



Timor
Resources

**Operating Management System
Environmental Management Plan - Drilling Activity
PSC TL-OT-17-09
Appendix L - Surface Water Management Plan
Doc No: TR-HSE-PLN-018**

**Revision: Rev1
Issue date: 04/06/21
Page: 1 of 10**



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Resources

**ENVIRONMENTAL MANAGEMENT PLAN (EMP)
DRILLING ACTIVITY
PSC TL-OT-17-09**

APPENDIX L - SURFACE WATER MANAGEMENT PLAN

TR-HSE-PLN-018



REVISION HISTORY

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Rev1	04/06/21	Issued for review

MANAGEMENT APPROVAL

POSITION TITLE	NAME	SIGNATURE	DATE
Chief Executive Officer	Suellen Osborne		04/06/21
GM Exploration	Jan Hulse		04/06/21

DISTRUBUTION LIST

AUTHORITY/COMPANY'S NAME	DATE	REVISION
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ACRONYMS

EIA Environmental Impact Assessment
EMP Environmental Management Plan
TR Timor Resources

1 INTRODUCTION

1.1 CONTEXT

The project is the construction of a wellsite and access road for the Timor Resources Rusa #1 exploration well in PSC TL-OT-17-09 on the South Coast of Timor Leste located at Suco Foho Ai-LiCo, Ainaro, Ainaro District.

1.2 PURPOSE

This project was determined to require a Category A Licence under Decree Law No. 5/2011.

The TR Surface Water Management Plan fulfils a requirement under the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). The EIA identified potential impacts from the project and various plans have been developed to supplement the EIS and EMP. The Plan presented here details the mitigation measures identified to minimise environmental impacts on surface waters from operational activities, as well as assigning responsibilities to ensure the activities are implemented.

This document is an appendix to the EMP – Appendix L.

1.3 SCOPE

This document will address the surface water management through mitigation measure for the PSC: TL-OT-17-09 drilling programme.

2 POTENTIAL WATER IMPACTS

2.1.1 Surface Water

A local topographic survey has been carried out in the area of the proposed well sites 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 well site. A 30 m Satellite DTM was used to compute a watershed analysis for the site. The analysis provided the catchment area upstream of the well site and the direction of flow(s) from the site. The EIS Project Description Section 4. presented a series of maps of the well location, any nearby receptors and also illustrated the drainage patterns

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 irrigation channels 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 or surface catch drains 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 after flowing through pollution control ponds at the discharge points from the wellsite.



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. The well also site incorporates two mud pits each with a total volume of approximately 1,908 m³ (12,000 bbls), a freeboard of 0.5m and lined with an impermeable High Density Polyethylene (HDPE) membrane liner.

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 of well pads. Therefore, any sedimentation associated with settlement of dust will be negligible.

During construction and operation, storm water runoff will be managed to prevent erosion of roads and slopes of well pads. 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, due to the short project timescale, small spatial scale, the likelihood of these effects occurring are extremely remote.

2.1.2 Liquid Wastes

Liquid wastes will arise from a variety of sources and mitigation measures are described below:

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 well site incorporates two mud pits with volumes of 477 m³ (3,000 bbls) and 1,431 m³ (9,000 bbls), each with a freeboard of 0.5m 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 interceptor pits where oil is periodically collected and discharged to the mud pit, clean water from the separator 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 there is no access to municipal sewers. A septic system will typically remove around 50% of the organic matter and suspended solid content in two to four days.



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 close to 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 EIS 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 all drilling activity is annular disposal.

3 MITIGATION MEASURES

3.1 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).
- Installation of silt fences during construction to trap surface run-off sediment from disturbed ground areas.
- The diesel storage tanks and oil lubricant drums are installed in a secondary containment area with an impervious HDPE lining to prevent ground pollution from diesel fuel or oils.
- Construct drainage ditches only where necessary to avoid concentrated flows. Use appropriate structures at culvert outlets to prevent erosion.
- Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer.
- Grey water from the bathroom showers and laundry facilities will flow to the septic system and drainage field.



- 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.

3.2 LIQUID WASTES

- 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.

4 RUSA #1 WELLSITE

4.1 MAP OF EXISTING DRAINAGE AT RUSA #1 WELLSITE AREA

The map below (Figure 4-1)shows the existing contours and surface water drainage pattern at the Rusa #1 wellsite area with the catchment area above the wellsite shown in pink colour.

A relatively small area of the overall catchment directly uphill of the wellsite will be diverted into the existing natural drainage channels, as indicated by the clouded area.

4.2 LAYOUT OF RUSA #1 WELLSITE WITH SURFACE WATER CONTROL

Figure 4-2 Shows that the discharge from the pollution control ponds will flow into the existing natural drainage channels.

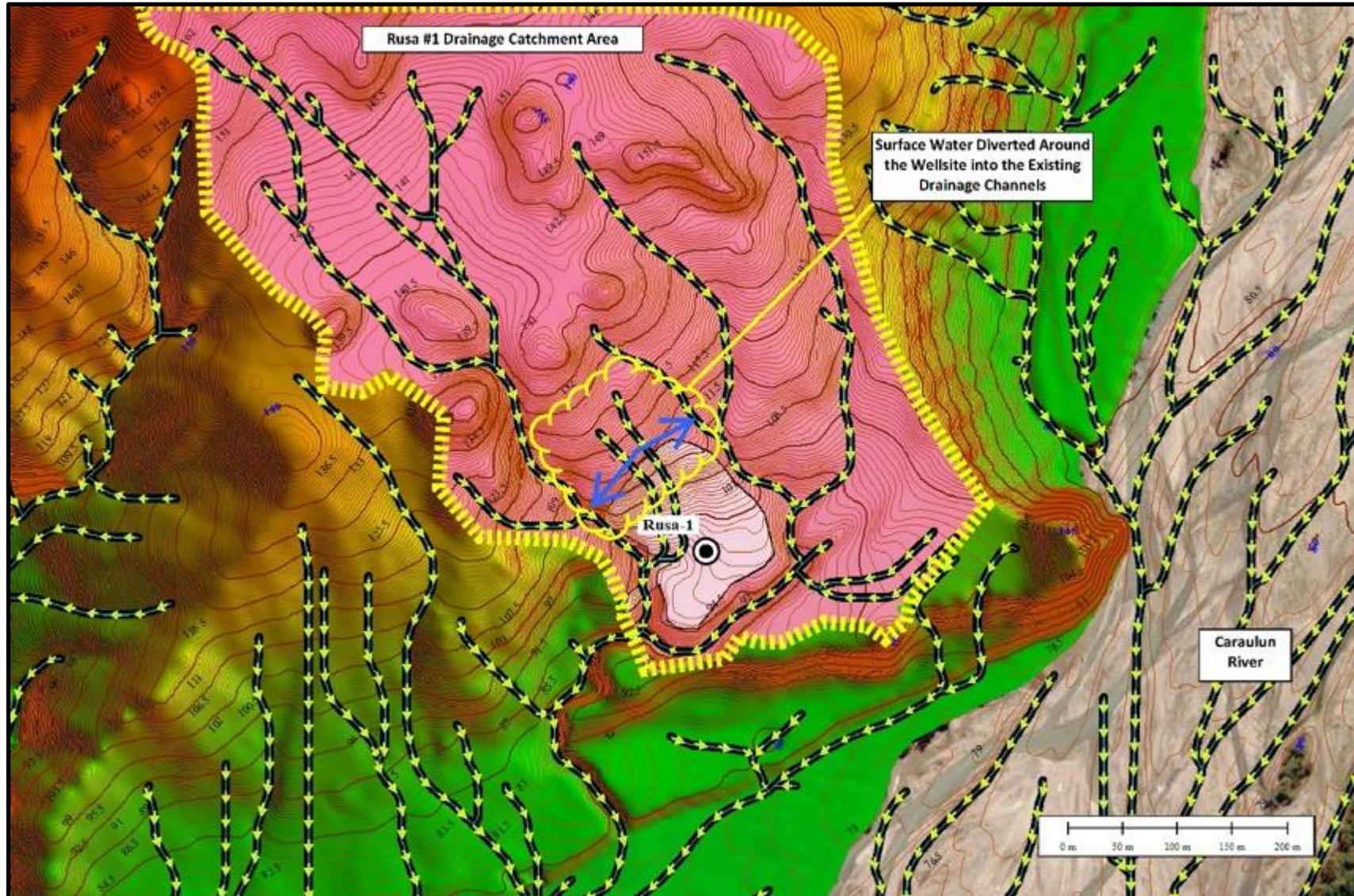


Figure 4-1: Map of Existing Drainage at Rusa #1 Wellsite Area



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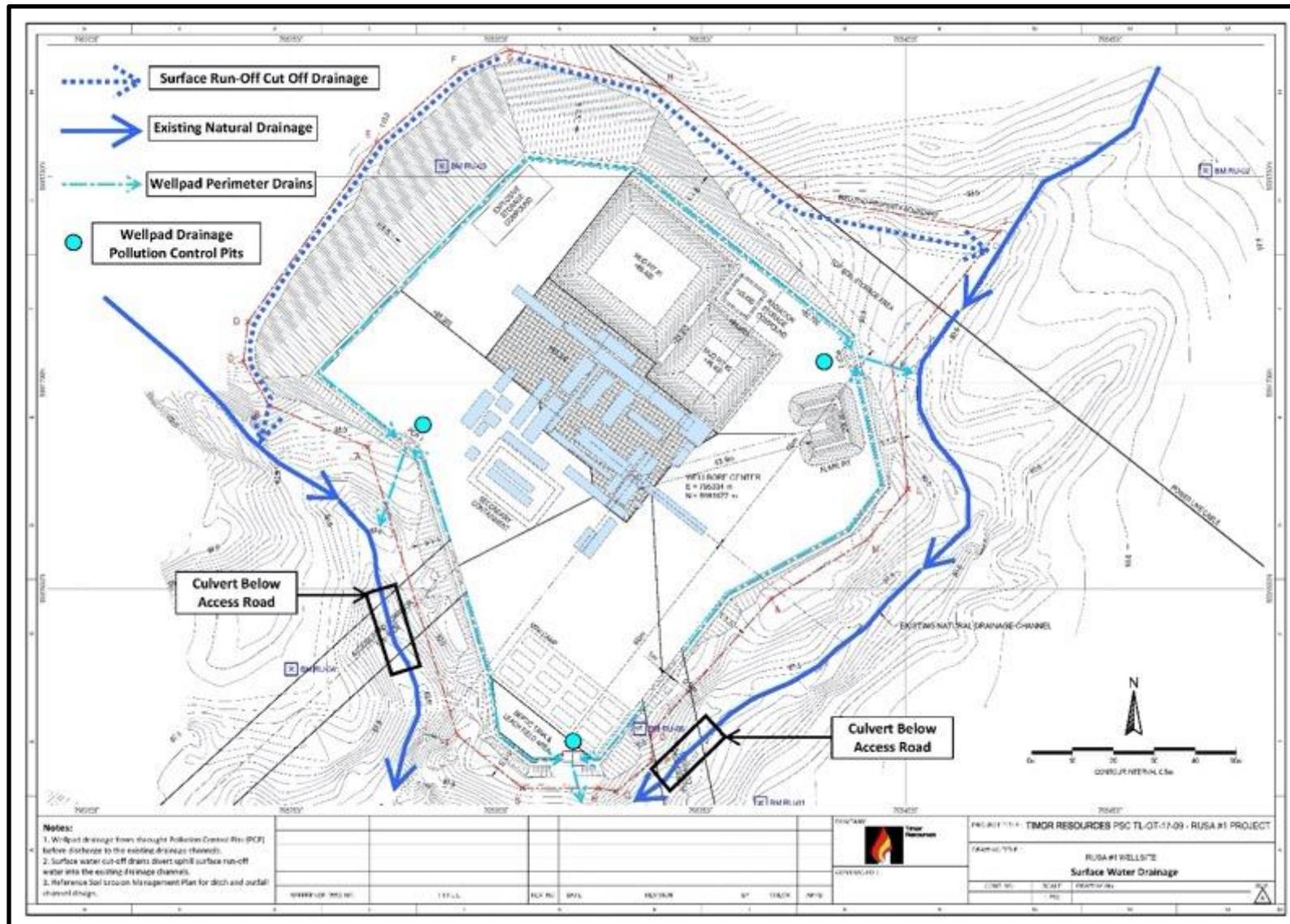


Figure 4-2: Layout of Rusa #1 Wellsite with Surface Water Control