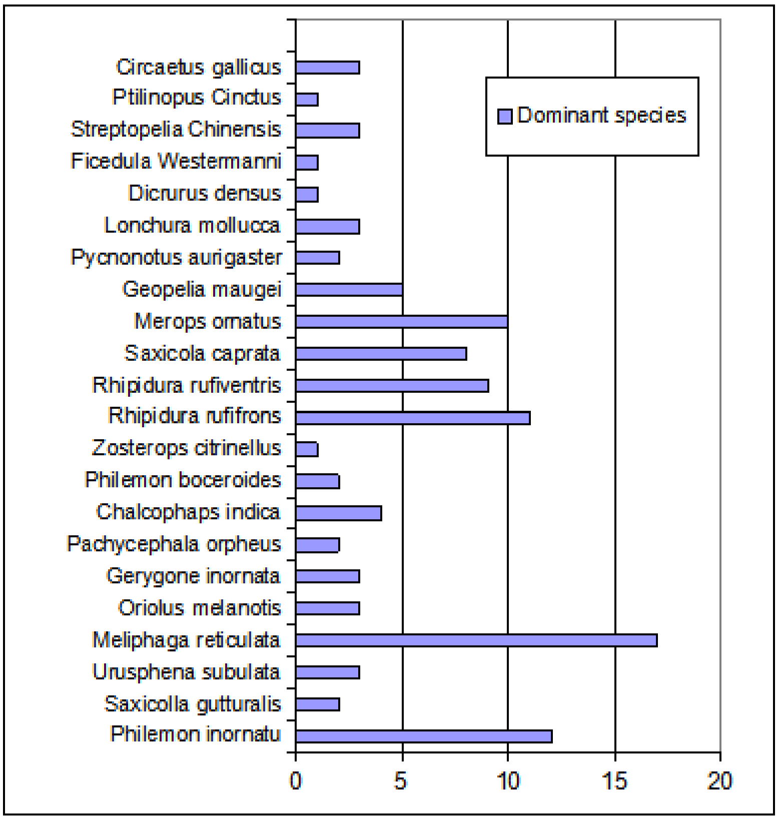


Table 6-29. Rusa-1 List of Birds Identified in Track 3 (NT3P1 - NT3P5)

No.	English Name	Species	Status	
1	Timor Friarbird	*Philemon inornatu*	NT	rr
2	White-bellied Bush-chat	*Saxicolla gutturalis*	NT	rr
3	Streak-breasted Honeyeater	*Meliphaga reticulata*		rr
4	Plain Fairy Warbler	*Gerygone inornata*		rr
5	Pied Bush-chat	*Saxicola caprata*		
6	Rufous Fantail	*Rhipidura rufifrons*		
7	Northern Fantail	*Rhipidura rufiventris*		
8	Rainbow Bee-eater	*Merops ornatus*		
9	Sooty-headed Bulbul	*Pycnonotus aurigaster*		

Table 6-30. Rusa-1 Bird Frequency Track 3 (NT3P1-NT3P5)

Species	Total Species
Philemon inornatu	3
Saxicolla gutturalis	2
Meliphaga reticulata	17
Gerygone inornata	5
Saxicola caprata	2
Rhipidura rufifrons	4
Rhipidura rufiventris	2
Merops ornatus	3
Pycnonotus aurigaster	1

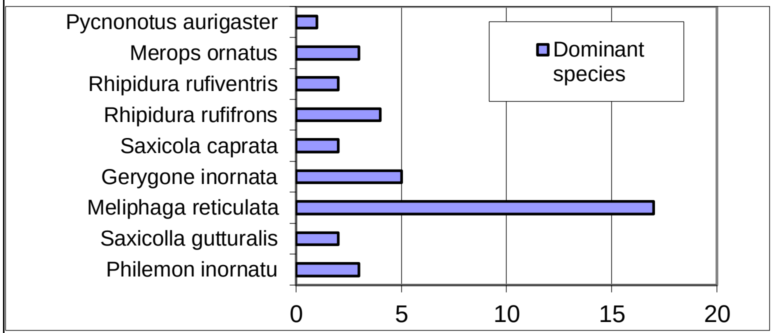
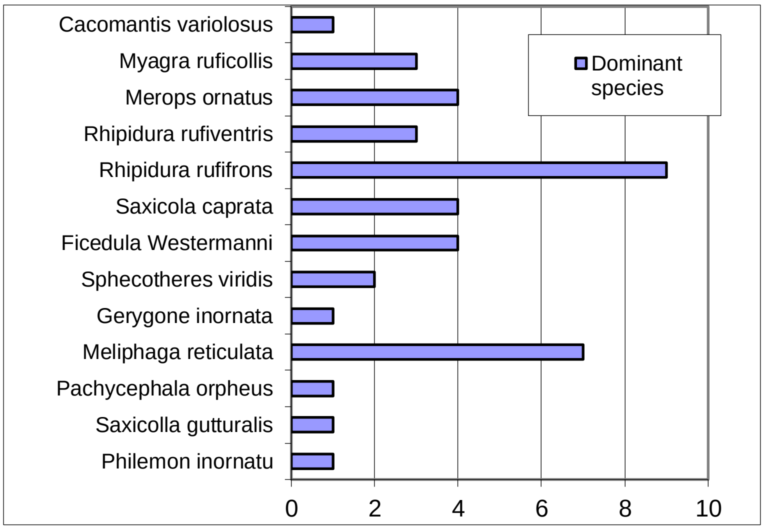


Table 6-31. Rusa-1 List of Birds Identified in Track 4 (NT4P1-NT4P5)

No.	English Name	Species	Status	
1	Timor Friarbird	*Philemon inornatu*	NT	rr
2	White-bellied Bush-chat	*Saxicolla gutturalis*	NT	rr
3	Fawn breasted Whistler	*Pachycephala orpheus*		rr
4	Streak-breasted Honeyeater	*Meliphaga reticulata*		rr
5	Plain Fairy Warbler	*Gerygone inornata*		rr
6	Timor Figbird	*Sphecotheres viridis*		rr
7	Little Pied Flycatcher	*Ficedula westermanni*		
8	Pied Bush-chat	*Saxicola caprata*		
9	Rufous Fantail	*Rhipidura rufifrons*		
10	Northern Fantail	*Rhipidura rufiventris*		
11	Rainbow Bee-eater	*Merops ornatus*		
12	Broad billed flycatcher	*Myagra ruficollis*		
17	Brush Cuckoo	*Cacomantis variolosus*		

Table 6-32. Rusa-1 Bird Frequency Track 4 (NT4P1-NT4P5)

Species	Total Species
Philemon inornatu	1
Saxicolla gutturalis	1
Pachycephala orpheus	1
Meliphaga reticulata	7
Gerygone inornata	1
Sphecotheres viridis	2
Ficedula westermanni	4
Saxicola caprata	4
Rhipidura rufifrons	9
Rhipidura rufiventris	3
Merops ornatus	4
Myagra ruficollis	3
Cacomantis variolosus	1



Mammals

These are the Mammals species that have been registered within and outside of the Rusa-1 location:

Table 6-33. Rusa-1 Listed Mammals

No.	English Name	Species	Status	
1	Long-tailed macaque	*Macaca facicularis*	NT	
2	Northern common cuscus	*Phalanger orientalis*	VU	

Reptiles

The terrestrial reptiles which have been registered withing and outside of Rusa-1 location are:

Table 6-34. Rusa-1 Listed Reptiles

No.	English Name	Species	Status	
1	Tokay gecko	*Gekko gecko*	-	-

6.2.7 Forests

In general, the economic activities of the local community, especially in Suco Foho-Ai-Lico, Administrative Post Hatu-Udo, Ainaro Municipality, mostly depend on agriculture, forestry, livestock, and fishery.

Based on observations and interviews with the local communities most people rely heavily on the forest resource for their income, to support family needs, including agricultural product, fishery and livestock. Other forms of utilisation of the forest resource includes firewood, construction, furniture and commercial as listed in Table 6-35.

Table 6-35. Forest Resource and Local Utilisation

No.	Forest Resource	Usage Type
1.	*Tectona grandis*	Construction, furniture and commercial
2.	*Gmelina arborea*	Wood for construction, furniture, and commercial
3.	*Canarium sp*	Wood for construction and furniture
4.	*Casuarina equicetifolia*	Wood for construction
5.	Nauclea orientalis	Wood for construction
6.	*Sterculia foetida*	Wood for construction
7.	(Ai laras)	Wood for construction
8.	(Ai maran)	Firewood
9.	*Bambusa sp*	Not only for construction but also for table and fences
10	*Corypha elata*	The product is not for community consumption neither for animals
11.	(Piku/bebak)	The product is not for construction and fences
12	(Tali tahan)	The product is not for construction
13.	(Tali metan)	The product is not for Sacred House construction
14.	*Imperata cilindrica*	The product is not for Sacred House construction
15.	*Aleurites moluccana*	The product is not for commercial
16.	*Copra (Cocos nucifera)*	The product is not for commercial
17.	(Tua mutin)	The product is not for consumption and commercial
18.	*Coconut oil*	The product is not for consumption and commercial
19.	(Nu'u laloir)	The product is not for consumption and commercial
20.	*Zingiber sp*	The product is not for consumption and commercial
21.	*Curcuma sp*	The product is not for consumption and commercial
22.	*Santalum album*	The product is not for commercial
23.	*Moringa sp*	The product is not for consumption and commercial

Forested areas were estimated to cover 742,000 ha in 2010, a reduction of 224,000 ha since 1990 (FAO, 2010). Deforestation is attributable to socio-economic pressures, years of conflict, unsustainable agricultural practices and rapid population increases. Many communities are reliant on wood for fuel in cooking and heating (GEF, 2012).

Originally, Timor-Leste was covered by a closed canopy of sub-tropical forest but by 2001 only 16 % of the country had a cover of dense forest and 65 % was completely bare (GEF, 2012).

6.2.8 Coastal Resources

There are no coastal resources at the Rusa-1 location.

6.3 ECONOMIC COMPONENTS

Timor Resource is Operator of the contract area known as PSC TL-OT-17-09 and is committed to carry out the drilling campaign that must align with the objectives which are to plan, build and operate the project according to sound industry practice and meet applicable government requirements and appropriate community expectations of environmental performance. For the purpose of this project, the economic component needs to be elaborated explicitly in the EIS document. These components include: employment sector, public infrastructure, land use, use of forest and other natural resources, fisheries, agriculture, tourism, and other industries.

6.3.1 Employment Sectors

Most of the population in Suco Foho-Ai-Lico, Post Administrative of Hatu-Udo, Municipality of Ainaro consist of farmers, commercial activities and fishermen, other are official (civil) servant (approximately 10 %) (see for example Table 6-36 and Table 6-37). Frequently these farmers earn their income from selling their local farming products to the customers such as corn, cassava, vegetable, banana, and teak wood. Supplementing their income supported by collecting and selling firewood, construction materials such as sand and rocks that they collected from the nearby rivers. Some small business owner established their mini stores (Kiosk); however, with only a small quantity of services provided. Due to low income or limited source of revenue, some of the local communities live under the poverty line.

Based on a survey on April 2020, it is demonstrated that aside from farming they also involve in livestock namely cattle, buffalo goats and chicken. Related to high population growth which is about 3 % annually, rapid urbanization and slow rate of job creation all have contributed to the poverty concern. Approximately, 41 % of the total population along the affected area lives on revenue less than $1 per day.

Table 6-36 and Table 6-37 illustrate the economic activity in and around Suco Foho-Ai-Lico, Post Administrative of Hatu-Udo, Municipality of Ainaro, based on the 2015 Census data from the National Directorate for Statistic, Ministry of Finance. Moreover, according to the socio-economic survey conducted in 2020, it is found that there are no significant changes in the employment sector because most the community still inhabit their previous way of surviving which is through farming.

Table 6-36. Main economic activity for the population aged ten years above
(Census, 2015)

LOCATION	Main Economic Activity			TOTAL
	Employed	Unemployed	Economically Inactive	
Post Adm. of Alas	2.844	71	2.865	5.780
Manufahi Municipality	19.471	445	20.043	39.959




The labor strength engaged during drilling will depend upon activities, since many activities are labor intensive. Most of the unskilled labor will be possibly acquired from the nearby villages and towns. In addition to direct employment, several opportunities for locals will be available in terms of supplier of goods and services during operation. It is believed that this project will provide job opportunities to local community – skilled individuals will be acquired from the community within the boundary of the project area through company's selection criteria.

Table 6-37. Employment Sectors

LOCATION	Main Economic Activity			TOTAL
	Employed	Unemployed	Economically Inactive	
Suco Foho-Ai-Lico	2.028	130	1.484	3.624
Post Administrative of Hatu Udo	4.206	170	3.266	7.642
Ainaro Municipality	22.775	778	21.116	44.669




6.3.2 Public Infrastructure

Since Independence, Timor-Leste's public infrastructure has started to develop rapidly in certain areas - especially the development of the roads, bridges and electricity in the country. The result of the field survey conducted in Suco Foho-Ai-Lico, Post Administrative of Hatu-Udo, Municipality of Ainaro shown that there are some old structures built during Indonesian occupation and still exist at the present time which are still significantly useful for the local community to assess this facility to transfer their local product to the markets. Considering its long existence, the safety factor of these old structures are now decreasing.

Other public infrastructures namely: electrical poles (power line), schools, church, hospital (clinic), water tanks/reservoir, irrigation system and others are also found along the project area (Figure 6-51). The national road from Berloic Uma (Manufahi Municipality) to Natarbora (Manututo Municipality) is still under construction and in some parts the rooute still utilises the older roads. Moreover, some villages in Suco Foho-Ai-Lico still lack basic infrastructure facilities - no electricity (only use solar panels provided by the Government) and the roads are still in poor condition. These infrastructure are expected to help and improve the livelihood of the local community in terms of social and economic benefits.

Bridge

Fresh water

Electricity Pole

Church

Health care centre

School

National roads

Storm Drainage

Figure 6-51. Infrastructure facilities surrounding project boundary

6.3.3 Land Use

During the field survey, it was found that the population living along the project area utilise the vacant land they own mostly for agricultural purposes - to grow fruits (banana, jackfruits), corn, cassava, rice, vegetables and teak trees. Due to lack of technical capabilities, some of those areas with good potential to be utilised for farming are abandoned. For the Rusa-1 well, the area is categorised as low relief with a small creek surrounding the drilling area. The land use is mainly for agricultural purposes.

6.3.4 Use of Forest and Other Natural Resources

Communities in the direct and indirect area of influence of the project are heavily reliant on the plantation products which used by the surrounding community to build houses, sometimes they sell it to other customers. Other natural resources originating from rivers are namely rocks, sand and surface water intended for irrigation of rice fields. Some people also undertake fishing as a source of food.

6.3.5 Fishing

Total area of Timor-Leste is 15,000 km^2 with a coastline around 706 km in length and marine economical jurisdictions area of approximately 75,000 km^2. Despite its long coastline and apparent abundant fishery resources, this sector is still deemed underdeveloped, people mostly eat what they catch with a small percentage of the catch sold to provide cash income. For additional detail see 6.2.4.

6.3.6 Agriculture

To a great extent in the last century, agriculture has become the backbone of Timor-Leste's economy. Most of the population living in the vicinity of the project area are heavily reliant on the agricultural sector as a way of sustaining their exsitence. It has been reported that agriculture is the main activity in Timor-Leste, providing subsistence to an estimated 80 % of the population and it also generates an average of 90 % of the country's exports (Timor-Leste Agricultural Census 2019).

Approximately 50 % of the population lives in rural areas and most of these practise subsistence agriculture. Agricultural practices that exist in the villages near to the well location are mostly similar to other villages throughout Timor-Leste. The existing agricultural products predominantly are sweet potato, potato, corn, cassava, vegetable banana, rice, beans, peanut, etc. Livestock typically includes cattle, buffalo, pigs, chickens and goats. In terms of the quality of cultivation, production is still below standard as the farmers still lack the management skills to maximise potential income for the local community.

Table 6-38 Household agriculture products and quantity produced both individually and collectively.

Table 6-38. List of household products and quantity identified in the census 2015.

Manufahi Municipality												
Administrative Post	Type of crop produced											
	Rice	Maize	Cassava	Sweet potato	Vegetables	Beans	Coffee	Coconut	All Seasons Fruits	Seasonal Fruits	Timber trees	Others
Alas	532	1,170	1,193	1,016	1,173	1,026	495	922	774	730	821	427
Fatuberlio	806	1,173	1,154	1,105	1,080	1,041	509	996	915	965	681	287
Same	1,198	4,594	4,507	4,096	3,851	4,191	3,013	3,208	3,595	3,610	2,278	1,546
Turiscai	125	1,081	984	945	782	632	937	221	698	669	189	222
TOTAL	**2,661**	**8,018**	**7,838**	**7,162**	**6,886**	**6,890**	**4,954**	**5,347**	**5,982**	**5,974**	**3,969**	**2,482**

Ainaro Municipality												
Administrative Post	Type of crop produced											
	Rice	Maize	Cassava	Sweet potato	Vegetables	Beans	Coffee	Coconout	All Seasons Fruits	Seasonal Fruits	mber tre	Others
Ainaro	702	2,199	2,201	2,138	1,636	1,683	1,737	1,407	1,632	1,558	1,413	906
Hato-Udo	631	1,795	1,749	1,635	1,564	1,645	694	1,644	1,578	1,551	1,722	1,090
Hato-Builico	316	2,049	1,526	1,751	1,704	857	1,484	480	1,409	1,495	437	468
Maubisse	1,085	3,433	2,734	3,075	2,836	1,737	3,071	1,145	1,673	1,902	1,028	1,086
TOTAL	**2,734**	**9,476**	**8,210**	**8,599**	**7,740**	**5,922**	**6,986**	**4,676**	**6,292**	**6,506**	**4,600**	**3,550**

6.3.7 Tourism

Ainaro and Manufahi Municipalities stretch from the central mountains to the southern coast. Inland, scenic vistas of the large mountains and expansive valleys are observed. Small villages can be found along the roads and on isolated ridges. The local climate and terrain are well suited to the cultivation of many tropical fruits and vegetables, and organically grown coffee.

The tourism industry for Timor-Leste is still undeveloped by global standards. However, increasingly it offers a variety of tourist activities. Timor-Leste was not originally a popular tourist destination for foreign tourists, but more recently this has been improving due to the economic and the security concerns gradually improving.

There are no major tourism places nearby the affected project area, however, there are some old structures that were built during Portuguese control (Figure 6-52),Jardim dos Herois e Martires da Patria (Figure 6-53) and Parque Dom Boa Ventura (Figure 6-54). The Parque Dom Boa Ventura is the closest attraction to Rusa-1 wellsite at a distance of 4.5 km.

Figure 6-52. Old Portuguese building

Figure 6-53. Jardim dos Herois e Martires da Patria

Figure 6-54. Parque Dom Boa Ventura

6.3.8 Other Industries

Based on the field survey, it was found that there are no major industries located nearby.. There are only small business enterprises (kiosk) owned by some of the community members within the neighbourhood.

6.4 SOCIAL COMPONENT

Social component of this environmental impact statement presents information on populations and communities affected by the drilling campaign. Community and family structures in the project area are also discussed as well as land ownership and other rights over lands. In addition, individual rights over natural resources on the project area have to be considered and recompensed (if necessary) during the design, preparation and implementation of the project.

6.4.1 Populations and Communities

According to the projection of the Department of Statistics, Ministry of Finance, in 2020 Timor-Leste has a population of approximately 1.3 million (estimate) with 1.5 % annual growth rate. The country is divided into 13 municipalities, 65 administrative posts, 451 Sucos and 2,233 Aldeias. The last population and housing census was conducted in 2015 is summarised in Table 6-39 with the Ainaro and Manufahi municipalities contributing to 5.4 % and 4.6 % of the total population, respectively.

Table 6-39. Summary of Timor-Leste demographic

Municipalities	Projected Number of Populations	Number of Households	Land Area km^2	Population Density / km^2
Aileu	53,009	7,598	676.02	78.4
Ainaro	64,616	10,600	869.80	73.9
Baucau	125,328	22,976	1,507.95	83.1
Bobonaro	99,205	17,635	1,380.82	71.8
Covalima	67,495	12,564	1,206.66	55.9
Dili	304,889	42,485	368.12	828.2
Ermera	132,054	20,671	770.83	171.3
Lautem	66,728	12,050	1,813.11	36.8
Liquica	75,909	11,885	550.95	137.8
Manatuto	47,806	7,467	1,785.95	26.8
Manufahi	55,130	9,023	1,326.60	42
Oecusse	71,132	14,345	817.23	87
Viqueque	78,265	15,297	1,880.39	41.6
TOTAL	1,191,578	204,596	14,954.43	79.7 (Overall Population density)

Source: Department of Statistics, Ministry of Finance, "Timor-Leste Population and Housing Census 2015 (Municipios em Numero)".

Table 6-40 lists out the number of Sucos, Aldeias and the area size for each one of the Post Administrative in Ainaro and Manufahi Municipalities. The wellsite is located in Suco Foho-Ai-Lico in the Post Administrative of the Hatu-Udo and the Betano camp is located in Suco Betano in the Post Administrative of Same.

Table 6-40. List of Ainaro and Manufahi Post Administratives and their Sucos and Aldeias.

Ainaro Municipality					
Post Administrative	**Sucos**		**Aldeias**		**Area size (%)**
	No. of Sucos	**Name**	**No. of Aldeias**	**Name**	
Ainaro	7	Ainaro,	31	Builico, Hato-Mera, Lugatu, Nugufu, Sebagulau, Teliga.	27.13%
		Cassa,		Boltama, Civil, Lailima, Mau-Suca Bemoris, Queca-Mau.	
		Manutaci,		Bau-Hati-Lau, Canudo, Hato-Meda-Udo, Rae-Buti-Udo.	
		Mau-Nuno,		Aileu, Mama-Lau, Mau-Suca.	
		Mau-Ulo,		Dagamessa, Hato-Lau, Hato-Lelo, Mau-Ulo-Pu, Mau-Ulu-Lau.	
		Soro,		Guer-Udo, Leolala, Poelau, Terlora.	
		Suro-Craic		Ailau, Bazar, No-Ulo, Ria-Mori	
Hatu-Udo	2	Foho-Ai-Lico,	16	Ailora, Ainaro-Quic, Baha, Lebo-Mera, Lesso, Raimerlau.	27.94%
		Leolima		Aimerleu, Dausur, Goulau, Groto, Hutseo, Lesse, Luro, Nuno-Boco, Rae-Soro, Suro-Craic.	
Hato-Builico	3	Mauchiga,	21	Goulora, Hato-Quero, Leotelo I, Leotelo li, Mauchiga.	14.93%
		Mulo,		Aituto, Bleheto, Hautio, Mano-Mera, Maulahulo, Mulo, Queorudo, Tatiri.	
		Nuno-Mogue		Hato-Builico, Hato-Seraquei, Laqueco, Lebulau, Mausoromata, Nuno-Mogue-Lau, Querema, Tucaro.	
Maubisse	9	Aituto,	63	Aihou, Airaca-Lau, Betulala, Goulolo, Hato-Buti, Lebututo, Lientuto, Mau-Lefo, Russulau.	30.00%
		Edi,		Demutete, Hebau, Lobibo, Rai-Mera, Talale, Tali-Felo.	
		Fatubessi,		Caitara, Cassimidei, Hohulo, Rae-Buti-Lau, Titibauria, Tutu-Fili.	
		Horai-Quic,		Cartolo, Gourema, Hatussao, Lau-Heli.	
		Liurai,		Bere-Tai, Erbean, Hoho-Naro, Mau-Mude.	

Ainaro Municipality					
Post Administrative	**Sucos**		**Aldeias**		**Area size (%)**
	No. of Sucos	**Name**	**No. of Aldeias**	**Name**	
		Manelobas,		Cotomata, Ernaro, Hautei, Hautilo.	
		Manetu,		Boro-Ulo, Dau-Lelo, Hahi-Tali, Lebo-Luli, Mau-Lai, Quiri-Coli, Russulau.	
		Maubisse,		Cano-Rema, Goulala, Hato-Fae, Hato-Luli, Hautado, Lequi-Tei, Ria-Leco, Ria-Mori, Sarlala, Teli-Tuco, Ura-Hou, Vila.	
		Maulau		Aihosan, Hahi-Mau, Hato-Cade, Hato-Lete, Laca-Mali-Cau, Lumo-Luli, Maleria, Rita, Tara-Bula, Ussululi, Buibela	
Total	**21**		**131**		**100%**

Source: DGE. (2018). *Ainaro em números: Estatística Município de Ainaro 2018*. 6°Edição 2018.Retrieved from https://www.statistics.gov.tl/wp-content/uploads/2020/03/Ainaro-em-Numeros-2018.pdf (Accessed: 04 February 2021).

Manufahi Municipality					
Post Administrative	**Sucos**		**Aldeias**		**Area size (%)**
	No. of Sucos	**Name**	**No. of Aldeias**	**Name**	
Alas	5	Aituha, Dotik, Mahaquidan, Taitudac, Uma Berloic	19	Leo dato, Rai Kesa. Lacaluan, Sarin, Weberec. Beremanek, Debuwain, Knua Alas, Tahu Bein, Uma Mean. Ailora, Kakeuk Laletek, Lurin, Mahaklusin, Manus. Baria Laran, Colocau, Culuhun, Uma Feric.	30.68%
Fatuberliu	5	Bubussuso, Caicassa, Clacuc, Fahinehan, Fatukahi	23	Aituha, Bubulora, Bubussusso, Lihu Lau, Orlora. Ailalec, Bubur Laletec, Caicassa, Sucaer Oan. Mane Hat, Nalolo, Saluquim, Tiro, Webicas. Ainessi, Daramata, Daurata, Riamori. Cledic, Fatubesi, Fatuboe, Fatumutin, Fuquiran.	28.34%
Same	8	Babulo, Betano, Dai-Sua, Grotu,	55	Lapuro, Lia-Nai, Nunu-Fu, Raimera, Searema, Turon, Uma-Liurai, Uma-Luli. Bemetan, Lalica, Leo-Ai, Loro, Rai-Fussa, Selihassan, Sessurai. Dai-Sua, Leco-Ai, Leco-Lau, Loti, Riatu.	26.78%

Manufahi Municipality					
Post Administrative	**Sucos**		**Aldeias**		**Area size (%)**
	No. of Sucos	**Name**	**No. of Aldeias**	**Name**	
		 Holarua, Letefoho, Rotuto, Tutuluro		Coli Dassi, Dato Rae, Leo Dato. Anilumo, Blaro, Carbulau, Datina, Deunai, Fahiluhan, Falitehu, Fatuco, Hatu-Rae, Orema, Russo, Tirilolo, Uru Fu. Ailuli, Cotalala, Ladiqui, Manico, Rai-Ubo, Ria-Lau, Tomonamo. Bere-Teni, Foe-Hei, Hatu-Hei, Leo-Fat, Sabou. Ailau, Batas, Bubolau, Dalun, Hastetuc, Roin, Sosemera.	
Turiscai	11	Aitemua, Beremana, Caimauc, Fatucalo, Foholau, Lessuata, Liurai, Manumera, Matorec, Mindelo, Orana.	40	Furak Lau, Laclo. Beremana, Dalubo, Fahilebo. Bussacoa, Fohua, Lemano, Railete, Risso. Darufu, Ermori. Leubuti, Lutarmata, Tarabula. Ailulimau, Bitibo, Lebucoa, Namoluli. Bilimano, Fanolelo, Fohonaru, Markoluli, Titilawai, Turiscai Lau. Assumata, Cotalaulara, Faturedalau, Toilero. Fatu Hei, Foho Tu, Orluli, Rimori. Aidila, Binani, Maubissi, Orcenaco. Fatulelo, Orana, Teberai.	14.20%
Total	**29**		**137**		**100%**

Source: DGE. (2018). *Manufahi em números: Estatística Município de Manufahi 2018*. 6°Edição 2018.Retrieved from: https://www.statistics.gov.tl/wp-content/uploads/2020/03/Manufahi-em-Numeros-2018.pdf (Accessed: 04 February 2021).

Ainaro and Manufahi have similar numbers of males and females in the population. Table 6-41 provides detail numbers of Ainaro and Manufahi projected total population by age group and gender reported by the General Directorate of Statistics (DGE) Timor-Leste in 2018.

Table 6-41. List of Ainaro and Manufahi projected total population by age group and gender

Ainaro Municipality, 2015 Census			
Age Group	**Male**	**Female**	**Total**
Under 1	925	786	1,711
1-4	3,689	3,431	7,120
5-9	4,981	4,515	9,496
10-14	4,786	4,491	9,277
15-19	3,842	3,616	7,458
20-24	2,074	2,081	4,155
25-29	1,792	2,017	3,809
30-34	1,661	1,730	3,391
35-39	1,268	1,339	2,607
40-44	1,587	1,435	3,022
45-49	1,349	1,064	2,413
50-54	775	696	1,471
55-59	596	528	1,124
60-64	677	682	1,359
65-69	1,164	1,484	2,648
70-74	522	549	1,071
75-79	258	255	513
80-84	124	132	256
85+	111	124	235
Total	32,181	30,955	63,136

Source: DGE. (2018). *Ainaro em números: Estatística Município de Ainaro 2018*. 6°Edição 2018.Retrieved from: https://www.statistics.gov.tl/wp-content/uploads/2020/03/Ainaro-em-Numeros-2018.pdf (Accessed: 04 February 2021).

Manufahi Municipality, 2015 Census			
Age Group	**Male**	**Female**	**Total**
Under 1	747	700	1,447
1-4	2,663	2,435	5,098
5-9	3,723	3,459	7,182
10-14	3,855	3,628	7,483
15-19	3,347	3,088	6,435
20-24	2,128	2,069	4,197
25-29	1,861	1,809	3,670
30-34	1,615	1,552	3,167
35-39	972	919	1,891
40-44	1,390	1,255	2,645
45-49	1,135	935	2,070
50-54	780	621	1,401
55-59	744	611	1,355
60-64	866	916	1,782
65-69	872	924	1,796
70-74	539	492	1,031
75-79	284	255	539
80+	229	273	502
Total	**27,750**	**25,941**	**53,691**

Source: DGE. (2018). *Manufahi em números: Estatística Município de Manufahi 2018*. 6°Edição 2018.Retrieved from: https://www.statistics.gov.tl/wp-content/uploads/2020/03/Manufahi-em-Numeros-2018.pdf (Accessed: 04 February 2021).

6.4.1.1 Land Area

Timor-Leste has a land area of approximately 15,000 km^2 with average population density of 79.7 per km^2. The highest land area by municipality in Timor-Leste is Viqueque and the smallest is Dili (the capital). Population density in Dili is extremely high as compared to other municipalities. This is an indication that many people are migrating into the city to participate in economic activity and schools.

The drilling location of the project encompasses two municipalities namely Ainaro and Manufahi. Rusa-1 well is located at Suco Foho-Ai-Lico, Administrative Post of Hatu-Udo, Ainaro Municipality, and the main camp at Betano, Manufahi Municipality. As indicated in Table 6-39 above, Ainaro has land area about 869.80 km^2 with population density of 73.9 per km^2 and Manufahi has land area of 1,326.60 km^2 with population density about 42 per km^2.

Administrative Post of Hatu-Udo with land area of 243.01 km^2 occupy about 28 % of Ainaro Municipality, as shown in Table 6-42 below. Hatu-Udo has a total number of 2 sucos and 32 Aldeias, as shown in Table 6-43.

Table 6-42. Geographic area of Ainaro and Manufahi by Administrative Post

Municipality	Administrative Post	Sucos	Area km^2	Percentage Area %
Ainaro	Ainaro Villa	Ainaro, Cassa, Manutaci, Mau-Nuno, Mau-Ulo, Soro, Suro-Craic	235.94	27.13
	Hato-Builico	Mauchiga, Mulo, Nuno-Mogue	129.88	14.93
	Hatu-Udo	Foho-Ai-Lico, Leolima	243.01	27.94
	Maubisse	Aituto, Edi, Fatubesi, Horai-Quic, Liurai, Manelobas	260.97	30
TOTAL			**869.80**	**100**
Manufahi	Alas	Aituha, Dotik, Mahaquidan, Taitudac, Uma Berloic	406.96	30.68
	Fatuberliu	Bubussuso, Caicassa,Clacuc, Fahinehan, Fatukahi	375.92	28.34
	Same	Babulo, Betano, Dai-Sua, Grotu, Holarua, Letefoho, Rotuto, Tutuluro.	355.28	26.78
	Turiscai	Aitemua, Beremana, Caimauc,, Fatucalo, Foholau, Lessuata, Liurai, Manumera, Matorec, Mindelo, Orana.	188.44	14.20
TOTAL			**1,326.60**	**100**

Table 6-43. Number of Sucos and Aldeias in Ainaro and Manufahi

Municipio	Posto	Suco	Aldeia
Ainaro	Ainaro Villa	7	32
	Hatu-Udo	2	16
	Hato-Builico	3	21
	Maubisse	9	63
Manufahi	Alas	5	19
	Fatuberliu	5	23
	Same	8	54
	Turiscai	11	39
	TOTAL	50	267

6.4.1.2 Population

Population of Ainaro and Manufahi municipalities are two of the lowest in Timor-Leste when compared with other municipalities. The total number of population in Ainaro and Manufahi municipality are 64,615 and 53,691, respectively. A total of 4,939 reside in Suco Foho-Ai-Lico as shown in Table 6-44 below. Among them 52 % are Male and 48 % are FemaleThe average proportion of people per household 6 in both Ainaro and Manufahi.

Table 6-44. General Population Demographic of Ainaro and Manufahi Municipalities

RUSA-1 WELL LOCATION	NUMBER OF PEOPLE			NUMBER OF HOUSEHOLDS
	Male	Female	Total	
Suco Foho-Ai-Lico	2,586	2,353	4,939	963
Post Administrative of Hatu-Udo	5,306	4,993	10,627	2,469
Municipality of Ainaro	33,249	31,366	64,615	10,600
Timor-Leste	607,705	583,873	119,1578	204,596

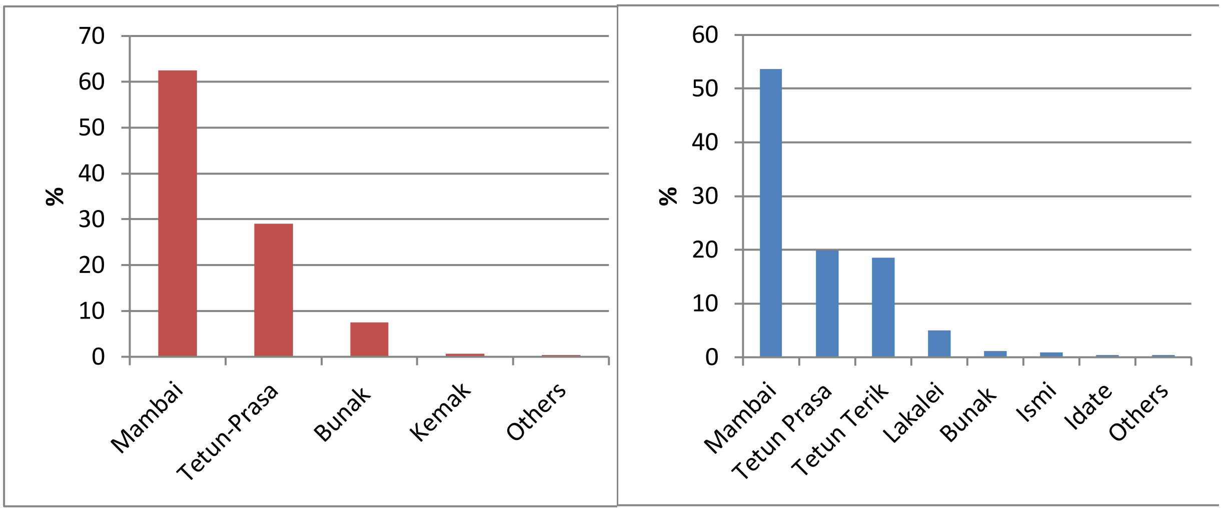
6.4.1.3 Language

Timor-Leste is a small island nation but its population speaks many languages. On average Timorese people speak two languages or greater. Most Timorese speak their dialect and other dialects. Other national languages have special consideration in the constitution of Timor-Leste Article 13.2, which recognise 16 languages and 32 dialects (see Table 5-1). The official languages in Timor-Leste are Tetum and Portuguese, along with English and Indonesian as working language.

There are two major language groups in Timor-Leste, namely Austronesian and Non-Austronesian. Mambae is an example of an Austronesian language which is widely spoken in Ainaro and Manufahi. On the other hand, Makasae which is widely spoken in Baucau and Viqueque is an example of a Non-Austronesian language. A more detailed overview of languages spoken in Timor-Leste is summarised in Figure 6-55 below.

Figure 6-55. Languages of Timor-Leste; Source: SIL International (Lewis, 2009).

In Ainaro Municipality the most spoken language is Mambai and Tetum Prasa (National Language) and a small number of the population speak Bunak, Kemak and others. Likewise, the majority of the population in the Manufahi Municipality speak Mambai and Tetum Prasa, as well as Tetum Terik. There are also small number within the population of Manufahi that speaks Lakalei, Bunak, Ismi and Idate as shown in Figure 6-56 below.



(a) Ainaro (b) Manufahi

Figure 6-56. Percentage of Most Spoken Language in (a) Ainaro and (b) Manufahi

6.4.1.4 Religion

Populations of Timor-Leste are predominantly Roman Catholic with 97.6 %, based on 2015 census. There are also other religious groups in the country including the Protestant Church (2.24 %), Islam (0.33 %), and Buddhist (0.07 %). In the Ainaro and Manufahi municipalities the major religion in the area is Catholic. Based on the survey conducted in Suco Foho-Ai-Lico and surrounding most of the people are Catholic and there are some small number of protestant and Islam.

6.4.1.5 Education and Literacy

Education in Timor-Leste has faced many challenges over the years since independence in 2002. The Government with its development partners have invested a great amount of efforts and resources to improve education levels in Timor-Leste. The overall education profile of Timor-Leste is as indicated in Table 6-45 Table 6-46 Table 6-47 and Table 6-48.

Table 6-45. Total number of students by level of education and sex, Timor-Leste 2015

	Male		Female		Total		Sex ratio (M/F)
	Numbers	Percentage	Numbers	Percentage	Numbers	Percentage	
Pre-Primary	10,826	5.0 %	10,440	5.2 %	21,266	5.1 %	103.7
Primary	112,233	51.4 %	101,353	50.4 %	213,586	50.9 %	110.7
Pre-Secondary	38,915	17.8 %	39,067	19.4 %	77,982	18.6 %	99.6
Secondary	31,652	14.5 %	29,487	14.7 %	61,139	14.6 %	107.3
Polytechnic /	998	0.5 %	762	0.4 %	1,760	0.4 %	131.0
University	20,037	9.2 %	16,598	8.3 %	36,635	8.7 %	120.7
Non formal	1,011	0.5 %	1,236	0.6 %	2,247	0.5 %	81.8
Undetermined	2,540	1.2 %	2,150	1.1%	4,690	1.1%	118.1
Total	218,212	100.0 %	201,093	100.0 %	419,305	100.0 %	108.5

The appropriate age for primary school is 5-12 years, pre-secondary is 13-15 years, secondary and vocational polytechnic is 16-18 years, and University is 18 years and above. Among boys and girls in Timor-Leste, there exists a gender gap in education participation. The highest gender gap occurs at University level where the sex ratio is120.7 with 20,037 male and 16,598 female. The sex ratio in lower levels of school narrows and is as follows: pre-primary (103.7), primary (110.7), pre-secondary (99.6) and secondary (107.3).

Table 6-46. Education profile at Municipal Level, Ainaro and Manufahi

Education Level	Municipality					
	Ainaro			Manufahi		
	Number of Students	Number of Teachers	Number of Schools	Number of Students	Number of Teachers	Number of Schools
Pre-Primary	878	34	18	1485	79	38
Primary and Pre-Secondary	17737	774	82	15743	599	76
Secondary School	2298	53	6	2597	100	6
Polytechnic	485	18	3	847	57	4
TOTAL	**21398**	**879**	**109**	**20672**	**835**	**124**

At the Municipality level, school infrastructure levels are as presented in Table 6-47 . There are a total of 109 schools in Ainaro and 124 schools in Manufahi. Looking at the number of students in both municipalities, the highest attendance is at primary and pre-secondary levels with 17,737 (82.9 %) in Ainaro and 15,743 (76.2 %) in Manufahi. In Ainaro the average numbers of students in schools is 49 students/school in pre-primary, 216 students/school in primary and pre-secondary, 383 students/school in secondary and 162 students/school in Polytechnic.

Table 6-47. School Attendance Status of Population in Suco Foho-Ai-Lico

LOCATION	SCHOOL ATTENDANCE				TOTAL POPULATION
	At School	Left School	Never Attended School	Don't Know	
Suco Foho-Ai-Lico	1,715	1,301	1,277	80	4,373
Post Adm. Hatu-Udo	3,789	2,623	2,528	135	9,075

In Foho-Ai-Lico, 59% of the Suco's total population of 4,939 have either never attended or didn't complete school.

Table 6-48. Level of Education in Suco Foho-Ai-Lico

LOCATION	LEVEL OF EDUCATION							TOTAL
	Pre-Primary	Primary	Pre-Secondary	Secondary	Diploma	University	Non Formal	
Suco Foho-Ai-Lico	208	1,541	588	560	18	69	32	3,016
Post Adm. Hatu-Udo	394	3,005	1,401	1,240	45	201	126	6,412

In Suco Foho-Ai-Lico, 208 students (6.9 %) are in pre-primary, 1,541 students (51.1 %) are in primary school, 588 students (19.5 %) are in pre-secondary, 560 students (18.6 %) are in secondary, 18 students (0.6 %) in Polytechnic/Diploma, 69 students (2.3 %) are in University and 32 students (1.1 %) are in non-formal education which indicates that the number of students

5 years old and above who attended school are mostly in pre-primary and primary school age 5-12 years old.

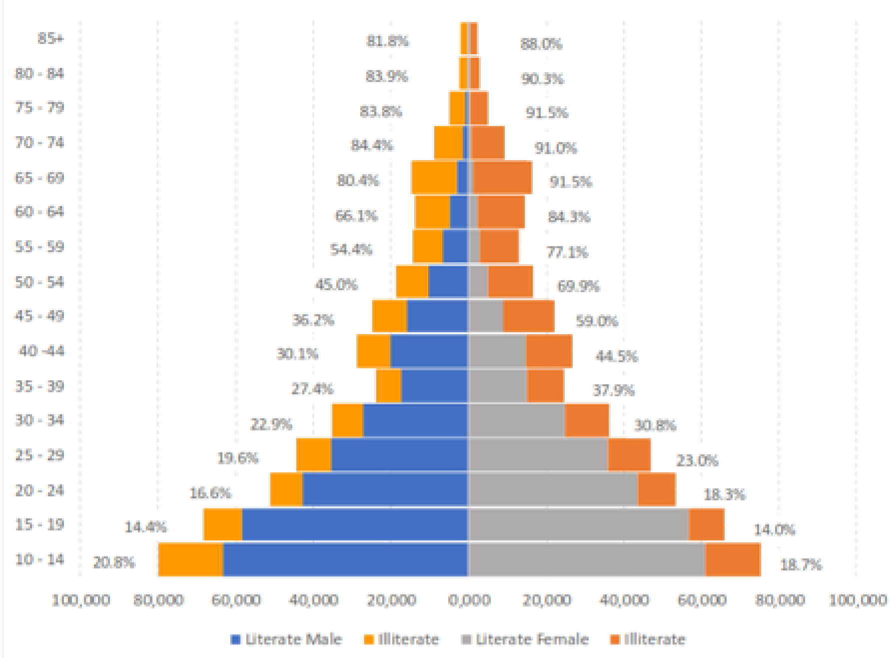


Figure 6-57. Populations of 10 years old and above by literacy status and sex.

Source: Timor-Leste population and housing census 2015, Analytical report on Education profile (2017).

The pyramid in Figure 6-57 indicates a very high illiteracy level in Timor-Leste. Overall in the five year age rackets shown in the pyramid there are higher levels of female illiteracy relative to male and additionally the relative percentage of illiteracy seems to increase with the age brackets. More than half of men 55 years and older and women 45 years and older are illiterate. When looking closely to the age group of 65-69 years old, more than 90 % of women and 80 % of men are illiterate and unable to write or read any of the four working languages used in Timor-Leste.

6.4.1.6 Livelihood and Poverty

Damage to infrastructure and the dislocation of the population during the independence struggle in 1999 and the holocaust in 2006 increased Timor-Leste's poverty. Local studies indicate that a higher proportion of the rural population are poor, compared to the urban areas. About 75 % of the poor live in rural areas and 25 % live in urban areas. Limited alternative sources of income have resulted in increasing numbers of poor people in rural areas. High population growth (around 3 % per year) rapid urbanisation and small formal sectors have resulted in slowly increasing employment rates in urban areas and have contributed to rising poverty levels.

The poverty incidence in the vicinity of the wellsite is high. All households have access to electrical power from the national transmission grid. Drinking water is accessed from a distribution pipe and local wells.

A survey conducted by Timor Resources through the Community on indirectly affected households highlighted the following characteristics of employment for community located within and surrounding the project area (Table 6-49).

Table 6-49. Livelihood of Households Indirectly Potentially Affected by the Project

Livelihood	Foho-Ai-Lico
Main Livelihood	
Farmer	16
Official Servant	
Teacher	
Kiosk Owner	2
Fishermen	1
Additional Livelihood	
Breeder	11
Rice Field	6
Raising Chicken	1

Most of the population in Foho-Ai-Lico are farmers (see Table 6-49). Agriculture is the main source of income in the local community. Additional income is generated from breeding animals and seasonal work e.g. farming the rice paddy fields twice a year.

6.4.2 Health Profiles of Communities

The National Directorate of Statistics, under the Ministry of Finance conducted Demographic and Health Surveys in 2003 and 2009. These national surveys have been used to guide observations of community health, namely; infant and child mortality, maternal mortality, child health, nutrition of children, and malaria given there is no data are available for the suco or even post administrative level.

6.4.2.1 Infant and Child

There has been a substantial improvement in Timor-Leste's child survival rate. The decline in the neonatal, post neonatal, infant, and child under 5 years mortality rates as reported by DHS 2009 indicates that Timor-Leste is on track to reach the target for Millennium Development Goal 4 (MDG), which is to reduce children under 5 mortality by two thirds by 2015.

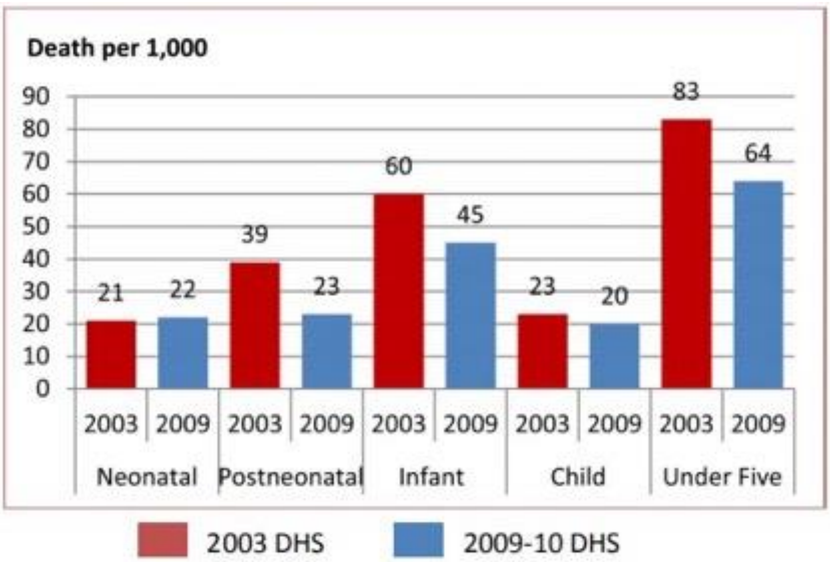


Figure 6-58. Mortality rate of Children and infants Maternal Mortality

As documented by DHS in 2009, Maternal Mortality Rate (MMR) in Timor-Leste remains one of the highest in the world. Direct estimates of maternal mortality for the 6 year period prior to survey in 2009/2010 are reported in Table 6-50.

Table 6-50. Estimates of maternal mortality (DHS, 2009)

Age	Maternal Deaths	Exposure Years	Mortality Rate[1]	Proportion of Maternal Deaths to Female Deaths
15 - 19	8	26,996	0.286	20.2
20 – 24	22	26,051	0.826	43.3
25 – 29	24	20,387	1.198	48.2
30 – 34	32	17,247	1.842	46.4
35 – 39	12	14,917	0.836	45.2
40 – 44	15	10,412	1.439	45.5
45 - 49	6	5,917	1.026	33.5
Total	120	121,927	0.960	41.7
General fertility rate (GFR)	0.172[a]			
Maternal mortality ratio (MMR)[2]	557			

6.4.2.2 Child Health

Combined with data on child mortality, information on child health depicts children as a vulnerable sub-group in the community. Children's health remains a great concern for both urban and rural children in Timor-Leste, as shown in Table 6-51. Of particular concern is the high rate of nonvaccination in children in rural areas (25 %).

Table 6-51. Health indicators for children in urban and rural areas (DHS, 2009)

Type	Health Indicator	Urban	Rural
Children's weight and size at birth	% of all live births found to be very small or smaller than average at birth	15.2%	15.7%
Vaccination	% of children age 12 -23 months who have received no vaccination at any time before the survey.	14.5%	25.3%
Prevalence of Acute Respiratory Infections (ARI)	% of children < 5 y.o who had ARI in the 2 weeks preceding the survey	2.8%	1.8%
Prevalence of fever	% of children < 5 y.o. who had fever in the 2 weeks preceding the survey	24.1%	17.6%
Prevalence of diarrhoea	% of children < 5 y.o.who had diarrhoea in the 2 weeks preceding the survey	18.9%	14.5%

DHS data from 2003 and 2009 indicate that there has been a slight increase in the level of stunting (shorter height for age), wasting (lower weight for height) and underweighing among children. Stunting increased from 49 to 53 %, wasting increased from 12 to 17 %, while underweighing is reported to have increased from 46 to 52 %. Additionally, malnutrition was reported to remain high in general with the proportion of children who have chronic malnutrition increased from 54 to 58 %.

6.4.2.3 Malaria

Malaria remains a leading public health problem in Timor-Leste with 80 % of the cases concentrated especially to only 4 of the 13 municipalities in the Country – Dili, Viqueque, Covalima and Lautem. As reported by DHS (2009), the number of confirmed cases of malaria has risen three folds between the year 2000 and 2008, however, caution should be taken as some of the increase could be due to a case of better diagnostic capacity, monitoring and surveillance in the field.

6.4.3 Institutions, Schools and Health Facilities

Around the project area there are two schools - EBF Sesurai and EBF Raemelau, two health clinics and there is also a Grupo Agrikultor Hupi, Hamahon Feto Timor (HAFOTI), Asosiasaun Agrikultor Raikotu. The nearest health clinic is located in Dai Sua village (3.5 km from the project area) and in the Ailora village. The health clinic is available 24 hours a day, 7 days a week if there are birth and foetal emergencies. The health clinic provides primary health care with no capability to treat major accidental injuries. The health centre near the project area is located in Same, Manufahi Municipality.

School and health infrastructure in Suco Foho-Ai-Lico, are shown in Figure 6-59.

Instituto Politecnico de Betano

EBF. Raemerlau

EBF. Sesurai

Health clinic in Dai-Sua

Figure 6-59. School and Health Infrastructure in Suco Foho-Ai-Lico, Hatu-Udo, Ainaro

6.4.4 Community and Family Structures

Generally the household family structures are headed by males in Timor-Leste (DHS, 2020). Likewise, in Foho-Ai-Lico households are led by males, based on the direct as was evidenced by directly surveying the surrounding project area. Mostly households have married couples and there lower numbers of people that are divorced/separated or widowed (Table 6-52 and Table 6-53).

The survey revealed a total of 16 households that would potentially be directly impacted by project activities. The majority of those surveyed are identified as nuclear family households consisting of parents and children. The minimum and maximum number of household members are 2 and 12, respectively with an overall average of 6 people.

Table 6-52. Baseline survey socio-economic survey results of the community in Foho-Ai-Lico directly affected by project activities.

No	Name	Main Livelihood	*Xefe da Familia* (household chief) by gender (male/female)	Total number of family members
1	Aleixo da Costa	Farmer	Male	5
2	Aleixo Gonzaga	Farmer	Male	4
3	Rozalino Nunes	Farmer	Male	5
4	Acacio da Costa	Kiosk owner and Farmer	Male	6
5	Jaime Soares	Farmer	Male	5
6	Joaozinho Seqera	Farmer	Male	3
7	Lucio da Costa	Farmer and Fishermen	Male	6
8	Sebastiao de Araoju	Farmer	Male	6
9	Sebastiao C. Magno	Farmer	Male	8
10	Aleixo Corte Real	Farmer	Male	6
11	Ismail Masugi	Farmer	Male	2
12	Sonio F. Sarmento	Farmer and Kiosk owner	Male	4
13	Umar Ali	Farmer	Male	12
14	Daniel Pereira	Farmer	Male	6
15	Paul da Costa	Farmer	Male	5
16	Angelino Noronha	Farmer	Male	8

Table 6-53. Socio economic survey results of broader community that will potentially be indirectly affected by the project activities.

No	Indirectly households affected	Main Livelihood	Total number of families
1	H1	Farmer	8
2	H2	Farmer	4
3	H3	Farmer	4
4	H4	Fishermen and Farmer	7
5	H5	Farmer	8
6	H6	Farmer	3
7	H7	Farmer	7
8	H8	Farmer	9
9	H9	Farmer	11
10	H10	Teacher and Farmer	9
11	H11	Farmer	5
12	H12	Farmer and Driver	6
13	H13	Farmer	5
14	H14	Farmer and Fishermen	8
15	H15	Farmer	14
16	H16	Farmer	5
17	H17	Official servant	10
18	H18	Farmer	5
19	H19	Farmer	4
20	H20	Farmer	11
21	H21	Kiosk owner and Farmer	7
22	H22	Farmer	9
23	H23	Farmer	7
24	H24	Farmer	7

6.4.5 Land Ownership

According to the DGTPSC, Ministry of Justice, the land plots identified in the project area are private land. Most of the land in Foho-Ai-Lico is private land, with the exception of the school land.

6.4.6 Common Individual Rights on Natural Resources

Communities directly and indirectly influenced by the the project are heavily reliant on the agricultural, some of them are fishermen, but not as a primary source of income. Understanding common and individual rights to natural resources is important in predicting potential impacts from diverting the use of certain resources within the community.

6.5 Cultural Components

6.5.1 Cultural Heritage and Sacred Sites

UNESCO defines the types of cultural heritage as both 'tangible' and 'intangible.' Tangible cultural heritage refers to materials, artifacts, monuments, buildings and sites that are the physical manifestations of a group or society's culture. Intangible cultural heritage refers to "*the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage*" (UNESCO 2003). The cultural components for this specific study, the overall aspects of the cultural heritage both tangible and intangible were not evaluated thoroughly within the areas of interest.

Customary cultures exist in both Ainaro and Manufahi and are ingrained with both intangible cultural heritage as defined by UNESCO, where the local communities celebrate their cultural ceremony or conduct local rituals at the site such as marriage; death; birth; harvest of agricultural products (commonly for rice and corn production and harvesting); and during extended dry seasons the community will perform a ritual to increase the probability of rainy seasons. Consequently, with the purpose of the ritual and belief, the community has confidence that they have asked the permission from the sacred land and sites to allow the activity of this project to continue as planned as discussed with Timor Resources Community Team.

6.5.2 Archaeological Site

There were no archaeological or anthropological sites identified during the socio-economic survey within the project area. Further, Groena Circoal confirmed in discussions with Direccao Patrimonio Cultural from Secretarido de Estado da Arte e Cultura, that there are no archaeological or protected cultural sites are recorded in the area.

6.5.3 Historical Site

There were no major historical sites identified within the project area surveyed. There are however, general historical sites outside the project areas such as the Dom Boaventura statue, which was a historical site of the Kingdom and the King of Boaventura.

6.5.4 Sacred Sites

Sacred places are defined as places valued and respected by local communities through unwritten norms; however, it is valid only in some developed societies where they define behavior patterns and give rights and obligations to members of the community or a line of family (Ministry of Tourism 2021).

There is one sacred site approximately 0.2 km from the Rusa-1 location called Nakabelis. This sacred house has been practicing several traditional skills to enhance and innovate their way of living. Here they use modern technology and key skills and experience to implement conservation practices for both sustainable forestry and animal farming with the goal to improve socio-economic values in the community. This type of practice occurs almost every year in both Ainaro and Manufahi, the aforementioned practice is performed by the *uma lisans* with the ceremony of *sau batar* during corn harvest season and farming time where surface water is diverted from the river into the agricultural irrigation system for farming purposes.

6.5.5 Unique Landscape

There is no unique landscape protected or conserved either by the local community or at State level at or in the proximity of the Rusa-1 wellsite.

7 CLIMATE CHANGE

This section describes relevant climate change to the drilling operations and decommissioning of the drilling wellsite. All relevant data and information on climate in this section are secondary sources and mostly taken from the national adaptation program of action on climate change (NAPA) adopted in 2010.

7.1 OBSERVATION AND HISTORICAL WEATHER TRENDS

Meteorological data was provided from an Automated Weather Station (AWS) owned by the Ministry of Agriculture within the Suai study area. The data spans from 2008 to 2014 calendar years for the following parameters:

- Maximum and minimum air temperature (ºC)
- Relative Humidity (%)
- Evaporation (mm)
- Wind speed (m/s)
- Rainfall (mm)

The supplied data are on a daily recorded basis and do not report on wind direction. A typical meteorological AWS shall make an hourly basis observation. In addition to this lack of information, there are significant gaps between months and years over the reported period. As such data does not provide sufficient time-dependent resolution to adequately assess the current trends of climate change.

According to NAPA there is no national country-specific studies and insufficient historical data for Timor-Leste to provide comprehensive analysis and evidence of how its climate has changed. A number of preliminary studies, including analysis of data from West Timor, can be used to provide indication of possible changes in climate in the region, and in addition, global models are also used to extrapolate information to Timor-Leste level. IPCC global models indicate that in South East Asia extreme weather events associated with El-Niño have been both increasing in frequency and intensity in the past 20 years. This has had an impact on Timor-Leste climate patterns with estimated decreases in mean rainfall indexes, in particular for the dry season and increased incidences of extreme weather events.

7.2 FUTURE PROJECTIONS UNDER PROJECTED CLIMATE CHANGE

There are number of models used to provide various projections of climate change in Timor-Leste. Those climate change projections, however do not represent a value specific to any actual location of a town or village in the country; it instead portrays the average change over the broad geographic region within the country and the surrounding oceans.

7.2.1 Temperature

The temperature projection indicates Timor-Leste will experience increasing of annual average air temperature and sea-surface temperature in the future according to emission projection scenarios, which are analysed for 30 interval years started from 2020, 2050 and 2080 and changes were calculated relative to the reference period 1961 – 1990. The increases of temperature for the years mentioned is in order of 0.8 ºC, 0.5 ºC and 2.2 ºC respectively.

Extreme temperature events are also expected to increase, i.e. by 2050, a 7-day or 30-day heat wave event can be expected to increase by up to 2.3 ºC and that length of such event can be expected to increase by two days. See for example AK-2010.

7.2.2 Rainfall

Rainfall is also expected to increase in relation to the reference period 1961 – 1990, by 2 %, 4 % and 6 % by 2020, 2050 and 2080 respectively. This overall rainfall projection is different from the current rainfall projection for Indonesia, but showing similar rainfall increase trends to northern part of Australia. According to NAPA, these differences in the rainfall projection trends may have been due to poor resolution in the current model used; and hence this data analysis may need to be reconsidered.

In addition to an expected overall increase in rainfall for Timor-Leste, extreme rainfall events are expected to increase across the different monthly periods. Overall the rainfall events are expected to become less frequent but more intense.

7.2.3 Sea Level Rise and Ocean Acidification

NAPA (2010) indicates that the sea level rise in Timor-Leste is expected to be the same as global averages with variations of only minus 0 - 1 cm per year. However, it should be taken into considerations that Timor-Leste is estimated to have an annual uplift of 1 cm given the tectonic activity. The following Table 7-1 shows the projection of sea level rise relative to 1990 reference period data:

Table 7-1. Projection of the sea level rise

Projected year	Sea level rise (cm)
2020	3.2 – 10 cm
2050	8.9 – 27.8 cm
2095	18 – 79 cm

NAPA further denotes that the possibility that sea level rise is larger than the 0.5 – 1.0 m range by 2100, relative to 1990 values, cannot be ruled out, for though there is considerable uncertainty surrounding estimates of future sea level rise, nearly all of the uncertainties indicate that corrections could be for higher rather than lower estimates.

It is also expected that given an increase in absorption of carbon dioxide (CO_2), the sea water pH level in Timor-Leste will decrease and lead to ocean acidification, which would have impact on marine ecosystems. The projection scenario indicates that by 2070's relative to 1990 reference period data, the ocean pH level would decrease by -0.16 – 0.17.

7.3 Climate Implications of the Proposed Project or the Environment

Implications of climate change on the project are summarised in Table 7-2.

Table 7-2. Implication of climate change on the proposed project or environment

Climate impact Source	Impact projection analysis	Potential factor impacted	Implications on project or environment
Temperature	- Changes to ambient temperature - Increase evaporation - Increase humidity	- Ground and surface water - Flora and fauna - Forest ecosystem - community health - Agriculture	- Potential impacts on human health due to increasing temperature, such as dehydration, easily fatigue - Potentially increase in energy consumption due to increasing of cooling system - Drought affects the soil fertility for farming
Rainfall	- Changes to rainfall patterns with increased or decreased rainfall - Increase in extreme rainfall events e.g. cyclones - Changes to flow and flooding regimes of rivers and drainages	- Ground and surface water - Flora and fauna - Forest ecosystem - community health - infrastructure	- Potential impacts to infrastructure and accommodation from flooding and cyclones - Affects the productivity due to extreme weather delays (e.g. road travelling, pre-drilling and drilling activity) - Impacts to the post-closure land use and decrease in success of rehabilitation due to a drying climate
Sea Level rise	- Inundation of lower lying areas - Changes to flow and flooding regimes of rivers and drainages - Saltwater intrusion of aquifers	- Ground water - Marine ecosystem - Marine flora and fauna - Soil	- Impacts to the coastal resources - inaccessible or unsafe - Impacts to the water supply with increased salinity due to intrusion - Impacts to long term land use and decrease in success of soil rehabilitation

7.4 Climate Change Adaptation Measures

For climate change impacts NAPA identifies vulnerable sectors, which are needed to be prioritised for climate adaptation or mitigation measures. These include, food security, water availability, ecosystem, human health, human settlement and infrastructure and disaster management. Therefore, for any project related mitigation measures proposed in this EIS and EMP shall reflect these priorities in addressing the climate change related impacts. The propose adaptation or mitigation measures are listed out in Table 7-3 and detailed discussion of mitigation measures are addressed in Section 9.4.

Table 7-3. Climate change adaptation measures or proposed mitigations

Drilling Phase (after Section 4.1)	Potential impact aspect	Adaptation measures or proposed mitigations (See Section 9.4 for details description of mitigation measures)
Predrilling; drilling; Suspension and Abandonment	Surface water	Propose mitigations for impacts related to drainage, as follows: - Cleaning of all oil, fuel and waste spills immediately - Waste management procedure to control litter - Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance program. - Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site.
Predrilling; drilling; Suspension and Abandonment	Ground water	Propose mitigation measures recommended for impacts to water supply described below: - Cleaning of all oil, fuel and waste spills immediately - Waste management procedure to control litter - Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance program. - Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site.
Predrilling; drilling; Suspension and Abandonment	Forest	Propose mitigation measures would be: - Develop Rehabilitation Plan for forest ecosystem conservation
Predrilling; drilling; Suspension and Abandonment	Terrestrial Flora and Fauna	Propose mitigation measures for impacts to terrestrial ecology described below: - Selection of the site to limit impact on habitat with the site selected having the lowest possible clearing footprint of all the configuration options. - Reduction in dust and noise generated through the implementation of a Dust and Noise Management Plan including wetting of unsealed roads, limiting dust generating activities when it is windy and monitoring of dust and noise levels in the project area and/or in the sensitive receptors locations.
Predrilling; drilling; Suspension and Abandonment	Air quality	Propose mitigation measures include: - Develop and Maintenance of the Grievance Redress Mechanism established prior pre-construction and expansion to include construction impacted stakeholders - Carry out periodical air quality survey at the sensitive receptors location - Carry out health screening for workers, especially those work directly under any dusty work environment
Predrilling; drilling; Suspension and Abandonment	Community health	Propose mitigation measures would be: - Workers should be provided with adequate shade, water and appropriate clothing including wide-brimmed hats and long-sleeves. - Workers should be closely monitored for symptoms of heat sickness and dehydration. - During extreme heat events, working hours should be adjusted to avoid the hottest parts of the day. - Develop and Maintenance of the Grievance Redress Mechanism established prior pre-construction and expansion to include construction impacted stakeholders - Facilitate education and awareness programs throughout the lifespan of the platform - Establish access controls to the site activities posing health and safety risks to the community. - Develop strict protocols for increased traffic safety.

8 ALTERNATIVES

As specified in Ministerial Diploma No. 46/2017 a brief description of the realistic alternatives for the project are described here. In the first case, the only known means of testing for the presence hydrocarbons in a subsurface accumulation is by a physical intersection by the means of drilling an exploration well. Therefore, there is no alternative to drilling operations. Drilling is a minimum work requirement to fulfil the obligation of the PSC.

Viable alternatives that can be considered are often limited because of technical requirements for the drilling program, typically the need to locate a well above or near the target hydrocarbon reservoir, the requirement to use specific types of equipment (e.g. drilling rig specification), materials (e.g. drilling fluids) and techniques based on the subsurface geology, and the requirement to select and schedule the drill rig in advance.

Analysis of alternatives for the project are simple, either **"No Project" Alternative**, that is, don't drill at all, or proceed after considering alternative methodologies, as described below, and assessment of potential impacts and identification appropriate mitigation, as required.

8.1 "No Project" Alternative

"**No Project" Alternative**: would mean that no drilling would be performed in this PSC which would preclude any possible future contribution to the growth of Timor-Leste's economy. The country will have fewer opportunities for oil/gas supply to the domestic market and for export and less economic growth. It could lead to less employment and secondary business opportunities.

The oil and gas sector accounts for 36 % of the country's GDP, 98 % of exports and 41 % of total imports in 2017. However, production has been decreasing since 2012 and continues to decline, with a year-on-year fall in production in 2017 of 15 percent. Petroleum production levels in 2012 averaged 202,500 barrels of oil equivalent per day (BOE/d), but in 2017 production was down to 114,000 BOE/d and by 2019 to 104,000 BOE/d.

Whilst the Government continues efforts to diversify the economy, the ongoing development of the oil and gas sector is seen as one of the pillars of future economic development. The award of the PSC TL-OT-17-09 to Timor Resources is seen as a crucial step for the future, since the area has been considered highly prospective for many years. The exploration activities are welcomed by the Government and any significant oil discovery could provide a long-awaited windfall for the benefit of the nation. The project therefore will potentially play an important part in the country's future development, particularly in the Ainaro and Manufahi Municipalities. Major benefits from a successful exploration drilling project could include increased employment opportunities for local communities both direct and indirect, improvement in livelihood of the communities, and increased revenue for the area.

Exploration drilling, following on from the seismic survey conducted in 2019, is a necessary next step to a potential discovery and development of a commercial hydrocarbon reserve. The project activities may potentially cause impacts to the local communities and the surrounding environment however, these are expected to be limited in space and time and will be eliminated or minimised in through the EMP. The "No project" option precludes the proving of any prospects identified in the seismic survey.

The "No Project" alternative for this project is not being considered further.

8.2 Well Location

Once drilling was accepted as the only means of evaluating the hydrocarbon potential of the subsurface targets identified, alternative methods and locations of drilling were reviewed (Timor Resources 2021b). The impact on delivering a technically successful operation were assessed in terms of successful subsurface intersection, degree of drilling difficulty and risk of hole problems, and incremental cost to the base condition.

The area surrounding the optimal well location was analysed to assess the impact on the environment, community, and cost of the various alternatives. These considerations are not mutually exclusive so have been considered in terms of a risk assessment based on the location of alternatives within the viable proximity of the optimal location.

As mentioned, viable alternative locations that can be considered are often limited because of technical requirements for the drilling program, typically the need to locate a well above or near the target hydrocarbon reservoir. Therefore, the options for the wellsite are constrained to within a few hundred metres depending on the subsurface targets.

The decision to drill vertical boreholes was made and approved early in the PSC TL-OT-17-08 program in order to avoid unnecessary operational risk and reduce cost, and hence, the rig specification was selected accordingly. The PSC TL-OT-17-09 program follows directly on from the PSC TL-OT-17-08 program, “back-to-back” and the rig is again only capable of meeting the straight, vertical borehole requirements, thus limiting the choice of the surface location. The surface location selection is a function of reaching the optimum bottom hole target and considering any sensitive issues at the surface location.

For the Rusa-1 location, full consideration has been given to geological, environmental, social, cultural and economic issues (Timor Resources 2021b).

8.2.1 Directional v Vertical Boreholes

Discussions on vertical versus directional drilling were considered during the project design and preparation and it should be noted that vertical, straight hole option was selected and approved by the authorities. It was concluded in both the PSC TL-OT-17-08 and PSC TL-OT-17-09 Terms of Reference (TOR) that directional drilling would have required further consideration, not only cost but because the technology introduces additional operational risk. Thus, there was an early decision to opt for vertical, straight holes on safety and cost grounds, however, for completeness the following provides a short description of the two alternatives.

8.2.2 Vertical Drilling

A vertical well is a borehole that is aimed at a target directly beneath it. A vertical well does naturally deviate during drilling but is designed to intersect within an allowable radius from the vertical target point vertical drilling is considered a conventional method of oil and gas extraction. Vertical wells differ from directional wells, such as inclined or horizontal wells, because they do not require the use of directional drilling or steering of the trajectory of the drill bit. This makes them less expensive to drill and develop. Moreover, vertical wells have traditionally been employed in the exploration phase of drilling where the primary objective is to establish the presence of oil or gas. Vertical wells are less prone to hole cleaning problems, sticking of drill pipe and bottom hole assembly and have a less complex requirement for evaluation (e.g., wireline logging versus LWD or pipe conveyed shuttle).

Historically, natural gas and oil exploration involved the use of vertical wells because directional drilling technology was expensive and complicated. Whilst the drilling is intended to be vertical the rig will have the capability to side track the hole if required.

8.2.3 Directional Drilling

Directional drilling is a drilling technique in which a well is bored at multiple angles. Directional drilling most often refers to drilling at non-vertical angles, including horizontally. Because a detailed knowledge of the subsurface structure is required to take advantage of the commercial benefits of directional drilling it is usually employed in the appraisal or development stages.

Directional drilling also allows access to areas where a vertical approach would not be possible, such as deposits that are below a body of water, or underneath a community or with difficult surface topography. Directional drilling can be more efficient and cause less surface disturbance of the environment but requires longer planning and early selection of specialised equipment. The decision to drill vertical boreholes lead directly to the selection of fit for purpose drilling equipment in terms of rig specification and capacity, the selected rig does not have the capacity to undertake directional drilling. Despite this, consideration was given to alternate well locations that would have required deviated drilling technology, but these were all deemed unfavourable options in the well location review (Timor Resources 2021b).

8.3 Water Consumption

Water consumption during the drilling campaign will be considered under the following categories:

- Potable (drinking water) – conforming to health standards
- Drilling fluid water – analysed and consistent physical and chemical properties
- General use (e.g. cleaning, dust suppression)
- Supply – reliability, drawdown of existing supply, effect on community supply

Daily water needs for drilling are estimated to be up to 60,000 L per day. Water will be sourced from local contractors. Water storage tanks on site will be filled and a mud system mixed prior to spud of the well. The level of offtake from the water source will be such that it is not detrimental to the supply for other users.

Same is one of the places in Timor-Leste with an abundance of water all year-round. JICA built a 20 km long water pipeline in the Same area. Consequently, many in the local community receive their water from this source, rather than commercial suppliers. It is therefore considered the preferred option not to use the Same community supply, but rather to use a number of local water suppliers in Same capable of supplying water volumes required, and the level of offtake is such that it is not detrimental to the supply for other users over such a short period required for the program which is 40 days.

Water supply will be met by local suppliers since the level of offtake is such that it is not detrimental to the supply for other users.

The Betano camp already sources its water from a water well.

8.4 Power Supply

There is no immediate source of mains power supply at the Rusa-1 wellsite, it would be necessary to construct a powerline from the nearest transformer sub-station to the rig. Despite the proximity of a 150 kv powerline close to the rig site, connection to this would require costly installation of stepdown transformer. Neither options are viable for a short term transient operation.

During the 2019 geophysical operations the stability and security of supply was unstable, it was observed that the local power grid has fluctuations in voltage and frequency that exceed the capacity of the sensitive electrical equipment that will be employed and would necessitate the installation of significant modulation equipment.

Given that there is no other source of power and the short time period, a 40 day drilling program, the rig will employ its own power generation, principally for safety reasons as a secure stable power supply is necessary during drilling operations. The rig power supply will be by diesel generators.

The main accommodation camp at Betano will utilise the mains supply to limit emissions however, an emergency diesel generator will be located at the camp.

8.5 Waste Management

8.5.1 Cuttings Disposal

Options for the disposal of drilled cuttings may include dewatering, encapsulation and burial in situ in the onsite mud pit; landspreading; landfill; use in subsequent road and wellsite construction works; or injection into the annular space of a well if the well is to be plugged and abandoned (IFC 2007b).

The options discussed below are assessed using the Environmental Impact Intensity Criteria as used for impact assessment in Section 9, see Table 9-2 and illustrated below.

CHARACTERISATION OF IMPACT	EVALUATION CRITERIA	RANKING
INTENSITY - ENVIRONMENT	**None:** The impact on the environment is not detectable	1
	Low: Low value. The impact affects the environment in such a way that natural functions and processes are not affected	2
	Medium: Moderate value. Where the affected environment is altered but natural functions and processes continue, albeit in a modified way	3
	High: High value. Where natural functions or processes are altered to the extent that they will temporary or permanently cease. Where the affected environment is permanently altered	4

8.5.1.1 Dewatering and Burial

Due to its simplicity, burial of wastes in small pits at drilling sites has been a standard means of cuttings waste disposal in the industry and has been identified as suitable method by IFC (2007a). However, with current awareness of pollutant migration pathways, the risks associated with open burial of wastes should be carefully considered.

The proposed method is:

- The cuttings pit contents will be dried out as far as possible
- cuttings will be mixed with an appropriate quantity of subsoil (typically three parts of subsoil to one part of waste by volume)
- A minimum of 1 m of clean subsoil will be placed over the mix
- Topsoil will be placed over the subsoil to fully reinstate the area
- The pit waste will be analysed and the maximum lifetime loads should be calculated
- Provision will be made for closure and aftercare as per the rehabilitation plan and will include records of location and content

Dewatering and burial on site represents an environmental impact significance as none - the impact on the environment is not detectable

8.5.1.2 Landspreading

Landspreading may be considered as an alternate to encapsulation for drilling fluids and cuttings with low levels of hydrocarbons and salts. The process involves the controlled and repeated application of cuttings on a soil surface with the area being periodically tilled to provide the necessary mixing with native soil and to aid oxygen transfer. Active landspreading may include the addition of water, nutrients and other materials to enhance the soil quality.

The characterisation and treatability of the cuttings should be assessed to determine whether landspreading may be effectively implemented. Site topography and hydrology, and the physical and chemical composition of the waste and resultant waste/soil mixture should be assessed, with salts most frequently limiting the application rate. Further the availability of land and the impact of changing land use should also be considered.

If landspreading is taken as the best option then monitoring should be conducted after landspreading to measure progress and determine whether there is a need for soil enhancement, e.g. fertiliser applications.

Landspreading represents an environmental impact significance as medium - Moderate value, where the affected environment is altered but natural.

8.5.1.3 Landfill

Landfills are generally specially constructed and monitored facilities designed to accommodate burial of large volumes of wastes. There is an option to use landfill and burial for inert, non-hazardous and non-toxic wastes in remote areas. However, some landfills may become little more than open dumps, and great care must be exercised to understand future liabilities in their design, operation and eventual closure.

Basic design considerations for any landfill should include, as a minimum, an impermeable lining to contain the landfill contents. The designated Municipal waste area doesn’t have a landfill, but does have a series of concreted areas that could be used for temporary storage of waste.

Landfill represents an environmental impact significance as medium - Moderate value, where the affected environment is altered but natural.

8.5.1.4 Road Construction

Cuttings can be dewatered and dried and removed from site to be used in subsequent road and wellsite construction works. Cuttings may also be used for brick manufacture as well as roadbed material. Road construction represents an environmental impact significance as high - High value, where natural functions or processes are altered to the extent that they will temporary or permanently cease or where the affected environment is permanently altered.

8.5.1.5 Annular disposal

Annular injection is a disposal method where pumpable wastes (usually mud pit fluids) are injected into the surface casing or production casing annulus (or other casing or casing annulus). However, this practice should be managed so that the wastes do not enter underground sources of water.

Annular injection is usually a "one-time" option and should only be considered if the well is to be plugged and abandoned, it is not suitable for continuous disposal. However, there is a threat of corrosion of the surface pipe or other casing. If the surface pipe is breached by corrosion the injected fluids may enter usable water sources.

It is recognised that cuttings with non-toxic fluid do not pose an environmental risk, and the preferred method of disposal is encapsulation on site, which avoids impacts identified above.

Annular disposal will be considered only in the case where the well is to be plugged and abandoned. This represents an environmental impact significance as none - the impact on the environment is not detectable.

8.5.2 Drilling Fluid (Mud) Alternatives

There are two main types of drilling mud used in various drilling operations: water-based, and non-aqueous drilling fluids (NADF), the latter are made using either a hydrocarbon base oil or a synthetic base oil. Oil-based NADF pose a potential impact to the environment since they contain hydrocarbon derived elements, whilst synthetic NADF use non-hydrocarbon oil base typically mineral oils, hence, reducing potential impact. On the other hand, water-based muds eliminate the need to use any oil-based fluid. It should be noted that water-based muds are considered the preferable environmental option compared with NADF alternatives.

As outlined in Section 8.2.2 with the early planning decision to drill vertical wells, the decision on drilling fluid selection was similarly made prior to the drilling campaign in PSC TL-OT-17-08. Water-based muds will be utilised on the well in PSC TL-OT-17-09 since this well directly follows on from the PSC TL-OT-17-08 program.

Water-based muds and the constituents of the mud have been selected to minimise any toxic components, with the sole exception of biocide, which is used in minimal amounts. Whilst some individual components pose limited safety hazards, (two components are caustic and will be treated as hazardous materials), the "whole mud" when made up is non-toxic and does not pose a potential environmental impact, it is selected as the environmentally preferable option.

The initial planning process led to the following decisions:

- The geological/geochemical assessments demonstrate that water-based muds are effective for this project
- Recycling of re-usable drilling fluid and removal of solid drilling waste at the wellsite will be maximised by optimised operation of solids separation

- Any fluid recycled on the wellsite will be as make up for new mud provided it conforms to required properties for acceptable drilling. If deemed not required, fluid will be pumped to the storage tank for use on the next well
- Any made up drill mud remaining at completion of all drilling activities may be disposed of through annular injection if the well is plugged and abandoned.

8.5.3 Incineration

Incineration uses combustion to convert wastes into less bulky materials. Incineration can refer to the practice of open burning of wastes in pits, although the degree of combustion achieved in commercial incinerators will be difficult to achieve in open burning. This is because commercial incinerators can control the residence time, temperature and turbulence within the incineration chamber to optimise combustion.

Thermal treatment (incineration) is a major option for the disposal of waste, because it greatly reduces the space requirement of landfills (typically by a factor of 4 to 10). Approximately 30 % of European municipal waste is disposed of through incineration (EU Science Hub. 2019).

The environmental concerns with incineration are health effects (primarily related to particulates, SO_2, NO_2 and CO) and greenhouse gas emissions. The incinerator to be located at Haemanu is an Inciner8 model constructed in the United Kingdom to European Union Standards. The applicable EU standards for incinerators of this type built prior to 2020 and ‘typical emissions’ provided by the manufacturer are presented in Table 9-35 below. The incremental concentration of pollutants from such incinerators is far below the ambient air quality guidelines of the WHO.

The amount of waste arising throughout the project are discussed in Section 9.3.6.2 also see the EMP Appendix A Waste Management Plan, the amount of waste after segregation of recyclables which can be incinerated is considered a small amount compared to community waste arisings in general and the opportunity to utilise an industrial incinerator as opposed to open burning or landfill is regarded as the best option, given there are no available suitable landfill sites.

Disposal of solids remaining after incineration should be incorporated into the encapsulation process for the cuttings as described in Section 8.5.1.1.

Waste will be stored at an area at rig site used for temporary storage of wastes prior to transfer to the project designated waste reception facility near to Haemanu supply base, where wastes will be segregated and managed as discussed in Section 9.3.6.2.

9 MEASURES OF IMPACT ASSESSMENT AND MITIGATION

9.1 METHODOLOGY AND APPROACH

The methods used for the identification and assessment of potential impacts associated with the project meet Timor-Leste legislative requirements, as defined under Environmental Licensing Decree Law 5/2011 and supporting Ministerial Diploma 46, in particular, Annex IV EIA Template. The approach also to meets Timor Resources Operating Management System (OMS) and the agreed drilling program.

Timir Resources followed internationally accepted methodology and best practices such as the International Finance Corporation: Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a); EHS General Guidelines (IFC 2007b); and IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).

The assessment process also followed oil and gas industry best practice such as the industry standard on environmental management - "*Environmental Management in Oil and Gas Exploration and Production*". UNEP Technical Report 37, 1997. ISBN 92-807-1639-5. IOGP Report No. 254.

Ministerial Diploma 46, Annex IV, further describes the approach required by the proponent to identify the project impacts, in particular for each project phase: construction, operation and decommissioning. Further, the assessment should address direct and indirect impacts, cumulative impacts, the impacts of climate change, the short, medium and long term impacts, temporary and permanent impacts, positive and negative impacts.

Impact assessment and mitigation measures are addressed under the following headings:

- 9.1.Methodology and Approach
- 9.2.Scope of the Assessment
- 9.3.Impact Identification, Significance and Mitigation
- 9.4.Summary of Impacts and Mitigation
- 9.5.Residual Impacts

9.1.1 Types of Impacts and Definitions

An impact is any change to a resource or receptor brought about by the presence of a project component or by the execution of a project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment. Table 9-1 describes Impacts according to their nature or type.

Table 9-1. Impact Nature and Type

Nature or Type	Definition
Positive	Impact that is of benefit to the receiving environment
Neutral	Impact that has no cost or benefit to the receiving environment
Negative	Impact that is a considered to represent an adverse change or introduces a new undesirable factor; A cost to the receiving environment
Direct	Impact that results from a direct interaction between a planned project activity and the receiving environment
Indirect	Impact that results from other activities that are encouraged to happen as a consequence of the project activity

9.1.2 Characterisation of Impacts

Predicting impacts is essentially a subjective value judgement exercise, based on qualitative or semi-quantitative approach, to determine what is likely to happen to the environment as a consequence of the drilling project. In order to address the significance of any impact it is necessary first to describe the character, nature and type of impacts that are to be considered.

The criteria used to describe impact characteristics are detailed in the Table 9-2 below, and are summarised as follows:

- **Extent:** The spatial scale of the impact (i.e. site-specific, local, regional, national and or international)
- **Duration:** The temporal scale of the impact, the time period over which the effect will last (i.e. short-term, medium-term, long-term, permanent)
- **Intensity - environment:** Sensitivity, resilience and/or ability to function
- **Intensity - social/cultural/economic:** Number of elements - individuals/households; communities/Sucos/Post Administrative/Municipalities; and enterprises, that could be affected by the impact
- **Likelihood:** The frequency/probability of impact or how often it might occur (i.e. not probable, probable, highly probable, definite)

The terminology used to describe the impact characteristics are provided in Table 9-2, and magnitude is illustrated in Figure 9-1.

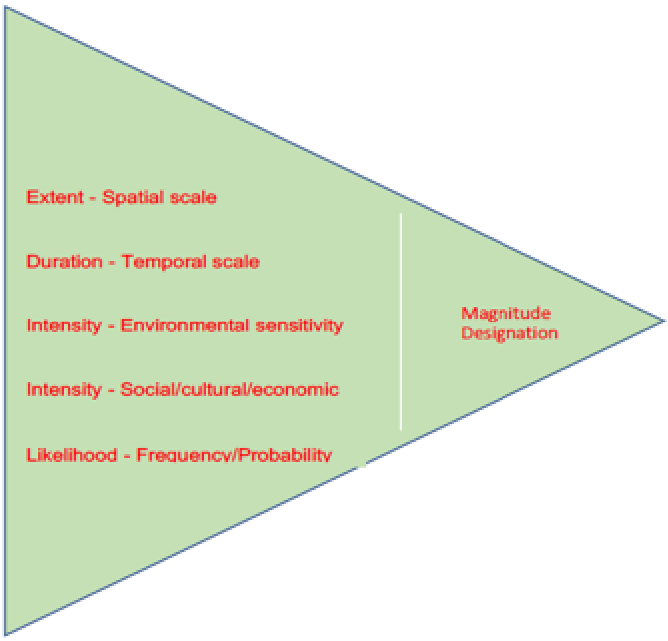


Figure 9-1. Assessing the Level of Magnitude

Table 9-2. Significance - Evaluation Criteria

CHARACTERISATION OF IMPACT	EVALUATION CRITERIA	RANKING
EXTENT	**Site-Specific:** Impact that are limited to the boundaries of the project site	1
	Local: Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	2
	Regional: Impact that extends far beyond the site boundary; widespread effect (i.e. 5 km and more from the Project Site Boundary)	3
	National and/or international: Impact that extends far beyond the site boundary; widespread effect	4
DURATION	**Short-term:** Impact that is quickly reversible; 0-5 years	1
	Medium term: Impact that is reversible over time; 5-15 years	2
	Long-term: Impact that lasts 16-30 years	3
	Permanent: Impacts that last over 30 years and resulting in a permanent and lasting change that will remain	4
INTENSITY - ENVIRONMENT	**None:** The impact on the environment is not detectable	1
	Low: Low value. The impact affects the environment in such a way that natural functions and processes are not affected	2
	Medium: Moderate value. Where the affected environment is altered but natural functions and processes continue, albeit in a modified way	3
	High: High value. Where natural functions or processes are altered to the extent that they will temporary or permanently cease. Where the affected environment is permanently altered	4
INTENSITY OR NUMBER OF ELEMENTS - SOCIAL, CULTURAL AND ECONOMIC	**None:** Affecting a small number of Individuals/households, individual enterprises.	1
	Low: Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	2
	Medium: Affecting more Individuals/households, communities, Sucos or Post Administrative, medium enterprises.	3
	High: Affecting a large number of Individuals/households, communities, Sucos, PA or Municipality, large enterprises	4

IMPACT	TIME SCALE OF IMPACT - LIKELIHOOD	RANKING
LIKELIHOOD	**Improbable:** Possibility of the impact materialising is negligible; chance of occurrence <10 %	1
	Probable: Possibility that the impact will materialise is likely; chance of occurrence 10-49 %	2
	Highly Probable: It is expected that the impact will occur, chance of occurrence50-90 %	3
	Definite: Impact will occur regardless of any prevention measures, chance of occurrence >90 %	4

9.1.3 Impact Significance

Impacts are described in terms of "*significance*". Significance is a function of the magnitude, severity or consequence of the impact based on the Evaluation Criteria and the likelihood of the impact occurring. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in Table 9-3 and Table 9-4 below.

Table 9-3. Significance Rating Matrix

SIGNIFICANCE					
EVALUATION CRITERIA		**LIKELIHOOD**			
Extent Duration Intensity - Environment Intensity - Social/Cultural/Economic		**Improbable 1**	**Probable 2**	**Highly Probable 3**	**Definite 4**
Site Specific/Short-term/None/None	**1**	**1 Negligible**	**2 Negligible**	**3 Negligible**	**4 Negligible**
Local/Medium Term/Low/Low	**2**	**2 Negligible**	**4 Negligible**	**6 Minor**	**8 Minor**
Regional/Long Term/Medium/Medium	**3**	**3 Negligible**	**6 Minor**	**9 Moderate**	**12 Moderate**
National/Permanent/High/High	**4**	**4 Negligible**	**8 Minor**	**12 Moderate**	**16 Major**

Table 9-4. Significance Ranking

SIGNIFICANCE RANKING	IMPACT LEVEL
13 - 16	Major
9 - 12	Moderate
5 - 8	Minor
1 - 4	Negligible
Positive impact	Beneficial

9.1.4 Mitigation Measures and Residual Impacts

In developing the mitigation measures, the EIA team relied upon on the internationally applied methodology that included lessons learnt from previous studies and the best practices such as the IFC/World Bank general EHS Guidelines and from the insight gained during fieldwork and stakeholder engagement exercise.

For activities with significant impacts, the EIA process is required to identify suitable and practical mitigation measures that can be implemented, and this is achieved through the implementation of the EMP. Finally, the impacts were re-evaluated assuming the appropriate mitigation measures are effectively applied, and this resulted in a significance rating for the residual impact under the EMP.

9.2 Scope Of The Preliminary Assessment

The scope of the project is described in the approved Project Document (13th August 2020 - ANPM/HSE/S/20/096) and EIA Terms of Reference (26th January 2021 - ANPN/HSE/S/21/021 2021).

IFC PS 1 advises that the scope of an impact identification process should be consistent with good international industry practice, which it describes as "*the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally*".

The scope of this study covers pre-drilling/construction, drilling and decommissioning, including all activities under each phase. The area selected for study was chosen, to be sufficiently large enough to consider a range of possible locations for the initial exploration well, but also to allow for possible follow up appraisal drilling within the area if required in the event of success. The Area of Interest (AOI) has been taken as 10 km.

This spatial concept has also been considered when assessing potential impacts and their extent and duration as presented in Section 9.3 and summarised in Section 9.4 (i) key Aspects; (ii) potential impact rating; (iii) a range of mitigation measures, and (iv) likely residual impact. In considering the spatial scope, each of the potential impacts were considered and the AOI, as described above, adequately addresses each, noting that for all, save perhaps a worst-case oil spill, the potential impact zone is considered to be significantly smaller than the AOI. The AOI for a worst-case spill will be addressed in the Site Specific Operational Oil Spill Plan.

It focuses primarily on the 2.5 ha wellsite and considers sensitive locators within a 10 km range of the Rusa-1 wellsite, the primary sensitive locators are summarised in Table 9-5

Table 9-5. Sensitive Locations for Air Quality and Noise in and around the wellsite area

Sample Site	Location	Sensitive Receptor	Distance (km)	Centroid Coordinates	
				Latitude	Longitude
01 - b	Aldeia Fatukabelak	Resident Settlement	0.93	09º 07' 05" S	125º 41' 33.8 "E
02 - a	Aldeia Sessurai	School area	1.06	09º 06'31.1" S	125º 41'44.8" E
03 - c	Aldeia Raimerlau	Resident Settlement	0.47	09º 06 '52.5" S	125º 41" 00" E

The potential impacts identified in the approved TOR include the following components, with the environmental components discussed in Section 9.3 and the social and economic impacts addressed in Section 10 and Section 11 respectively.

Environmental Components (See Section 9.3)

1. Decreasing air quality – construction and operation, principally dust and generator and vehicle emissions
2. Noise - increasing noisy condition during construction and operation phase; drilling activities, increased traffic along the main road – predicted noise levels compared to existing background levels
3. Water quality potential degradation but ground water dependent – changes pH, ammonia, sedimentation and other parameters also ground water dependent
4. Land use change – conversion of public and private land uses into drilling site, facilities, areas, current land use and cover
5. Habitat destruction/degradation and biodiversity loss
6. Solid waste - solid waste management, garbage from rig and camp
7. Wastewater and stormwater – sewage treatment; wash water; rain water; hazardous material spills

Economic, Social and Cultural Components (See Section 10 and Section 11)

1. Land acquisition and physical displacement – number of households and people affected, land types and areas acquired, etc.
2. Economic displacement and livelihoods – local businesses and employment
3. Loss of cultural heritage sites – types and significance of sites
4. Safety - worker and community safety pre-operation during construction, operation and decommissioning
5. Traffic – during construction and operation, primarily between Suai and the wellsite site
6. Employment- increased employment opportunities, and increased support services opportunities, e.g. shops and transport services

9.3 Preliminary Impact Identification and Assessment

The following sections discuss the findings of a preliminary assessment of impacts and relate to Section 4 - Project Description and Section 6 - Environmental Description. Each of the sub-sections describe the process, the potential impact, their significance and describes mitigation measures that are considered in project design and execution.

Section 9.3.1 Describes the preliminary assessment of positive impacts arising from the project, whilst the succeeding sub-sections identify potential negative impacts. The significance of the negative impacts is assessed followed by a description of the proposed mitigation measures.

Impacts are described for pre-drilling/construction, drilling and decommissioning.

9.3.1 Positive Impacts

9.3.1.1 Employment Opportunities

Construction (Timorese labour component 88)

There will be several employment opportunities during the construction phase for: community consultation, community liaison officers, civil construction crews, civil engineers, concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electrician surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, security, geologists, administration, accounting, operations management, work team supervisors.

Operations (Timorese labour component 114)

Additional employment during the operations phase includes rig related labour, inclusive of drilling crew, derrickmen, roustabouts, company men, geologists, security, labourers, and crew. In addition, the following positions remain important: concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electricians, surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, administration, accounting, operations management, work team supervisors.

Decommissioning (Timorese labour component 88)

Company men, geologists, security, labourers, and crew. In addition, the following positions remain important: heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electricians, surveyors, labourers, accommodation manager, administration, accounting service, cooks, cleaners, administration, accounting, operations management, work team supervisors.

9.3.1.2 Procuring Goods and Services

Procurement from Timorese owned and operated businesses in the contract area goods and services include but are not limited to:

1. Fresh food and water
2. Accommodation housing/office supply
3. Diesel supply
4. Import services for customs clearance
5. Rental of heavy equipment, trucks, cranes
6. Environmental consultancy engagement
7. Aggregate and rock base

In preparation for the local suppliers to be able to offer their goods and services Timor Resources has undertaken promotional workshops and engagements to educate the local suppliers as to what they can supply and in what quantities they can participate. Raising the standard of the local suppliers, to be able to participate in the tender process and to be a supplier has been an activity undertaken over 18 months already in working with the communities and the local district administrator, in preparation.

9.3.1.3 Customs Duties and Taxes

The use and consumption of various specialist drilling materials, such as machinery, mud components, drill bits, etc. will attract taxes and customs duties, which will be payable to the government hence increasing government revenue while the cost of these materials will be payable directly to the producers.

Imported equipment will net greater than US$220,000 in import duties alone, as heavy equipment comes into the country.

WHT will be payable and collected on the employment and contracts, providing revenue to the state exceeding US$462,000.

9.3.1.4 Community Programs

Timor Resources has implemented a number of community programs, including horticulture, gifted seeds, irrigation and financial support. The supply of irrigation and water infrastructure has been the focus of Company support during seismic and is continuing during the drilling campaign.

Support for local sporting competitions, teams and local events is another community contribution. The sponsoring of the Manufahi Cup, the Tour de Dili, and the local community football and soccer federations.

Infrastructure within the project area is set to improve especially the roads leading to the site after improvement eases access of transportation. The roads to the site will also serve other residents who are set to benefit from this infrastructure development brought by the project.

9.3.2 Land

“Land” covers both direct land use and traffic impact on the community and also soil related aspects resulting from land disturbance throughout all project phases: pre-project/ construction, operations and decommissioning.

9.3.2.1 Land Use

The wellsite is approximately 2.5 ha in area which includes an allocation of land for the well pad (approximately 1ha), where on private land, a short-term rental payment has been be negotiated with the landowner. The access road already exists and is being improved as a community project.

Section 4.4.3 provides detailed maps of the drilling location delineating existing and the proposed new access road, the major drainage systems (see Figure 4-7 access roads, and Figure 4-8 catchment to the wellsite and out flow), urbanised areas and other infrastructure boundaries.

The existing 1000 m of public road is being upgraded as a community project ahead of program initiation, a new section will be constructed of approximately 750m to get to the gate at the wellsite and to access gravel for site construction from the Caraulun river immediately south of the wellsite. Both sections will be 6 m wide with 10 to 20 m of clearance for wide loads. Locally sourced rock will be used as base course up to 30 cm in thickness for the roads. Existing public infrastructure such as highways and local roads, bridges and underpasses will be assessed. If required, they will be upgraded or modified with approval of the relevant authorities to allow for the safe mobilisation of the equipment to the project locations.

Land use impacts may occur throughout the project phases, if there are conflicts with existing land use such as habitation, agriculture, forest, grazing lands, etc., and where the land is occupied by the drilling rig. Typically, the surface location can be selected to avoid use of inhabited or productive land and should always consider occupying land that is already disturbed.

The displacement of local fauna is directly related to activities of clearing because it involves the loss of their habitat. Likewise, in the construction stage the presence of vehicles, machinery, heavy equipment (for the formation of the drilling platform and the construction of drilling facilities), sounds, as well as the presence of workers in the area may cause a significance disturbance on local fauna. Larger more mobile species, such as the vulnerable *Phalanger Orientalis* and Near Threatened *Macaca facicularis* (should they happen to be at the drill location construction area), will likely be displaced to adjacent areas or have their normal range area reduced. The consequence of this temporary displacement or reduction in range is unlikely to be significant because of the relatively short duration of drilling activities.

9.3.2.1.1 Land Use Impact Significance

Table 9-6. Significance Impact on Land Use

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The use of the land is temporary and will be returned to the landowner. Natural functions and processes are not affected.	8
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**7**

9.3.2.1.2 Mitigation Measures - Land Use

- Contact local stakeholders early in the process to identify sensitive land areas, land uses, issues, and local plans and any local regulations.
- Site the project on previously disturbed land whenever possible.
- Depending on the individual site, consider steps to minimise the amount of vehicular traffic and human activity.
- Provide adequate public notice of planned activities.
- Establish a rehabilitation plan that addresses both interim and final rehabilitation requirements and agree after-use if applicable. Ensure that interim rehabilitation of disturbed areas is conducted as soon as possible.
- Compensate farmers for crop damage and restore compacted soils.

9.3.2.1.3 Residual Impact - Land Use

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, any potential impacts are insignificant. The implementation of the land use mitigation measures will contribute to reducing the significance of the residual impact associated but the residual impact on land use remains **Minor**.

Table 9-7. Pre and Post Mitigation Significance: Impact on Land Use

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Minor	Minor

9.3.2.2 Traffic

Vehicular movements will occur along local access routes and access roads throughout the project - construction/operations/decommissioning. Vehicle congestion may occur on local roads during construction with trucks carrying the rig, delivering the construction plant and rig facilities and other small vehicles carrying workers to the site. There will be daily vehicle movements to and from the site throughout the operating phase for re-supply purposes, and similar issues may arise during decommissioning. These impacts will mainly be a source of annoyance to local residents but will increase the potential of safety related incidents for other road users and local residents living and working within a close proximity to the access roads and the site.

Strict traffic management procedures will be implemented which will also limit all traffic movement through villages and in particular at school opening and closing times.

9.3.2.2.1 Traffic Impact Significance

Table 9-8. Traffic- Significance Traffic Impacts

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Regional	3	The potential impact may affect 5 km or more around the site.	12
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	None	1	The impact on the environment is not detectable, therefore discount as a criterion	-
Intensity - Social/Cultural/ Economic	Medium	3	Affecting more Individuals/ households, communities, Sucos or Post Administrative, medium enterprises.	12
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Moderate**	**9**

9.3.2.2.2 Mitigation Measures - Traffic

Control of traffic build-up throughout the project phases will be achieved by observing the following measures:

- Plan to use existing roads to the maximum extent possible.
- Prepare an access road siting study and management plan to guide road design and maintenance standards, coordinate closely with Municipality and national Government authorities responsible for maintaining roadways and bridges. Compare the number, size, and weight of loads to service projects to the existing road infrastructure to determine if roads and bridges are adequate to support intended loads.
- Implement strict traffic management procedures in association with the Municipality.
- Route project traffic to minimise impacts on local communities.
- Issue notices/advisories of pending traffic inconveniences and conduct briefing meetings with local authorities, schools and residents before the commencement of works.
- Flagmen should be employed to control traffic and assist all vehicles as they enter and exit the project site.
- Maintain on site a record of incidents and accidents.
- Ensuring that all drivers for the project understand and comply with speed limits.
- Ensure all vehicles and machinery used for the project are in good working condition both legally and are fit for purpose.

- Control dust along un-surfaced roads, especially near residences, schools and fields.
- Limit all traffic movement through villages in particular school opening and closing times.

9.3.2.2.3 Residual Impact - Traffic

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, the implementation of the traffic mitigation measures will contribute to reducing the significance of the residual impact associated with traffic impact to **Minor**.

Table 9-9. Pre and Post Mitigation Significance: Traffic Impact

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Moderate	Minor

9.3.2.3 Soil

The exploration drilling campaign requires the building of the wellsite and upgrading (1000 m) and construction (750 m) of the access road from the nearest public road. The wellsite area of 2.5 ha will be levelled after topsoil is removed and a rock base course up to 50cm in thickness is installed. If the geotechnical survey dictates, additional foundation will be used under high load bearing areas. The wellsite incorporates two mud pits with a combined operating volume of approximately 1908 m^3 (12,000 bbls), lined with a High-Density Polyethylene (HDPE) membrane

Construction activities will involve vegetation clearing, leveling and soil compaction. The main environmental impacts of these works are; loss of vegetation and habitat, loss of topsoil productivity and soil compaction. Secondary effects are increased susceptibility of soil to erosion (see also Section 9.3.4.1 Surface water), and potential contamination of soils with petroleum products (See Section 9.3.4.3 leaks and spills).

Vegetation Habitat (see also Section 9.3.5): The vegetation habitat at the wellsite include primary forest, secondary forest, savanna, agricultural production and teak plantation (see Section 6.2.6.2 Overall Baseline Condition). These habitats are widespread through the region and the wellsite locations represent only small fraction of these habitats regional distribution. There are no critical habitat, such as wetlands or mangrove forests near the wellsite. Furthermore the tree species observed are not on global level in the category of threatened species nor are they species with limited geographical expansion in accordance with IUCN International Agreement.

Topsoil Productivity: The topsoil and vegetative material within it are relatively nutrient rich and contain valuable seedbank that if not carefully removed and stored would have long term consequences on capacity to return to the land to its original habitat or agricultural purpose. The arable topsoil and vegetation will be stockpiled on the side of the lease within the fence line or in the case of access corridors, to the side of the road. The topsoil will be used to rehabilitate the site once drilling is completed in areas which are no longer required.

Soil Compaction: Soil compaction and introduction of rock base will be carried out after the topsoil and vegetation has been removed. Impact to the subsoil is proportionate to the amount of disturbance, thus, given the minimal size of land used for the wellsite, approximately 100 m x 100 m the potential impacts may be considered minor.

Activities during the decommissioning phase include removal of the well pad, with the community public road returned in good condition. Similar to the impacts recorded in the construction phase, movement of machinery and loading and offloading of transport vehicles present a threat to the soil structures and characteristics and changes in the runoff patterns could cause soil erosion (see Section 9.3.4.1. Surface water).

9.3.2.3.1 Soil Impact Significance

Table 9-10: Significance Impact on Soil

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts are predominantly limited to the boundaries of the project site but may extend beyond the site where access roads are constructed	8
Duration	Short-term	1	Although removal of topsoil and soil compaction will occur largely during the construction phase, the effect will continue through operations until the site are decommissioned and rehabilitated.	4
Intensity - Environmental	Medium	3	Topsoil removal and soil compaction will be limited to specific areas of the wellsite and access road if applicable. The affected environment is altered but natural functions and processes continue, albeit in a modified way	12
Intensity - Social/Cultural/ Economic	None	1	Affecting a small number of Individuals/households, individual enterprises	4
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**7**

9.3.2.3.2 Mitigation Measures - Soil

Construction

- Restricting removal of vegetation and soil cover to those areas necessary for the project.
- Remove all topsoil and store off site.
- Manage storm and flood flash water effectively to avoid movement of loss soils.
- The disturbed areas should be rehabilitated with indigenous vegetation as soon as possible to prevent soil erosion if it was necessary.
- Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the project footprint.

- Preventing pollution of ground from servicing of vehicles and wastes by having specific sites for collection, sorting and transport of wastes.
- Construction vehicles should remain on designated roads and should avoid off-site driving.
- Compacting area with loose soils.

Decommissioning

- Soil originally removed in the construction phase and stored will be returned upon restoration of the drill site and access road if necessary.
- Drains will be installed, and drainage patterns will be re-established to prevent erosion.
- Wellsite and roads are either left to an agreed after-use or rehabilitated following drilling. If the well is successful, the area will be reduced to the minimum size necessary in discussion with the authorities and the landowner.
- During restoration and rehabilitation of the wellsite and roads, the site will be ripped before returning of the stockpiled topsoil.
- Soil profile and contours will be reinstated upon completions of decommissioning phase.

9.3.2.3.3 Residual Impact - Soil

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, the implementation of the soil mitigation measures will contribute to reducing the significance of the residual impact associated with the impact on soil to **Minor**.

Table 9-11. Pre and Post Mitigation Significance: Impact on Soil

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Minor	Minor

9.3.3 Air Quality

Dust

Construction and decommissioning activities may generate dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. Vehicle movements along gravel access roads, where present, may raise dust during the operations phase. These activities are likely to generate air quality impacts related to dust and can be measured and monitored as Particulate Matter (PM), see Section 6.1.4 for discussions on background levels of $PM_{2.5}$ and PM_{10}.

To reduce impacts from dust during the construction, operations and decommissioning phases, the main mitigation measures will be:

- Watering - dust suppression
- Speed reduction
- Vehicle movements restricted to site and access roads

Gaseous Emissions

Emissions to the atmosphere from the drilling program will mainly arise from combustion products resulting from diesel engine exhaust, both the rig generators and service vehicles, and from hydrocarbon flaring if the well is tested see Table 9-12. The major sources and typical emission gases arising are combustion products from burning of diesel fuel, mainly CO_2 and H_2O resulting from the oxidation of hydrocarbons. CO, CH_4, NO, NO_2 and N_2O gases will be emitted in the exhaust as well as unburnt hydrocarbons and particulates. Some sulphur may be released depending on the sulphur content of the diesel fuel.

Additional pollutants may include hydrogen sulphide (H_2S) although there is no evidence to suggest H_2S is present in the region; volatile organic compounds (VOC); glycols; and polycyclic aromatic hydrocarbons (PAHs), although 95 %-99 % PAH is destroyed in combustion in the engine/generator.

Table 9-12. Drilling Emission Sources

Emission Source	Purpose	Treatment	Point of Emission	Emission Gas
Diesel fuel	Engines for power production: rig and vehicles	Combustion	Engine exhaust	CO_2,NO_X,VOC,CH_4,CO,N_2O
Well testing	Testing of wells	Combustion	Burner	CO_2,NO_X,VOC,CH_4,CO,N_2O
Other direct hydrocarbon emission	Drilling fluid Well clean-up Fugitives and Leaks Produced water Storage tanks	None None None None None	Evaporative Vent stack/tanks BOP Vent stack Vent stack	VOC,CH_4 VOC,CH_4 VOC,CH_4 VOC,CH_4 VOC,CH_4

Major Emission Gases

Carbon Dioxide (CO_2): is the main product of combustion, together with water. It is a non-poisonous gas. However, the major environmental impact receiving attention is its contribution to the global atmospheric greenhouse effect. Whilst it is the weakest in terms of specific greenhouse effect, the large emission quantities make it the predominant contributor.

Carbon Monoxide (CO): is a poisonous gas produced from incomplete combustion, low in terms of quantity and greenhouse effect.

Nitrogen Oxides (NOx): is the common term for nitric oxide (NO) and nitrogen dioxide (NO_2). NO is rapidly oxidised in the atmosphere to the more toxic nitrogen dioxide. Both gases contribute to acidic deposition whether through precipitation or dry deposition. NO_x, in combination with volatile hydrocarbon components (VOC), forms photochemical oxidants as secondary pollutants, with properties and effects quite different from those of their original components, and impacts over large distances. The most important of these secondary photochemical oxidants is Ozone (O_3), which, in the lower atmosphere, interacts with other air pollutants and contributes as a greenhouse gas. Ozone in the upper layers or stratosphere is subject to a different phenomenon - ozone depletion.

Nitrous Oxide (N_2O): is produced in smaller quantities during combustion processes and is a strong greenhouse gas.

Methane (CH_4): is a non-poisonous gas and, although emitted only in small quantities from oil and gas operations, its high potency in terms of greenhouse effect makes it a key consideration.

Volatile Organic Compounds (VOC): is a common term for all volatile hydrocarbon components except methane, it does not have a strong greenhouse effect, but in combination with NOx produces photochemical oxidants, particularly ozone, as a secondary pollutant. Some components such as benzene and polycyclic aromatic hydrocarbons pose significant health risks.

Halon and CFC: are synthetic, non-poisonous gases, which have received much attention in recent years for their effects in the degradation of ozone in the upper atmosphere. Both have a strong greenhouse effect.

Hydrogen Sulphide (H_2S): is a toxic flammable gas. It is denser than air and tends to accumulate in low lying areas. In a rig environment, if the gas is vented downwind it disperses and is soluble in atmospheric moisture. The environmental impact is negligible, however, because of the acute toxicity, the main concerns are with human safety. H_2S is not expected in this project.

During well testing the intent is to separate the hydrocarbon test fluids to avoid a smoky flare with fall out that may impact the nearest community. Alternative disposal options may be considered, but it is necessary to fully consider the safety of handling volatile hydrocarbons and if deemed unsafe the fluids may be burnt or incinerated.

If flaring is the only option available for the disposal of test fluids, an efficient test flare burner head equipped with an appropriate combustion enhancement system will be selected to minimise incomplete combustion, black smoke, and hydrocarbon fallout. In addition, the minimum volume of hydrocarbons required for the test will be flowed and well test durations will be reduced to the extent practical.

The Project Description Section 4.4.3 presented a map of the well location and any nearby receptors, maps covering the Rusa-1 drilling location, the Betano base camp and Haemanu supply base are provided above in Figure 4-8 and Figure 9-3 to Figure 9-5. Figure 4-8 covers an area of approximately 3 km radius from the well location.

From these maps the following can be concluded regarding receptors:

Rusa-1: The wellsite lies on a flat area, between two small natural watercourses on a generally south-easterly dipping slope. The catchment area draining to the wellsite is of limited extent (2,551 m^2) and will be diverted to the adjacent watercourses. Two knickpoints in the watercourses have been identified as suitable locations for spill containment if required.

The area surrounding the site has a low habitation density, noise and air quality impacts will be low and will be monitored.

The location is susceptible to access issues if operations were to be conducted in the wet season. The gradients on the Hatu-Udo road are high in places and could preclude movement of heavy equipment if on unsealed sections and wet.

Betano Base Camp: The camp at Betano has been operational from 2018 to the present day, during the seismic acquisition in 2019 the accommodation at the camp was more than 100 people. There has been no significant impact on the surrounding community since the camp was installed, this is expected to continue through the drilling operation. Emissions from the camp will be low, the main contributions being from a small generator to provide camp power if the EDTL supply is interrupted. There will be no dust arising from the camp as all are on compacted ground.

Haemanu Warehouse and Yard: emissions from the warehouse and yard operations will be low, as with the Betano Camp the main contributions being from a small generator to provide power if the EDTL supply is interrupted. There will be no dust arising from the warehouse or yard area as all are on hardstanding.

Without mitigation measures, air quality impacts from air pollutants emitted by generator combustion throughout the project are expected to be local in extent, short-term in duration, reversible and of small magnitude.

The emissions from vehicles will be transient, intermittent and spatially variable, therefore it is expected only a small incremental increase in combustion-based air pollutants will be generated by the project.

Assessment Criteria

In the absence of air quality legislation or regulations, recognised international guidance from IFC and WHO will be used in this study (see Table 9-13). Regarding air quality IFC refers to the WHO guideline values for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. In this project the principle potential impacts relate to dust arising from construction activities and emissions from diesel engines both for power generation and in plant and vehicles. As such this study focuses on particulates ($PM_{2.5}$ and PM_{10}) and NO_2 and SO_2, the former using available secondary data and limited primary data collection as comparisons. In the case of engine emissions, the levels will be calculated using recognised emission estimate methodology applicable to diesel engines.

Table 9-13. WHO Ambient Air Quality Guidelines 2005

	AVERAGING PERIOD	GUIDELINE VALUE µg/m^3
Sulphur Dioxide (SO_2)	24-hour mean 10-minute mean	20 (guideline) 500 (guideline)
Nitrogen Dioxide (NO_2)	Annual mean 1-hour mean	40 (guideline) 200 (guideline
Particulate Matter PM_{10}	Annual mean 24-hour mean	20 (guideline) 50 (guideline)
Particulate Matter $PM_{2.5}$	Annual mean 24-hour	10 (guideline) 25 (guideline)
Ozone	8-hour mean	100 (guideline)

9.3.3.1 Air Quality Impacts - Construction

Construction activities will also produce various air pollutants, which can have both negative effects on both human and environmental health. The potential for air quality impacts comes primarily from dust and engine emissions. Dust will be generated by earth works and excavation and the extent of the raising of dust will depend on several factors such as:

- The moisture and silt content of the materials
- Distances travelled on unpaved surfaces
- The mitigation measures employed
- The type of construction activities occurring (e.g. excavation)
- Volume of material being moved
- The area of exposed materials

Engine emissions arise from construction equipment, transport trucks, personal vehicles, power saws, and generators.

9.3.3.1.1 Air Quality Impact Significance - Construction

Table 9-14. Construction - Significance Impact on Air Quality

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Medium	3	The decrease in Air Quality will be temporary but may create dust nuisance and impact on the fauna and flora around the project site.	12
Intensity - Social/Cultural/ Economic	Medium	3	Affecting more Individuals/ households, communities, Sucos or Post Administrative, medium enterprises.	12
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Moderate**	**9**

9.3.3.1.2 Mitigation Measures - Construction Air Quality

- Sprinkling water on soil before excavation and periodically when operations are under way to prevent raising of dust.
- Use of low sulphur fossil fuel.
- Controlling the speed and operation of construction vehicles; drivers should adhere to the speed limit of 20 km/hr on access roads and 40 km/hr on blacktop roads.
- Regular maintenance and services of machines and engines.
- In order to control exhaust, educate and raise awareness of construction workers on emission reduction and on emissions that are likely to occur during the construction of the well pad and access roads leading to the site, the following measures shall be implemented during construction:
  - Vehicle idling time shall be minimised
  - Equipment shall be properly tuned and maintained.
- To minimise air pollution due to dust emission or transport of waste materials during construction, the waste materials must be transported in covered vehicles especially if the route is through frequently used roads.
- Workers in dusty areas on the site need to be issued with PPE such as, dust masks and safety goggles during dry and windy conditions.

- Sensitise truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points.

9.3.3.1.3 Residual Impact - Construction Air Quality

The implementation of the construction mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact on Air Quality to **Minor**.

Table 9-15. Pre and Post Mitigation Significance: Construction Impact on Air Quality

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Construction	Moderate	Minor

9.3.3.2 Air Quality Impacts - Operations

There will be limited source of dust during operations arising from vehicle traffic on gravel access roads. The main air quality emission source during operations is the burning of diesel in the rig generators and service vehicles. Total diesel fuel consumption for the well is estimated to be 5000 L per day for rig generators and transport. The well program is expected to take 40 days and based on this, the emissions can be calculated and are presented in the table below with some 480 tonnes CO_2 is produced for the Rusa-1 well and 500 tonnes of GHG.

Table 9-16. Emission Estimates for Rusa-1 Well Resulting from Diesel Generators

(Derived from OGP (ex E&P Forum) Tier 3 estimation method.
CO_2 equivalents (CO_2E) are calculated using Global Warming Potentials (GWPs) from the Intergovernmental Panel on Climate Change's Fourth Assessment Report.)

Emission Gas	Tonnes	CO_2E [(3)] Tonnes
CO_2	480 [(1)]	480
CO	3.45	-
NO_x	8.10	-
N_2O	0.03	8.94
SO_x	0.60 [(2)]	-
CH_4	0.03	0.75
VOC	0.55	-
GHG	496.23	489.69

[(1)] *assumes carbon content of 85 % by weight for diesel fuel*
[(2)] *sulphur content assumed as 0.2 % by weight for diesel fuel*
[(3)] ** EPA greenhouse-gas-equivalencies calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator).*

The total release of CO_2E during the drilling operation is estimated to be 480 tonnes of CO_2E per well, as shown in Table 9-16. Significant greenhouse gas (GHG) emissions occur from all oil and gas operations worldwide (>100,000 tons CO_2 equivalent per year) IFC (2007).

The levels of gaseous emissions in the project are very low, and whilst there is an overall contribution in terms of emission gases, the levels are insignificant in comparison with other operations in Timor and globally. For example, in 2018, CO_2 emissions per capita for Timor-Leste was 0.2 metric tons, so with a population of approximately 1¼ million this equates to 275,000 tonnes. Source (World Data Atlas, 2018).

Timor-Leste is a minor emitter of greenhouse gases, and therefore mitigation is not currently an important issue in the country, but adaptation will be (World Bank 2009). Carbon dioxide emissions (0.2 tonnes) are low compared with Indonesia (1.4 tonnes) but at the same level as Lao PDR. The GHG emissions arising from the proposed activities are insignificant (approximately 0.2 %), and therefore will not significantly impact the environment.

The option to use a locally available incinerator is discussed in Section 8.5.3 and 9.3.6.2.

If hydrocarbons are discovered a well test program may be instigated, either immediately following the completion of the well, or at a later date. A test separator will be utilised to process any produced hydrocarbons from well testing operations. Gas will be burned in the flare pit using a specialised burner and liquids stored in tanks. A detailed Well Testing program, as required by ANPM, will be issued separately.

9.3.3.2.1 Air Quality Impact Significance - Operations

Table 9-17. Operations - Significance Impact on Air Quality

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	8
Intensity - Social/Cultural/ Economic	Low	2	Affecting more Individuals/ households, communities, Sucos or Post Administrative, medium enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**7**

9.3.3.2.2 Mitigation Measures - Operations Air Quality

- Sprinkling water on access roads to reduce dust.
- Use of low sulphur fossil fuel.
- Speed limit on access road 20 km/hr, 40 km/hr blacktop.
- Regular maintenance and services of machines and engines.
- In order to control exhaust, educate and raise awareness of drivers on emission reduction and on emissions that are likely to occur during the operations, the following measures shall be implemented during construction:
  - Vehicle idling time shall be minimised
  - Equipment shall be properly tuned and maintained
- Sensitise truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points.

9.3.3.2.3 Residual Impact - Operations Air Quality

The implementation of the operations mitigation measures will contribute to reducing the significance of the residual impact associated but the impact on Air Quality remains **Minor**.

Table 9-18. Pre and Post Mitigation Significance: Operations Impact on Air Quality

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Operations	Minor	Minor

9.3.3.3 Air Quality Impacts - Decommissioning

Emissions generated by activities during the decommissioning phase include vehicular engine combustion emissions; diesel emissions from equipment and generators; and dust from source such as land clearing, structure demolition, cement removal, backfilling, dumping, and tuck movements. Similarly, reclamation of disturbed areas through grading, seeding, and planting may also emit limited dust levels.

9.3.3.3.1 Air Quality Impact Significance - Decommissioning

Table 9-19. Decommissioning - Significance Impact on Air Quality

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Medium	3	The decrease in Air Quality will be temporary but may create dust nuisance and impact on the fauna and flora around the project site.	12
Intensity - Social/Cultural/ Economic	Medium	3	Affecting more Individuals/ households, communities, Sucos or Post Administrative, medium enterprises.	12
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Moderate**	**9**

9.3.3.3.2 Mitigation Measures - Decommissioning Air Quality

High levels of dust resulting from decommissioning works will be minimised by implementing the following measures:

- Covering of all haulage vehicles carrying debris for dumping at approved sites.
- Stockpiles of fine materials should be wetted or covered with tarpaulin during windy conditions.
- Workers in dusty areas on the site should be issued with dust masks and safety goggles.
- Using well maintained equipment and machines with efficient engines meaning low emissions.
- Using dust screens.

9.3.3.3.3 Residual Impact - Decommissioning Impact on Air Quality

The implementation of the decommissioning mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact on Air Quality to **Minor**.

Table 9-20. Pre and Post Mitigation Significance: Decommissioning Impact on Air Quality

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Decommissioning	Moderate	Minor

9.3.4 Water

9.3.4.1 Surface Water

A local topographic survey has been carried out in the area of the proposed wellsite and combined with a semi-regional Digital Terrain Model to delineate natural drainage patterns by watershed analysis. This analysis allows for planning of diversion of surface water within and around the wellsite. A 30 m Satellite DTM was used to compute a watershed analysis for the site. The analysis provided the catchment area upstream of the wellsite and the direction of flow(s) from the site. The Project Description Section 4.4.3 presented maps of the of the well location, any nearby receptors and also illustrated the drainage patterns. The wellsite lies on a flat area, between two small natural watercourses on a generally south-easterly dipping slope. The catchment area draining to the wellsite is of limited extent (2,551 m^2) and will be diverted to the adjacent watercourses. Two knickpoints in the watercourses have been identified as suitable locations for spill containment if required.

The potential environmental effects occurring as consequence of changes in surface water flow relate to water as a resource and changes in water quality.

Water as a resource: If excessive sediment loads are introduced into streams or the river through erosion it can have the effect of altering natural patterns of water flow and consequently the supply or drainage of water. The drilling location will have berms to distribute surface water run-off around the site and minimise disruption of natural flow patterns. Surface water that falls on the site will be directed to a watercourse on the downstream side of the lease.

Water quality: The potential for impacts to surface water quality are contamination from the well location or increased sediment load.

The potential exists for leakage of fuel or oils from construction heavy equipment at the drilling location. To prevent such spills escaping the well pad a perimeter drainage ditch will be constructed around the drill location. All spills on the well pad will be contained and immediately cleaned up. The wellsite incorporates two mud pits with a combined operating volume of approximately 1908 m^3 (12,000 bbls), lined with a High-Density Polyethylene (HDPE) membrane

The potential sources of increased sediment load to water are the settlement of dust and the erosion of soil. During construction, operation and decommissioning phase, water will be used to control dust from road traffic, assembling and dismantling the wellsite. Therefore any sedimentation associated with settlement of dust will be negligible.

During construction, storm water runoff will be managed to prevent erosion of roads and slopes of the well pad, such measures are addressed in the Environmental Management Plan Appendix K - Soil Erosion Management Plan and Appendix L - Surface Water Management Plan. Such soil erosion, if allowed to reach water courses, could adversely affect water quality through increased turbidity, increased sedimentation and possibly the introduction of chemical contamination from areas outside of the drill location. Turbidity from suspended particles are a natural occurrence in water bodies, however, extended periods of high turbidity can cause reduction in light necessary for photosynthesis by phytoplankton and aquatic plants. It can also adversely affect fish health through irritation of gill membranes. However, given the short project timescale, small spatial scale, and measures outlined in the EMP, the likelihood of these effects occurring are extremely remote.

9.3.4.1.1 Surface Water Impact Significance

Table 9-21. Significance Impact on Surface Water

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	4
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	2
Intensity - Environmental	Medium	3	Potential spills may affect a larger area beyond the site, once they come into contact with runoff or storm water. Where the affected environment is altered but natural functions and processes continue, albeit in a modified way	6
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	4
Likelihood	Probable	2	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Moderate**	**4**

9.3.4.1.2 Mitigation Measures - Surface Water

- Minimise the planned amount of land to be disturbed as much as possible by use of existing roads.
- Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure).
- Construct drainage ditches only where necessary. Use appropriate structures at culvert outlets to prevent erosion.
- Refuel in a designated fuelling area that includes a temporary berm to limit the spread of any spill.
- Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer;
- Any discharge of grey water should be treated first to avoid contaminating water sources.
- Upon completion of the decommissioning phase, disturbed areas will be contoured and vegetated to minimise the potential for soil erosion and water quality related impacts.

- Temporary sediment and erosion control measures such as sediment fences installed where necessary especially in areas in close proximity to drains or surface water features to avoid runoff to water source.
- Any area artificially elevated via pad or access track construction will be lowered to original ground level by removal of paving material unless otherwise instructed by the landowners.
- Original drainage patterns will be restored.

9.3.4.1.3 Residual Impact - Surface Water

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, any potential impacts are insignificant. The implementation of the mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact on Surface Water to **Negligible**.

Table 9-22. Pre and Post Mitigation Significance: Impact on Surface Water

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Minor	Negligible

9.3.4.2 Groundwater

The potential negative impacts on groundwater arise from extraction for use in drilling activities and as a dust suppressant, and degradation of water quality from polymers and other additives used when drilling.

Water will be sourced from local contractors in Same that are capable to supply the volume of water required for consumption for Rusa-1. Same is one of the places in Timor-Leste with abundance of water year round. The level of offtake from the water source will be such that it is not detrimental to the supply for other users and will not compromise the availability of water for the local communities.

Polymer drilling muds are of low toxicity and provide the benefit of maintaining stability of the borehole during drilling. This benefit occurs because the polymer sticks to surface of clay particles, through hydrogen bonding or electrostatic attraction, when the polymer mud contacts with the rock around the borehole. It is this characteristic that also limits the potential for movement of polymers through groundwater.

The shallow aquifer will be cased early in the drilling program to prevent contamination of the aquifer by drilling fluids. There is a possibility that remnants and waste from these operations could pollute shallow aquifers. The environmental effects that would occur are likely to be localised elevated oxygen demand due the introduction of oxidizable carbon (present in the organic polymers) leading to reduced dissolved oxygen content the groundwater and potentially a consequential temporary localised reduction in pH level.

9.3.4.2.1 Groundwater Impact Significance

Table 9-23. Significance Impact on Groundwater

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Regional	3	The potential impact may affect 5 km or more around the site.	6
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	2
Intensity - Environmental	Medium	3	Potential spills may affect a larger area beyond the site, once they come into contact with groundwater. Where the affected environment is altered but natural functions and processes continue, albeit in a modified way	6
Intensity - Social/Cultural/ Economic	Medium	3	Affecting more Individuals/households, communities, Sucos or Post Administrative, medium enterprises	6
Likelihood	Probable	2	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Moderate**	**5**

9.3.4.2.2 Mitigation Measures - Groundwater

- Conductor casing will be set to case the hole through the shallow ground water aquifers before drilling continues. Based on water well data for aquifer depths in PSC TL-OT-17-08, the deepest regional aquifer was-found at 82 m.
- Mud chemicals are non-toxic with the exception of biocide, but this is used in low quantities.

9.3.4.2.3 Residual Impact - Groundwater

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, the implementation of the mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact on Groundwater to **Negligible**.

Table 9-24. Pre and Post Mitigation Significance: Operations Impact on Water

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Minor	Negligible

9.3.4.3 Operational Leaks and Spills

Small scale spillages and leakages may occur throughout the project phases, however, rig design incorporates leak minimisation and drainage containment systems to ensure that spillages do not enter the environment. All storage facilities will be contained within adequate bunding.

The majority of chemicals employed during drilling operations are related to drilling mud and described in Section 4.4.1.2.2. All chemicals utilised in the project were subject to strict vetting by ANPM as part of the import requirements, a comprehensive checklist was completed and approved by ANPM in May 2020, a full MSDS database is maintained. There is an inherent potential for spillage and consequent leakage into the environment, however, proper storage, rig design, handling and operating procedures will be incorporated, hence, the risk of impact from chemical and hazardous materials can be minimised. The potential for impact given proper facilities and design and good operating practice is considered minimal.

In the unlikely event of accidental release of hydrocarbons to the ground, such as diesel fuel or machinery oils, the low hydraulic conductivity of the compacted clay sub-soil will limit the amount of downward migration. The majority of hydrocarbons would be retained on the compacted surface and subjected to weathering, primarily through evaporation and photodegradation, which are the most active mechanisms under tropical conditions where the solar radiation is of high intensity.This weathering would result in the rapid loss of lighter (more toxic) hydrocarbon fractions to atmosphere within the first 12 to 24 hours. The corresponding increase in the density and viscosity of the remaining hydrocarbon fractions would further limit the potential downward migration of and spilled hydrocarbons through the compacted soil.

Hydrocarbons that do penetrate the soil surface, or remain on the surface after weathering, are less toxic (due to loss of lighter fractions) but would retain sufficient toxicity of chemical compounds to reduce the diversity and evenness of the soil microbial community in immediate vicinity (Mukherjee et al. 2014). However there are hydrocarbon-tolerant and hydrocarbon-degrading species that would survive and proliferate by utilising hydrocarbons as an energy source. So successful is this natural biodegradation process that an environmental technology, bioremediation, has developed steadily over the past 50 years based on this natural biodegradation process (Pande et al. 2020).

Biodegradation of hydrocarbons would occur more rapidly nearer the soil surface due to the presence of oxygen in the soil void spaces and more slowly in deeper soils due to anoxic conditions. The duration of toxic effects to soil microflora is variable and site specific and would be measured in weeks for the surface, and near surface, clay soils and months for any hydrocarbons that penetrate through to the anoxic levels of the soils.

All chemicals and fuel on site will be stored in bunded impermeable areas with adequate shading. Correct storage, handling, use and transportation of chemicals will be followed according to manufacturer's specifications, Material Safety Data Sheets (MSDS) and Regulations.

A Hazardous Substance Standard Operating Procedure (SOP) will be developed to provide a complete framework for chemicals management in compliance with company rules and national standards. There will be no disposal of unused chemicals, all excess materials will be quantified and recorded and returned to the vendors.

Contaminated materials treatment and disposal are addressed in the EMP Appendix A - Waste Management Plan, and contingency plans are prepared to assess and prepare for all spill risks and a separate, site specific oil spill contingency plan is presented in Appendix D which includes details of arrangement with third parties on oil spill response and insurances to cover any environmental damages resulting from an oil spill. Requisite insurance documents are registered with ANPM.

9.3.4.3.1 Leaks and Spills Impact Significance

Table 9-25. Significance Impact from Leaks and Spills

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	4
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	2
Intensity - Environmental	Medium	3	Potential spills may affect a larger area beyond the site, once they come into contact with runoff or storm water. Where the affected environment is altered but natural functions and processes continue, albeit in a modified way	6
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	4
Likelihood	Probable	2	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Moderate**	**4**

9.3.4.3.2 Mitigation Measures - Leaks and Spills

- Rig design incorporates leak minimisation and drainage containment systems to ensure that spillages do not enter the environment.
- All chemicals and fuel on site will be stored in bunded impermeable areas with adequate shading.
- Correct storage, handling, use and transportation of chemicals will be followed according to manufacturer's specifications, material safety data sheets and regulations.
- Provide a Hazardous Substance SOP for chemicals management in compliance with company rules and national standards.
- No disposal of unused chemicals, all excess materials will be quantified and recorded and returned to the vendors.
- Prepare spill contingency plans.

9.3.4.3.3 Residual Impact - Leaks and Spills

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, any potential impacts are inconsequential. The implementation of the mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact from Leaks and Spills to **Negligible**.

Table 9-26. Pre and Post Mitigation Significance: Impact from Leaks and Spills

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Minor	Negligible

9.3.4.4 Worst Case Oil Spill Scenario

If hydrocarbons are discovered there is a possibility that a larger scale well-related incident may occur, and best industry practice requires a worst case scenario is addressed. Such events are rare, however, contingency plans will be prepared to assess and prepare for such an eventuality. In Timor-Leste four uncontrolled flows have been reported; Aliambata (oil and gas 1916), Matai-1 (water 1960), Tafara East-1 (water 1969) and Suai Loro-2 (gas 1971), all were minor and did not involve injury or significant environmental damage.

The major risk potential is related to loss of well control (i.e. well blowout) and an oil spill contingency plan is prepared for such a scenario (See EMP Appendix D). In the case of an oil spill, arrangements are in place with local contractors for heavy plant, equipment and labour. Timor Resources has adopted best practices approach to preventing a situation where reactive measures such as surface or Relief Well intervention are required. However, since all potential scenarios need to be considered, Timor Resources have planned for intervention as a worst-case, with Wild Well Control Limited as the nominated well control specialists and Oil Spill Combat Team as the agency to assist in clean-up from an oil spill.

Timor Resources carries requisite insurance including, but not limited to, Control of Well Insurance, Redrilling/Extra Expense Insurance, Seepage and Pollution, Clean-up and Contamination Insurance, details of Timor Resources insurances are registered with ANPM.

9.3.4.4.1 Worst Case Oil Spill Impact Significance

Table 9-27. Significance Impact from Worst Case Oil Spill

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	National	4	Impact that extends far beyond the site boundary; widespread effect	8
Duration	Long-term	3	Impact that lasts 16-30 years	6
Intensity - Environmental	High	4	Where natural functions or processes are altered to the extent that they will temporary or permanently cease.	8
Intensity - Social/Cultural/ Economic	High	4	Affecting a large number of Individuals/households, communities, Sucos, PA or Municipality, large enterprises	8
Likelihood	Probable	2	Possibility that the impact may materialise chance of occurrence >10 %	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Major**	**8**

NOTE: whilst the impact significance shown above indicates a Moderate impact, for assessment purposes at a local level the impact could be considered as Major for assessment purposes.

9.3.4.4.2 Mitigation Measures - Worst Case Oil Spill

- Detailed well design aimed at prevention of any loss of control during drilling.
- Preventative measures and equipment integral in well design, including drilling fluids (mud) and blow-out preventer, well control procedures. See Project Safety Case.
- Prepare oil spill contingency plan.

9.3.4.4.3 Residual Impact - Worst Case Oil Spill

The implementation of the mitigation measures will contribute to reducing the significance of the residual impact associated with the impact of a worst case oil spill but still remains **Moderate**.

Table 9-28. Pre and Post Mitigation Significance: Impact from Leaks and Spills

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Major	Moderate

9.3.4.5 Water Supply

Daily water needs for drilling are estimated to be up to 60,000 L per day. Prior to the start of the drilling it is estimated that a water volume of 50,000 L will be stored in the tanks and pits on site.

During ongoing drilling operations, the estimated additional requirement is 10,000L - 20,000L per day depending on the operation.

Water will be sourced from local contractors in Same that are capable to supply the volume of water required for consumption for Rusa-1. Same is one of the places in Timor-Leste with abundance of water year round. The level of offtake from the water source will be such that it is not detrimental to the supply for other users.

For camp use it is estimated to allow 100 L per person per day, thus with a total crew of 70 people in both camps the daily requirement is an additional 7,000 L. Water source is from a water well at the Betano camp.

Project activities will not compromise the availability of water for the local communities.

9.3.4.5.1 Water Supply Impact Significance

Table 9-29. Significance Impact on Water Supply

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	2
Duration	Short-term	1	Any impact is quickly reversible to normal levels post decommissioning.	1
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	2
Intensity - Social/Cultural/ Economic	Low	2	Affecting small number of Individuals/ households, communities, Sucos.	2
Likelihood	Not Probable	1	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Negligible**	**2**

9.3.4.5.2 Mitigation Measures - Water Supply

- Procure adequate water for the operations with a high yield.
- Ensure no water use competition with the local community.

9.3.4.5.3 Residual Impact - Impact on Water Supply

The implementation of the mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact on Water Supply to **Negligible**.

Table 9-30. Pre and Post Mitigation Significance: Impact on Water Supply

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Decommissioning	Negligible	Negligible

9.3.5 Biodiversity, Flora and Fauna

Biodiversity, flora and fauna impacts if present will mainly occur during construction phase and decommissioning with the removal of project facilities and rehabilitation. Little or no reduction in wildlife habitat would be expected as the areas concerned are small and the project is of short duration.

Loss of flora and/or fauna is of great concern in any project. Disturbance to land and soils can cause changes to the flora and fauna communities, however, there will be little or no impact on the ecology, and disturbance is limited since the locations have been selected to avoid sensitive habitats, to identify, where possible, previously disturbed land and to keep footprint to a minimum, see location map and site description in Section 4.4.3.

Animal populations may be affected by changes in vegetation, soil, water and noise levels arising from these operations, such as:

- Displacement in the immediate vicinity
- Habitat disturbance
- Direct habitat loss and modification
- Blockage of access to habitats

Habitat disturbance could include vegetation or soil removal (Section 9.3.2.3), erosion (Section 9.3.4.1), changes in soil structure, changes in topography and hydrology. Access to habitats can be blocked by the construction of the access road and well pad.

In regard to biodiversity, it is important to consider, to the extent possible on the basis of existing knowledge:

- Rate of extinction occurring and likely to occur
- Minimum sustainable gene pools and population size
- Dynamics of ecosystems that support threatened or endangered species
- Status, distribution and vulnerability of individual species
- Regional differences in extinction rates.

With regard to the effect of noise on bird life this is addressed in Section 6.2.6.2 (see Table 6-21) and in the noise impact discussion in Section 9.3.7 below, which provides a conclusion that the exploration well drilling activities will not cause significant negative impact to identified bird species within wellsite because distribution of those bird species are categorized widespread residence, which means they can live, hide and feed in types of places such as tropical forest, woods, plantations and among community residence. Therefore, those bird species can move out to other location when drilling activities are being carried out.

In considering these aspects it should be borne in mind the spatial and temporal aspects of this project, the minimal areal extent of the project is minimal, and the project is considered short term and transient thus no biodiversity impacts are envisaged.

9.3.5.1 Biodiversity, Flora and Fauna Impact Significance

Table 9-31. Significance Impact on Biodiversity, Flora and Fauna

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	6
Duration	Short-term	1	Impact that is quickly reversible; 0-5 years	3
Intensity - Environmental	Low	2	Although plant species will be temporarily impacted, they can be replanted during rehabilitation. There are no biodiversity aspects. The intensity is low since the vegetation in most of the areas is already disturbed from previous human activities. The impact affects the environment in such a way that natural functions and processes are not affected	6
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	6
Likelihood	Highly Probable	3	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**5**

9.3.5.2

9.3.5.3 Mitigation Measures - Biodiversity, Flora and Fauna

- Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements
- Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary.
- Implement a tree planting program to offset loss of trees due to the construction phase
- Clearing vegetation only in construction areas and demarcating areas where no clearing will happen.
- Vehicles coming into the site must use designated roads.
- Apply spill prevention practices and response actions in refuelling and vehicle-use areas to minimise accidental contamination of habitats.
- Address spills immediately per the appropriate spill management plan, and initiate soil clean-up and soil removal if needed.
- Turn off all unnecessary lighting at night to avoid disturbing wildlife and migratory birds.
- Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance.
- Schedule decommissioning activities to avoid disturbance of resources during critical periods, for example at night, or year, for example breeding, nesting seasons.
- Rehabilitate all the areas of disturbed soil using weed free native grasses and shrubs.
- Undertake rehabilitation activities as early as possible on disturbed areas in consultation with the relevant authorities, e.g. Forestry Department.
- Timor Resources and Direção Geral das Florestas Cafe e Plantas Industriais should to work together to find a solution for deforestation to grow plants in area affected by drilling activities.

9.3.5.4 Residual Impact - Biodiversity, Flora and Fauna

Given that the project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, any potential impacts are insignificant. The implementation of the mitigation measures will contribute to reducing the significance of the residual impact associated with the loss of Biodiversity, Flora and Fauna to **Negligible**.

Table 9-32. Pre and Post Mitigation Significance: Impact on Biodiversity

Phase	Significance (Pre-mitigation)	Residual Impact Significance
All	Minor	Negligible

9.3.6 Waste

9.3.6.1 Liquid Effluents

Liquid wastes will arise from a variety of sources and mitigation measures are described here.

Liquid wastes sources include rainwater, firewater, washdown water and leaks and minor spillages in the hazardous area of the rig. Open drains on the rig floor will collect any oily residues and discharge to the mud pit. The wellsite incorporates two mud pits with a volume of approximately 447 m^3 (3,000 bbls) and 1,431 m^3 (9,000 bbls), a freeboard of 0.5 m and lined with a High-Density Polyethylene (HDPE) membrane liner.

Berms are constructed around the location for containment and management of surface water which is directed to a perimeter drainage ditch. The perimeter drain is routed to an interceptor where oil is periodically collected and discharged to the mud pit, clean water from the interceptor is discharged offsite.

Sewage will be collected and treated in a standard field septic system and the effluent discharged under the ground surface through a trickle feed weeping tile. Septic systems are commonly used as primary treatment in rural areas world-wide or on sites where soil is not suitable for the installation of sewers. A septic system will typically remove around 50 % of the organic matter and suspended solid content in two to four days (Csinaros, 2011).

Septic system discharge is high in soluble nitrogen and phosphorus and other nutrients (Na, K, Cl, B and Mn) and represents a source of nutrient emissions to surface waters, however these nutrients are progressively retained by soil particles and assimilated by microflora as they migrate through the soil. There are no wetlands within 1 km of any of the drill site location, therefore the risk of nutrient enrichment of surface water as result of septic discharge is negligible.

The mud system to be used (described in Section 4.4.1.2.2) is a Potassium Chloride / Polymer mud. Whilst some individual components pose limited safety hazards, (two components are caustic and will be treated as hazardous materials), the “whole mud” when made up is non-toxic and does not pose a potential environmental impact. Potassium Chloride / Polymer mud is a widely accepted water-based mud system for drilling water-sensitive shales, with PHPA (partially hydrolysed polyacrylamide) the polymer.

Partially hydrolysed polyacrylamide is a polymer formed from units of acrylamide. It is classified as low toxicity and is commonly used as a flocculant in water and wastewater treatments. It is used in drilling muds to encapsulate solids and provide inhibition by interacting with bentonite to improve rheology. Degradation of PHPA may lead to the release of the acrylamide monomer which is known to have high toxicity. Several studies have demonstrated that naturally occurring microbes in soils, sediments, and water systems can degrade acrylamide to the non-toxic products ammonia and acrylic acid over periods of days to months.

The planned disposal method for any leftover drilling mud at completion of the drilling activity is annular disposal.

9.3.6.1.1 Liquid Effluents Impact Significance

Table 9-33. Significance Impact of Liquid Effluents

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	8
Duration	Short-term	1	Impact that is quickly reversible; 0-5 years	4
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	8
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**7**

9.3.6.1.2 Mitigation Measures - Liquid Effluents

- Open drains on the rig floor will collect any oily residues and discharge to the mud pit.
- Rainwater is routed via the perimeter drain to an interceptor where oil is separated.
- Sewage will be collected and treated in a standard field septic system and the effluent discharged to the ground through a trickle feed weeping tile to a leach field.
- The drilling rig will have a test separator to process any produced fluid from well testing operations. Any produced liquids will be stored in tanks and transported to existing facilities for processing.
- Compliance with Municipality on waste matters.
- Employing a waste management plan.

9.3.6.1.3 Residual Impact - Liquid Effluents

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, the implementation of the mitigation measures will contribute to reducing the significance of the residual impact of liquid effluents, however, to ensure adequate management the residual impact remains **Minor**.

Table 9-34. Pre and Post Mitigation Significance: Impact of Liquid Effluents

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
All	Minor	Minor

9.3.6.2 Solid Wastes

Solid wastes generated during normal drilling operations comprise dry domestic wastes, industrial organic wastes, and industrial inorganic wastes. An area at the rig site will be used for temporary storage of wastes prior to transfer to the assigned Municipality waste reception facility assigned for the campaign near to Haemanu yard, where wastes will be segregated and managed as discussed below.

There will be no Naturally Occurring Radioactive Material (NORM) produced during the drilling campaign. NORM is a product in production operations and not in exploration drilling.

Cuttings: cuttings volumes are calculated by multiplying the cross-sectional area (πr^2) of each of the well sections (see Section 4.4.1) by the depth of the well. There are two options for the Rusa-1 total well depth, either 2,601 m (base case) or 3,936 m (future option only). Thus cuttings will be in the region 500 m^3 to 750 m^3.

As described in Section 4.1 the drill cuttings will be conveyed to the surface via the riser to be treated in the solids treatment system. The solid treatment system will consist of shale shaker, desander, mud cleaner and centrifuge. A partially closed loop system is operated that reduces the need for multiple pits, hence the pits are smaller because the storage volumes are less. This, together with high efficiency solids control equipment, minimises the amount of residual fluid on drilled cuttings with the excess fluids discharged to the pit.

Options for the disposal of cutting is described in Section 8.5.1 and the preferred option is dewatering and burial on site which represents an environmental impact significance as none (see Table 9-2) and is preferred when compared with the potential impacts identified with other options. Due to its simplicity, burial of wastes in small pits at drilling sites has been a standard means of cuttings waste disposal in the industry and has been identified as suitable method by IFC (2007a). The proposed method is:

- The cuttings pit contents will be dried out as far as possible;
- cuttings will be mixed with an appropriate quantity of subsoil (typically three parts of subsoil to one part of waste by volume);
- A minimum of 1 m of clean subsoil will be placed over the mix;
- Topsoil will be placed over the subsoil to fully reinstate the area.
- The pit waste will be analysed and the maximum lifetime loads should be calculated.
- Provision will be made for closure and aftercare as per the rehabilitation plan and will include records of location and content.

Waste mud in the region of 200 m^3 to 400 m^3 will arise from the well. The initial planning process led to the following decisions:

- The geological/geochemical assessments demonstrate that water-based muds are effective in this well.
- Recycling of re-usable drilling fluid and removal of solid drilling waste at the rig-site will be maximised by optimised operation of solids separation.
- Any fluid recycled on the rig site will be as make up for new mud provided it conforms to required properties for acceptable drilling. If deemed not required, fluid will be stored for use on the next well.

Dry domestic wastes typically comprise general hotel management type wastes from the camp such as paper, disposable cups, food waste, packaging etc. During the drilling project typical waste arising of 5 tonnes per week will occur, however, given the short duration of the drilling program the volumes of waste arising are considered negligible. All dry domestic wastes will be incinerated. It is proposed that the Suai Hospital Inciner8 unit be moved to the designated Municipal waste site and commissioned.

Thermal treatment (incineration,) is a major option for the disposal of waste, because it greatly reduces the space requirement of landfills (typically by a factor of 4 to 10). Approximately 30 % of European municipal waste is disposed of through incineration (EU Science Hub. 2019).

The environmental concerns with incineration are health effects (primarily related to particulates, SO_2, NO_2 and CO) and greenhouse gas emissions. The incinerator at the Suai Hospital is an Inciner8 model constructed in the United Kingdom to European Union Standards. The applicable EU standards for incinerators of this type built prior to 2020 and 'typical emissions' provided by the manufacturer are presented in Table 9-35 below. The incremental concentration of pollutants from such incinerators is far below the ambient air quality guidelines of the WHO.

Table 9-35. Emissions from incinerator

Parameter (0.5 hour average)	EU Standard (mg/m^3)	Manufacturer "typical "emissions (mg/m^3)
NO_2	400	60
SO_2	200	2.4
CO	100	78.3
Particulates	30	12

Greenhouse gas: In terms of total environmental impact the greenhouse emissions carbon dioxide (CO_2) is likely to dominate. However an inventory of relative greenhouse gas emissions for alternative treatment options would require detailed specification of the landfill or other alternatives, in particular whether the methane (CH_4) from the decay of organic waste is captured or not. This is a relevant consideration because methane has a global warming potential (100 years) 28 times higher than CO_2.

Particulates: There are numerous well-conducted studies linking particulate air pollution with a wide range of health effects. The PM_{10} and PM_{25} particulate emissions at the wellsite areas often exceed the WHO recommended levels (see Table 9-13). Commissioning the 'Inciner8' incinerator will enable more efficient burning of municipal waste and may provide an environmental in through the reduction of overall particulate emissions

Oxides of Sulfur, Oxides of Nitrogen, and Carbon Monoxide: The health risk of oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and carbon monoxide (CO) are relatively well known and have been used in development of emissions standards, including the EU incinerator emission standards presented above, that are premised on the incinerator being located within relatively high density urban areas. The Worley Parsons study conducted for the Suai Supply Base (see Section 6.1.4.2) found that NO_x and SO_x were below the threshold limit of reporting, that is, <1 $\mu g/m^3$. In general, the principal gaseous pollutants from traffic SO_x/NO_x /CO were well dispersed in open terrain. Since peak emission concentrations from the incinerator will occur close to the source and then disperse the potential for SO_x/NO_x/CO emissions from the incinerator exceeding health standards and causing adverse health effects is extremely remote.

Industrial Organic Wastes include paper, wood, oily rags, non-metallic oil filters, absorbent pads, plastic wraps, packing materials, sludges and various small amounts of other flammable materials. All industrial organic wastes will be incinerated.

Small amounts of the solid industrial waste produced will require special care. Therefore, oily wastes, e.g. rags, absorbent materials etc. and hazardous material (chemicals) will be segregated at source for batch incineration at the designated waste facility.

Unused chemicals will be stored onsite for future use or returned to the vendors.

Industrial Inorganic Wastes arisings from normal operations will include discarded wire, scrap metals, paint and thinner, rags, cans, plastics, spent filtration cartridges, chemical drums, metallic filters, glass items and batteries. Typical amounts that will require disposal will be small, less than a tonne for the full project. Industrial inorganic wastes will be disposed of via local facilities for scrap metals and special wastes (e.g. batteries, used drums etc.). Wastes will be segregated onsite before reclamation.

Medical waste will be properly stored in bio-hazard medical waste containers and managed by the rig medic, arrangements have been made to dispose of the small levels of medical waste at the Suai Hospital.

9.3.6.2.1 Solid Waste Impact Significance

Table 9-36. Significance Impact of Solid Wastes

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment depending on treatment/ disposal method

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Medium	3	Where the affected environment is altered e.g. emissions from incineration, but natural functions and processes continue, albeit in a modified way.	12
Intensity - Social/Cultural/ Economic	Low	2	Affecting more Individuals/ households, communities, Sucos or Post Administrative, medium enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**8**

9.3.6.2.2 Mitigation Measures - Solid Waste

- Work in concert with the Municipalities to develop and implement a fit for purpose waste management plan.
- Assessing and creating opportunities for reducing, reusing, and recycling of waste.
- Municipality making available suitable facilities for the collection, segregation, storage and safe disposal of the wastes.
- Creating waste collection areas for segregation of waste with clearly marked facilities such as colour coded bins. The bins to be coded according to biodegradable and non-biodegradable, reuse, recycling and reduce.

9.3.6.2.3 Residual Impact - Solid Waste

The volumes of waste arisings are small when considering the short nature of the project and with the implementation of implementation of the mitigation measures together with robust waste management (See EMP Appendix A - Waste Management Plan), the significance of the residual impact associated with solid wastes are **Minor**.

Table 9-37. Pre and Post Mitigation Significance: Impact of Solid Waste

PHASE	SIGNIFICANCE (PRE-MITIGATION)	RESIDUAL IMPACT SIGNIFICANCE
All	Minor	Minor

9.3.7 Noise

Noise can potentially pose a problem if disturbance is caused to wildlife or human inhabitants close to the operation. Noise will arise throughout the project during construction, operations and decommissioning, however, in mitigation, any noisy equipment will be acoustically clad to minimise potential impacts.

The areal extent of noise impact is subject to several influencing factors such as temperature, humidity and wind speed and direction. However, to assess the potential impact of noise on the surrounding communities, the attenuation distance of noise level in air was calculated.

The expected levels of noise during operations are presented below and will be in the region of 40-60 dB(A) at the perimeter fence falling to 30-40 dB(A) 350 m from the rig (see noise attenuation maps for the wellsite, Figure 9-3 , Betano camp Figure 9-4 and Haemanu yard Figure 9-5). Noise levels should not exceed the levels presented in the IFC Guidelines (Table 9-39) or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site (see sensitive receptors Table 6-3 and Figure 6-32) for any sustained length of time. Background noise levels were recorded during the project baseline survey and results are within the WHO guideline range (see Table 9-13).

The actual noise levels will be less than calculated where intervening infrastructure and vegetation are located between the source and monitoring location. The type of walls of dwellings, for instance brick or wood, will also impact noise levels. Sound level units are quoted in total decibels (dB) or decibels within the human audible frequency spectrum (dBA).

The typical sound levels for rig components and locations are shown below (from (Radtke, 2016), (Abadi et al, 2015) & (SLR Consulting, 2011)). The actual sound levels during the operation will be subject to the type of activity being conducted (e.g. drilling, tripping, circulating).

Table 9-38. Typical Noise Levels Emitted by Rig Equipment

SOUND LEVEL (DBA)	TYPICAL SOURCE	SUBJECTIVE EVALUATION
130	N/A	Intolerable without PPE
100-120	Engine Generators, Desander / Desilter	Extremely Noisy
80-100	Mud Pumps, Compressors, Shakers	Very Noisy
60-80	Rig noise in camp offices	Loud
40-60	Rig Noise at site perimeter	Moderate to Loud
30-40	Rig Noise 350 m from Source	Quiet
20-30	Rig Shut down, background	Almost Silent – Very Quiet

The percentage drop in sound level with distance from source was calculated using Free Field Inverse Square Law. Using dB2=dB1+10ln(d1/d2) where dB2 is the sound level at a given point at a distance of d2 from the sound level dB1 at a distance of d1 from the source. For the purpose of this calculation a sound level of 80 dB 1m from the source was used and plotted on the 350 m extent map for the Rusa-1 wellsite (Figure 9-2).

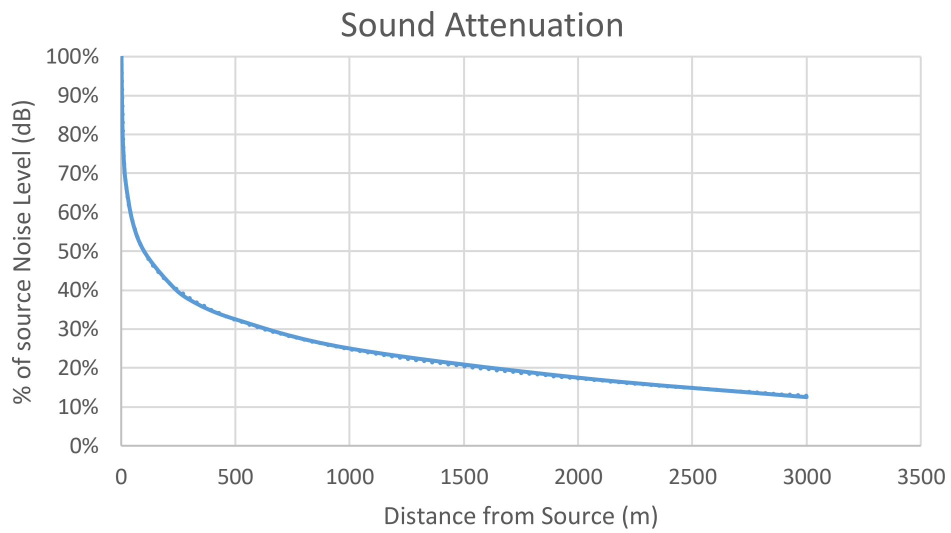


Figure 9-2. Attenuation Rate of Sound Level in Air

Currently there are no specific environmental assessment standards or legislation addressing noise in Timor-Leste so World Bank standards are considered as per IFC Guidelines, see Table 9-39.

Table 9-39. Noise Level Guidelines

(Source: WHO Guidelines for Community Noise - Berglund et al. 1999)

NOISE LEVEL GUIDELINES		
	One Hour L_{Aeq} (dBA)	
Receptor	Daytime 07:00 - 22:00	Night time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

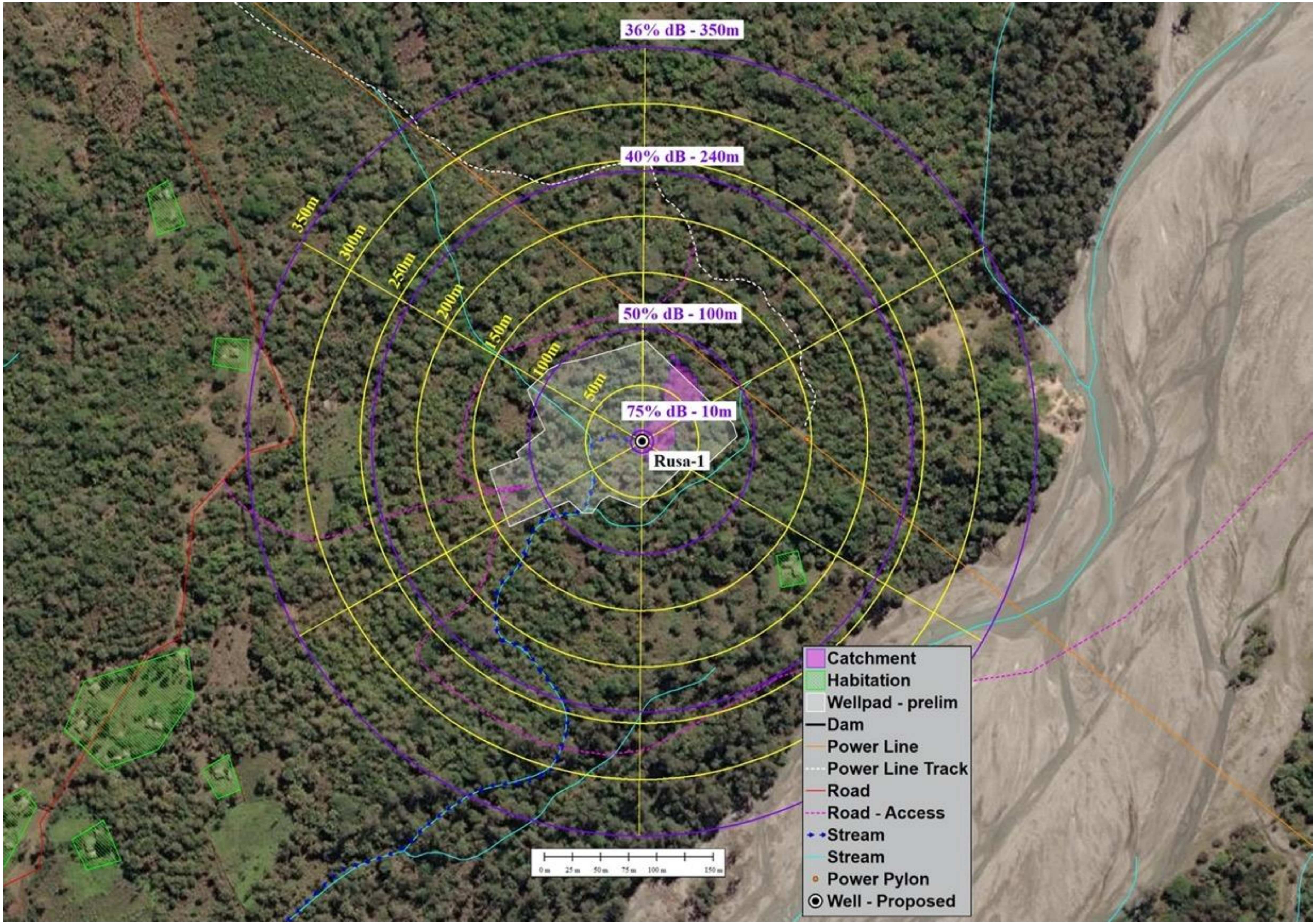


Figure 9-3. Rusa-1 Wellsite, Local Infrastructure and Noise Attenuation

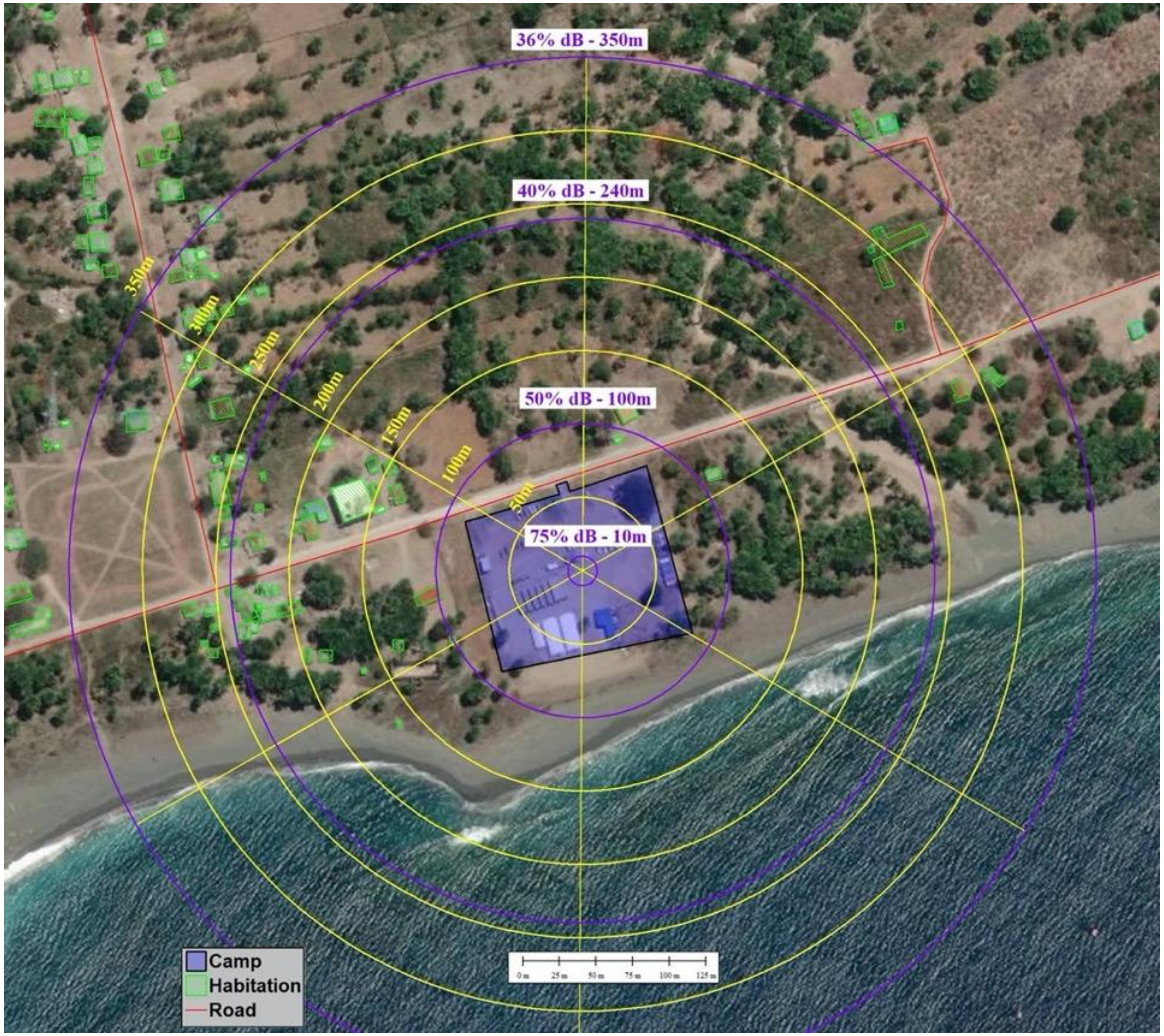


Figure 9-4. Betano Base Camp, Local Infrastructure and Noise Attenuation

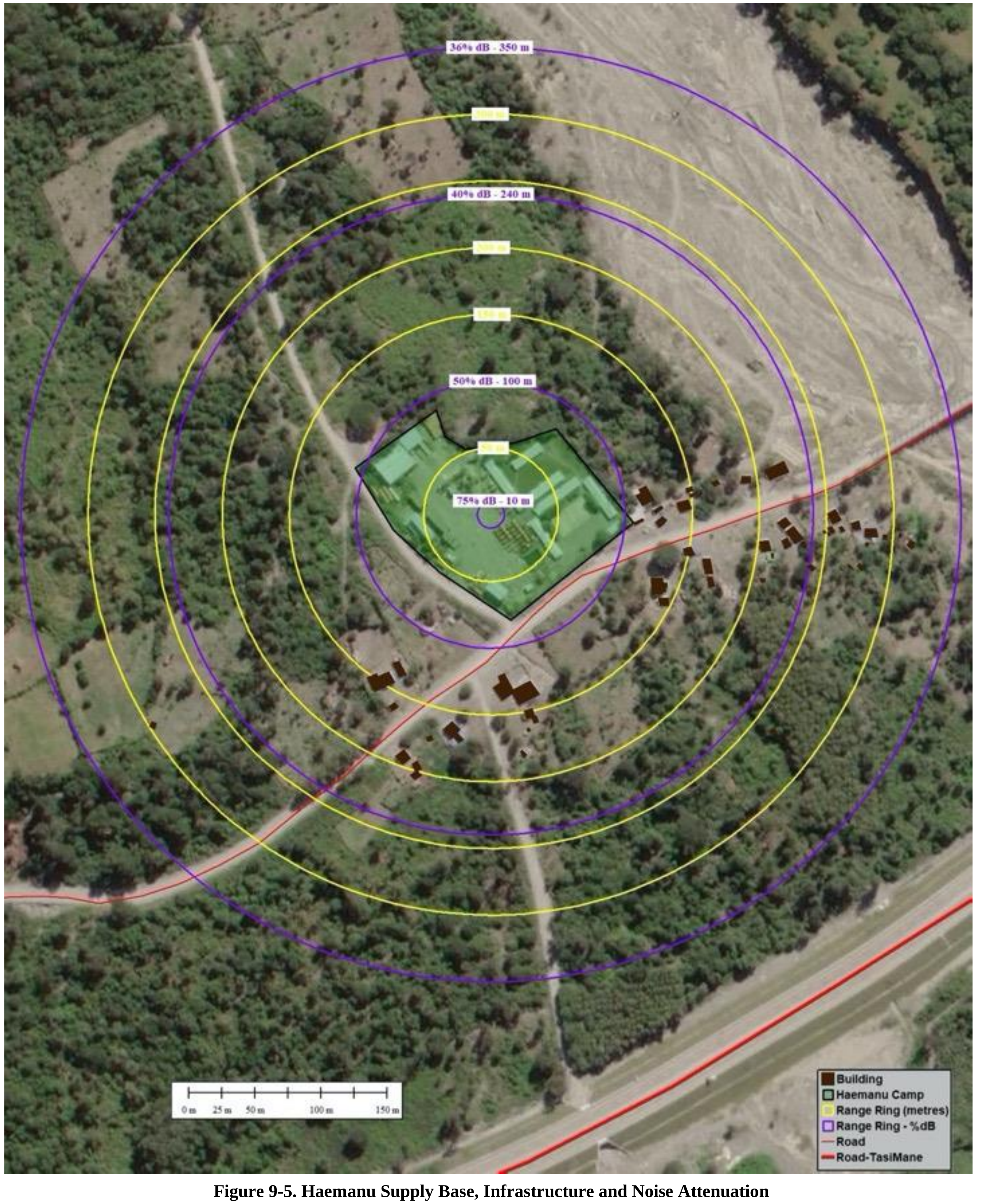


Figure 9-5. Haemanu Supply Base, Infrastructure and Noise Attenuation

The impacts of noise and light on fauna have been shown to be cumulative and therefore are discussed together in this section.

The effect of noise and light pollution to larger animals such as *Phalanger Orientalis* and *Macaca facicularis* (should they happen to be at or passing the drill location), will likely be temporary displacement and loss of access to the drilling locations. The consequence of this temporary displacement or reduction in range is unlikely to be significant because of the relatively short duration of drilling activities.

Noise and light pollution affect birds through avoidance of noisy areas, and change in vocal communication (Ortega. 2012). However, whether these behavioural changes affect fitness is less clear, as is how and why species vary in their sensitivity to these stressors. In a recent study Senzaki et al. (2020) investigated the effect of light and noise pollution on reproductive success in 142 bird species by pairing an extensive citizen science dataset with high-resolution noise and light data from across the United States. They found that nesting success was strongly linked to both the physical characteristics and the habitat of occupied. For example, overall nest success was negatively correlated with noise among birds in closed environments but not in open woodland habitat. No data is available describing noise and light impacts to the bird species present or likely to be present at the drilling locations (listed in Section 6.2.6) hence it is necessary to take a conservative approach and assume that they would be negatively affected if present in the area. However the potential consequences are mitigated by the relatively short duration of the drilling activities and the small footprint of impact. It is considered unlikely that drilling activities will cause significant negative impact to identified bird species within wellsite because firstly; the normal distribution of those birds is widespread and the total area of habitat affected is a only very small portion of their natural range and secondly the duration of disturbance is relatively short.

9.3.7.1 Noise - Construction

During the construction phase of the proposed project, there is expected to be an increase in the noise levels within the area due to machinery and equipment including generators, vehicular traffic, and other construction activities. These may contribute to noise levels above the background within the site and along the roads to the site.

9.3.7.1.1 Noise Impact Significance - Construction

Table 9-40. Construction Significance Impact from Noise

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct cost to the receiving environment

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	8
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**7**

9.3.7.1.2 Mitigation Measures - Construction Noise

- Restrict construction activities to normal working hours 08:00 to17:00.
- Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works.
- Machinery should be maintained regularly to reduce noise resulting from friction during operations.
- Drivers to adhere to speed limits within the project site access roads and vicinity
- A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to.
- Restrict hooting of vehicular horns.
- Locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from any nearby sensitive receptors.
- Shielding the area to reduce noise propagation as necessary.

9.3.7.1.3 Residual Impact - Construction Noise

The implementation of the construction mitigation measures will contribute to reducing the significance of the residual impact associated with Noise Pollution to **Negligible**.

Table 9-41. Pre and Post Mitigation Significance: Construction Impact from Noise Pollution

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Noise Construction	Minor	Minor

9.3.7.2 Noise - Operations

Drilling operations produce limited noise from drilling machinery and vehicular movement.

9.3.7.2.1 Noise Impact Significance - Operations

Table 9-42. Operations Significance Impact from Noise

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Impacts will directly affect those who are within the project site.

Criteria	Ranking		Description	Impact Significance
Extent	Site Specific	1	The potential impact may affect 5 km or more around the site.	4
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	8
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**6**

9.3.7.2.2 Mitigation Measures: Operations Noise

- Machinery should be maintained regularly to reduce noise resulting from friction during operations.
- A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to.
- Muffle and maintain all equipment used.
- Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as possible.

9.3.7.2.3 Residual Impact - Operations Noise

The implementation of the operation mitigation measures will contribute to reducing the significance of the residual impact associated with noise but impact remains **Minor**.

Table 9-43. Pre and Post Mitigation Significance: Operations Impact from Noise Pollution

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Noise Operations	Minor	Minor

9.3.7.3 Noise - Decommissioning

There is expected to be an increase in the noise levels due to machinery/ equipment including generators, metal grinders, vehicular traffic, and other activities. As with the construction phase elevated noise levels within the site can affect workers and near-by residents, passers-by and other persons within the vicinity of the site.

9.3.7.3.1 Noise Impact Significance - Decommissioning

Table 9-44. Decommissioning Significance Impact from Noise

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Impacts will directly affect those who are within the project site.

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	The potential impact may affect 5 km or more around the site.	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	8
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	8
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**7**

9.3.7.3.2 Mitigation Measures - Decommissioning Noise

- Restrict decommissioning activities to normal working hours 08:00 to17:00h
- Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works.
- Machinery should be maintained regularly to reduce noise resulting from friction during operations.
- Drivers to adhere to speed limits within the project site access roads and vicinity
- A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to.
- Restrict hooting of vehicular horns.
- Locate all stationary equipment (i.e., compressors and generators) as far as practicable from any nearby sensitive receptors.
- Limit pick-up trucks and other small equipment to an idling time, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Shielding the area to reduce noise propagation as necessary.

9.3.7.3.3 Residual Impact - Decommissioning Noise

The implementation of the decommissioning mitigation measures will contribute to reducing the significance of the residual impact associated with the Impact on Noise to **Negligible**.

Table 9-45. Pre and Post Mitigation Significance: Decommissioning Impact from Noise Pollution

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Noise Decommissioning	Minor	Negligible

9.3.8 Light, Odours and Heat

Light: The rig site will be illuminated during night-time to ensure adequate visibility for work to proceed safely and the perimeter fence illuminated for security purposes, hence the main cause of concern will be excessive light during hours of darkness.

Extraneous light may cause problems for humans and wildlife, but since there are no people or sensitive biological assemblages in the immediate vicinity of the wellsite and the project is limited spatially to one-hectare, is short term and transient in nature, impacts are negligible.

The effect of light on fauna is similar to, and cumulative to noise, hence the effect of light and noise have been discussed together in section 9.3.7 above. It is concluded that because the project is limited spatially to the 2.5 ha drilling location and its immediate surrounds, and is short term and transient in nature, potential impacts are negligible.

Odours: There are no direct sources of odour from the drilling activities. However, if hydrocarbons are discovered small amounts of vapours may be released during normal operations. There is a low potential to encounter H_2S, if so, an odour nuisance may arise. The normal criteria for H_2S odour nuisance is 3 minute average ground level of 0.5 ppb of H_2S. As with light, the project is limited spatially to the one-hectare drilling location and its immediate surrounds, and is short term and transient in nature, potential impacts are negligible.

Heat : There are no direct heat sources that will extend outside of the perimeter fence.

9.3.8.1 Light, Odours and Heat Impact Significance

Table 9-46. Significance Impact from Light

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Impacts will directly affect those who are within the project site.

Criteria	Ranking		Description	Impact Significance
Extent	Site Specific	1	The potential impact is limited to the boundaries of the project site.	4
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The impact affects the environment in such a way that natural functions and processes are not affected	8
Intensity - Social/Cultural/ Economic	None	1	Affecting a small number of Individuals/ households/individual enterprises.	4
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**5**

9.3.8.2 Mitigation Measures Light

- The site occupies a small area will be in place temporarily.
- Any important sensitivity in the project areas (e.g. infrastructures, areas of significant vegetation cover, sensitive cultivations, important sites for cultural heritage, etc.) will be identified and avoided as appropriate.
- Use a lower level of lighting i.e. sufficient to enhance the night-time visibility required for safety and security
- Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal.
- Shading floodlights to only shine inside the site perimeter
- Turn off all unnecessary lighting at night to avoid disturbing wildlife and migratory birds.

9.3.8.2.1 Residual Impact - Light

Given that the project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, any potential impacts in regard to light are inconsequential, and the implementation of mitigation measures will contribute to reducing the significance of the residual impact to **Negligible**.

Table 9-47. Pre and Post Mitigation Significance: Impact from Light Pollution Residual

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Light	Minor	Negligible

9.3.9 Community

The project will cause various interactions with the local community through all phases, most are addressed in the previous sections such as: positive impacts related to employment, local services and community programs; whilst environmentally related negative impacts were addressed associated with land use, traffic, air quality and noise.

Other potential impacts on the local community relate to safety issues and the requirement for the local population to be made aware of various operational hazards, such as road safety, keeping a safe distance from the wellsite, and understanding hazards. Various programs will be established to ensure the community are aware of hazards and emergency plans, in addition, a complaints/grievance mechanism will be established to ensure an open, two-way dialogue. The community is an integral part of Timor Resources management of the project and understanding perceptions, expectations and concerns are central to the process.

Timor Resources have been involved in community engagement since award of PSC TL-OT-17-09 and in particular during the 2019 seismic campaign.

9.3.9.1 Community Impact Significance

Table 9-48. Significance Impact on Community

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Negative and direct impact on the community

Criteria	Ranking		Description	Impact Significance
Extent	Local	2	Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from Project Site Boundary)	8
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	4
Intensity - Environmental	Low	2	The impact on the environment is not detectable, therefore discount as a criterion	8
Intensity - Social/Cultural/ Economic	Medium	3	Affecting more Individuals/ households, communities, Sucos or Post Administrative, medium enterprises.	12
Likelihood	Definite	4	Impact will occur regardless of any prevention measures.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Minor**	**8**

9.3.9.2 Mitigation Measures - Community

- Consultation with the Municipality and liaison with community during the planning phase.
- Establish a robust, open, two way Complaints/Grievance Mechanism.
- Establishing emergency procedures and ensuring the community are aware and educated on following them and commensurate to the magnitude and type of risk.
- The work site will be fenced off to protect the general public from dangers associated with the drilling operations, including security in and around the site to control the movement of people.
- Placing visible and readable warning signs around the work site and access roads where there are exposures.
- Compliance with Timor Resource's local content policy that reflects the requirement to hire locally, including a transparent and accessible application and short-listing process of workers.
- Where possible, look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry.

9.3.9.3 Residual Impact - Community

The project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature, thus there is limited potential to cause permanent or significant impact on the local community. Close liaison will be established with the community and local authorities and a grievance and redress scheme will be implemented, however, the significance of the residual impact associated with the impact on the Community remains **Minor**.

Table 9-49. Pre and Post Mitigation Significance: Impact on Community

PHASE	SIGNIFICANCE (PRE-MITIGATION)	RESIDUAL IMPACT SIGNIFICANCE
All	Minor	Minor

9.3.10 Visual

Oil and gas activities may have negative impacts on visual resources that are valued by people who live in or use an area. Visual impacts may arise from the presence of the drilling facilities however, most are low level containerised units <5 m in height, with only the drilling mast rising some 40m height above ground level.

After the 40 day drilling program, the rig will be removed and the site restored to its original condition or to an agreed after use, thus there will be no lasting visual impact as a result of the drilling activities.

If a discovery is made, a well head will be installed, but the rig will still be removed from the location. In this case a reduced area will be retained with the well head and fenced off for safety reasons, however the well head is unlikely to cause any visual impact.

9.3.10.1 Visual Intrusion Impact Significance

Table 9-50. Significance Impact from Visual Intrusion

Evaluation Criteria	Evaluation Ranking	Description
Nature	Negative, Direct	Impacts will directly affect those who are within the project site.

Criteria	Ranking		Description	Impact Significance
Extent	Site Specific	1	The potential impact is limited to the boundaries of the project site.	3
Duration	Short-term	1	Impacts will last during construction and operational phase but return to normal levels post decommissioning.	3
Intensity - Environmental	None	1	The impact on the environment is not detectable.	3
Intensity - Social/Cultural/ Economic	Low	2	Affecting a small number of Individuals/ households, communities or Sucos, small enterprises.	6
Likelihood	Highly Probable	3	It is expected the impact will occur, chance of occurrence 50-90 %.	
OVERALL IMPACT SIGNIFICANCE RATING (PRE-MITIGATION)			**Negligible**	**4**

9.3.10.2 Mitigation Measures - Visual Intrusion

- The site occupies a small area and the drilling facilities will be in place temporarily.
- The project is limited spatially to the one-hectare drilling location and its immediate surrounds and is short term and transient in nature.
- Any important sensitivity in the project areas (e.g. infrastructure, areas of significant vegetation cover, sensitive cultivations, important sites for cultural heritage, etc.) will be identified and avoided as appropriate.

9.3.10.3 Residual Impact - Visual Intrusion

Since the project is limited spatially to the drilling location and immediate surrounds, is short term and transient in nature, any potential visual impacts are considered inconsequential, thus any impact on visual intrusion is **Negligible**.

Table 9-51. Pre and Post Mitigation Significance: Impact from Visual Intrusion Residual

Phase	Significance (Pre-Mitigation)	Residual Impact Significance
Visual Intrusion	Negligible	Negligible

9.3.11 Cumulative Impacts

The assessment of cumulative impacts aims to identify those environmental, social or health aspects that may or may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future project activities or other projects/activities may result in a larger and more significant impact. IFC state "*Cumulative impacts may result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*" (IFC 2012). The assessment of cumulative impact has considered existing similar industries, additive stressors and incremental land use changes.

Similar industries: Timor Resources hold the licence for PSC TL-OT-17-08 and there is no other no other onshore oil and gas activity in the area or in the in the country. Furthermore, the scope of the other industries assessed were limited to limited mining and quarrying, agricultural activities, IT and service activities (see Section 6.3). On this basis there is little other comparable industrial activity to which this project would have a potential to contribute material cumulative impacts.

The exploration drilling phase is the second step in the oil and gas development cycle, after seismic. It is limited spatially to a 2.5 ha drilling location and its immediate surrounds thus is local in extent, short term in duration, transient in nature and considered a temporary activity with low risk of cumulative impacts. Cumulative impacts will be investigated in greater detail during any future production phase of the project.

Additive stressors: Where identified stressors are known to have cumulative effect on fauna, such as noise and light pollution and traffic movement, these stressors have been considered together in the relevant sections.

Incremental land use change: Clearing of land for drilling operations can have the cumulative effect of an incremental decrease in natural habitat. Timor Resources have mitigated potential cumulative loss of habitat by selection of drill locations on previously disturbed lands wherever practicable to do so.

9.4 Summary of a Preliminary Assessment of Impacts and Possible Mitigation Measures

Table 9-52 and Table 9-53 provide a summary of the project impacts and mitigation measures recommended to minimise and/or eliminate these impacts, the residual impact after application of the mitigation is shown in the right-hand column.

Table 9-52. Summary of Positive Impacts

NO	IMPACT	SCOPE
1.	**Employment**	**Construction** (Timorese labour component 88) There will be several employment opportunities during the construction phase for: community consultation, community liaiso officers, civil construction crews, civil engineers, concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electrician surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, security, geologists, administration, accounting, operations management, work team supervisors. **Operations** (Timorese labour component 114) Additional employment during the operations phase includes rig related labour, inclusive of drilling crew, derrickmen, roustabouts, company men, geologists, security, labourers, and crew. In addition, the following positions remain important: concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electricians, surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, administration, accounting, operations management, work team supervisors. **Decommissioning** (Timorese labour component 88) Company men, geologists, security, labourers, and crew. In addition, the following positions remain important: heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electricians, surveyors, labourers, accommodation manager, administration, accounting service, cooks, cleaners, administration, accounting, operations management, work team supervisors.
2.	**Procuring Goods and Services**	Procurement from Timorese owned and operated businesses in the contract area goods and services include but are not limited to; 1. Fresh Food and water 2. Accommodation Housing/Office Supply 3. Diesel Supply 4. Import Services for customs clearance 5. Rental of Heavy Equipment, trucks, cranes 6. Environmental Consultancy Engagement 7. Aggregate and rock base

NO	IMPACT	SCOPE
3.	**Customs Duties and Taxes**	The use and consumption of various specialist drilling materials, such as machinery, mud components, drill bits, etc. will attract taxes and customs duties, which will be payable to the Government hence increasing government revenue while the cost of these materials will be payable directly to the producers.
4.	**Community Programs**	Timor Resources has implemented a number of community programs, including horticulture, gifted seeds, irrigation and financial support. The supply of irrigation and water infrastructure has been the focus of Company support during seismic and is continuing during the drilling campaign. Support for local sporting competitions, teams and local events is another community contribution. The sponsoring of the Manufahi Cup, the Tour de Dili, and the local community football and soccer federations. Infrastructure within the area is set to improve especially the roads leading to the site after improvement eases access of transportation. The roads to the site will also serve other residents who are set to benefit from this infrastructure development brought by the project.

Table 9-53. Summary of Negative Impacts and Mitigation

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
1.	**Land Use** All Phases	**Minor 7**	• Contact local stakeholders early in the process to identify sensitive land areas, land uses, issues, and local plans and any local regulations. • Site the project on previously disturbed land whenever possible. • Depending on the individual site, consider steps to minimise the amount of vehicular traffic and human activity. • Provide adequate public notice of planned activities. • Establish a rehabilitation plan that addresses both interim and final rehabilitation requirements and agree after-use if applicable. Ensure that interim rehabilitation of disturbed areas is conducted as soon as possible. • Compensate farmers for crop damage and restore compacted soils.	**Minor**
2.	**Traffic** All Phases	**Moderate 9**	• Plan to use existing roads to the maximum extent possible. • Prepare an access road siting study and management plan to guide road design and maintenance standards, coordinate closely with Municipality and national Government authorities responsible for maintaining roadways and bridges. Compare the number, size, and weight of loads to service projects to the existing road infrastructure to determine if roads and bridges are adequate to support intended loads. • Implement strict traffic management procedures in association with the Municipality. • Route project traffic to minimise impacts on local communities. • Issue notices/advisories of pending traffic inconveniences and conduct briefing meetings with local authorities, schools and residents before the commencement of works. • Flagmen should be employed to control traffic and assist all vehicles as they enter and exit. • Maintain on site a record of incidents and accidents. • Ensuring that all drivers for the project understand and comply with speed limits. • Ensure all vehicles and machinery used for the project are in good working condition both legally and are fit for purpose.	**Minor**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
			• Control dust along un-surfaced roads, especially near residences, schools and fields. • Limit all traffic movement through villages in particular school opening and closing times.	
3.	**Soil** All Phases	**Minor** **7**	**Construction** • Restricting removal of vegetation and soil cover to those areas necessary for the project. • Remove all topsoil and store off site. • Manage storm and flood flash water effectively to avoid movement of loss soils. • The disturbed areas should be rehabilitated with indigenous vegetation as soon as possible to prevent soil erosion if it was necessary. • Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the project footprint. • Preventing pollution of ground from servicing of vehicles and wastes by having a specific site for collection, sorting and transport of wastes. • Construction vehicles should remain on designated roads and should avoid off-site driving. • Compacting area with loose soils. **Decommissioning** • Soil originally removed in the construction phase and stored will be returned upon restoration of the drill site and access road if necessary. • Drains will be installed, and drainage patterns will be re-established to prevent erosion. • Wellsite and roads are either left to an agreed after-use or rehabilitated following drilling. If the well is successful, the area will be reduced to the minimum size necessary in discussion with the authorities and the landowner. • During restoration and rehabilitation of the wellsite and roads, the site will be ripped before returning of the stockpiled topsoil. • Soil profile and contours will be reinstated upon completions of decommissioning phase.	**Minor**
4.	**Air Quality** Construction	**Moderate** **9**	• Sprinkling water on soil before excavation and periodically when operations are under way to prevent raising of dust.	**Minor**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
			• Use of low sulphur fossil fuel. • Controlling the speed and operation of construction vehicles; drivers should adhere to the speed limit of 20 km/hr on access roads and 40 km/hr blacktop. • Regular maintenance and services of machines and engines. • In order to control exhaust, educate and raise awareness of construction workers on emission reduction and on emissions that are likely to occur during the construction of the well pad and access roads leading to the site, the following measures shall be implemented during construction: - Vehicle idling time shall be minimised - Equipment shall be properly tuned and maintained. • To minimise air pollution due to dust emission or transport of waste materials during construction, the waste materials must be transported in covered vehicles especially if the route is through frequently used roads. • Workers in dusty areas on the site need to be issued with PPE such as, dust masks and safety goggles during dry and windy conditions. • Sensitise truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points.	
5.	**Air Quality** Operations	**Minor** **7**	• Sprinkling water on access roads to reduce dust. • Use of low sulphur fossil fuel. • Speed limit on access road 20 km/hr on access roads and 40 km/hr blacktop. • Regular maintenance and services of machines and engines. • In order to control exhaust, educate and raise awareness of drivers on emission reduction and on emissions that are likely to occur during operations, the following measures shall be implemented during construction: - Vehicle idling time shall be minimised - Equipment shall be properly tuned and maintained • Sensitise truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points.	**Minor**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
6.	**Air Quality** Decommissioning	**Moderate 9**	• Covering of all haulage vehicles carrying debris for dumping at approved sites. • Stockpiles of fine materials should be wetted or covered with tarpaulin during windy conditions. • Workers in dusty areas on the site should be issued with dust masks and safety goggles. • Using well maintained equipment and machines with efficient engines meaning low emissions. • Using dust screens.	**Minor**
7.	**Surface Water** All Phases	**Minor 4**	• Minimise the planned amount of land to be disturbed as much as possible by use of existing roads. • Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure). • Construct drainage ditches only where necessary. Use appropriate structures at culvert outlets to prevent erosion. • Refuel in a designated fuelling area that includes a temporary berm to limit the spread of any spill. • Refuel in a designated fuelling area that includes a temporary berm to limit the spread of any spill. • Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer; • Any discharge of grey water should be treated first to avoid contaminating water sources. • Upon completion of the decommissioning phase, disturbed areas will be contoured and vegetated to minimise the potential for soil erosion and water quality related impacts. • Temporary sediment and erosion control measures such as sediment fences installed where necessary especially in areas in close proximity to drains or surface water features to avoid runoff to water source. • Any area artificially elevated via pad or access track construction will be lowered to original ground level by removal of paving material unless otherwise instructed by the landowners. • Original drainage patterns will be restored.	**Negligible**
8.	**Groundwater** All Phases	**Minor 5**	• Conductor casing will be set to case the hole through the shallow ground water aquifers before drilling continues. Based on water well data for aquifer depths in PSC TL-OT-17-08, the deepest regional aquifer was-found at 82 m. • Mud chemicals are non-toxic with the exception of biocide, but this is used in low quantities.	**Negligible**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
9.	**Operational Leaks and Spills** All Phases	**Minor 4**	• Rig design incorporates leak minimisation and drainage containment systems to ensure that spillages do not enter the environment. • All chemicals and fuel on site will be stored in bunded impermeable areas with adequate shading. • Correct storage, handling, use and transportation of chemicals will be followed according to manufacturer's specifications, material safety data sheets and regulations. • Provide a Hazardous Substance SOP for chemicals management in compliance with company rules and national standards. • No disposal of unused chemicals, all excess materials will be quantified and recorded and returned to the vendors. • Prepare spill contingency plans.	**Negligible**
10.	**Worst Case Oil Spill** Operations	**Major 8**	• Detailed well design aimed at prevention of any loss of control during drilling. • Preventative measures and equipment integral in well design, including drilling fluids (mud) and blow-out preventer, well control procedures. See Project Safety Case. • Prepare oil spill contingency plan.	**Moderate**
11.	**Water Supply** All Phases	**Negligible 2**	• Procure adequate water for the operations with a high yield. • Ensure no water use competition with the local community.	**Negligible**
12.	**Flora, Fauna and Habitat. Biodiversity** All Phases	**Minor 5**	• Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements • Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary. • Implement a tree planting program to offset loss of trees due to the construction phase • Clearing vegetation only in construction areas and demarcating areas where no clearing will happen. • Vehicles coming into the site must use designated roads.	**Negligible**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
			• Apply spill prevention practices and response actions in refuelling and vehicle-use areas to minimize accidental contamination of habitats. • Address spills immediately per the appropriate spill management plan, and initiate soil clean-up and soil removal if needed. • Turn off all unnecessary lighting at night to avoid disturbing wildlife and migratory birds. • Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. • Schedule decommissioning activities to avoid disturbance of resources during critical periods, for example night, or year, for example breeding, nesting seasons. • Rehabilitate all the areas of disturbed soil using weed free native grasses and shrubs. • Undertake rehabilitation activities as early as possible on disturbed areas in consultation with the relevant authorities, e.g. Forestry Department. • Timor Resources and Direção Geral das Florestas Cafe e Plantas Industriais should to work together to find a solution for deforestation to grow plants in area affected by drilling activities.	
13.	**Liquid Effluents** All Phases	**Minor 7**	• Open drains on the rig floor will collect any oily residues and discharge to the mud pit. • Rainwater is routed via the perimeter drain to an interceptor where oil is separated. • Sewage will be collected and treated in a standard field septic system and the effluent discharged to the ground through a trickle feed weeping tile. • The drilling rig will have a test separator to process any produced fluid from well testing operations. Any produced liquids will be stored in tanks and transported to existing facilities for processing. • Compliance with Municipality on waste matters. • Employing a waste management plan.	**Minor**
14.	**Solid Waste** All Phases	**Minor 8**	• Work in concert with the Municipality to develop and implement a fit for purpose waste management plan. • Assess and create opportunities for Reducing, Reusing, and Recycling of waste generated.	**Minor**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
			• Municipality making available suitable facilities for the collection, segregation, storage and safe disposal of the wastes. • Create waste collection areas for segregation of waste with clearly marked facilities such as colour coded bins. The bins to be coded according to biodegradable and non-biodegradable, reuse, recycling and reduce.	
15.	**Noise** Construction	**Minor** **7**	• Restrict construction activities to normal working hours 0800hrs to1700hrs • Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works. • Machinery should be maintained regularly to reduce noise resulting from friction during operations. • Drivers to adhere to speed limits within the project site access roads and vicinity • A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to. • Restrict hooting of vehicular horns. • Locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from any nearby sensitive receptors. • Shielding the area to reduce noise propagation as necessary.	**Minor**
16.	**Noise** Operations	**Minor** **6**	• Machinery should be maintained regularly to reduce noise resulting from friction during operations. • A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to. • Muffle and maintain all construction equipment used. • Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as possible.	**Minor**
17.	**Noise** Decommissioning	**Minor** **7**	• Restrict decommissioning activities to normal working hours 0800hrs to1700hrs • Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works.	**Negligible**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
			• Machinery should be maintained regularly to reduce noise resulting from friction during operations. • Drivers to adhere to speed limits within the project site access roads and vicinity • A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to. • Restrict hooting of vehicular horns. • Locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from any nearby sensitive receptors. • Limit pick-up trucks and other small equipment to an idling time, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible. • Shielding the area to reduce noise propagation as necessary.	
18.	**Light, Heat and Odours**	**Minor 5**	• The site occupies a small area will be in place temporarily. • Any important sensitivity in the project areas (e.g. infrastructures, areas of significant vegetation cover, sensitive cultivations, important sites for cultural heritage, etc.) will be identified and avoided as appropriate. • Use a lower level of lighting i.e. sufficient to enhance the night-time visibility required for safety and security • Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. • Shading floodlights to only shine inside the site perimeter • Turn off all unnecessary lighting at night to avoid disturbing wildlife and migratory birds.	**Negligible**
19.	**Community** All Phases	**Minor 8**	• Consultation with the Municipality and liaison with community during the planning phase. • Establish a robust, open, two way Complaints/Grievance Mechanism. • Establishing emergency procedures and ensuring the community are aware and educated on following them and commensurate to the magnitude and type of risk. • The work site will be fenced off to protect the general public from dangers associated with the drilling operations, including security in and around the site to control the movement of people.	**Minor**

NO	IMPACT	IMPACT RATING	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT
			• Placing visible and readable warning signs around the work site and access roads where there are exposures. • Compliance with Timor Resource's local content policy that reflects the requirement to hire locally, including a transparent and accessible application and short-listing process of workers. • Where possible, look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry.	
20.	**Visual**	**Negligible 4**	• The site occupies a small area and the drilling facilities will be in place temporarily. • The project is limited spatially to the one-hectare drilling location and its immediate surrounds and is short term and transient in nature. • Any important sensitivity in the project areas (e.g. infrastructure, areas of significant vegetation cover, sensitive cultivations, important sites for cultural heritage, etc.) will be identified and avoided as appropriate.	**Negligible**

9.5 Incorporation of Mitigation Measures into the design of the Project

Timor Resources is committed to achieving incident free operations through the provision of effective HSE management across all of its operations and worksites for the benefit of employees, contractors and the community, this is achieved through application of the Company's Operating Management System (OMS). The eleven Elements of the OMS are summarised in Table 9-54 and is based on the international standard **PLAN-DO-CHECK-ACT**.

Once the full assessment is completed any mitigation measures identified for the management of impacts will be integrated into the project design through the OMS. Implementation will follow Timor Resources HSE Policy and the OMS and meet Timor-Leste legislation and regulations, in particular, Environmental Basic Law No 26/2012, Environmental Licensing Decree Law 5/2011 (and supporting Ministerial Diplomas 45/46/47) and Decree-Law No.18/2020 Onshore Petroleum Operations.

The key OMS elements for implementation of the mitigation measures are included under:

- Element 7 Operational Controls:
  - Health, Safety and Environmental Management
  - Management of Change
  - Contractor and Purchasing Management
  - Asset Integrity, Engineering and Project Management
- Element 9 Crisis and Emergency Management
- Element 10 Assurance
  - Inspection and Audit
  - Non-Conformance Corrective and Preventative Action
- Element 11 Performance and Compliance

Full details are provided in the Environmental Management Plan (EMP) and a summary of the key elements of the EMP are included in Section 12.

Table 9-54. Timor Resources Operating Management System

PDCA CYCLE	OMS ELEMENT	OBJECTIVE
CORE	1. LEADERSHIP AND ACCOUNTABILITY	Provide visible leadership at Corporate and Business Unit level with clearly defined and documented authority and accountability. Champion Corporate culture, behaviours and performance.
PLAN	2. RISK ASSESSMENT AND CONTROL	Conduct comprehensive and routine assessment of the hazards and risks associated with activities and operations. Appropriate action is taken to control and mitigate risks. Conduct routine reviews.
	3. POLICIES, EXPECTATIONS AND LEGAL REQUIREMENTS	Policies, Expectations, Standards and legal requirements are properly identified, interpreted and tracked.
	4. OBJECTIVES, TARGETS AND IMPROVEMENT PLANS	Set Objectives and establish annual Targets and Key Performance Indicators. Define effective ways of measuring progress and performance. Specify how performance improvements will be achieved and assign responsibilities.
	5. ORGANISATION, RESOURCES AND CAPABILITY	Define and document organisational structure. Specify resource, competence and assurance requirements. Implement training, organisational learning, and competency development programs.
	6. DOCUMENTS AND RECORDS	Establish and maintain appropriate and practical documentation and records, document control and record management systems.
DO IMPLEMENTATION AND OPERATIONS	7. OPERATIONAL CONTROLS	Appropriate systems and controls are implemented and maintained for all HSE, Security, Engineering, Project, Asset Integrity, Process Safety and Operational activities. Monitor and report on the effectiveness of the systems, and establish mechanisms to prevent non-compliance, corrective and preventative action. Implement methods to manage change and controls for contractors.
	8. COMMUNICATIONS	Establish and maintain processes and procedures for effective communication of information internally and engagement with partners and all other stakeholders.
	9. CRISIS AND EMERGENCY MANAGEMENT	Develop Crisis and Emergency Management capability. Implement and maintain for all activities and operations. Plans are tested and personnel are trained in their expected roles.
CHECK ASSURANCE	10. ASSURANCE	Implement a routine Assurance program: inspection and audit, and a system for managing non-conformance. Report, investigate and analyse all incidents, and act effectively on results.
ACT	11. PERFORMANCE AND COMPLIANCE	Establish and maintain appropriate systems for monitoring and reporting performance and the status of Governance: compliance with and performance of Policies, Expectations, Standards and legal requirements. Assess the effectiveness of the OMS to deliver sustainable performance through management review.

9.6 Residual Impacts

Table 9-55 shows a summary of the residual impacts after taking account of mitigation measures.

Table 9-55. Summary of residual impacts

NO	IMPACT	INITIAL IMPACT RATING	RESIDUAL IMPACT AFTER MITIGATION
1.	**Land Use All Phases**	**Minor 7**	**Minor**
2.	**Traffic All Phases**	**Moderate 9**	**Minor**
3.	**Soil All Phases**	**Minor 7**	**Minor**
4.	**Air Quality Construction**	**Moderate 9**	**Minor**
5.	**Air Quality Operations**	**Minor 7**	**Minor**
6.	**Air Quality Decommissioning**	**Moderate 9**	**Minor**
7.	**Surface Water All Phases**	**Minor 4**	**Negligible**
8.	**Groundwater All Phases**	**Minor 5**	**Negligible**
9.	**Operational Leaks and Spills All Phases**	**Minor 4**	**Negligible**
10.	**Worst Case Oil Spill Operations**	**Moderate 8**	**Moderate**
11.	**Water Supply All Phases**	**Negligible 2**	**Negligible**
12.	**Biodiversity, Flora and Fauna All Phases**	**Minor 5**	**Negligible**
13.	**Liquid Effluents All Phases**	**Minor 7**	**Minor**
14.	**Solid Waste All Phases**	**Minor 8**	**Minor**
15.	**Noise Construction**	**Minor 7**	**Minor**
16.	**Noise Operations**	**Minor 6**	**Minor**
17.	**Noise Decommissioning**	**Minor 7**	**Negligible**
18.	**Light, Odours and Heat**	**Minor 5**	**Negligible**
19.	**Community**	**Minor 8**	**Negligible**
20.	**Visual**	**Negligible 4**	**Negligible**

10 PRELIMINARY EVALUATION OF SOCIAL IMPACTS

This section of the EIS depicts social evaluation and assessment of communities who are directly and in indirectly affected by the implementation and development of this project. The components taken into consideration during the assessment include: socio-cultural aspects, legislative and regulatory consideration; social issues analysis; strategy for social development outcome; social implications analysis and alternatives; and recommendation and monitoring plans for the proposed project.

The social background to the project is detailed in Section 6.4 and a preliminary assessment of impacts are described in Section 9.3, with specific reference to the positive social interactions addressed in 9.3.1 and Community impacts in 9.3.9. Further, significant social benefits arise in terms of the economic assessment described in Section 11.

10.1 Purpose And Objective

The purpose of the social impact assessment is to identify the social aspects that might be impacted by the implementation of the proposed project – to design a methodology for social assessment that will avoid, mitigate and compensate any adverse impacts in order to improve general conditions such as rural road construction of the surrounding project area. Furthermore, this assessment will also provide an overview of the possible social development such as employment and training that will bring positive impact to populations.

The scope of this social assessment will include the Rusa-1 well location in Suco Foho-Ai-Lico, Posto Hato-Udo, Ainaro Municipality. The radius of the social assessment is around 10 km of the drilling point.

The socio-economic team of this project has conducted a series of socialization and public consultation within the community surrounding the project. During the consultation with local communities, the concerns, recommendation, perspective and insight are recorded and analysed in order to develop social impact evaluation framework that will provide a mitigation and control measures to the community affected by the project.

10.2 Description of Socio-Cultural, Institutional, Historical and Political Context

Timor-Leste's communities are unique and strong in many different social aspects – those include traditional animist beliefs, influence from former colony of Portugal, impact of WWII, and the more recent Indonesian invasion in 1975-2002. For many communities in all administrative division, there is a profound sense of cultural identity. The country is rich in cultural heritage handed down from generation to generation which will be of great tourism potential.

Traditional institutional set up in most Timorese community is Uma-Lulik (sacred house). It is an ancestral house which is considered as social representation of family and symbolic representation of certain culture. Many societal rules and norms have been practiced for a long time is passed down for generations. Different Uma-Lulik from different Sucos/Aldeia has its own sets of traditional practices. For example, some cultures prohibits people to eat a certain vegetables, some cultures prohibits people to eat certain animal meat. Community in rural area give importance to Uma-Lulik norms as the basis of their rule of law within the community. In addition to Uma-Lulik (sacred house) as sacred places, people also believe that powers reside in rivers, lakes, stone, trees, mountains and animals. Animism beliefs are widely practiced in most Timorese societies. These cultural aspects and sacred items must be considered and followed during the design and implementation of the project.

Historically, the Portuguese presence has changed the cultural landscape in Timor-Leste ,but mostly in urban cities. The Portuguese influence is less evident in remote villages. Christianity has had strong influence on peoples beliefs. Many people have a tendency towards Christian beliefs rather than in animism beliefs and this is very noticeable in urban populations like in Municipality or Administrative Post, but not so much in remote areas such as Sucos and Aldeias. In a remote societies such as Suco Foho-Ai-Lico the majority of people still have strong traditional beliefs.

In the political context of the Government, Secretario Estado Arte no Kultura, is the government institution responsible to protect national identity by preserving its cultural heritage. Laws and Regulations for the protection of cultural heritage is emphasised in various Diploma Ministerial.

10.3 Legislative and Regulatory Consideration

The Timor-Leste Constitution of the Democratic Republic of Timor-Leste under Section 141 states: *Ownership, use and development of land as one of the factors for economic production shall be regulated by law*. Socio-cultural aspects of the project will be developed in accordance with Timor-Leste national legislation and regulation (Decree Law), and relevant Diploma Ministerial. Other relevant legislation and regulations include:

- Labour Law (Law No.4/2012)
- Environmental Licensing Law (DL No.5/2011)
- Onshore Petroleum Operations Law (Law No.18/2020)
- Impact Benefit Agreement (DM No.44/2017)
- IFC EHS Guidelines and where applicable Performance Standards
- Timor Resources Code of Business Conduct
- Timor Resources Health, Safety and Environmental (HSE) Policy
- Timor Resources Stakeholder Engagement Guidelines (TR-HSE-GUI-001)
- Timor Resources Redress and Grievance Plan (EMP Appendix C: TR-HSE-PLN-009)
- Timor Resources Community Consultation Plan (EMP Appendix I: TR-HSE-PLN-013)

Timor-Leste's Labour Law guarantees '*the equality principles*' under Chapter II, Article 6 which ensures equal opportunities for everyone accessing employment, training and professional development, working condition and remuneration. Furthermore, according to the law no applicant will be preferred or disadvantaged due to origin, race, colour, ethnic, social, economic and political status or ideological beliefs, religion, physical and mental condition or age.

IFC Guidelines and Performance Standards also encourage non-discrimination and equal opportunity principles for employment and fair treatment for all workers including protecting vulnerable workers such as children, migrant workers, and workers engaged by third parties and contractors.

Timor Resources operates under a strict Code of Business Conduct that ensure productive relationships are established with the community, suppliers, customers and business partners, conducting all activities with transparency and integrity. All parties shall conduct their business dealings with a high priority for ethical standards, honestly, openly, fairly and safely and expect the same of all those with whom business is conducted. The Company will:

- Operate as a responsible member of the communities of which it is a part, exercising care and sensitivity towards the environment.
- Show respect for human dignity and internationally recognised human rights wherever it operates. Strive to ensure that those countries and communities where business is conducted benefit from its presence and aim to minimise any adverse effects its activities may have on the environment.
- Adopt appropriate HSE polices to govern its activities.
- Ensure that partners and contractor's policies are compliant with its standards and recognise that all working on the its' behalf can impact operations and reputation and that a common responsibility for safety is shared by all.
- Review and ensure opportunities are provided for access by poor and excluded groups to goods, services and opportunities provided by the project and the enabling environment for public participation.

Timor Resources Code of Business Conduct, Policies and the Operating Management System ensures equal opportunities and non-discriminatory principles in accordance with TL laws and IFC Guidelines. Hence, where applicable, the procedures allow everyone to access employment opportunities, provide goods and services and other related business activities during the drilling operations.

10.4 Analysis of Social Issues

10.4.1 Social Structure and Key Issues

In Timorese culture mostly men are responsible leading the family structure involved in the community decision and activities. Generating ideas and decision making-process usually occurs in small groups. Decisions are made by local leader in consultation with the elderly in the community with majority consensus. Timorese societies give a high importance to social hierarchy and the importance of "elders". Therefore, in implementing this project, Timor Resources has consulted with local leaders and the elderly with regards to upgrading the access road, cutting down trees, and cultural site concerns.

The key social issues among people who live in remote villages are centred around the community, education, economy, gender inequalities and employment opportunities. The project will add positive value in response to some of the social issues as mentioned above. The planning, design and implementation of the project is to provide job opportunities for the local population allowing for capacity building through on the job training through direct employment in the project or indirectly by accessing products and services in the region.

Timor Resources Code of Business Conduct commits to promote equal opportunities and to ensure that personnel do not act in a way that unlawfully discriminates against others on the grounds of their sex, ethnic origin, nationality, race, colour, religion, philosophical belief, age, marital status, civil partnership, pregnancy or maternity, sexual orientation, disability or because they have or are proposing to change their gender.

10.4.2 Institutions, Rules and Behaviour

Considerable background information is provided in Section 6.4, and Section 10.2 provided a broad description of the socio-cultural, institutional, historical and political context in the area, including details of the characteristics of social groups, intra-and inter-group relations. When considered against the short timeframe for the project and limited opportunities and interactions with the local communities, there are no foreseen institutional constraints or barriers to project success.

Should any issues arise Timor Resources has in place a project specific Redress and Grievances Plan (TR-HSE-PLN-009) as presented in the EMP, Appendix C. The Grievance and Redress Mechanism (GRM) will ensure appropriate controls are implemented to avoid, manage, mitigate and remediate any negative impacts whilst maximising positive impacts. Timor Resources will establish positive, co-operative relationships with relevant government agencies and surrounding communities with the aim of ensuring key stakeholders are informed of Timor Resources performance.

The objectives of the GRM are to:

- Help Timor Resources understand the community's or stakeholder groups' perception of the environmental and social risks and impacts of the project.
- Ensure that formal grievances from the communities or others are promptly heard, analysed, handled and answered in order to take preventative actions and detect causes before they can have significant implications on business performance.
- Have a transparent and fair process for affected communities and other stakeholder groups seeking to have their grievances resolved.

10.4.3 Project Stakeholders

Timor Resources recognise that the nature, frequency, and level of effort of stakeholder engagement is commensurate with the project's risks and adverse impacts and will be addressed through the statutory Environmental Assessment process required under Law 5/2011 and Law 18/2020 Onshore Petroleum Operations. Stakeholder engagement is addressed in Timor Resources OMS document TR-HSE-GUI-001 Stakeholder Engagement Guidelines and is an ongoing process that involves the following elements:

- Identify and assess objectives
- Engage stakeholders and develop engagement plans
- Implement engagement plans
- Monitor and review

The prime objectives of the process are to:

- Identify those stakeholders directly and indirectly affected by the project.
- Identify those whose "interests" determine them as stakeholders.
- Verify stakeholder representatives.
- Engage with stakeholders in their own communities.
- Work with representative and accountable Government and community-based organizations and NGOs.
- Develop socio-cultural-economic baseline with a focus on vulnerable groups.

Where adverse environmental and/or social impacts may occur, Timor Resources will identify the affected communities and develop and implement a Stakeholder Engagement Plan that is scaled to the project risks and impacts and allows the effective participation of those identified as potentially disadvantaged or vulnerable.

Stakeholder engagement is primarily conducted through direct public consultation meetings between Timor Resources, as the project proponent, government authorities, the general public, local institutions and other interested parties, see EMP Appendix I: Community Consultation Plan TR-HSE-PLN-013. The proponent presents information on the project to participants with a specific section dedicated to question and answer.

Group discussions may be held with affected individuals, families and communities as well as small group gatherings with local elderly to discuss on the cultural ceremony requirements.
Reporting and follow up is essential to the success of the stakeholder engagement process. All engagements must be properly recorded and reported, with all recommendations, grievances, complaints fully addressed, and where accepted, followed through and closed out in a timely manner.

Grievances will be tracked and monitored as they proceed through the system. Effective monitoring, tracking and documentation accomplish several goals:

- Document the severity of a complaint (high, medium, low) according to specific criteria. The level of severity guides requirements for alerting senior management and determines the seniority of management oversight needed.
- Provide assurance that a specific person is responsible for overseeing each grievance—from receipt and registration to implementation.
- Promote timely resolution.
- Regularly inform all concerned (the grievant and appropriate company personnel) about the status of the case and progress being made toward resolution.
- Document the company's response and outcome(s) to promote fairness and consistency
- Record stakeholders' response(s) and whether additional research or consultation is needed.
- Provide a record of settlements and help develop standards and criteria for use in the resolution of comparable issues in the future.
- Monitor the implementation of any settlement to ensure that it is timely and comprehensive.
- Provide data needed for quality control measures, to assess the effectiveness of the process and action(s) to resolve complaints.

The following are the categories of identified stakeholders:

- Project affected communities, especially of those lives within or nearby the project development area
- Local authorities, such as local police, president of municipality, post administrator, Chefe Suco, Chefe aldeias, Chefe juventude and Chefe grupo
- Community elders
- Community groups: youth group, widows' group, etc.
- Landowners
- Local employees
- Local services providers
- Local NGOs

The Timor Resources OMS provides assurance that the system is effective by monitoring and measuring processes, confirming controls are effective, assessing progress and performance, and identifying opportunities for improvement. Monitoring and performance information is prepared for management review, internal and external benchmarking and stakeholder communications, see OMS Performance and Compliance Standard: TR-GEN-STD-00-000-011.

10.4.4 Participation

Participation is implemented through the Community Consultation Plan (TR-HSE-PLN-013) see EMP Appendix I and Timor Resources Stakeholder Engagement Guidelines (TR-HSE-GUI-001).

Timor Resources employs various methods with regard to communication and consultation with communities and authorities and these are summarised as follows:

- Focussed questionnaires
- Negotiation on compensation/leasing
- Tenancy sgreement arrangements
- Site notices

To date Timor Resources has been involved in various engagement programs in regard to both the seismic and the forthcoming drilling projects. Consultation was carried out through an individual approach, in small group discussions and through public consultation. Affected individuals or families were directly approached in the case of land use. Small group gatherings were also carried out with local elderly to discuss cultural ceremony requirements and with local authorities to disseminate information and discussion on public consultation.

The Public consultations were conducted by means of direct meetings between the Timor Resources and the general public, local institutions and other interested parties. The facilitator (Groena Circoal) and the Timor Resources directly present material regarding the project to the participants with a specific section dedicated to questions and answers.

Before starting the consultation, the facilitator engaged directly with the participants to provide information on the structure of the public consultation itself. Apart from direct engagement the invitation was also formally issued to the participants.

It has been mentioned previously that where job opportunities are available they will be prioritised for local communities. Any local labour will be employed through fair and transparent recruitment process to avoid social jealously and/or misinterpretation, priority will be given initially to the community living within the immediate area of Suco Foho-Ai-Lico. This issue was raised at the public consultations (see Section 13).

10.4.5 Societal Risk

Positive impacts arising from the project are summarised in Section 9.3.1 and various project impacts on both the environmental aspects and socio-cultural-economic components are presented in Sections 9.3.2 onwards. Other potential impacts on the local community relate to safety issues and the requirement for the local population to be made aware of various operational hazards, such as road safety, keeping a safe distance from the wellsite, and understanding the nature and risk of potential project hazards.

Various programs will be established to ensure the community are aware of potential hazards and emergency plans, in addition, a complaints/grievance mechanism will be established to ensure an open, two-way dialogue, see EMP Appendix C - Redress and Grievance Plan TR-HSE-PLN-009. The Community is an integral part of Timor Resources management of the project and understanding perceptions, expectations and concerns are central to the process. Mitigation measures include:

- Consultation with the Municipality and liaison with community during the planning phase.
- Establish a robust, open, two-way Complaints/Grievance Mechanism.
- Establishing emergency procedures and ensuring the community are aware and educated on following them and commensurate to the magnitude and type of risk.
- The work site(s) will be fenced off to protect the general public from dangers associated with the drilling operations, including security in and around the site to control the movement of people.
- Placing visible and readable warning signs around the work sites and access roads where there are exposures.
- Compliance with Timor Resources' local content policy that reflects the requirement to hire locally, including a transparent and accessible application and short-listing process of workers.
- Where possible, look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry.

10.5 Strategy to Achieve the Results of Social development outcomes.

Timor Resources have been involved in community engagement since award of PSC TL-OT-17-09 and in particular during the 2019 seismic campaign, details are provided in Section 13. However, with the short project timeframe and small spatial extent there are limited opportunities for social development, hence, social impacts such as sudden demographic change, land use change and cultural related issues are considered highly unlikely, see Section 6.4 and 6.5 and 9.3.

Timor Resources will carry out a cultural ceremony at the nearest cultural heritage sites within the project area. The objective is to acquire permission culturally from the communities and the communities' elders. Timor Resources will liaise with the local authority and other related Ministry or Institution for support in terms of liaison or mediation with the communities for cultural and project mutual understanding and collaboration. All follow-up cultural ceremony documentation will be reported and shared with the authorities and related and stakeholders.

10.6 Implications for Alternative Analysis

The project alternatives indicate little social-cultural interference or interaction only those in regard to location and water supply. In the former case, a limited amount of land is occupied, approximately 2.5 ha, and this land required for the project has been identified through the Land and Property office and discussed with local land holders. In regard to water, there are local suppliers, hence Timor Resources will engage these suppliers for short term supply given te drilling program is only approximately 40 days.

10.7 Recommendation for the Project Design and Implementation Measures.

Whilst the project is short term in nature and highly localised in spatial extents and consequently has limited opportunity for project design alterations, Timor Resources have been involved in discussions with the local authorities, community and during the public consultations and will engage in a road improvement program for the immediate community.

10.8 Monitoring Plan

Through the EIA process a framework for monitoring and evaluation has been developed and is presented in the EMP *Appendix F - Monitoring and Inspection Schedules.* Implementation will be coordinated in consultation with key stakeholders through the project Community Consultation Plan TR-HSE-PLN-013.

11 ECONOMIC ASSESSMENT

This economic assessment involves analysing a number of issues related to the economic viability of a project that carried out at different stages throughout the operational cycle. It is known that the most recent recorded economic activities inside the project area are significantly low. The data has shown that approximately 41 % of the population in the affected area live with an income around $1per day and rely on their traditional way of farming as the main source of income. Broadly at the municipality and even national level the overall employment rate is considered low. Therefore, the presence of the project is likely to have positive impacts either directly or indirectly especially to the communities residing in the vicinity of the drilling area, where there will be opportunities for employment associated with the project.

In the event that commercial quantities of hydrocarbon are discovered, more long term employment opportunities may be created. Once employment opportunities are identified, all hiring will be carried out according to the company's Code of Business Conduct and include a transparent hiring process to avoid any resentment among locals. The first consideration will be given to residents of the affected area as a whole when they have the adequate competencies.

Other opportunities besides job-related will be training ranging from language, safety in the workplace, and computer skills that will aid the workers to gain more experiences for future work.

Manufacturers, consultants, contractors and service companies will receive a full and fair opportunity to provide goods and services to the project on a competitive basis. This indirect involvement includes catering, internet service providers, vegetables, and other suppliers. The economic impact of direct and indirect income described in this section has the potential to significantly enhance the quality of life of the people in the affected area generally people that live in and around Suco Foho-Ai-Lico Post Administrative of Hatu-Udo.

The costs, benefits and cost effectiveness of mitigation measures for environmental impacts of the project will be alleviated through the following acceptable standard approaches:

- Establish and implement the best environmental monitoring program to control and monitor the project implementation which the impacts should be within acceptable standard threshold that has been planned.
- Select appropriate drilling equipment, decommissioning technology and approach that reduce the severity of the environmental destruction.
- Develop and implement biodiversity activities plan to replace or restore any loss forest ecosystem, terrestrial habitats, flora and fauna, wetlands and/or mangroves.
- Use proper equipment and methodology for site clearance to limit impacts of noise, dust and pollution to the nearest community and environment, and
- Establish good relationship with the local community.

11.1 Cost and Benefit of Environmental Impacts

11.1.1 Engagement and Consultation

Developing strong, respectful relationships with community members and consulting with individuals or groups who are directly or indirectly impacted by Timor Resources' activities is a priority. Wherever possible, Timor Resources will seek to involve communities in obtain all perspectives and decision-making.

Timor Resources' community engagement and consultation considers local land use rights and cultural heritage and practices. Timor Resources' information dissemination, negotiation and engagement activities consider local decision-making customs and conventions.

Timor Resources have established a local community liaison officer in Same to facilitate ongoing communications and two-way-feedback.

Timor Resources' Community Affairs Team make regular visits to the villages, providing the opportunity for communities to raise concerns or grievances and discuss development projects or sponsorship opportunities. All the visits and resulting commitments are recorded centrally.

11.1.2 Grievance Management

Providing effective channels for expressing and resolving grievances and concerns reduces the risk of escalation and ensures Timor Resources address community concerns appropriately.

Community members can raise matters at any of Timor Resources' sites through the local community liaison officers or during routine visits by Timor Resources' Community Affairs Team. Timor Resources record the grievance centrally, assess it for potential risk or impact, and elevate or respond to it accordingly. Material grievances are reported to the senior management team. This approach ensures grievances relating to Timor Resources' activities can be raised easily and in a culturally appropriate manner.

11.1.3 Land Access and Resettlement

The drilling site does not require any resettlement of people and Timor Resources have avoided all areas of cultural significance.

When engaging with project area community members regarding land access, Timor Resources have:

- Negotiated land access agreements in good faith and in a respectful and reasonable manner.
- Consulted with landowners to obtain their consent. These consultations typically cover the impact and term of the proposed use or access, employment and business development opportunities.
- Put in place a community land use agreement, a resettlement and livelihood restoration plan, and agreements if displacement or relocation is required.
- Timor Resources also provide compensation and land rental to local landowners for land use in accordance with the Timor-Leste rates, as required by the Onshore Decree Law of Timor-Leste. Timor Resources assess and provide this compensation transparently, in the presence of relevant community and government representatives or independent observers.

11.1.4 Impact Management

The project will have a significant multiplier effect for the community and the Country at large. The positive impacts are identified as employment, consumption of local goods and services, paying of local taxes and import duties as well as the benefit of the CSR program Timor Resources has and will continue to be undertaken during the project.

Timor Resources drilling activity will attract spending onshore that exceeds US$8.4million for this well, to be drilled called Rusa-1. during this drilling campaign. Key categories of interest, can be tracked and monitored under the following positive impact categories.

11.1.4.1 Positive Impacts - Employment

150 -180 positions will be filled by Timorese nationals during the 2021 Drilling Campaign. There will be a combination of skilled and unskilled positions, in the drilling crews, civil construction crews, geological teams, security teams, catering and services for the drilling contractor as well as a host of unskilled positions for labourers, cooks, cleaners and administration staff.

Employment opportunities will be advertised, and the unskilled positions will be filled by the recruitment of the local community.

Skilled positions will be filled from domestic and international markets, with a bias towards on the job training to capacity build and increase skills of the domestic work force, in Timor Resources' efforts to facilitate the employment of Timorese nationals.

The locally experienced workforce will be competitively recruited to work alongside expatriates during the drilling campaign and there will be training for the "shadow program" whereby Timorese persons can learn on the job skills, to be eligible to take over from an expatriate employee, when the level of competency has been achieved that allows for the national worker to productively contribute to the work program in the drilling crew.

Pre-Drilling Employment (Timorese labour component 88)
Community consultation, community liaison officers, civil construction crews, civil engineers, concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electrician surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, security, geologists, administration, accounting, operations management, work team supervisors.

Drilling Employment (Timorese labour component 114)
Additional employment during this phase brings in for rig related labour, inclusive of drilling crew, derrickmen, roustabouts, company men, geologists, security, labourers, and crew. As well as the following positions : concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electrician surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, security, geologists, administration, accounting, operations management, work team supervisors.

Decommissioning Employment (Timorese labour component 88) – Company men, geologists, security, labourers, and crew. As well as the following positions: concreters, heavy vehicle drivers, light vehicle drivers, supervisors, engineers, mechanics, electrician surveyors, labourers, accommodation manager, security, administration, accounting service, cooks, cleaners, security, geologists, administration, accounting, operations management, work team supervisors.

11.1.4.2 Positive Impact: Procurement of Goods and Services

Procurement from Timorese owned and operated businesses in the contract area goods and services include but are not limited to:

- Fresh Food and water $142,344
- Accommodation Housing/Office Supply $126,700
- Diesel Supply $276,000
- Government Charges including import duties and WHT $682,000
- Rental of Heavy Equipment, trucks, cranes $172,000
- Environmental Consultancy Engagement $190,000
- Aggregate and rock base $42,000

In preparation for the local suppliers to be able to offer their goods and services Timor Resources has undertaken promotional workshops and engagements to educate the local suppliers as to what they can supply and in what quantities they can participate. Raising the standard of the local suppliers, to be able to participate in the tender process and to be a supplier has been an activity undertaken over 18 months already in working with the communities and the local district administrator, in preparation.

11.1.4.3 Positive Impact: Customs Duties and taxes

Imported equipment will net greater than US$220,000 in import duties alone, as heavy equipment comes into the country.

WHT will be payable and collected on the employment and contracts, providing revenue to the state exceeding US$462,000.

11.1.4.4 Positive Impact: General of CSR programs

Timor Resources has implemented a number of CSR programs, including horticulture. Acreage of land owned by farming cooperative group has been gifted seeds, irrigation and financial support to increase their capacity to grow commercial crops. This reduces poverty, increase food nutrition for the community at large.

Support for the local sporting competitions, teams and local events is a CSR contribution Timor Resources intends to continue. The sponsoring of the Manufahi Cup, the Tour de Dili, the local community football and soccer federations.

During drilling there is the expectation that US$70,000 will be spent on CSR initiatives directly associated with the contract area

11.2 Cost and Benefit of Environmental Mitigation Measures

Table 11-1 provides a broad estimate of costs related to mitigation. It includes high cost capital equipment items such as blow-out preventers, diverter, emergency valves the flare line and pressure and flow monitoring equipment (see Items 1 and 2 below), all such items may be categorised as “environmental” spend as they perform environmental protection functions, e.g. preventing a blow out, monitoring high pressure events that could lead to a blowout. Item 3 is a cost estimate for the mud chemicals which provide a key “barrier” down hole balancing downhole pressures so removing the risk of over-pressure and a blowout. Item 4 covers training costs for personnel and permitting costs, Items 6, 7 and 8 are costs to be considered as local costs in and around the project area.

11.2.1 Non-Monetary Value Impacts

The monetary economic benefits on both the environment and local community as well to the country as whole have been covered under local content.

Other project impacts that are not necessarily converted into monetary values are household labour and civic activity and other forms of "collective efficacy" or "social capital" such as building community trust, reciprocity and civic engagement are not included in monetary value (Cahn, 2014). These non-monetary value aspects are not likely to be impacted by any project activities. They are in fact embedded or rooted within the traditional customs and culture of local community. Accordingly, it implies that the non-monetary values or aspects such as home labour, family and community area creation of a culture or social assets. Thus, though they may not be included in the economic measurement aspects, they do have social and cultural values within a community and/or a family unit.

Table 11-1. Whole Program Environmental Costs (both PSCs)

	Item	Pre Drilling/ Construction	Drilling	Decommissioning
1	Equipment Used for Environmental and Risk Mitigations. BOPS's, Diverter, ESD, Flare Line	$1,850,000		
2	Pumps, Choke Lines, Pressure and Flow Monitoring, equipment redundancy	$475,000	$400,000	
3	Mud Weighting and Lost circulation	$100,000	$310,000	
4	Rig Certification, Crew training, Crew Certification, Rig maintenance, Approvals, Safety Case, HSE, Category A license	$360,000	$210,000	$120,000
5	Air Noise Light Pollution Habitat, Baseline Studies.	$220,000	$60,000	$220,000
6	Community and cultural, education, inclusion employment, procurement of goods and services, community relations, information sharing, celebrations, local sponsorship, land and surface leasing fees.	$190,000	$260,000	$76,000
7	Civil construction, planning, equipment, logistics inside Timor-Leste incl. import duties, WHT	$596,000	$40,000	$120,000
8	Decommissioning, Reforestation, removal of civil constructed sites, monitoring, reporting.	-		$180,000

12 SUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) for construction, operations and decommissioning phases has been prepared. This includes requirements for monitoring, auditing, and compliance. International Finance Corporation Performance Standard 1 (IFC 2012) underscores the importance of managing environmental and social issues throughout the life of a project. An effective EMP is a continuous process requiring engagement between the proponent, the local communities directly affected by the project and other stakeholders such as National and Municipal authorities.

The EMP will follow the Timor Resources OMS "*Plan - Do - Check - Act*" PDCA cycle appropriate to the nature and scale of the project and the impacts identified and summarised in this EIA by:

- Adopting a mitigation hierarchy to anticipate, avoid, minimise and, where residual impacts remain, offset impacts to the environment and affected communities.
- Ensuring that all grievances from the community are responded to and managed appropriately.
- Promoting and providing adequate engagement with communities throughout the project on issues that could potentially affect them and ensuring that relevant information is disclosed and shared.

The EMP outlines the actions and outcomes required to address the issues raised in the EIA, and includes performance standards, targets and time frames, and assigning responsibilities for implementation.

A grievance mechanism is established to resolve concerns promptly, following an understandable and transparent consultative process that is readily accessible, at no cost and without retribution to the party that originated the issue or concern.

12.1 Proposed Mitigation Measures

Based on the assessment of impacts and possible mitigation measures described in Section 9.4 and summarised in Table 9-52 including positive impacts and Table 9-53 including negative impacts.

12.2 Monitoring Measures

Key aspects of the EMP are summarised in Table 12-1 which describes the program through performance standards, targets, time frames and responsibilities.

12.3 Roles and Responsibilities

Roles and responsibilities are summarised in Table 12-2 below.

Table 12-1. Environmental Management Plan

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
1.	**Land Use** **All Phases**	**Minor**	• Contact local stakeholders early in the process to identify sensitive land areas, land uses, issues, and local plans and any local regulations. • Site the project on previously disturbed land whenever possible. • Depending on the individual site, consider steps to minimise the amount of vehicular traffic and human activity. • Provide adequate public notice of planned activities. • Establish a rehabilitation plan that addresses both interim and final rehabilitation requirements and agree after-use if applicable. Ensure that interim rehabilitation of disturbed areas is conducted as soon as possible. • Compensate farmers for crop damage and restore compacted soils.	**Negligible**	Grievance/ Complaints records	Community Affairs Officer	Continuous	**Timor Resources Grievance Mechanism** **International Best Practice:** IOGP (E&P Forum) and UNEP (1997). Environmental Management in Oil &Gas Exploration and Production 1997. IOGP Report No. 254
2.	**Traffic** **All Phases**	**Moderate**	• Plan to use existing roads to the maximum extent possible. • Prepare an access road siting study and management plan to guide road design and maintenance standards, coordinate closely with Municipality and national Government authorities responsible for maintaining roadways and bridges. Compare the number, size, and weight of loads to service projects to the existing road infrastructure to determine if roads and bridges are adequate to support intended loads. • Implement strict traffic management procedures in association with the Municipality.	**Minor**	Adherence to Traffic Management Procedure Journey Management Speed Monitoring Engine and generator	Operations Manager	Daily Daily Daily Monthly	**Timor Resources Traffic Management Plan Grievance Mechanism** **International Best practice:** IOGP Land Transportation Safety Recommended Practice 365 November 2016 Issue relevant Reports and Standard Operating Procedures

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Route project traffic to minimise impacts on local communities. • Issue notices/advisories of pending traffic inconveniences and conduct briefing meetings with local authorities, schools and residents before the commencement of works. • Flagmen should be employed to control traffic and assist all vehicles as they enter and exit the project site. • Maintain on site a record of incidents and accidents. • Ensuring that all drivers for the project understand and comply with speed limits. • Ensure all vehicles and machinery used for the project are in good working condition both legally and are fit for purpose. • Control dust along un-surfaced roads, especially near residences, schools and fields. • Limit all traffic movement through villages in particular school opening and closing times.		service records Driver training Defensive driving		Induction	Accident and Incident Reports
3.	**Soil** **All Phases**	**Minor**	• **Construction** • Restricting removal of vegetation and soil cover to those areas necessary for the project. • Remove all topsoil and store off site. • Manage storm and flood flash water effectively to avoid movement of loss soils. • The disturbed areas should be rehabilitated with indigenous vegetation as soon as possible to prevent soil erosion if it was necessary. • Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the project footprint.	**Minor**	Regular Inspection of road culverts and rig drainage system Adherence to Site Civils Construction Procedure	Operations Manager Civils Construction Engineer	Weekly Monthly	**International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a)

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Preventing pollution of ground from servicing of vehicles and wastes by having specific sites for collection, sorting and transport of wastes. • Construction vehicles should remain on designated roads and should avoid off-site driving. • Compacting area with loose soils. • **Decommissioning** • Soil originally removed in the construction phase and stored will be returned upon restoration of the drill site and access road if necessary. • Drains will be installed, and drainage patterns will be re-established to prevent erosion. • Wellsite and roads are either left to an agreed after-use or rehabilitated following drilling. If the well is successful, the area will be reduced to the minimum size necessary in discussion with the authorities and the landowner. • During restoration and rehabilitation of the wellsite and roads, the site will be ripped before returning of the stockpiled topsoil. • Soil profile and contours will be reinstated upon completions of decommissioning phase.					
4.	**Air Quality Construction**	**Moderate**	• Sprinkling water on soil before excavation and periodically when operations are under way to prevent raising of dust. • Use of low sulphur fossil fuel. • Controlling the speed and operation of construction vehicles; drivers should adhere to the speed limit of 20km/hr on access roads and 40km/hr blacktop. • Regular maintenance and services of machines and engines.	**Minor**	Dust management Particulates Monitoring Fuel Consumption	Civils contractor for construction Civils Contractor Transport Contractor for service vehicles	Daily Monthly Daily	**Timor Resources Air Quality Management Plan** World Health Organisation (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005 - Summary of Risk Assessment.

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• In order to control exhaust, educate and raise awareness of construction workers on emission reduction and on emissions that are likely to occur during the construction of the well pads and access roads leading to the sites, the following measures shall be implemented during construction: - Vehicle idling time shall be minimised - Equipment shall be properly tuned and maintained. • To minimise air pollution due to dust emission or transport of waste materials during construction, the waste materials must be transported in covered vehicles especially if the route is through frequently used roads. • Workers in dusty areas on the site need to be issued with PPE such as, dust masks and safety goggles during dry and windy conditions. • Sensitise truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points.		Engine and generator service records	Transport Contractor	Monthly	World Health Organisation (2018). WHO Fact Sheet Ambient (outdoor) air pollution. 2 May 2018. **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).
5.	**Air Quality Operations**	**Minor**	• Sprinkling water on access roads to reduce dust. • Use of low sulphur fossil fuel. • Speed limit on access road 20km/hr on access roads and 40km/hr blacktop. • Regular maintenance and services of machines and engines. • In order to control exhaust, educate and raise awareness of drivers on emission reduction and on emissions that are likely to occur during	**Minor**	Dust management Generator fuel consumption Particulates Monitoring	Drilling contractor Drilling Contractor for rig emissions/ Transport contractor	Daily Daily Monthly	**Timor Resources Air Quality Management Plan** World Health Organisation (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			operations, the following measures shall be implemented during construction: - Vehicle idling time shall be minimised - Equipment shall be properly tuned and maintained • Sensitise truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points.		Fuel Consumption Engine and generator service records	for service vehicles Transport Contractor Drilling contractor	Daily Monthly	2005 - Summary of Risk Assessment. World Health Organisation (2018). WHO Fact Sheet Ambient (outdoor) air pollution **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).
6.	**Air Quality Decommissioning**	**Moderate**	• Covering of all haulage vehicles carrying debris for dumping at approved sites. • Stockpiles of fine materials should be wetted or covered with tarpaulin during windy conditions. • Workers in dusty areas on the site should be issued with dust masks and safety goggles. • Using well maintained equipment and machines with efficient engines meaning low emissions.	**Minor**	Dust management Particulates Monitoring Engine and generator	Civils contractor Civils contractor Transport contractor	Daily Monthly Monthly	**Timor Resources Air Quality Management Plan** World Health Organisation (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Using dust screens.		service records	for service vehicles		dioxide and sulphur dioxide. Global update 2005 - Summary of Risk Assessment. World Health Organisation (2018). WHO Fact Sheet Ambient (outdoor) air pollution **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).
7.	**Surface Water All Phases**	**Minor**	• Minimise the planned amount of land to be disturbed as much as possible by use of existing roads. • Identify and avoid unstable slopes and local factors that can cause slope instability	**Negligible**	Inspection of sewage system Perimeter drain oil trap	Drilling Contractor/ Camp Boss Drilling Contractor	Monthly Each Tour (12 hourly)	World Health Organisation (2011). WHO Guidelines for Drinking-water Quality, 2011

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			(groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure). • Construct drainage ditches only where necessary. Use appropriate structures at culvert outlets to prevent erosion. • Refuel in a designated fuelling area that includes a temporary berm to limit the spread of any spill. • Refuel in a designated fuelling area that includes a temporary berm to limit the spread of any spill. • Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer; • Any discharge of grey water should be treated first to avoid contaminating water sources. • Upon completion of the decommissioning phase, disturbed areas will be contoured and vegetated to minimise the potential for soil erosion and water quality related impacts. • Temporary sediment and erosion control measures such as sediment fences installed where necessary especially in areas in close proximity to drains or surface water features to avoid runoff to water source. • Any area artificially elevated via pad or access track construction will be lowered to original ground level by removal of paving material unless otherwise instructed by the landowners. • Original drainage patterns will be restored.		Regular checking and cleaning of oil, fuel and waste spills Inspection of perimeter drain and road culverts	Drilling Contractor Operations Manager	Each Tour (12 hourly) Weekly	**International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
8.	**Groundwater All Phases**	**Minor**	• The freshwater aquifer at approximately 84m is cased off immediately after passing through before drilling continues • Mud chemicals are non-toxic with the exception of biocide, but this is used in low quantities.	**Negligible**	Inspection of sewage system Perimeter drain oil trap	Drilling Contractor/ Camp Boss Drilling Contractor	Monthly Each Tour (12 hourly)	World Health Organisation (2011). WHO Guidelines for Drinking-water Quality, 2011

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
					Regular checking and cleaning of oil, fuel and waste spills Inspection of perimeter drain and road culverts	Drilling Contractor Operations Manager	Each Tour (12 hourly) Weekly	**International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
9.	**Operational Leaks and Spills** **All Phases**	**Minor**	• Rig design incorporates leak minimisation and drainage containment systems to ensure that spillages do not enter the environment. • All chemicals and fuel on site will be stored in bunded impermeable areas with adequate shading. • Correct storage, handling, use and transportation of chemicals will be followed according to manufacturer's specifications, material safety data sheets and regulations. • Provide a Hazardous Substance SOP for chemicals management in compliance with company rules and national standards. • No disposal of unused chemicals, all excess materials will be quantified and recorded and returned to the vendors. • Prepare spill contingency plans.	**Negligible**	OSCP Regular checking and cleaning of oil, fuel and waste spills Inspection of perimeter drain and road culverts OSCP drill	HSE Officer Drilling Contractor Operations Manager HSE Officer	Continuous Each Tour (12 hourly) Weekly Pre spud	**Timor Resources Oil/Chemical Spill Contingency Plan (OSCP)** **International Best Practice:** - IPIECA (2016). Oil spills: inland response good practice guidelines for incident management and emergency response personnel - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a)

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
								- EHS General Guidelines (IFC 2007b)
10.	**Worst Case Oil Spill Operations**	**Major**	• Detailed well design aimed at prevention of any loss of control during drilling. • Preventative measures and equipment integral in well design, including drilling fluids (mud) and blow-out preventer, well control procedures. See Project Safety Case. • Prepare oil spill contingency plan.	**Moderate**	CMP / IMP ERP Maintenance ofcmP/IMP CMP/IMP/ ERP Drill	General Manager Exploration Drilling Contractor HSE Officer HSE Officer	Continuous Continuous Continuous Pre spud	**Timor Resources Crisis Management Plan (CMP) / Incident Management Plan (IMP) Emergency Response Plan (ERP)** **International Best Practice:** - IPIECA (2015). Oil spills: inland response good practice guidelines for incident management and emergency response personnel No 514 2015. - IPIECA (2014). Incident Management System No 517 Nov 2014. - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a)

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
								- EHS General Guidelines (IFC 2007b)
11.	**Water Supply** **All Phases**	**Negligible**	• Procure adequate water for the operations with a high yield. • Ensure no water use competition with the local community.	**Negligible**	Monitor water usage Monthly water management report	Drilling Contractor Operations Manager	Daily Monthly	**Timor Resources Grievance Mechanism** **International Best Practice:** IOGP (E&P Forum) and UNEP (1997). Environmental Management in Oil &Gas Exploration and Production 1997. IOGP Report No. 254
12.	**Biodiversity, flora, fauna and habitat** **All Phases**	**Minor**	• Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements • Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary. • Implement a tree planting program to offset loss of trees due to the construction phase • Clearing vegetation only in construction areas and demarcating areas where no clearing will happen. • Vehicles coming into the site must use designated roads. • Apply spill prevention practices and response actions in refuelling and vehicle-use areas to minimize accidental contamination of habitats.	**Negligible**	Grievance/ Complaints records	Community Liaison Officer/HSE Officer	Continuous	**Timor Resources Grievance Mechanism** IUCN (2020). *The IUCN Red List of Threatened Species. Version 2020-2.*

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Address spills immediately per the appropriate spill management plan, and initiate soil clean-up and soil removal if needed. • Turn off all unnecessary lighting at night to avoid disturbing wildlife and migratory birds. • Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. • Schedule decommissioning activities to avoid disturbance of resources during critical periods, for example night, or year, for example breeding, nesting seasons. • Rehabilitate all the areas of disturbed soil using weed free native grasses and shrubs. • Undertake rehabilitation activities as early as possible on disturbed areas in consultation with the relevant authorities, e.g. Forestry Department.					
13.	**Liquid Effluents All Phases**	**Minor**	• Open drains on the rig floor will collect any oily residues and discharge to the mud pit. • Rainwater is routed via the perimeter drain to an interceptor where oil is separated. • Sewage will be collected and treated in a standard field septic system and the effluent discharged to the ground through a trickle feed weeping tile. • The drilling rig will have a test separator to process any produced fluid from well testing operations. Any produced liquids will be stored in tanks and transported to existing facilities for processing. • Compliance with Municipality on waste matters. • Employing a waste management plan.	**Negligible**	Inspection of sewage system Perimeter drain oil trap	Drilling Contractor/ Camp Boss Drilling Contractor	Monthly Each Tour (12 hourly)	**Timor Resources Waste Management Plan** **Timor Resources Grievance Mechanism** **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
								- IOGP (2009). Guidelines for waste management with special focus on areas with limited infrastructure Report No. 413, rev1.1 September 2008 (updated March 2009)
14.	**Solid Waste** **All Phases**	**Minor**	• Work in concert with the Municipality to develop and implement a fit for purpose waste management plan. • Assess and create opportunities for Reducing, Reusing, and Recycling of waste generated. • Municipality making available suitable facilities for the collection, segregation, storage and safe disposal of the wastes. • Create waste collection areas for segregation of waste with clearly marked facilities such as colour coded bins. The bins to be coded according to biodegradable and non-biodegradable, reuse, recycling and reduce.	**Minor**	Cuttings volumes recorded Rig wastes recorded, manifested and tracked Camp wastes recorded, manifested, tracked All wastes: Monthly Summary report	Drilling Contractor Drilling Contractor Camp Boss Operations Manager	Daily Daily Daily Monthly	**Timor Resources Waste Management Plan** **Timor Resources Grievance Mechanism** **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IOGP (2009). Guidelines for waste management with special focus on areas with limited infrastructure Report No. 413, rev1.1 September 2008

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
								(updated March 2009)
15.	**Noise Construction**	**Minor**	• Restrict construction activities to normal working hours 0800hrs to1700hrs • Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works. • Machinery should be maintained regularly to reduce noise resulting from friction during operations. • Drivers to adhere to speed limits within the project site access roads and vicinity • A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to. • Restrict hooting of vehicular horns. • Locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from any nearby sensitive receptors. • Shielding the area to reduce noise propagation at Raiketan as necessary.	**Negligible**	Noise monitoring at fence and sensitive receptors	Operations Manager	Monthly	**Timor Resources Noise Management Plan** **Timor Resources Grievance Mechanism** World Health Organisation (2015). WHO noise quality standard – WHO, 2015. **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
16.	**Noise Operations**	**Minor**	• Machinery should be maintained regularly to reduce noise resulting from friction during operations. • A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to. • Muffle and maintain all construction equipment used.	**Minor**	Noise monitoring at fence and sensitive receptors	Operations Manager	Monthly	**Timor Resources Noise Management Plan** **Timor Resources Grievance Mechanism** World Health Organisation (2015). WHO noise quality standard – WHO, 2015.

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as possible.					**International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
17.	**Noise Decommissioning**	**Minor**	• Restrict decommissioning activities to normal working hours 0800hrs to1700hrs • Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works. • Machinery should be maintained regularly to reduce noise resulting from friction during operations. • Drivers to adhere to speed limits within the project site access roads and vicinity • A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to. • Restrict hooting of vehicular horns. • Locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from any nearby sensitive receptors. • Limit pick-up trucks and other small equipment to an idling time, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.	**Negligible**	Noise monitoring at fence and sensitive receptors	Operations Manager	Monthly	**Timor Resources Noise Management Plan** **Timor Resources Grievance Mechanism** World Health Organisation (2015). WHO noise quality standard – WHO, 2015. **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Shielding the area to reduce noise propagation at Raiketan as necessary.					
18.	**Light, Heat and Odours**	**Minor**	• The site occupies a small area will be in place temporarily. • Any important sensitivity in the project areas (e.g. infrastructures, areas of significant vegetation cover, sensitive cultivations, important sites for cultural heritage, etc.) will be identified and avoided as appropriate. • Use a lower level of lighting i.e. sufficient to enhance the night-time visibility required for safety and security • Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. • Shading floodlights to only shine inside the site perimeter • Turn off all unnecessary lighting at night to avoid disturbing wildlife and migratory birds.	**Negligible**	Grievance/ Complaints records	Community Affairs Officer	Continuous	**Grievance Mechanism** **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
19.	**Community All Phases**	**Minor**	• Consultation with the Municipality and liaison with community during the planning phase. • Establish a robust, open, two way Complaints/ • Grievance Mechanism. • Establishing emergency procedures and ensuring the community are aware and educated on following them and commensurate to the magnitude and type of risk. • The work site(s) will be fenced off to protect the general public from dangers associated with the drilling operations, including security in and around the site to control the movement of people.	**Negligible**	Grievance/ Complaints records Local Recruitment Program New recruit Training and Induction	Community Affairs Officer Country Manager Community Affairs Officer	Continuous Pre-project Continuous Continuous	**Grievance Mechanism** **National Labour Code and SEPFOPE Regulation** **International Best Practice:** - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas

No.	Impact	Impact Rating	Proposed Mitigation Measures	Residual Impact	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
			• Placing visible and readable warning signs around the work sites and access roads where there are exposures. • Compliance with Timor Resource's local content policy that reflects the requirement to hire locally, including a transparent and accessible application and short-listing process of workers. • Where possible, look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry.		Local Community Education and Awareness Program	Community Affairs Officer		Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
20.	**Visual**	**Negligible**	• The site occupies a small area and the drilling facilities will be in place temporarily. • The project is limited spatially to the 2.5 ha drilling location and its immediate surrounds and is short term and transient in nature. • Any important sensitivity in the project areas (e.g. infrastructure, areas of significant vegetation cover, sensitive cultivations, important sites for cultural heritage, etc.) will be identified and avoided as appropriate.	**Negligible**	Grievance/ Complaints records	Community Affairs Officer	Continuous	**Grievance Mechanism**

Table 12-2. Summary of Mitigation Measures and Roles and Responsibilities

Monitoring	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
Land Use **All Phases**	Grievance/ Complaints records	Community Affairs Officer	Continuous	Timor Resources Grievance Mechanism International Best Practice: IOGP (E&P Forum) and UNEP (1997). Environmental Management in Oil &Gas Exploration and Production 1997. IOGP Report No. 254
Traffic **All Phases**	Adherence to Traffic Management Procedure Journey Management Speed Monitoring Engine and generator service records Driver training Defensive driving	Operations Manager	Daily Daily Daily Monthly Induction	Timor Resources Traffic Management Plan Grievance Mechanism **International Best practice:** IOGP Land Transportation Safety Recommended Practice 365 November 2016 Issue relevant Reports and Standard Operating Procedures Accident and Incident Reports
Soil **All Phases**	Regular Inspection of road culverts and rig drainage system Adherence to Site Civils Construction Procedure Baseline parameters repeated sensitive receptors	Operations Manager Civils Construction Engineer Operations Manager	Weekly Monthly Prior to rehabilitation	International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a)
Air Quality **Construction**	Dust management Particulates and Air Quality Standard Gases Monitoring at fence and sensitive receptors Fuel Consumption	Civils contractor for construction Civils Contractor for construction Transport Contractor for service vehicles	Daily Monthly Daily	Timor Resources Air Quality Management Plan World Health Organisation (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005 - Summary of Risk Assessment. World Health Organisation (2018). WHO Fact Sheet Ambient (outdoor) air pollution. 2 May 2018. International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)

Monitoring	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
	Engine and generator service records	Transport Contractor	Monthly	- IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).
Air Quality Operations	Dust management Generator fuel consumption Particulates and Air Quality Standard Gases Monitoring at fence and sensitive receptors Fuel Consumption Engine and generator service records	Drilling contractor Drilling Contractor for rig emissions/ Transport contractor for service vehicles Transport Contractor Drilling contractor	Daily Daily Monthly Daily Monthly	Timor Resources Air Quality Management Plan World Health Organisation (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005 - Summary of Risk Assessment. World Health Organisation (2018). WHO Fact Sheet Ambient (outdoor) air pollution International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).
Air Quality Decommissioning	Dust management Particulates and Air Quality Standard Gases Monitoring at fence and sensitive receptors Engine and generator service records	Civils contractor Civils contractor Transport contractor for service vehicles	Daily Monthly Monthly	Timor Resources Air Quality Management Plan World Health Organisation (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005 - Summary of Risk Assessment. World Health Organisation (2018). WHO Fact Sheet Ambient (outdoor) air pollution International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IFC Performance Standard 1 (PS 1) - Assessment and Management of Environmental and Social Risks (IFC 2012).
Surface Water All Phases	Inspection of sewage system Perimeter Drain Oil Trap	Drilling Contractor/ Camp Boss Drilling Contractor Drilling Contractor	Monthly Each Tour (12 hourly) Each Tour (12 hourly)	World Health Organisation (2011). WHO Guidelines for Drinking-water Quality, 2011 International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)

Monitoring	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
	Regular checking and cleaning of oil, fuel and waste spills Inspection of perimeter drain and road culverts Baseline parameters repeated at sensitive receptors	 Operations Manager Operations Manager	 Weekly Quarterly	
Groundwater All Phases	Inspection of sewage system Perimeter drain oil trap Regular checking and cleaning of oil, fuel and waste spills Inspection of perimeter drain and road culverts Baseline parameters repeated at sensitive receptors	Drilling Contractor/ Camp Boss Drilling Contractor Drilling Contractor Operations Manager Operations Manager	Monthly Each Tour (12 hourly) Each Tour (12 hourly) Weekly Quarterly	World Health Organisation (2011). WHO Guidelines for Drinking-water Quality, 2011 International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Operational Leaks and Spills All Phases	OSCP Regular checking and cleaning of oil, fuel and waste spills Inspection of perimeter drain and road culverts OSCP drill	HSE Officer Drilling Contractor Operations Manager HSE Officer	Continuous Each Tour (12 hourly) Weekly Pre spud	Timor Resources Oil/Chemical Spill Contingency Plan (OSCP) International Best Practice: - IPIECA (2016). Oil spills: inland response good practice guidelines for incident management and emergency response personnel - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Worst Case Oil Spill Operations	CMP / IMP SERP Maintenance of CMP/IMP CMP/IMP/ SERP Drill	General Manager Exploration Drilling Contractor HSE Officer HSE Officer	Continuous Continuous Continuous Pre spud	Timor Resources Crisis Management Plan (CMP) / Incident Management Plan (IMP) Site Emergency Response Plan (SERP) International Best Practice: - IPIECA (2015). Oil spills: inland response good practice guidelines for incident management and emergency response personnel No 514 2015. - IPIECA (2014). Incident Management System No 517 Nov 2014. - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)

Monitoring	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
Water Supply **All Phases**	Monitor water usage Monthly water management report	Drilling Contractor Operations Manager	Daily Monthly	Timor Resources Grievance Mechanism International Best Practice: IOGP (E&P Forum) and UNEP (1997). Environmental Management in Oil &Gas Exploration and Production 1997. IOGP Report No. 254
Biodiversity, flora, fauna and habitat **All Phases**	Grievance/ Complaints records	Community Liaison Officer/HSE Officer	Continuous	Timor Resources Grievance Mechanism IUCN (2020). *The IUCN Red List of Threatened Species. Version 2020-2.*
Liquid Effluents **All Phases**	Inspection of sewage system Perimeter drain oil trap	Drilling Contractor/ Camp Boss Drilling Contractor	Monthly Each Tour (12 hourly)	Timor Resources Waste Management Plan Timor Resources Grievance Mechanism International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IOGP (2009). Guidelines for waste management with special focus on areas with limited infrastructure Report No. 413, rev1.1 September 2008 (updated March 2009)
Solid Waste **All Phases**	Cuttings volumes recorded Rig wastes recorded, manifested and tracked Camp wastes recorded, manifested, tracked All wastes: Monthly Summary report	Drilling Contractor Drilling Contractor Camp Boss Operations Manager	Daily Daily Daily Monthly	Timor Resources Waste Management Plan Timor Resources Grievance Mechanism International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b) - IOGP (2009). Guidelines for waste management with special focus on areas with limited infrastructure Report No. 413, rev1.1 September 2008 (updated March 2009)
Noise **Construction**	Noise monitoring at fence and sensitive receptors	Operations Manager	Monthly	Timor Resources Noise Management Plan Timor Resources Grievance Mechanism World Health Organisation (2015). WHO noise quality standard – WHO, 2015. International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Noise **Operations**	Noise monitoring at fence and sensitive receptors	Operations Manager	Monthly	Timor Resources Noise Management Plan Timor Resources Grievance Mechanism

Monitoring	Monitoring/ Performance Indicator	Responsible Person / Function	Timing and Frequency	Performance Standard
				World Health Organisation (2015). WHO noise quality standard – WHO, 2015. International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Noise **Decommissioning**	Noise monitoring at fence and sensitive receptors	Operations Manager	Monthly	Timor Resources Noise Management Plan Timor Resources Grievance Mechanism World Health Organisation (2015). WHO noise quality standard – WHO, 2015. International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Light **All Phases**	Grievance/ Complaints records	Community Affairs Officer	Continuous	Grievance Mechanism International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Odours **All Phases**	Grievance/ Complaints records	Community Affairs Officer	Continuous	Grievance Mechanism International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)
Community **All Phases**	Grievance/ Complaints records Local Recruitment Program New recruit Training and Induction Local Community Education and Awareness Program	Community Affairs Officer Country Manager Community Affairs Officer Community Affairs Officer	Continuous Pre-project Continuous Continuous	Grievance Mechanism National Labour Code and SEPFOPE Regulation International Best Practice: - Environmental Health and Safety (EHS) Guidelines for Onshore Oil and Gas Development (IFC 2007a) - EHS General Guidelines (IFC 2007b)

13 DISCLOSURE OF INFORMATION AND PUBLIC CONSULTATION

13.1 Purpose of the Consultation During the Preparation of EIS

Public consultation is a key requirement in obtaining the environmental licence under Law 5/2011, with the process determined under Ministerial Decree 47/2017. The consultation provides an opportunity for Timor Resources to disseminate technical and non-technical information on the project to local communities, as well as an opportunity for the public to provide input, opinions and ideas regarding the project. Timor Resources' independent consultant Groena Circoal presented information on the location of the drilling site, the well depth, equipment to be used, infrastructure involved, as well as the legal basis, local content, and the potential effects on communities and the surrounding environment.

In addition to dissemination of drilling information, the consultation was used to identify community or individuals land and housing which might be directly or indirectly affected by the activities.

13.2 Methodology and Approach

Consultation was carried with individuals, small groups and larger public consultation forums. Affected individuals or families were directly approached in the case of land use proposed as the drilling site. Small group gatherings were also carried out with local elderly to discuss the cultural ceremony requirements and, with local authorities in regards to plans for dissemination of information through public consultation.

The public consultations were conducted by means of direct meeting between the project owner and the general public, local institutions and other interested parties. The facilitator and the project owner directly presented the material to the participants with a specific section dedicated to question and answer.

Before starting the consultation, the facilitator engaged directly with the participants to provide information on the structure of the public consultation itself.

The public consultation was carried out at two separate gatherings one at Suco Foho-Ai-Lico near the drilling location and the other at Betano where the camp is situated. Each consultation was a half day presentation.

13.3 Summary of Consultation Activities

Below is a summary of consultation activities which were carried out in different stages:

13.3.1 Early Engagement

Prior to the finalisation of wellsite determination through seismic evaluation, Timor Resources established communication with local elderly people and local authority to disseminate information that Timor Resources has a confirmed plan to carry out drilling activities. Through these engagements, Timor Resources sought the support of the local authority to identify land ownership of wellsite area and possible access road. Timor Resources has secured deals with the land owner and National and Municipal Land and Property Department were also engaged to confirm the wellsite land entitlement.

13.3.2 Period of data collection and drafting of EIS

During data collection, Timor Resources and consultant Groena Circoal approached authorities in Ainaro Municipality, Post Administrative Hatu-Udo, and Suco Foho-Ai-Lico and advised that a team of engineers will visit the wellsite and community area to collect environmental data. The team also accessed forest and farm areas for collection of climate and ecological data and carried out transect survey for flora and fauna assessment.

Local health clinics were also visited to collect health statistics and to discuss hospitals condition or readiness to respond to emergencies during the drilling operations.

Meetings were also held with traditional elders to discuss the traditional ceremonies prior to drilling and also to identify any landmark sacred sites which may need to be protected or for awareness of potential access restrictions.

13.3.3 Actual Public Consultation

When the formal public announcement was published (see Appendix 13-1) in the media and the public gathering dates were determined, local authorities were approached to secure community halls as the consultation venue. Formal invitations were dispatched to local authorities, local institution, NGOs and other interest parties. Village chiefs were requested to assist by disseminating the invitation verbally to the general public, village elders and youth groups.

Community attendance at the public consultations was high. A wide range of participants such as parents, elderly people, youth, students, member of public institutions, local authorities and the Police attended (Appendix 13-2).

With the experience gained from previous public consultations, during the seismic campaign and from those conducted in PSC TL-OT-17-08 regarding drilling operations, Timor Resources ensured the following key topics were made aware to participants in order to assist and focus the discussions:

Local Participation
Timor Resource advised that, where job opportunities are available, they will be prioritised for local communities. Any local labour will be employed through fair and transparent recruitment process, priority will be given initially to the community living within the immediate area of Suco Foho-Ai-Lco. Similarly, in the provision of local goods and services.

Cultural And Traditional Respect And Ceremonies
Timor Resources has demonstrated a respect for the cultural and traditional sites and ceremonies and is committed to respect the culture and traditions of the surrounding area. Local elders have advised that traditional ceremony prior to spud is necessary to follow local custom.

Avoiding Damaging The Environment
Timor Resources is committed to protecting the environment will focus attention the key flora and fauna identified during the baseline survey. Community livestock and their feeding grounds will not be disturbed.

Compensation regarding land use
Timor Resources is committed to provide compensation and land rental to local landowners for land use in accordance with Timor-Leste rates, as required by the Onshore Decree Law of Timor-Leste. Timor Resources assess and provide this compensation transparently, in the presence of relevant community and government representatives or independent observers.

Community Programs
Timor Resources has implemented a number of CSR programs, including horticulture that is now well established. Acreage of land owned by farming cooperative group has been gifted seeds, irrigation and financial support to increase their capacity to grow commercial crops.

Support for the local sporting competitions, teams and local events is a CSR contribution Timor Resources intends to continue. The sponsoring of the Manufahi Cup, the Tour de Dili, the local community football and soccer federations.

During drilling there is the expectation that US$70,000 will be spent on CSR initiatives directly associated with the contract area

13.4 Summary of Main Comments from Participants - Suco Foho-Ai-Lico

The following questions were raised by participants during the public consultation at Suco Foho-Ai-Lico:

Domingos de Sousa Martins
The Local Community always maintain good cooperation with the Company Timor Resources and would like to see:

a-Small jobs given to the locals in a fair selection
b-Can the Company use small vehicles to build the access road?

Answer by Filomeno De Andrade
Grateful to hear the good cooperation of the locals with Timor Resources and Timor Resources will continue to have the locals as good partner in the activities

- *a- Regarding small jobs when is unskilled we always liaise with the community leaders to a fair opportunity for everybody. We don't do selections. We provided the number of workers required and leave to the Community leader's decision to allocate workers for these unskilled positions, as long as they are physically fit for the job.*
  - *For skilled jobs we follow the results from job advertisement and selection by Human resources sector. Using a committee, we shortlist and then interview candidates.*
  - *We have never approached anybody isolated offering a job. We follow the rules, transparency and procedures adopted by the Company to be fair to everybody.*
- *b- The Company always follows international best practice in all activities. It is no point to use a small vehicle for heavy and big job out of the purpose, capacity and quality of the vehicle. We want a vehicle to do the job and not to destroy the vehicle.*

Paulo da Costa
a- We need help from Timor Resources to build access road to the Community of Be Mos and Electricity.
b-We have water but need improvement to the existing infrastructure.

Answer by Filomeno de Andrade

- *a- We received a proposal from the Community leader of Foho-Ai-Lico. I have submitted to the Company to look at the proposal. If it can be implemented as Community project to respond to the need of your Community we are supportive. I understand that your request is so important for your Community as it will benefit the students to travel to school, any* *patient with urgent medical assistance etc. We will be happy to assist and I will comeback to your Community as soon as possible.*

b- *We will assess to find out the improvement required and also comeback to you*

Santiago da Costa

Concern with the veterans as in many activities they are the obstacle therefore request them to support Timor Resources activities.

Also if there any job opportunity should be fair to everybody and not to give only to the veterans.

Filomeno de Andrade – Thank you Santiago. I shall leave your concerns to you and the Local Authority and Community Leaders to discuss the issue.

Juvenal da Costa

a-Concerns by the way Timor Resources handled the job applications in the past without public announcement of the results and similar approach to the process done by the Government.
b-Timor Resources did not follow the procedures in the community socialization for supply of foods and did not give any participation of local companies.

Answer by Filomeno de Andrade

a- *Timor Resources openly advertised vacancies for semiskilled and unskilled locally at all level of the government structure from village to District Administration levels. In the announcement we made clearly written at the bottom of the page that we will only contact the selected applicants for job interview. This information was clearly stated and shown in the advertisement.*
  - *It was the company recruitment procedures and we only contacted those who were selected. Timor Resources has policies and procedures for recruitment.*
  - *If we have to do the public announcement covering all the village to the District Administration it would take at least 4 months to undertake when the job is for less than 3 months.*

b- *Regarding to the supply of food I believe you didn't participate in any of the socialization meetings neither the goods and services workshop here at Foho-Ai-Lico otherwise you would have gathered the necessary information to participate in the program. Also we announced a meeting at our camp in Betano to all those who interested to supply food to the camp. There are healthy and safety procedures for this activity. Just to let inform that we had an interesting case with Foho-Ai-Lico. We were told to come to collect fish. The camp boss and myself came here. As we arrived the fisherman jumped into the lake and after 3 hours caught only 8 fish. We returned empty hand with no fish. How could we feed 98 workers with 8 fish.*

Salustiano

Thank you for the presentation. He has concern with impact to the water and also recruitment of the locals.

Abilio Fernandes – A samples of water were collected and the quality will be monitoring periodically to ensure the quality is maintained.

Filomeno de Andrade
Local consumption of water will not be affected. Water for the operation will be provided by water suppliers. Water for drilling will be from the river and also from retail suppliers if necessary.
Regarding recruitment of the locals. If it is for unskilled or semiskilled we will advertise the positions available. There are procedures to follow. There will be a short list, job interview and medical examination prior to job offer.

Herculano das Dores
As a veterans he wants to ensure no impediment and suggested Timor Resources to have coordination with veterans to ensure no failure in the activities.

Filomeno de Andrade
Thank you, Mr Herculano, and noted your suggestion. Will contact you when we start with the activities.

Agostinho da Costa
Wanted to inform that he has his land with certificate therefore leave to our consideration if we use his land for access road.

Filomeno de Andrade
The access road is requested by the Community Leader and also members of the Community. I leave to the Community leader to discuss the issue. We received a proposal from the Community leader and we try to assist and possible build a road requested by the community.

Juvenal da Costa
Does not agree with the company policy regarding recruitment process. Still wants the same way as the government.

Filomeno de Andrade
Timor Resources has own policy and procedures for recruitment which is in coordination and agreement with SEFOPE. Our policy is different on recruitment process to hourly rate and fortnight payment of salaries. Everybody was happy with it. You can testify with that gentleman seating next to you. He was Timor Resources employee in Suai. It is simple Mr Juvenal. You apply if agreed with our policy and procedures. Do not apply if you don't agree.

13.5 Details of Activities and Participants Suco Foho-Ai-Lico

As planned and advertised in the social media the Environment Public Consultation for EIS /EMP was carried out at Suco Foho-Ai-Lico on 27 of April 2021.

Venue- Suco Foho-Ai-Lico (Outdoor)
Time : 9:00am – 12:30pm
Particpants:

- Sub District Administrator of Hatudo Mr Rogerio da Costa
- OGL Hatudo- Mr Cegres Zelino Tilman
- Police Commander of Hatudo Mr Tomas Josep
- Community leader of Suco Foho-Ai-Lico Mr Donato de Araujo Laot
- Community leader of Leolima Mr Mariano de Almeida
- Community village leaders-Ferando da Costa, Alcino Amaral, Nazario das Dores, Juliao dos Santos, Rui Tati Tilman, Crisodio da Costa, Anita Honoria, Carmelita da Costa, Domingas da Costa, Julianti da Costa
- Local Veterans- Herculano das Dores, Santiago da Costa, Carmelito da Silva
- Timor Resources: Ocky Maher, Veronica Belo and Filomeno De Andrade
- Groena Consultant: Zefimo Corbafo, Abilio Fernandes, Caniggio Quintas

Agenda:

1. Introduction by MC – Veronica Belo
2. Opening by Hatudo Representative - Mr Cegres Zelino Tilman
3. Opening by Representative of Local Authority – Mr. Rogerio da Costa
4. General Decree Law - EIS and EMP Mr. Zefimo Carbafo and Mr. Abilio Fernandes
5. General Overview of the Project Timor Resources – Mr. Filomeno de Andrade
6. Open discussion (question, suggestion, and answer)
7. Message by Policy Commander – Mr Tomas Josep
8. Closed by Hatudo Representative - Mr Cegres Zelino Tilman
9. Closed by Representative of Local Authority – Mr. Rogerio da Costa
10. Lunch Together with Participants

Total number of participants - 230 - Signed Attendance list 179, Unable to sign 51

13.5.1 Introduction to the Meeting

The sub District Administrator opened the public consultation by greeting all the participants and grateful for the initiative of Timor Resources. See Figure 13-1 .

He is originally from Suco Foho-Ai-Lico therefore he was sharing the happiness of the locals due to the discovery and drilling in the area. He has a very good communication with Timor Resources and contacts have been constant with updates information of environment studies and plan of drilling preparation to take place in the area. He had a meeting with Timor Resources in his office on Monday, two days before this Public Consultation to go through the Environment Public Consultation received weeks ago. This event is very important and is part of the requirement to get license for drilling which is Category A License. Timor Resources are here to participate in this Pubic consultation to support with the necessary information for Timor Resources to submit the application for Category A License to drill at Suco Foho-Ai-Lico.

Figure 13-1. Opening by the sub Administrator of Hatudo Mr Rogerio da Costa

As per the agenda the environment team will present the legal framework related to the activities and the environmental studies and surveys carried out. Also they will go through the environment impacts in the affected areas. Beside the drilling preparation activities to carry out whenever Timor Resources is ready he had signed a proposal to Timor Resources to build a road to the Community of Be Mos /Raimerlau. The proposal included also road improvement to Bobe and Leolima. The access road to Be Mos will greatly assist movement of the Community in the area including students walking to school, medical assistance to patients and supply of foods and other basic needs of the community living in the area. I strongly support the proposal from the Community Leader of Suco Foho-Ai-Lico . This would be a testimonial of the good relationship of Timor Resources with the Community of Suco Foho-Ai-Lico and Hatudo. Timor Resources have also discussed about road improvement in Hatudo which will facilitate movement of their drilling equipment Suai- Suco Foho-Ai-Lico but also to complete the project of road improvement left uncompleted by the contractors due to lack of funds. Timor Resources have so many companies working in Hatudo’s area however support to the Community is rare to happen. Timor Resources is here for oil and gas but they never ignored any difficulties within the community as happened during Christmas for the vulnerable families. Timor Resources expect the presence of ANPM to acknowledge Timor Resources’ request for support to Timor Resources for road to the Community of Be Mos. This is a Community request beside the drilling activities and as sub District Administrator he will assume full responsibility to any question for the project.

He expects the Community to participate in the Environment Pubic Consultation for Timor Resources to get the necessary response as required in the environment submission for drilling. Also from the veterans I expect their support to the project. This is a development project which will complement their fight for liberation. Their Commander Gil has requested me to convey a message of full support with no obstacle to the project and make the drilling program become e reality at Suco Foho-Ai-Lico.

The outcome of this environment Public Consultation is to get License for drilling. Let’s all get the information share by Timor Resources, participate and provide the necessary support. The luck is in Timor Resources’ doorsteps. Timor Resources must cooperation in full. The outcome of the drilling activities is to benefit Timor Resources’ community and development of the Country. To the Land owners and property owners must cooperate. Is a project for the Nation. Mr Xanana have made a comment due opposition from the land owners to any development in the Country by saying that If he knew such ownerships of land and and their attitude during the fighting with Indonesia during the occupation he wouldn’t spent much time fighting and let the property owners fight for their properties.

Timor Resources has been very cooperative and has developed god relations and partnership with us in the project. Let’s support each other and make this project a reality for the Company and for us and Timor Resources’ Nation.

13.5.2 Further Discussions

Mr Tomas Yosep the police commander, provided a brief comment: The Country is Govern by Law and Order. Police force are agents of this implementation. This project is big investment and will highly benefit the Nation. Police Force will ensure the project is carried out with no obstacle and will be available at all time for any support. Disturbances and interruptions to this type of project is highly expensive with no benefit to anybody therefore requested cooperation and participation of the whole community to make this project successful at Foho-Ai-Lico and Hatudo.

Mr Deonato Araujo, Community leader of Foho-Ai-Lico was happy with the mobilization and participation. He submitted the proposal for access road to Be mos. He would like to move on with the proposal therefore will discuss with all the land owners affected by the proposed road to ensure availability of land for the road.

The Sub District Administrator closed the Environment Public Consultation. He was happy with the way the public consultation was carried out. He is looking forward to work with Timor Resources in the road improvement in Hatudo area to enable movement of the drilling equipment. He will assume full responsibility for any road improvement including section of roads left with no repair by the contractors. He fully support the access road proposed by the Community leader of Foho-Ai-Lico. While as sub Administrator he will not repeat the donation as happened with one Chinese company recently.

At the request from the local community the company donated a religious statue. This statue in placed in a chapel completely in ruin exposing prayers to unsafe situations in rainy or windy days. Why didn’t they ask for repair of the chapel in lieu of a small statue which won’t solve destruction and ruining of the chapel. This is an example when Timor Resources request assistance and support need to be precise, realistic and effective. The Community leader should liaise with the community of Bemos to be realistically benefit from the road they request.

Let us all support Timor Resources to have drilling at Foho-Ai-Lico a realistic dream of bright future for all of us. Thank you

The Environment Public Consultation was concluded at 1:30pm

Figure 13-2. Attendees at Suco Foho-Ai-Lico

13.6 Summary of Main Comments from Participants

The following questions were raised by participants during the public consultation at Suco Betano:

Hermenegildo Pereira
a. High Risk category A affecting fauna and Flora. What measures for air and soil?

Answer by Abilio Fernandes
Samples of air and soil were taken for study and will set as reference in our data record. The Company will monitor the quality of air and soil periodically to ensure be like the data record. If changes occur corrective measures will take place to rectify the problem.

b. Is lease agreement done before or after drilling?

Answer by Filomeno de Andrade
Land negotiation and agreement is done before the use of land. The agreement should contemplate all the necessary activities including duties and responsibilities from both sides: landowner and operator.

c. What will happen to the houses close to the drilling sites?

Answer by Filomeno de Andrade
According to the Law and procedures in place we will relocate the occupants and find It is contemplating in the law. If houses are close to the drilling the occupants are relocated and conditions of the relocation are subject for negotiations between the occupants and the operator. In our case at the well location is far from any houses therefore no relocation and the provisional in the law is not applicable for Rusa.

d. What happen after the drilling?

Answer by Filomeno de Andrade
If found oil in quantity for production the operator will review the lease agreement with the landowner for longer lease or purchase of the land possible just for the well head and the access. If not found oil or the quantity is not commercially viable for production the land will return to the landowner under conditions agreed in the lease agreement.

Moeses Pereira
Just recommendation to the Community to cooperate and support Timor Resources drilling activities. The outcome is not only benefiting the Company but the Country.

Answer by Filomeno de Andrade
Thank you for the support.

Tito Gonzaga
a. Recently, around two months ago ETO caused oil spill of around 5000 L to the sea during the transfer from shipment to the power station. There is no more fish in the area and no fishing activities since. What approach Timor Resources will have in this case?

Answer by Filomeno de Andrade
That is ETO's problem, and the Government should take the necessary measures to deal with it. We are not involved in it. We do have high concern with the damages that occurred but is not Timor Resources problem. It is ETO and the Government's problem. Timor Resources will have an Environment Mitigation Plan in place for drilling activities and this is what we are discussing now. My suggestion for you to raise your concerns to the Government and Local Authorities

b. What implication would be with extension of 5 KM to the sea?
Answer by Filomeno De Andrade
The extension is related to continuity of the geological formation to the sea. We are doing Onshore drilling and there is no implication while the drilling in Onshore. For any offshore activity we will have law and procedures to follow including environment studies and environment mitigation plan.

Maria Martins
What is the environment impact for areas surrounding the drilling sites and what preventive measures are taken?

Answer by Abilio Fernandes
I went through the slides regarding the environment survey and studies and also environment mitigation plan. Yes, we have preventive measures for any negative impact

Filomeno de Andrade
We have provided copy of the EIS and EMP which is in the Suco's office. We encourage you to read in additional to the explanation of Mr Abilio Fernandes. We are always available for any question you may want to ask.

Aniceto da Costa
a. Why still not sure with the discovery sine you have carried out seismic and Geologic activities?

Answer by Filomeno de Andrade
We are using 2 D technology. It does not tell the volume and the quantity. 3D technology is different however is very expensive.

b. If you have now result, would you have handed over the data to the Government?

Answer by Filomeno de Andrade
Correct. It is in the PSC contract. If we don't have discovery will handed out the data acquired to the Government

Simoes
If no discovery what is next?

Answer by Filomeno De Andrade
If we have no discovery, we will close the well. Follow the abandonment procedure according to the law and lease agreement and move out of the place.

Joao Dias
What recruitment system is in place?

Answer by Filomeno de Andrade
The recruitment system is for:

- *Skilled – Professional with years of experience according to requirements in the job description and advertisement. Job advertisement is national wide through newspaper, television and social media, local administration notice board.*
- *Semi-skilled – Professional with years of experience according to requirements in the job description and advertisement. Job advertisement national wide through newspaper, television social media, local administration notice board*
- *Unskilled- background and experience according to requirements in the job description and advertisement. Job advertisement locally through social media, local radio, and local administration notice board.*

13.7 Details of Activities and Participants

As planned and advertised in the social media the Environment Public Consultation for EIS /EMP was carried out at Suco Betano the 28th of April 2021.

Venue: Suco Betano Community Hall (Outdoor)
Time: 09:30 – 12:30
Subject: Environment Public Consultation in PSC TL-OT-17-09

- Police Commander of Same : Mr. Adão de Araujo
- Community Leaders of Betano Representative : Mr. Felix da Costa
- Community Villages Leaders : Aurio Francisco, Saul Seixas, Domingos Tilman, Saturnina Seixas, Manuel das Neves
- Traditional Leaders : Jose de Nascimento
- Timor Resources : Filomeno de Andrade, Octavianos Maher, Veronica Belo
- Groena Consultant : Zefimo Corbafo, Abilio Fernandes, Caniggio Quintas

AGENDA

1. Introduction by MC – Veronica Belo
2. Opening by Community Leaders of Betano Representative - Mr. Felix da Costa
3. Opening by Representative of Local Authority – Mr. Rogerio da Costa
4. General Decree Law - Environment Impact and Management Plan Environment by Groena Consultant – Mr. Zefimo Carbafo and Mr. Abilio Fernandes
5. General Overview of the Project Timor Resources – Mr. Filomeno de Andrade
6. Open discussion (question, suggestion, and answer)
7. Message by Policy Commander – Mr. Adao de Araujo
8. Closed by Community Leaders of Betano Representative - Mr. Felix da Costa
9. Lunch Together with Participants

Total Number of Participants : 78 -Signed attendance List 67, Unable to Sign 11

13.7.1 Introduction to the Meeting

The representative of Community leader Mr. Feliz da Costa opened the environment public consultation by greeting Timor Resources, the Environment Consultants and all the participants. He was proud to represent the Community Leader who was unable to attend the meeting due to commitments at the District Administration office.

He was happy to see Betano included to participate in the drilling activities of Timor Resources in PSC TL-OT-17-09. He requested all the participants to pay attention to the information shared by Timor Resources and the Environment Consultant. For any impact to the Community of Betano should that be discussed and find solutions to get the drilling project moving with no obstacles. It is big project and big investment which outcome will also benefit people of Betano, District of Manufahi and the Country Timor-Leste.

Figure 13-3. Community Leader Mr. Felix da Costa Opening the Consultation

13.7.2 Further Discussions

Mr Adao de Araujo, the police commander, provided a brief comment: Police force are also human being. Their duties are to ensure Law and Order are in place to secure peace and safe environment to the population. The level of defence and self-defence by police force are on many occasions interpreted as very aggressive. Troublemakers must be aware of police response as reaction to their actions. Timor Resources will have law and discipline in place also to ensure activities of Timor Resources are carried out with no obstacles. Police Force will be always available to secure such big investment carried out their activities according to their plan and timeframe with no problem.

After the message by the Police Commander Mr. Felix da Costa, the representative of the Local Community Leader closed the Environment Public Consultation with thank you to all the participants. Special Thank you to Mr. Filomeno de Andrade and from Manufahi to bring the project to his homeland and will have all the necessary support for success of the project.

Figure 13-4. Attendees at Betano Public Consultation

13.8 Recommendation for Future Consultations

With the experience gained from this and previous Public Consultations, it is advantageous to prepare a list of potential issues that the participants might consider for discussion at the meeting. The following are the topics that were made aware to participants in order to assist and focus the discussions:

- Local Participation
- Cultural And Traditional Respect And Ceremonies
- Avoiding Damaging The Environment
- Compensation regarding land use
- Community Programs

14 DIFFICULTIES ENCOUNTERED

It was very difficult to find information specifically relating to the Rusa-1 location and therefore it was necessary to rely on information from the region in general and other parts of Timor-Leste. Similarly, there is very little information available on the country's biodiversity and natural environment.

There are no accredited laboratories available in Timor-Leste and with Covid restrictions Timor Resources had to rely on hand held instrument measurements rather than more sophisticated technical systems operated by competent laboratories. This was particularly true with regard to air and soil sampling.

15 CONCLUSIONS AND RECOMMENDATIONS

15.1 CONCLUSIONS

Timor Resources, a company registered in Timor-Leste under TIN 20032094, and Timor Gap the National Oil Company of Timor-Leste entered into Production Sharing Contract PSC TL-OT-17-09 for petroleum operations on the 7th of April 2017. The Contract made under the Law No.13/2005 enables exploration activities to be carried out for the purpose of development and exploitation of Petroleum in the Contract Area. Timor Resources is the Project Proponent and Operator who on behalf of the Contractor group seeks to drill a single exploration drilling in good oil field practice. The Contract Area defined by PSC TL-OT-17-09 is an area that covers 1,291 km^2, including 1,002.4 km^2 onshore extending along the coastline for approximately 52 km and up to 30 km inland, and 288.6 km^2 of the near offshore for an average distance of 6 km from the coastline.

Based on Article 5 (defining project scope) chapter III environmental assessment information phase under Decree Law No.5/2011 Environmental Licensing and ANPM decision on category for drilling project in PSC TL-OT-17-09 ANPM/HSE/S/20/096 dated 13th August 2020, the proposed project that falls in Category A, thus requires a formal environmental assessment. The structure of the assessment process follows that as set out in the Annex IV of the Ministerial Diploma No.46/2017 of the 2nd of August 2017. Further, Law No.5/2011 requires that full details of the project are disclosed to the public and that the public are engaged in public consultations as required in Ministerial Diploma No.47/2017 of the 2nd of August 2017 related to *Public Consultation Procedures and Requirements During the Environmental Assessment process.*

The methods used for the identification and assessment of potential impacts associated with the project meet Timor-Leste legislative requirements, as described above.

Following the description and nature of the proposed works (Section 4) and consideration of the prevailing environment (Section 6), the residual impacts resulting from the assessment after mitigation (Section 9) are summarised here and in Table 15-1.

Traffic - An increase in traffic may create a nuisance and potential impact on the safety of other road users, however, this is a short program temporally and the transient nature of the project limits potential effects.

Soil - Removal of topsoil and soil compaction will occur largely during the construction phase, the effect will continue through operations until sites are decommissioned and rehabilitated.

Air Quality - During construction a decrease in air 1uality from dust may cause nuisance and impact on the community and fauna and flora immediately near to the project site. A short construction program and low levels of diesel usage limit impacts.

Gaseous emissions during rig operations may create a nuisance and minor impact in the immediate area around the project site. A short drilling program of 40 days and low levels of diesel usage in the region 5,000 L/day or 150 tonnes diesel for the duration of the well limit impacts.

As with the construction phase, dust may cause a nuisance during decommissioning, but this again will be short term and temporary. During the decommissioning period, air quality impacts are considered short term and transient.

Solid Waste - Solid wastes will arise from a project of this nature, waste management will provide the best available solution for waste management, however, the principal method of incineration will result in emissions to the atmosphere. Any emissions will be short term. A Waste Management Plan (WMP) has been completed and takes into account the processes for treating or eliminating, partly or fully, all waste generated by the project.

Noise - Drilling operations will be conducted on a 24 hour, 7 day per week basis so may cause a short term nuisance for local communities and wild life. The duration is expected to be only 30-40 days and consequently this impact is to be considered only short term and transient.

Mitigation measures have been proposed for all the negative impacts identified to protect the physical, biological, and socio-economic environments. An Environmental Management Plan (EMP) has been developed to manage the potential impacts and ensure that they remain at acceptable levels throughout the course of the program. A “No Action” alternative was determined to be unwarranted because the proposed program is required by agreement between Timor Resources and the Government of Timor-Leste and is consistent with national development objectives and can clearly be executed with little measurable environmental impact.

The impact assessment technique used determines that most identified impacts are classed as having a “Moderate” significance level which are reduced to “Minor” on the application of mitigation measures. Those identified as “Minor” were subsequently reduced to “Negligible” on application of residual measures. The singular exception relates to a catastrophic oil spill which would result in a “Major” impact, that is, potentially long term and affecting a larger regional area beyond the site, this mitigated by the implementation of an oil spill contingency plan and the emergency response and incident management plans, reducing the impact to “Moderate”.

The impact assessment outlined in this EIS reflects that the project is limited spatially to the drilling location and immediate surrounds and is short term and transient in nature. Consequently, there is limited potential to cause significant or permanent impacts. Any negative residual impacts are considered inconsequential compared to the benefits generated.

Table 15-1. Summary of Residual Impacts (after Table 9-55)

NO	IMPACT	INITIAL IMPACT RATING	RESIDUAL IMPACT AFTER MITIGATION
1.	Land Use All Phases	Minor 7	Minor
2.	Traffic All Phases	Moderate 9	Minor
3.	Soil All Phases	Minor 7	Minor
4.	Air Quality Construction	Moderate 9	Minor
5.	Air Quality Operations	Minor 7	Minor
6.	Air Quality Decommissioning	Moderate 9	Minor
7.	Surface Water All Phases	Minor 4	Negligible
8.	Groundwater All Phases	Minor 5	Negligible
9.	Operational Leaks and Spills All Phases	Minor 4	Negligible
10.	Worst Case Oil Spill Operations	Moderate 8	Moderate
11.	Water Supply All Phases	Negligible 2	Negligible
12.	Biodiversity, Flora and Fauna All Phases	Minor 5	Negligible
13.	Liquid Effluents All Phases	Minor 7	Minor
14.	Solid Waste All Phases	Minor 8	Minor
15.	Noise Construction	Minor 7	Minor
16.	Noise Operations	Minor 6	Minor
17.	Noise Decommissioning	Minor 7	Negligible
18.	Light, Odours and Heat	Minor 5	Negligible
19.	Community	Minor 8	Negligible
20.	Visual	Negligible 4	Negligible

15.2 RECOMMENDATIONS

The EIA process has identified that the project is limited spatially and is short term and transient in nature with limited potential to cause any permanent or significant impacts. The negative residual impacts are considered inconsequential compared to the benefits generated, hence the Environment Authority is requested to license the project.

The project is viable subject to the EMP being followed and complying with all other statutory requirements that the project subscribes to.

Key recommendations are as follows:

1. Implement a Redress and Grievance Procedure that will be used throughout the project.
2. The Community Liaison Officer will maintain continuous engagement with all stakeholders and keep communities informed at all stages of the project in regard to activities, schedules and potential impacts.
3. All activities to be conducted in compliance with Timor-Leste laws including but not limited to: Law No.3 2012 - Legislative Authorisation in Environmental Matters; Law No 26 2012 - Environmental Basic Law; Decree-Law No.18/2020 - Onshore Petroleum Operations.
4. All activities to be conducted in compliance with Timor Resources HSE policy and Operating Management System Standards.
5. Consult with local administration and security agencies for support on security issues.
6. Liaise with the local community during the recruitment process.
7. Implement a Waste Management Plan and agree waste management practices and facilities in consultation with the Municipality.
8. Wastes should only be transported by an approved waste transporter agreed in consultation with the Municipality.
9. Implement a Traffic Management Plan and enforce traffic speed limits to minimise dust generation.
10. Make use of the existing access roads to the maximum extent possible.
11. Minimise vegetation clearance.
12. Prepare Rehabilitation Plan at the decommissioning stage.
13. Implement Noise and Air Quality Management Plans.
14. Implement Incident Management System: Crisis Management Plan - Corporate, Incident Management Plan - National, and Site Emergency Response Plan and Oil Spill Contingency Plan - local.

16 NON-TECHNICAL SUMMARY

English	Tetum
Timor Resources Pty Ltd acquired onshore PSC TL-OT-17-09 in Ainaro and Manufahi Municipalities on 7 April 2017. The licence covers1,291 km^2, including 1,002.4 km^{2}onshore extending along the coastline for approximately 52 km and up to 30km inland, and 288.6km^2 of the near offshore for an average distance of 6 km from the coastline.	Timor Resources Pty Ltd hetan contratu ba rai laran PSC TL-OT-17-09 iha Municipio Ainaro e Manufahi iha loron 7 de Abril 2017. Lisença ida ne'e ba area 1,291 km^2 nebe 1,002.4 km^2 iha rai laran tuir tasi ibun mais ou menus 52 km no to'o 30 km ba railaran e 288.6 km^2 tama tasi laran mais ou menus 6 km sura husi tasi ibun.
The project is to conduct exploration drilling of a single well named Rusa-1 within the Post Administrative Hatu-Udo, Ainaro Municipality. The exploration drilling is planned to commence in Q4 2021, subject to easing of restrictions imposed due to Covid-19 pandemic.	Projeto ida ne'e atu halao esplorasaun ho perfurasaun mina matan ida naran Rusa-1 iha postu Administrativu Hatudo, Municipio Ainaro.Perfurasaun ba esplorasaun planu atu hahu iha Q4 tinan 2021, depende oin sa restrisaun hamenus tan medida ba Pandemia Covid 19.
This well was identified as a result of prospect evaluation carried out by Timor Resources' exploration team which ultimately defined the targeted plays to be drilled.	Posu ida ne'e identifika tuir procesu estudu no tetu hala'o husi equipa esplorasaun Timor Resources nian nebe halo desisaun ikus liu kona ba fatin nebe atu halo perfurasaun.
The methods used for the identification and assessment of potential impacts associated with the project meet Timor-Leste legislative requirements, as defined under Environmental Licensing Decree Law 5/2011 and supporting Ministerial Diploma 46, which describes the approach required by Timor Resources to identify the project impacts, in particular for each project phase: construction, operation and decommissioning.	Metodo ne'ebe usa atu hala'o identifikasaun no tetu potensial impactu kona ba projetu tuir lei hatete iha Timor Leste, tuir hatete iha Licensa Ambiental Decreto Lei 5/2011 no mos apoiu husi diploma Ministerial 46 nebe hatudu dalan atu Timor Resources tuir hodi hare impactus ba projetu, liu liu iha fase ba projetu ida ida nian hanesan: construsaun, operasaun no remata.
The project activities are broken down into three phases with regard to impact assessment: construction, drilling operations and decommissioning, the project activities are summarised as follows:	Atividade projeito nian sei fahe iha fase tolu tuir estudu ba impactu: construsaun, perfurasaun, operasaun e remata, atividade ba projetu bele tau hamutuk hanesan tuir mai:
Land access - the proposed drilling site does not require any resettlement of people, and all areas of cultural significance have been avoided. Land use and land access discussions included: • Negotiations in good faith and in a respectful and reasonable manner.	**Asesu ba Rai** - Area nebe hanoin atu fura la precija la muda ema e fatin nebe importante ba cultura hasses tiha ona. Diskuti ba rai atu uja no dalan liu fatin tenki hatama mos: • Negosiasaun ho fiar, respeita no hahalok diakalu no respeito.

• Consultation with landowners to obtain their consent. These consultations covered the impact and term of the proposed use or access, employment and business development opportunities. • A community land use agreement, a resettlement and livelihood restoration plan, and agreements if displacement or relocation is required. • Compensation and land rental with local landowners for land use in accordance with the Timor-Leste rates, as required by the Onshore Decree Law of Timor-Leste. Compensation payments are transparent and made in the presence of relevant community and government representatives or independent observers. **Geotechnical, Geochemical and Topographic surveys -** Surveys are conducted to gain understanding of the topography and soil characteristics of well sites and road access. **Land clearance for road access and site construction -** The arable topsoil and vegetation is stockpiled and used to rehabilitate the site once drilling. **Road and bridge surveys plan -** Surveys have been conducted on existing roads, bridges, and highways and mapped for the rig moves. **Establish water supply -** Water will be sourced from local contractors. The amount of offtake from the water source will be such that it is not detrimental to the supply for other users. **Well Site -** the dimension of each site is 100m x 100m. Two mud pits with approximate dimensions of 18m x 20m x 3m and 14m x 30m x 3m will be prepared with an impermeable membrane to prevent soil contamination. The pits will be fenced. **Drilling Operations -** The Drilling operation will be conducted as per standard onshore oilfield best practice, the well specific drilling programs is approved by ANPM. Drilling operations will be conducted around the clock. The time taken to drill a bore hole is expected to be in the order of 30-40 days.	• Konsultasaun ho nain ba rai atu sira hatan. Konsulta sira ne'e kona ba impacto e oin sa atu uja rai ka dalan, emprega ema e oportunidade atu desenvolve negocio • Akordu ba uja comunidade nia rai, muda hela fatin no planu atu hadia moris e akordu karik muda sai ka ba hela fatin seluk wainhira precija. • Compensasaun no renda ba rainebe uja husi nain ba rai kona ba rai uja tuir folin iha Timor Leste, tuir lei Onshore nian iha Timor Leste. Pagamentu ba compensasaun sira transparente no hala'o iha representante husi comunidade, governu ka observadores independentes. **Survey Geotechnical, Geochemical e Topofraphic** hala'o atu hetan comprende kona ba topografia no carateristica rai nian iha mina fatin no dalan acesu. **Hamos fatin ba dalan atu ba Fatin construsaun** – Rai leten ne'ebe suru no ai horis sei rai hamutuk atu bele usa fali hodi hadia fatin ne'e wainhira perfurasaun remata. **Survey ba luron ho ponte**–Survey hala'o ona ba luron, ponte no highways nebe iha mapaatu lori liu rig. **Oin sa atu fornese be**–Be sei foti husi contrator lokal. Be nebe atu foti sei husi fatin nebe la hamenus be nebe fornese ba ema seluk nebe uja. **Fatin posu mina**–Kada fatin fura mina nia luan metru 100 x100. Fatin rua ba tau tahu nia bot 18m x 20m x 3m e 14m x 30 x 3m sei prepara ho membrana atu labele iha contaninasaun husi rai. Fatin tahu nia sei iha lutu haleu. **Operasaun Perfurasaun** - Perfurasaun sei hala'o tuir padraun nebe diak liu atu fura mina iha rai laran, programa especifiku ba perfurasaun ne aprova husi ANPM. Operasaun perfurasaun sei hala'o ho lalais. Tempu nebe lori atu hala'o perfurasaun ida sei lori loron 30 – 40.

Well Testing - Where a hydrocarbon formation is found well tests may be conducted. **Rig Move -** Rig moves from one location to the next have been planned and routes assessed including review of road width, intersections, bridges, community and public infrastructure. **Decommissioning -** If the well does not contain oil, the site is decommissioned and restored to its original state or to a state as agreed with landowners and approved by the appropriate authorities.	**Teste ba posu mina**–Fatin nebe hetan formasaun hydrocarbon (mina)sei hala'o teste ba posu ne'e. **Movimento ba Rig** (ekipamentos hodi halo perfurasaun) –Planu ba rig nia dalan atu liu husi fatin ida ba fatin seluk halo tiha ona no mos hare no hadia luron nia luan, comunidade no infraestrutura publika. **Dekomisionamento -** Se karik posu nebe fura la iha mina, fatin ne taka e hadia fali tuir molok atu hahu atividade sira ou tuir situasaun nebe konkorda ho nain ba rai no hetan aprova husi autoridade relevante.
The following alternatives were assessed as part of the project: • **"No Project"** -A "No Project" alternative was rejected. • **well location** -The area surrounding the optimal well location was analysed to assess the impact on the environment, community, and cost of the various alternatives. These considerations are not mutually exclusive so have been considered in terms of a risk assessment based on the location of alternatives within the viable proximity of the optimal location. • **project design** -an early decision was made to drill vertical, straight holes on safety and cost grounds. • **water source** -water supply will be met by local suppliers since the level of offtake is such that it is not detrimental to the supply for other users. • **Power supply** -there is no immediate source of mains power supply at the Rusa-1 well location, thus, power for the rig will be supplied from diesel generators on site to ensure consistent supply, the Betano camp will utilise mains supply with a backup generator as required. • **Cuttings disposal -** Cuttings will be buried in an impermeable liner on site after dewatering.	Alternativa sira tuir mai hare fali ona hanesan mos parte projetu : • **"La iha Projeto"-** Alternativa ba "La iha Projetoatu"rejeita ona. • **Posu fatin**–Fatin nebe haleu ida nebe mak diak liu ba posu fatin analiza ona hodi tetu impaktu kona ba ambiente, comunidade no folin ba alternativas sira seluk. Considerasaun ida ne'e labele hanesan lolos ba fatin hotu nebe hare ona tuir risku nebe mak tetu ba fatin sira alternativa nebe besik fatin ida nebe mak diak liu. • **Projetu nia design**–Decisaun hala'o uluk tiha ona kona ba perfurasaun vertical e los baseia ba safety no folin. • **Fatin Be nian**-Be atu fornese ne'e sub contactor sei halo tuir nebe mak precija no quantidade nebe mak foti sei la prejudika fali ema sira seluk. • **Eletrisidade** -Oras dadaun Eletrisidade la tama iha fatin posu Rusa-1, tan ne'e eletrisidade ba rig sei fornese husi generator Diesel iha fatin ne duni atu bene asegura fornesimentu estavel, acampamentu Betano sei uja husi EDTL no iha back up ho generator wainhira precija. • **Fatin rai Foer**–Foer husi perfurasaun sei hakoi ho lensol impermeaval iha site wainhira maran.

• **drilling fluids** -Water based drilling fluids will be utilised throughout the project. **Environment** The drilling activities will not cause significant negative impact to identified animals within the location because they can move out to other locations when drilling activities are being carried out. **Positive Impacts** • **Employment** - 150 -180 positions will be filled by Timorese nationals during the whole of the drilling campaign. There will be a combination of skilled and unskilled positions, in the drilling crews, civil construction crews, geological teams, security teams, catering and services for the drilling contractor as well as a host of unskilled positions for labourers, cooks, cleaners and administration staff. • **Community programs** -Timor Resources has implemented a number of CSR programs, including horticulture that is now well established. Acreage of land owned by farming cooperative group has been gifted seeds, irrigation and financial support to increase their capacity to grow commercial crops. During drilling there is the expectation that US$70,000 will be spent on CSR initiatives directly associated with the contract area • **Complaints - Commun**ity members can raise matters at any of Timor Resources' sites through the local community liaison officers. Grievance are recorded, assessed for potential risk or impact, and responded to it accordingly, and/or elevated to senior management. This approach ensures grievances relating to our activities can be raised easily and in a culturally appropriate manner.	• **Fluido husi perfurasaun** - Fluido kahur ho be sei uja iha perfurasaun tomak. **Ambiente** Atividade perfurasaun sei la fo impaktu negativu bot ba animal sira nebe mak identifika ona besik fatin ne'e tan bele muda ba fatin seluk wainhra hala'o hela perfurasaun. **Impaktu Positivo** • **Kampo de trabalho**- Fatin servisu 150-180 sei fo'oba ema Timor sira wainhira hala'o perfurasaun. Fatin sira ne'e sei kahur ema skilled, unskilled, crew ba perfurasaun, crew ba construsaun civil ekipa geologia, ekipa security, catering no servisu ba perfurasaun no mos posisaun unskilled ba labour, tein, cleaners no administrasaun • **Programa ba Comunidade**- Timor Resources implementa ona programa ba komunidade hanesan horticulture nebe hari diak hela ona. Rai bot ho grupu agricultura hetan apoio ho fini, irrigasaun no apoio ho osan hodi habot tan sira nia capasidade atu kuda sasan ba fan. Wainhira hala'o perfurasaun hein atu uja $70,000.00 ba atividade nebe ligadu ho CSR iha area Kontratu. • **Keixa**- Membro komunidade bele hato'o keixa ou duvidas ba iha Timor Resources nia Site liu husi Community Liaising Officer. Sira nia keixa sei regista,tetu kona ba potensial risku ka impaktu no hetan resposta tuir keixa, e/ou hasai ba senior management. Dalan ida ne'e atu asegura keixa kona ba ami nia atividade bele fasil atu hato'o tuir hahalok no cultura nebe diak..

• **Procurement of Goods and Services** - procurement from Timorese owned and operated businesses in the contract area goods and services include but are not limited to: - Fresh Food and water $142,344 - Accommodation Housing/Office Supply $126,700 - Diesel Supply $276,000 - Government Charges including import duties and WHT $682,000 - Rental of Heavy Equipment, trucks, cranes $172,000 - Environmental Consultancy Engagement $190,000 - Aggregate and rock base $42,000 **Residual Impacts** • **Traffic** - An increase in traffic may create a nuisance and potential impact on the safety of other road users. Limited number of locations and roads, short program and transient nature of the project limits potential effects. • **Soil** - Removal of topsoil and soil compaction will occur during the construction phase and continue until sites are decommissioned and rehabilitated. **Air Quality** - a decrease in Air Quality from dust and gaseous emissions during operations may create a nuisance and minor impact on the fauna and flora around the project site. A short drilling program (30-40 days) and low levels of diesel usage limit impacts. With the short project period impacts are considered short term and transient. • **Solid Waste** - by the nature of the project, solid wastes will arise, waste management will provide the best available solution for waste management, however, the principal method of incineration will result in emissions to the atmosphere.	• **Prokuramento ba sasan no services-** Prokuramento husi Companhia Timor no business sira iha area Goods and Services nebe inklui mai be la'os ne deit ba: -Hahan fresku ho be $142,344 -Hela fatin/Fornesimentu ba Office $126,700 - Fornecimentu mina diesel $276,000 - Servisu importasaun no customs clearance WHT $682,000 - Aluga equipamentos pesadus, truck no cranes $172,000 - Konsultasaun ba impaktu ambiental $190,000 - Fatuk rahun no fatuk $42,00 **Impaktu residuais** • **Trafiku-** movimentu trafiku ne'ebe mak aumenta karik inkomoda no iha posibilidade atu fo impaktu ba seguransa ema seluk ne'ebe mak usa luron Hamenus fatin no luron, habadak programa no movimentu oin oin huis projectu hamenus dalan ba efeitu sira • **Rai-** suru rai parte leten nian no kompaktasaun sei akontese durante fase konstrusaun no kontinua to'o fase dekommisionamentu no rehabilitasaun ba rai ne'e. • **Kualidade ar-** Kualidade ar karik sei redus husi rai rahun no emisaun gas durante fase operasaun karik sei inkomoda no karik sei fo impaktu ki'ik ba animal no ai horis iha area projeto. Programa perfurasaun ne'ebe badak (loron 30-40 ba kada posu) no usa gasoel ne'ebe mak la barak sei limita nia impaktu. Ho periodo projeto ne'ebe badak signifika nia impaktu mos sei badak e liu lalais. • **Lixo Solido** – tuir lalaok projeito nian, lixo solido sei existe, jestaun lixo nian sei oferese solusaun nebe diak atu maneja lixo solido sira ne'e, maibe, metodo principal insinerasaun (sunu) sei resulta emissao ba atmosfera.

• **Noise** - drilling operations will be conducted on a 24 hour, 7 day per week basis so may cause a nuisance for local communities and wild life, but the duration is 40 days, thus is short term and transient.	• **Barulhu**- Atividade perfurasaun sei halao durante loron no kalan (24 horas) no loron hitu kada semana. Tamba ida ne'e, karik sei inkomoda komunidade local no animal fuik sira. Maibe, durasaun projeto sei hotu iha tempu badak e tamba ida ne'e, nia ipaktu mos sei akontese durante tempu ne'ebe badak.
Public Consultation Presentations were made to local communities in the areas where the well site is located. The participants included the public, local community leaders such as Chefe Suco, Chefe Aldeia and local youth groups, also representatives of local authorities such as District Administrator, Sub District Administrator and Vice Commander of Police. Consultations were carried out at the following communities, participation was positive. • Tuesday 27 April 2021 Suco Foho-Ai-Lico. • Wednesday 28 April 2021 Suco Betano.	**Konsultasaun Publiku** Apresentasaun ba programa halo ona ba komuidade local iha area ne'ebe besik ba iha posu lima ne'ebe atu fura. Partisipante iha konsultasaun publiko inklui komunidade local, lideres locais hanesan Chefe Suco, Chefe Aldeia no juventude local no mos representante husi autoridade local hanesan Administrador Municipio, Administrador sub distrito no vise komando PNTL. Konsultasaun publiku halo iha fatin sira hanesan tuir mai ne'e: • Tersa Feira 27 Abril 2021 Suku Fohoailico. • Quarta Feira 28 Abril 2021 Suku Betano
Conclusions Mitigation measures have been proposed for all the residual impacts identified aimed at protecting the physical, biological, and socio-economic environments. An Environmental Management Plan (EMP) has been developed to manage the potential impacts of the proposed activities and ensure that they remain at acceptable levels throughout the course of the program.	**Conclusaun** Medidas ba mitigasaun hato'o ona iha proposta ba ba impaktu residual hotu ne identifika ona hodi bele mos proteje ambiente fisiku biologia, no socio-economikal. Sistema Planu Gestaun ba Ambiente (EMP) desenvolve ona atu bele maneija impaktu ne'ebe karik sei akontese ba atividade iha proposta no garante katak sei iha nivel aceitavel wainhira programa hala'o hela.
Recommendations Key recommendations are as follows: • Implement a Redress and Grievance Procedure that will be used throughout the project. • The Community Liaison Officer will maintain continuous engagement with all stakeholders and keep communities informed at all stages of the project in regard to activities, schedules and potential impacts.	**Rekomendasaun** Rekomendasaun principal sira mak hanesan tuir mai ne'e: • Kria Sistema atu bele hodi simu reklamasaun no sei implementasaun durante period projeto nian • Ofisial ba Assuntu Comunitarion sei halo nafatin contaktu ho parte hotu nebe partisipa no hato'o nafatin informasaun ba comunidade kona ba fase hotu hotu relasiona ho atividade, planu no impaktu nebe bele mosu.

• All activities to be conducted in compliance with Timor-Leste laws including but not limited to: Law No.3 2012 - Legislative Authorisation in Environmental Matters; Law No 26 2012 - Environmental Basic Law; Decree-Law No.18/2020 - Onshore Petroleum Operations. • All activities to be conducted in compliance with Timor Resources HSE policy and Operating Management System Standards. • Consult with local administration and security agencies for support on security issues. • Liaise with the local community during the recruitment process. • Implement a Waste Management Plan and agree waste management practices and facilities in consultation with the Municipality. • Wastes should only be transported by an approved waste transporter agreed in consultation with the Municipality. • Implement a Traffic Management Plan and enforce traffic speed limits to minimise dust generation. • Make use of the existing access roads to the maximum extent possible. • Minimise vegetation clearance. • Prepare Rehabilitation Plans at the decommissioning stage. • Implement Noise and Air Quality Management Plans. • Implement Incident management system: Crisis Management Plan - Corporate, Incident Management Plan - National, and Emergency Response Plan and Oil Spill Contingency Plan - local.	• Atividade hotu sei hala‘o tuir lei ne’ebe hala’o iha Timor Leste maibe la’os deit: Lei no..3 2012 konaba ba autorizasaun ba assuntus ambientais, Lei numero 26 2012 konaba lei basico ambiental, Dekreto Lei numero 18/2020 konaba atividade petrolifero iha rai laran. • Atividade hotu sei hala‘o tuir Timor Resources nia Sistema Saude Seguransa Ambiental no Padraun ba sistema manejamentu ba operasaun. • Konsulta ho administrasaun local no agencia seguransa atu apoia kona ba asuntu seguransa nian.. • Kordena ho komunidade local durante prosesu rekrutamento. • Implementa Sistema de jestaun ba foer no konkorda ho praticas jestaun ba foer no facilidades no consulta ho municipio. • Foer so bele transporta husi kompanhia ne’ebe mak hetan ona aprovasaun atu transporta foer. • Implementa Sistema de jestaun ba trafiku no reforsa limite de velocidade hodi bele minimiza rai rahun. • Utiliza dalan ne’ebe mak iha nanis ona se possivel. • Minimiza hamos ou tesi ai horis • Prepara plano ba rehabilitasaun ba fase decomisiasaun • Implementa Sistema de jestaun ba kualidade ar no barulho • Implementa Sistema de jestaun ba incidente hanesan: Plano jestaun de Krise – Corporativa, Plano de jestaun ba incidente – Nasional, no Plano resposta ba situasaun emergencia no plano hodi resposta ba Mina fakar – local.

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