Preliminary Remediation Action Plan

Stage 3 Early Works – Rum Jungle Mine Site

Department of Industry, Tourism and Trade

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SLR Project No.: 680.30185.00000

27 September 2023

Revision: 1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	27 September 2023	Various	Ned Connolly	Ned Connolly

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Acronyms and Abbreviations

ACM	Asbestos containing materials
AMD	Acid and metalliferous drainage
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013)
Auditor	Independent contaminated land auditor responsible for overseeing contaminated land remediation and must be accredited under section 68 of the *Waste Management and Pollution Control Act 1998*
CHMP	Cultural heritage management plan
Commonwealth Approval	Approval (EPBC 2016/7730) granted under the *Environment and Biodiversity Conservation Act 1999 (Cth)*
CSM	Conceptual site model
DITT	Department of Infrastructure, Tourism and Trade
EBFR	East Branch Finniss River
EIS	Environmental Impact Statement
NT Approval	Environmental Approval EP2023/022 – 001, issued pursuant to section 69 of the *Environment Protection Act 2019 (NT)*
ERP	Emergency response plan
ESCP	Erosion and sediment control plan
LTEMP	Long term environmental management plan
NAF	Non acid forming
NLC	Northern Land Council
NT	Northern Territory
NTG	Northern Territory Government
NT EPA	Northern Territory Environment Protection Authority
PAF	Potentially acid forming
PRAP	Preliminary remediation action plan
RAP	Remediation action plan
REMP	Receiving environment monitoring program
RMP	Radiation management Plan
RvMP	Revegetation management plan
WMP	Water Management Plan
WRD	Waste rock dump
WSF	Waste storage facility

1.0 Introduction

The Northern Territory Government (NTG) Department of Industry, Tourism and Trade (DITT) commissioned SLR Consulting Australia Pty to prepare this Preliminary Remediation Action Plan (PRAP) for early Stage 3 remediation works at the former Rum Jungle mine, located approximately 6 km north of Batchelor, Litchfield Council, Northern Territory (NT).

Remediation of the former Rum Jungle mine and its nearby former satellite mine sites of Mt Burton and Mt Fitch is proposed to occur over five stages. Stage 1 and Stage 2 of the remediation project, which included technical studies and stakeholder consultation as part of development of the remediation strategy, have been completed. Stage 3 includes a five-year construction phase and five-year stabilisation phase. Stage 4 and Stage 5 will involve monitoring and management of the rehabilitated areas. Refer to **Figure 1** for an overview of the scope of work included in Stage 3 of the remediation project.

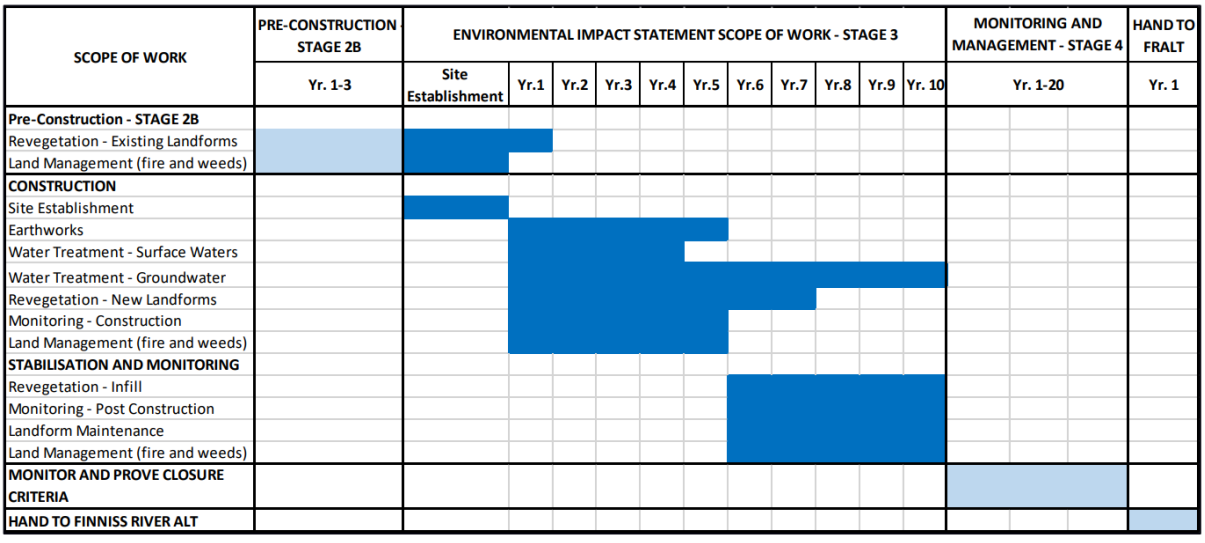
This PRAP is limited to management controls and requirements for the construction of a culvert creek crossing, which is scheduled to occur as part of the site establishment and early works within Stage 3 of the remediation project: Further detail on the scope of work covered by this PRAP is provided in **Section 6.0**.

There are numerous management plans and reports that have been published in relation to the Site. This PRAP does not intend to reiterate or paraphrase existing information pertaining to the history of the Site, nor remediation works beyond the scope of work that this PRAP applies to.

This PRAP has been prepared for the purpose of being suitable for relevant stakeholders involved in the early works of Stage 3 of the remediation project (ie: to provide reference to relevant management plans and documents, where applicable, as well as provide an overview of controls to be implemented throughout the works to ensure the protection of the environment and human health).

For comprehensive detail on the site condition and studies into the contaminating processes, refer to the Draft EIS document (DPIR, 2019a) and the detailed technical reporting within the appendices of the Draft EIS. Significant work has been completed over recent years to characterise site conditions.

Figure 1 Rum Jungle remediation project schedule



Source: DPIR 2019a

1.1 NT Approval and Purpose of this PRAP

Environmental Approval EP2023/022 - 001 (the NT Approval) for the remediation of the Rum Jungle mine was approved by the Minister for Environment, Climate Change and Water Security on 29 March 2023. Approval was granted under section 69 of the *Environment Protection Act 2019* for the rehabilitation works to be undertaken in accordance with the conditions stipulated in the NT Approval.

There are numerous conditions in the NT Approval that refer to a remediation action plan (RAP), which must be prepared, reviewed and endorsed by the contaminated land auditor, accredited under section 68 of the *Waste Management and Pollution Control Act 1998*, (the Auditor) prior to commencement of remediation works. Given that the early works are included within the broader scope of the remediation project, which has been deemed a significant action under the *Environment Protection Act 2019* and will be regulated under the NT Approval, a RAP must be prepared to allow for commencement of the action.

As the early works do not include remediation works (ie: works that involve the handling/movement of identified contaminated material for the purpose of improving the condition of the site and allowing for its intended future land use), this PRAP has been prepared in lieu of a RAP that covers the entire remediation project and that addresses all RAP conditions in the NT Approval.

The purpose of this PRAP is to provide sufficient information, including management plans and controls to be implemented during the early works, to satisfy the Auditor that the early works will be carried out in a way that prevents or minimises potential adverse impacts to environmental, human health, social and cultural values. Note that potential adverse impacts associated with the early works relate to unexpected finds (unidentified sources/areas of contamination that may be encountered during the early works), minor interaction with potentially contaminated soil and groundwater, and indirect impacts from known areas of contamination.

1.2 Objectives

In accordance with condition 2-1 of the NT Approval, the overarching environmental objectives of the broader remediation project are to:

- Improve environmental conditions onsite to support long-term improvement in the downstream aquatic ecosystem condition; and
- Improve environmental conditions onsite to support future use of the land for traditional ceremony, culture and subsistence use of natural resources.

The purpose of the early works included in this PRAP is to facilitate future remediation works that will meet the abovementioned broader objectives.

The objectives of this PRAP are to:

- Detail the requirements and controls for the management of known or assumed contamination within the Site to be implemented for the nominated early works defined in **Section 6.0;**
- Ensure that early works are carried out in accordance with relevant contaminated land legislation, guidelines and standards; and
- Provide guidance to minimise and mitigate potential adverse impacts to environmental, human health, social and cultural values.

1.3 Limitations of this PRAP

Limitations regarding the application of this PRAP include the following:

- This PRAP has been prepared for the Stage 3 early works and site establishment works only. Any works outside of the scope of the early works, as set out in **Section 6.0**, are not included in this PRAP and the preparation of a new RAP will be required prior to commencement of the broader site remediation works.
- This PRAP has been prepared in general accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013) (herein referred to as "ASC NEPM") and the National Remediation Framework (CRC CARE 2019), however, as the early works do not include actual remediation works, there are numerous sections that would normally be included in a RAP that have been omitted from this PRAP, as they do not apply to the scope of the early works.

Detailed scopes of work are provided within relevant technical scopes and tender documents for each separate works package included in early works and site establishment covered within this PRAP. A high-level summary of works to be undertaken is included in this PRAP to provide context for the requirements and controls provided herein. In addition, it is understood that detailed methodologies will be developed by contractors as part of their tender applications for some of the scope items included in the early works. These tendering processes are still underway at the time of writing this PRAP.

2.0 Site Overview and Background

The Rum Jungle mine consists of the following land parcels:

- Rum Jungle proper – Section 2968 Hundred of Goyder (vacant NT Crown land recommended for grant under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) by the Aboriginal Land Commissioner Justice Toohey on 22 May 1981)
- Mt Burton – Section 998 Hundred of Goyder (estate in fee simple held privately, unzoned)
- Mt Fitch – within NT Portion 3283 (Crown Lease Perpetual 862 held by the Northern Territory Land Corporation)

Refer to **Figure 2** for a regional overview map indicating the location of each of the abovementioned land parcels. Existing site conditions, including water courses, landform features, impacted areas etc, are indicated in **Figure 3**.

The Site was previously operated for uranium and copper mining between 1953 and 1971. The mining activities at the Site resulted in significant environmental impacts, primarily caused by acid and metalliferous drainage (AMD). The oxidation of sulfidic mine waste rock and tailings and consequent release of AMD has resulted in ongoing pollution of the East Branch of the Finniss River (EBFR) and downstream aquatic ecosystems over the past 50 years.

Rehabilitation of the Site was undertaken in the 1980s by the Australian Government, which reduced the generation of AMD and metal loads being discharged to the Finniss River. However, deterioration of the mine waste landforms and infiltration of the waste rock dumps (WRD) over time has resulted in increased AMD generation and further environmental impacts have resulted.

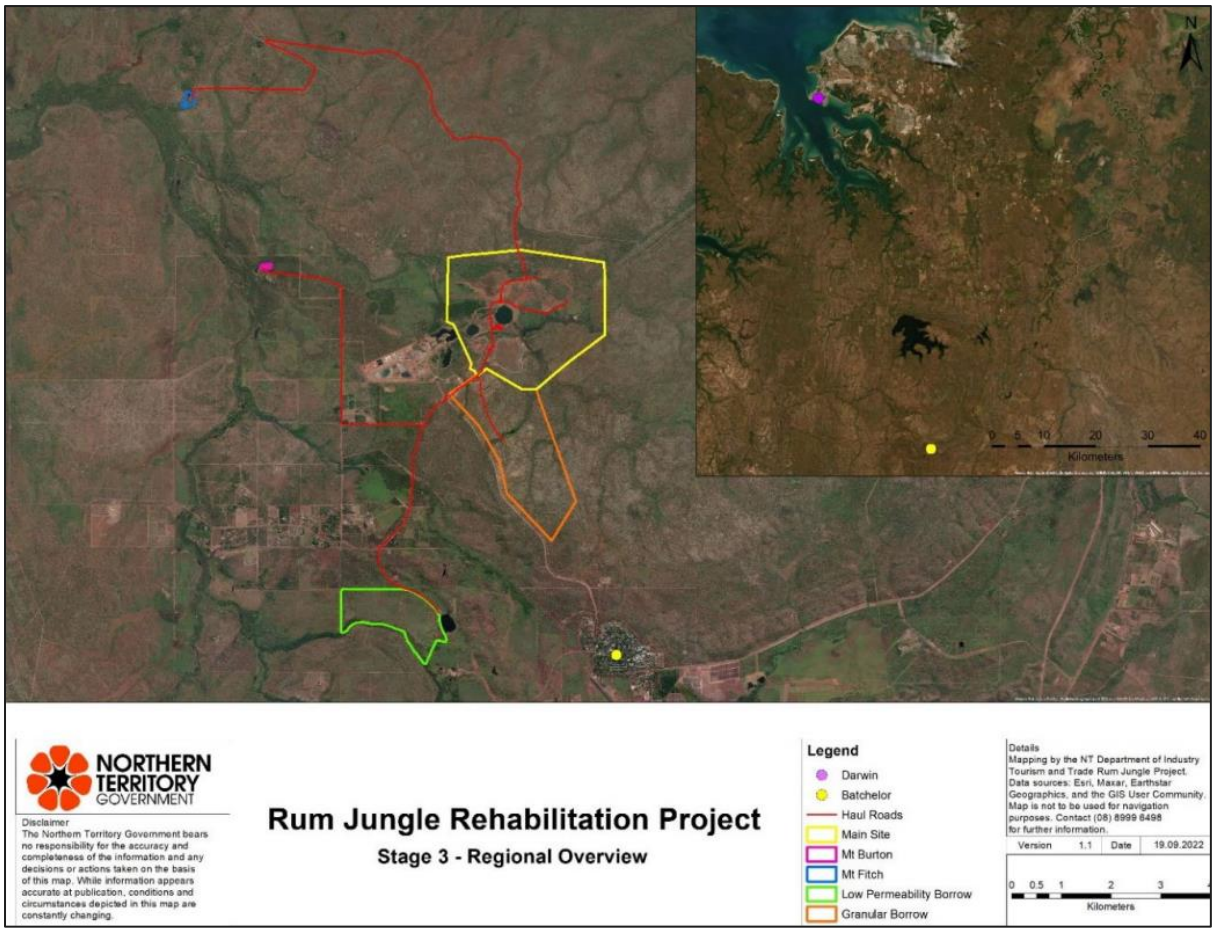
The Australian Government and the NTG began working under a National Partnership arrangement in 2009 to understand the contamination status of the Site by conducting routine monitoring and investigation works. The results and findings of these studies have informed the development of an improved rehabilitation strategy that is consistent with the

views and interests of traditional Aboriginal owners and that meets contemporary environmental and mined land rehabilitation standards.

In 2020, DITT submitted the draft Environmental Impact Statement (EIS) for the rehabilitation of the Site to the NT Environment Protection Authority (NT EPA) for assessment under the *Environmental Protection Act 2019*. The proposed rehabilitation project involves remediation works to address contamination issues that have been primarily caused by the ongoing generation of AMD and pollution of groundwater and waterways.

On 29 March 2023, the NT EPA issued the NT Approval that stipulates conditions to be complied with prior to, during and following completion of the remediation project.

Figure 2 Regional overview map



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W
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COMMUNICATION SPIRE
OLD CLAY BORROW
ESTIMATED BOUNDARY OF OLD BORROW AREA
CULVERT/BRIDGE
OLD TAILINGS DAM
DILAPIDATED STRUCTURES
OLD STOCKPILE AREA
DYSONS OPEN PIT WASTE ROCK DUMP
FLOW CONTROL WEIR
FINNISS RIVER (EAST BRACH)
DYSONS WASTE ROCK DUMP
MAIN PIT
OLD COPPER EXTRACTION AREA
BRIDGE
STACKED LARGE BOULDERS
INTERMEDIATE PIT
ABANDONED DRILL RIG
FINNISS RIVER DIVERSION
FINNISS RIVER (EAST BRACH)
MAIN WRD LEVEE
BROWNS OXIDE SITE BOUNDARY
INDICATIVE EXTENT OF CULVERT AND CROSSING
RADIOLOGICAL SOILS
LOW LYING FLOOD PRONE SECTION OF ACCESS TRACK
INTERMEDIATE WASTE ROCK DUMP
FITCH CREEK
MAIN WASTE ROCK DUMP
GATE AND CULVERT
GATE AND CULVERT
LITCHFIELD PARK ROAD
RUM JUNGLE ROAD

LEGEND

	AREA OF CONTAMINATED SOIL
	AREA OF RADIOLOGICAL SOIL
	OLD BORROW AREAS
	APPROXIMATE EXTENT OF ASSUMED ASBESTOS CONTAMINATION
	EXISTING ACCESS TRACK
	POOR QUALITY ACCESS TRACK
	RIP RAP LINED FLOW CHANNEL
	CUT ROCK FLOW CHANNEL
	DRAINAGE LINES
	BOUNDARY CHAINLINK FENCE

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DPIR - MINES DIVISION

RUM JUNGLE

EXISTING SITE CONDITIONS

FIGURE 3

3.0 Contamination Status

The primary pollution source at the former Rum Jungle mine site is AMD generated from sulfidic mine waste including tailings and waste rock. The site is contaminated with acids, metals, salts and radioactive material as a result of historical mining. There are also minor amounts of asbestos containing materials (ACM) onsite associated with previous mine buildings and relic mining equipment. The location and extent of contaminated soils is indicated in **Figure 3**.

Groundwater underlying the site is heavily impacted by AMD seepage and likely contributes to pollutant loads in surface waters, along with loads from surface runoff containing high concentrations of salts and metals. The polluted surface and groundwater that discharges from the site are the main contaminant pathways to the Finniss River.

A preliminary conceptual site model (CSM) was developed and included in the Draft EIS (DPIR, 2019a) to summarise the source-pathway-receptors onsite for all sources of known contamination including for AMD, radiological sources and ACM. Refer to **Table 1** for the preliminary CSM.

Note that as the early works do not include handling or active interaction with known contaminated materials, a detailed overview of the contamination status of the Site has not been included in this PRAP. Further detail on the type, location, nature and extent of contamination will be included in the RAP / subsequent RAPs that will be prepared prior to commencement of “Year 1” remediation works, which will include water treatment and handling/movement of impacted material.

The following sources/areas of contamination will require consideration/management as part of the early works that this PRAP applies to, due to the proximity of these areas to early works areas:

- Main WRD – Storage of waste rock from the Main Pit. Area covering 318,275 m^2, 21 m maximum height/depth, total volume of 4,529,675 m^3.
- Main WRD Levee – impacted soil bunds. Area covering 12,950 m^2, 5 m maximum height/depth, total volume of 68,975 m^3.
- Intermediate WRD – Storage of waste rock from Intermediate Pit. Area covering 84,750 m^2, 13 m maximum height/depth, total volume of 734,900 m^3.
- Old Copper Extraction Area – Area used as a copper leach pad. The ore was stripped in the 1980s as part of rehabilitation activities and disposed of in Dyson’s Pit. Area covering 70,000 m^2.
- Radiological soils – Areas where uranium ore was previously stockpiled and milled/processed, as well as potential naturally occurring radioactive material.

Table 1 Preliminary conceptual site model

Source Details		Pathway Details	Receptor Details
Legacy WRDs and Operational Features (primary contamination sources)	*Tailings and WRDs* Intermediate WRD - PAF-I Main WRD - full range of PAF and non acid forming (NAF) Dyson's Pit Overburden - PAF-I Dyson's WRD - predominantly NAF Main North WRD - contaminated spoil (NAF) *Rehabilitated Former Operational Areas* Copper Extraction Area - copper and sulphate Former Plant Site - radiological soils and asbestos containing legacy structures Old Tailings Dam Area - leached metal impacts in subsoils Old Stockpile Areas - radiological soils and isolated pocket of process liquor (in sub-surface)	*Contamination Vectors from Waste Rock and Contaminated Soils* Atmospheric exchange due to cover-system absence or deterioration leading to increased acidification, sulphate and heavy metal release *via* seepage and/or leaching to groundwater. Capillary rise of contaminants through cover systems to surface soils. Seepage of impacts from landforms caused by infiltration and formation of elevated hydraulic pressure within mounded features. Salt affected soils and drainage channel / watercourse sediments (secondary source).	Surface water body and sediments (ultimately EBFR) Groundwater aquifer (and secondary source)
		Surface Water and Groundwater Vectors Lateral migration of impacted soils through fluvial and aeolian dispersion. Lateral migration of exposed residual contamination *via* surface water flow. Vertical or lateral seepage of contamination within groundwater.	
		Radiation Vectors Release of radon and radiation associated with radiological sources.	Atmospheric and dispersion
		Ecological Vectors Direct contact between terrestrial fauna and surface contaminants (sub-surface contaminants with burrowing fauna). Bioaccumulation in terrestrial and aquatic flora and fauna.	Terrestrial flora and fauna (within riparian zone) Aquatic flora and fauna (within surface water bodies)
		Human Health Vectors Ingestion of contaminated media *via* impacted flora, fauna, surface water and/or groundwater. Direct contact with contaminated soils, sediment, surface water and groundwater.	Traditional landowners / users, Site workers Other site visitors
Surface/Ground Water (secondary sources)	*Impacted Groundwater* AMD-impacted groundwater Cu liquor impacted groundwater *Legacy Mine Pits – Surface Waters* Intermediate Pit Main Pit *Surface Water Channels (and sediments)* EBFR Diversion Channel Upper EBFR Fitch Creek Former EBFR Channel (now incorporating Copper Creek)	*Surface Water and Sediment Vectors* Dispersion / migration of contaminants in surface water and sediments. Short term sinks for contaminated sediments. Concentration / settling of contaminants in slow moving or stagnant waters during dry seasons.	Surface water body and sediments
		Groundwater-Surface Water Interaction (seasonally ephemeral) Lateral seepage from groundwater to river in wet seasons. Vertical or lateral seepage from river to groundwater in dry seasons.	Groundwater aquifer
		Ecological Vectors Impacts to riparian zones from contaminated surface water, groundwater, sediment or WRD seepage. Bioaccumulation in aquatic flora and fauna.	Terrestrial flora and fauna (within riparian zone) Aquatic flora and fauna (within surface water body)

Source Details		Pathway Details	Receptor Details
		Human Health Vectors Ingestion of (drinking) or direct contact with (bathing, recreational use) surface water. Ingestion of contaminated media *via* consumption of impacted flora, fauna, surface water and/or groundwater.	Traditional landowners / users, Site workers Other site visitors

4.0 Regulatory and Technical Framework

The following Acts and Regulations relate to this PRAP and the scope of early works:

- *Environment Protection Act 2019 (NT)*
- *Waste Management and Pollution Control Act 1998 (NT)*
- *Northern Territory Aboriginal Sacred Sites Act 1989 (NT)*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
- *Heritage Act 2011 (NT)*
- *Soil Conservation and Land Utilisation Act 1969 (NT)*
- *Weeds Management Act 2001 (NT)*
- *Dangerous Goods Act 1998 (NT)*
- *Work Health and Safety (National Uniform Legislation) Act 2011 (NT)* and *Work Health and Safety (National Uniform Legislation) Regulations 2011 (NT)*
- *Radiation Protection Act 2004 (NT)*
- *Australian Radiation Protection and Nuclear Safety Act 1998 (Cth)*

The following guidance materials have informed the preparation of this PRAP:

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013)
- National Remediation Framework (CRC CARE 2019)

Refer to **Section 1.1** for an overview of the NT Approval for the remediation of the Rum Jungle mine. Condition 9 of the NT Approval details the requirements of the RAP. Given this document is a preliminary RAP that does not include remediation of contaminated material, it must be stated that this PRAP does not intend to address all the requirements under condition 9.

The remediation project has also been approved under section 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999*. This approval (Ref: EPBC 2016/7730, herein referred to as the "Commonwealth Approval") was granted by the Department of Climate Change, Energy, the Environment and Water on 7 July 2023.

5.0 Key Stakeholders and Responsibilities

Refer to **Table 2** for the key roles and responsibilities in the early works included as part of this PRAP.

Table 2 Early works roles and responsibilities

Name	Roles and responsibilities
DITT	NT Government department delivering the remediation project, as well as current site controller/occupier. Roles within DITT that have responsibilities under this PRAP include the following: • Project Director – responsible for ensuring project systems are in place and resourced so that the early works can be conducted in a safe and environmentally responsible manner in accordance with this PRAP and relevant management plans and procedures.

Name	Roles and responsibilities
	• Project Services Director and Site Superintendent – responsible for managing the contractors engaged to deliver the early works, as well as for ensuring works are carried out in accordance with this PRAP and all site-specific procedures and protocols are adhered to. • HSE Director and Officer – responsible for ensuring the early works are conducted in a safe and environmentally responsible manner in accordance with this PRAP and relevant management plans and procedures. Responsible for ensuring all personnel working on the site are appropriately inducted and familiar with this PRAP.
NT EPA	Independent regulatory body in the NT, authorised to administer the *Waste Management and Pollution Control Act 1998*, which applies to this PRAP. Responsible for issuing the NT Approval, responding to reported pollution incidents, and undertaking enforcement action for breach of legal instruments and licenses.
Kungarakan and Warai people and the Northern Land Council (NLC)	The Kungarakan and Warai people are the traditional owners of the land that the former Rum Jungle mine site lies on. The traditional owners and the NLC are responsible for consulting with DITT on the views of the traditional owners prior to finalisation of the RAP and the site audit report and throughout the implementation of the rehabilitation project. .
Todd Mitchell AECOM	Contaminated Land Auditor (the Auditor), accredited under section 68 of the *Waste Management and Pollution Control Act 1998*, responsible for reviewing and certifying compliance of relevant documents prepared by the environmental consultant, as per the requirements of the NT Approval, and ensuring the remediation works are conducted in accordance with relevant legislation, guidelines and standards, so that the Site is suitable for its intended use.
Mark Stuckey Environmental Earth Sciences International	Peer Reviewer Contaminated Land Auditor (the Peer Reviewer), accredited under section 68 of the *Waste Management and Pollution Control Act 1998*, responsible for conducting a peer review of the review of the PRAP by the Auditor.
Civil Earthworks Contractor	Contractor engaged to construct the culvert crossing. Responsible for conducting works in accordance with this PRAP and relevant management plans.

6.0 Overview and Timing of Early Works

This PRAP is limited to management controls and requirements for the construction of the internal culvert and crossing, which is scheduled to occur as part of the early remediation works (Stage 3).

Culvert construction is expected to commence in late September 2023 and be completed by late December 2023.

6.1 Site Establishment

6.1.1 Temporary Fencing and Signage

Maintenance of fencing and access gates is already in progress to restrict uncontrolled access to the site. This includes the construction of some new site boundary fencing along existing firebreaks, where possible, to minimise the extent of vegetation clearing required. This activity is not considered part of this PRAP.

Signs will be installed as required to inform construction workers and site visitors of the presence and location of contaminated/restricted areas (eg: radiological soils, Old Copper

Extraction Area). As per the Radiation Management Plan (RMP) (RJ3-4-MP-029), all radiation areas or locations of potential elevated radiation levels at the site will be clearly marked with safety signs that conform to *AS 1319-1994 Safety Signs for the Occupational Environment.*

In addition, buffer zones shall be applied to all archaeological sites, including identified aboriginal and historical objects and places, as identified in the draft Cultural Heritage Management Plan (CHMP) (Martin-Stone, 2020).

6.1.2 Site Facilities

Site facilities for the early works may include demountable crib room and site office facilities and portable toilet and handwashing facilities. These will be imported to the site by the civil earthworks contractor and be removed from the site following completion of the early works. Establishment of site facilities for the following phases of the remediation works will not be included in the early works.

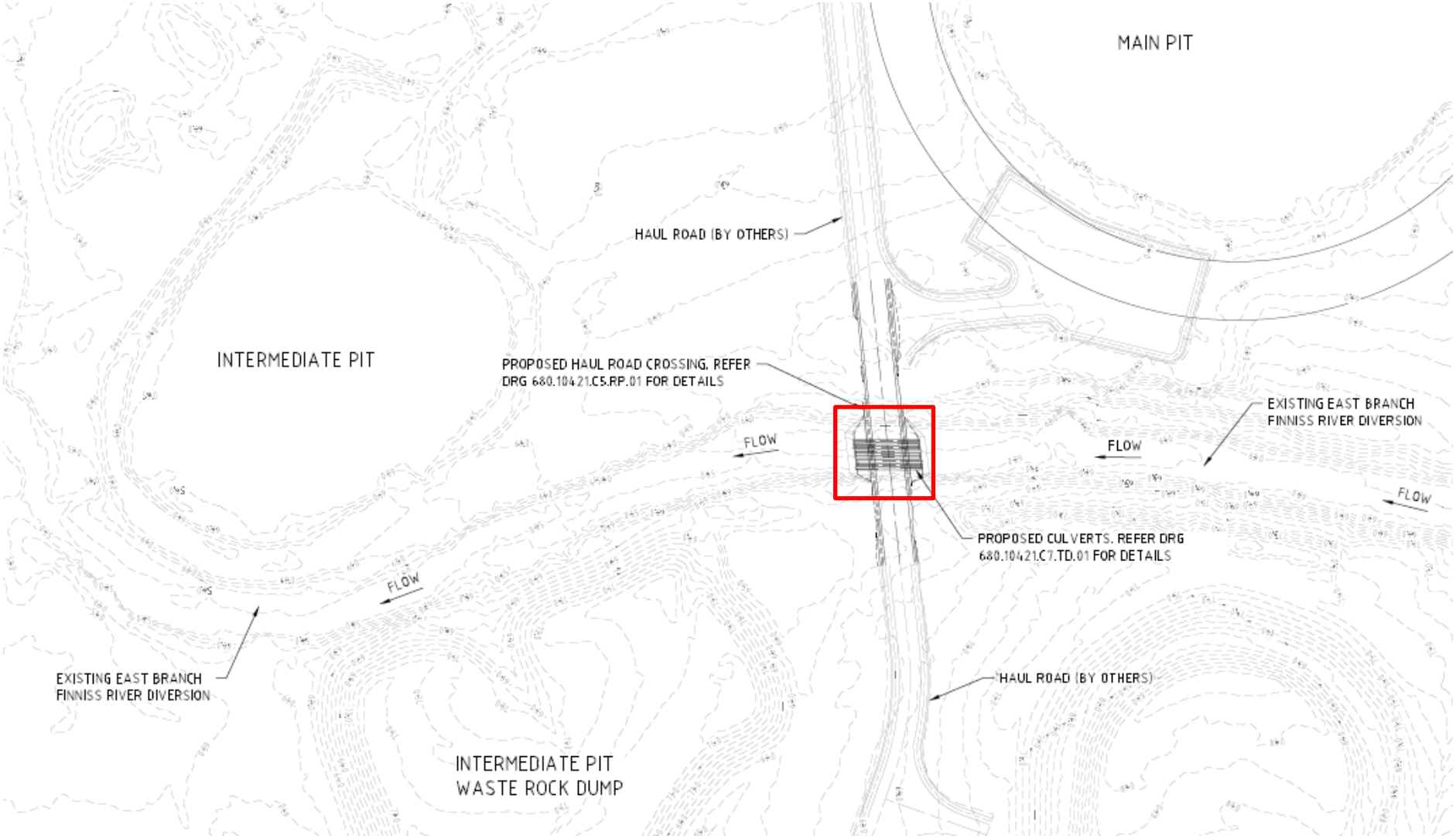
If required, water for dust suppression will be sourced from the Main Pit. The civil earthworks contractor will install a temporary standpipe with a diesel pump to fill water carts.

6.2 Culvert Creek Crossing

The construction of the culvert crossing over the EBFR diversion channel within Rum Jungle proper will be carried out as part of the early works. The internal haul road network, including those parts immediately north and south of the culvert crossing, will be constructed in the next phases of Stage 3 remediation works. The culvert crossing will be installed this dry season while the creek is not flowing to facilitate internal road construction and remediation works to commence in the following year.

Refer to **Figure 4** for a drawing indicating the location of the culvert creek crossing to be constructed as part of the early works in relation to relevant site features. Construction drawings for the culvert crossing are included at **Appendix A**. Note that the section of the crossing to be constructed as part of the early works is from chainage 80 to chainage 180, as indicated in the drawings at **Appendix A**.

Figure 4 - Culvert Crossing



7.0 Performance Criteria

As remediation works are not included in the scope of early works that this PRAP applies to, the requirement to include performance criteria, as per condition 9-1 of the NT Approval, has not been complied with. With the approval of the Auditor, direct reference to performance criteria is not required in this PRAP.

8.0 Contingency Actions

As remediation works are not included in the scope of early works that this PRAP applies to, the requirement to include contingency actions, as per condition 9-1 of the NT Approval, has not been complied with. With the approval of the Auditor, direct reference to contingency actions is not required in this PRAP.

9.0 Health and Environmental Risk Assessment

To comply with condition 9-2(1) of the NT Approval, preparation of this PRAP has been informed by a health and environmental risk assessment. A project risk assessment that considered the Stage 3 remediation project works and the Site at completion of the remediation works was undertaken as part of the EIS process. Detail on the risk identification and assessment process undertaken is included in Chapter 3.4 of the EIS.

The time periods included in the EIS risk register include: (i) Construction (ie: Stage 3 of the remediation project, up to 15 years); and (ii) Post rehabilitation into the long term (ie: Stage 5 of the remediation project, greater than 20 years onwards).

Given that the works covered by this PRAP are limited to the nominated early works for Stage 3 remediation works, a subset of risks included in the risk register relate to the early works. The key risks to health and environment that require management during the early works have been included and risk ratings revised. Refer to **Appendix B** for the health and environmental risk assessment matrix that relates to the early works included in this PRAP. Risk descriptors are also included in **Appendix B**.

Revision of this PRAP will require review of the health and environmental risk assessment and update as necessary to ensure all potential risks associated with the scope of works have been included and considered.

10.0 Requirements and Controls

10.1 Material Movement Tracking

All soil and rock material that is excavated onsite or imported to the site shall be included on a register that will include the following regarding material movements:

- Source of material (eg: imported fill, excavated material from culvert construction area)
- Status of the material (eg: clean fill, waste rock etc)
- Quantity of material
- Reason for material movement (eg: construction of haul road – cut material)
- Location that material is moved to
- Any additional details, eg: sampling and analysis if undertaken, controls implemented to ensure minimal environmental and human health risk etc.
- Stockpile ID if required

Refer to **Appendix C** for an example material movement register.

Maintaining a complete and accurate register of the types and quantities of soil and rock that are relocated during the early works will ensure that subsequent phases of the remediation project capture all known contaminated material that requires management to allow the site to be suitable for its intended future land use.

Note that no soil or rock material can be removed from the site.

10.2 Water Management

10.2.1 Groundwater Management

The only interaction with groundwater will be routine groundwater monitoring, which will be carried out for the duration of Stage 3 of the remediation project in accordance with the monitoring plan set out in the Environmental Monitoring Plan (RJ3-4-P-018).

10.2.2 Surface Water Management

No active discharge of known or suspected contaminated water shall occur as part of the early works. The section of the EBFR diversion channel where the culvert creek crossing will be constructed does not flow over the dry season period that construction works are scheduled to be completed. The design itself has erosion protection measures for the long term.

Routine surface water monitoring will be carried out for the duration of Stage 3 of the remediation project in accordance with the monitoring plan set out in the Environmental Monitoring Plan (RJ3-4-P-018).

10.2.3 Water Management Plan

To comply with condition 9-4(6) of the NT Approval, a water management plan (WMP) is required as part of the RAP. Condition 21-1 of the NT Approval states that the RAP "must include a revised and updated version of the water management plan (Appendix 3 of the Draft EIS - Water Management Plan Stage 3 Rum Jungle Rehabilitation Project version 4 dated 27 November 2019)".

The existing WMP (DPIR, 2019b) for the remediation project has not been updated for the early works, as no active discharge of water will be carried out. As such, and with the approval of the Auditor, a WMP that satisfies condition 21 of the NT Approval has not been included in this PRAP. An updated WMP that satisfies the requirements of condition 21 of the NT Approval will be prepared and included in the main/subsequent RAP.

10.2.4 Receiving Environment Monitoring Program

To comply with condition 9-4(5) of the NT Approval, a receiving environment monitoring program (REMP) is required as part of the RAP. The purpose of the REMP is to identify changes in downstream water quality and flow compared to the pre-construction aquatic ecosystem changes. The requirements of the REMP are outlined under condition 20 of the NT Approval.

A REMP that complies with condition 20 of the NT Approval will be prepared and included in the main/subsequent RAP. With the approval of the Auditor, a REMP is not required as part of the PRAP as the early works does not include the handling/movement of identified contaminated material, and the extent of construction work is limited to the installation of culverts and construction of one crossing.

Note that routine surface water monitoring will be carried out for the duration of the early works in accordance with the monitoring plan set out in the Environmental Monitoring Plan (RJ3-4-P-018).

10.3 Erosion and Sediment Control

Given the small footprint of the works areas (ie: less than ~0.5 hectares), the potential for the early works to contaminate stormwater with sediment, which could potentially impact the receiving environment and the EBFR, is considered low.

The civil earthworks contractor will complete works in line with the project's Site Erosion and Sediment Control Measures Plan (SLR 2022) for the construction of the culvert crossing. This document has been prepared in line with the *Best Practice Erosion & Sediment Control* guideline (IECA 2008).

Erosion and sediment control measures will be in place to minimise the potential impact on downstream water quality. Wind and water erosion of disturbance areas cannot be eliminated completely, however the following measures will be taken to minimise the impact:

- Conducting best practice land clearing procedures for all proposed disturbance areas, focussing on minimising footprint disturbance.
- Undertake disturbance works, as much as is practically possible, during the dry season (May to November) and during periods when good weather is forecast.
- Appropriate storage of soil stockpiles in areas away from roadways and other drainage lines. Suitable sediment control measures will be installed downslope of soil stockpiles and upslope of clean water runoff diverted (where possible).
- Clearly identifying/communicating no-go areas to maintain disturbance areas and traffic movement to the designated areas.
- Effective dust suppression measures.
- Any liquid wastes, fuels and oils stored on-site will be sufficiently bunded to contain any potential spills. Accidental spillage or poor management of fuels, oils, lubricants, hydraulic fluids, solvents and other chemicals during the construction phase will be controlled through spill management actions (including the availability of spill kits) to prevent water quality and ecological impacts and no further mitigation measures are considered necessary. Captured liquid wastes, fuels and oils should be disposed of at an appropriately licenced facility.
- Implementing an effective monitoring and maintenance program for the site.
- Following up civil works with the application of spray grass or a sterile cover crop such as Japanese Millet to rapidly establish cover over all soil stockpiles and disturbed ground.

10.4 Radiation Monitoring and Management

As the early works do not include handling or active interaction with known radiation sources a detailed overview of the radiation status of the site has not been included in this PRAP. Further detail including an updated RMP will be included in the main RAP / subsequent RAPs that will be prepared prior to commencement of main remediation works.

The pathway in which workers may be exposed to radioactive material during the early works includes via inhalation of radioactive dusts (ie: long-lived alpha activity) and radon decay products (eg: radon gas) through incidental exposure (eg: background concentrations generated by wind). Note that no handling of identified sources of radiological soils/rock is scheduled to occur as part of the early works.

A high-level summary of the controls that will be implemented for the early works include the following:

- Ensuring all exposed mobile plant are fitted with high-efficiency particulate air filters to cabins.
- Review of job procedures to ensure the correct controls (personal protective equipment etc) are in place to manage the risk of inhalation of radioactive dusts and radon decay.
- Review of job procedures to ensure the risk of ingestion of radioactive material by hand to mouth transfer is adequately addressed.

10.5 Dust Management

Dust generation is expected to be greatest during mechanical excavation of the ground surface and loading and offloading of soil/rock material. Mobile plant transiting throughout the site is also a source of dust generation that is required to be controlled during the works.

Note that the main potential contaminant of concern regarding dust generation in the areas that early works will be conducted is rouge dust (ie: inhalable/respirable dust).

Water carts will be utilised for dust suppression throughout the works, as required. Water for dust suppression will be sourced from the Main Pit. The civil earthworks contractor will install a temporary standpipe with a diesel pump to fill water carts.

No dust emissions shall be emitted beyond the boundary of each active work area. Visual monitoring of dust emissions will be carried out during the works. If excessive dust emissions are observed, works shall cease and not recommence until soil material has been adequately wetted down.

Note that a DITT representative will be onsite for the duration of the culvert construction works to oversee the works and ensure works are being carried out in accordance with the PRAP.

10.6 Stockpile Management

Stockpiling activities expected to occur as part of the construction of the culvert creek crossing include the following:

- Cut material that is suitable for reuse in construction
- Excess cut material that is not suitable for reuse, including but not limited to geotechnically unsuitable material (ie: material that is not suitable for reuse in construction)
- Imported fill material – will likely require progressive temporary stockpiling for use in culvert crossing construction
- Pavement materials imported to site

Requirements for all stockpiles that are formed during the early works, including materials that are temporarily stored before being reused in construction/remediation activities completed before the onset of this wet season, include the following:

- Stockpile locations must be approved by the site supervisor prior to storing soil or rock materials. The site supervisor will consider the following factors when determining whether a proposed stockpile location is appropriate:
    - Type of material to be stockpiled (ie: soil/rock, contamination status)
    - Volume of material

  - Length of time stockpile will be in place
  - Proximity to sensitive environmental receptors, such as waterways
  - Surface water flows and potential for erosion due to overland flow / slope of ground surface, or potential for impacted runoff to interact with stockpiled material (eg: runoff from a WRD)
  - Contamination status of underlying ground surface
  - Whether there is a requirement to install a separation/barrier layer to proposed stockpile area
  - Availability of alternative suitable locations
- The material movement tracker must be updated for all stockpiles when they are created, added to, moved and removed (refer to **Section 10.1**)
- Maintain appropriate soil moisture content to reduce dust emissions (particularly during handling).

10.7 Decontamination Requirements

Earthmoving plant and equipment will not be permitted to leave site until inspection by the DITT project team. DITT project personnel will visually inspect the equipment leaving site through the main gate for visual cleanliness. If a vehicle appears dirty, then egress from site may be refused until it has been satisfactorily re-cleaned. The radiation safety officer or competent person will be the adjudicator where there is any dispute on the cleanliness of equipment.

10.8 Cultural Heritage Management

To comply with condition 9-4(1) of the NT Approval, a CHMP that addresses the requirements of condition 5 of the NT Approval is required as part of the RAP. A draft CHMP has been prepared for the remediation project and consultation with NLC and the traditional owners is currently underway. Whilst the CHMP is being revised and agreed to by relevant stakeholders (and with the approval of the Auditor), an interim cultural heritage protocol will be implemented for the early works, in lieu of a CHMP that complies with condition 5 of the NT Approval.

Refer to **Appendix D** for a copy of the interim cultural heritage protocol to be implemented for the early works.

Note that no aboriginal or historical objects/places have been identified within the extent of the early works areas (Martin-Stone, 2020).

A CHMP that complies with condition 5 of the NT Approval will be included as part of the main RAP.

10.9 Vegetation and Weed Management

No new clearing will be required for construction of the internal haul road culvert section included in the early works. All existing and proposed access road and tracks have received ground-based topical spraying of weeds over the last several years. This was to reduce the likelihood of weed spread along roads and tracks by vehicle movement.

Management of existing intact native vegetation and culturally significant flora species, as well as weed control, is not considered relevant under this PRAP, as it is unrelated to contaminated land (ie: outside of the scope of the ASC NEPM). Refer to the Weed Management Plan (RJ3-4-MP-011) for further detail.

If any vegetation clearing is required to complete the early works included in this PRAP, the following documents will apply:

- RJ3-4-F-004 Ground/Vegetation Disturbance Form
- RJ3-4-Pr-007 Vegetation Clearing Procedure

To comply with condition 9-4(4) of the NT Approval, a revegetation management plan (RvMP) is required as part of the RAP. As this document is a preliminary RAP in which no remediation works are scheduled to occur, a RvMP that satisfies condition 17 of the NT Approval has not been included in this PRAP.

A RvMP for the revegetation of land disturbed by the remediation project works, which would otherwise be left as exposed soil areas following completion of remediation works, will be prepared and included in the main/subsequent RAP.

10.10 Workplace Health and Safety Management

All contractors engaged to conduct work onsite must prepare their own project-specific risk assessment and safe work method statement. These documents must be provided to DITT for review and approval prior to commencing work onsite. All contractors must also provide relevant licences and tickets relevant to the works to be carried out.

10.11 Emergency Management

An Emergency Response Plan (ERP) (RJ3-4-MP-026) has been prepared for the rehabilitation project to establish and maintain emergency management plans. The ERP collates relevant emergency information and details procedures for a planned and coordinated response to an emergency. Site specific emergency responses shall be included in work, health and safety documentation prepared for the early works.

The following high/extreme risks to people and property were identified in a hazard and risk assessment completed by DITT and are deemed as emergency situations relevant to the remediation project that would trigger the emergency management plan:

- Work accident resulting in serious injury or damage
- Vehicle accident or collision
- Fire
- Cyclone

Refer to **Table 3** for emergency contact details.

Table 3 Emergency contacts

Emergency type/service	Contact	Phone number
Life threatening of time critical emergency	Triple zero – emergency services	000 or 112
Non-life threatening or time critical emergency	Batchelor Community Health Clinic (Monday to Friday, 9am-4pm only)	8976 0011
	Palmerston Regional Hospital	7979 9200
Fire	Batchelor Volunteer fire brigade	8995 5400 / 8946 4105 0418 192 078
Police	Batchelor Police Station	8976 0015 131 444

Emergency type/service	Contact	Phone number
Poisons information	National Poisons Information Centre	13 11 26

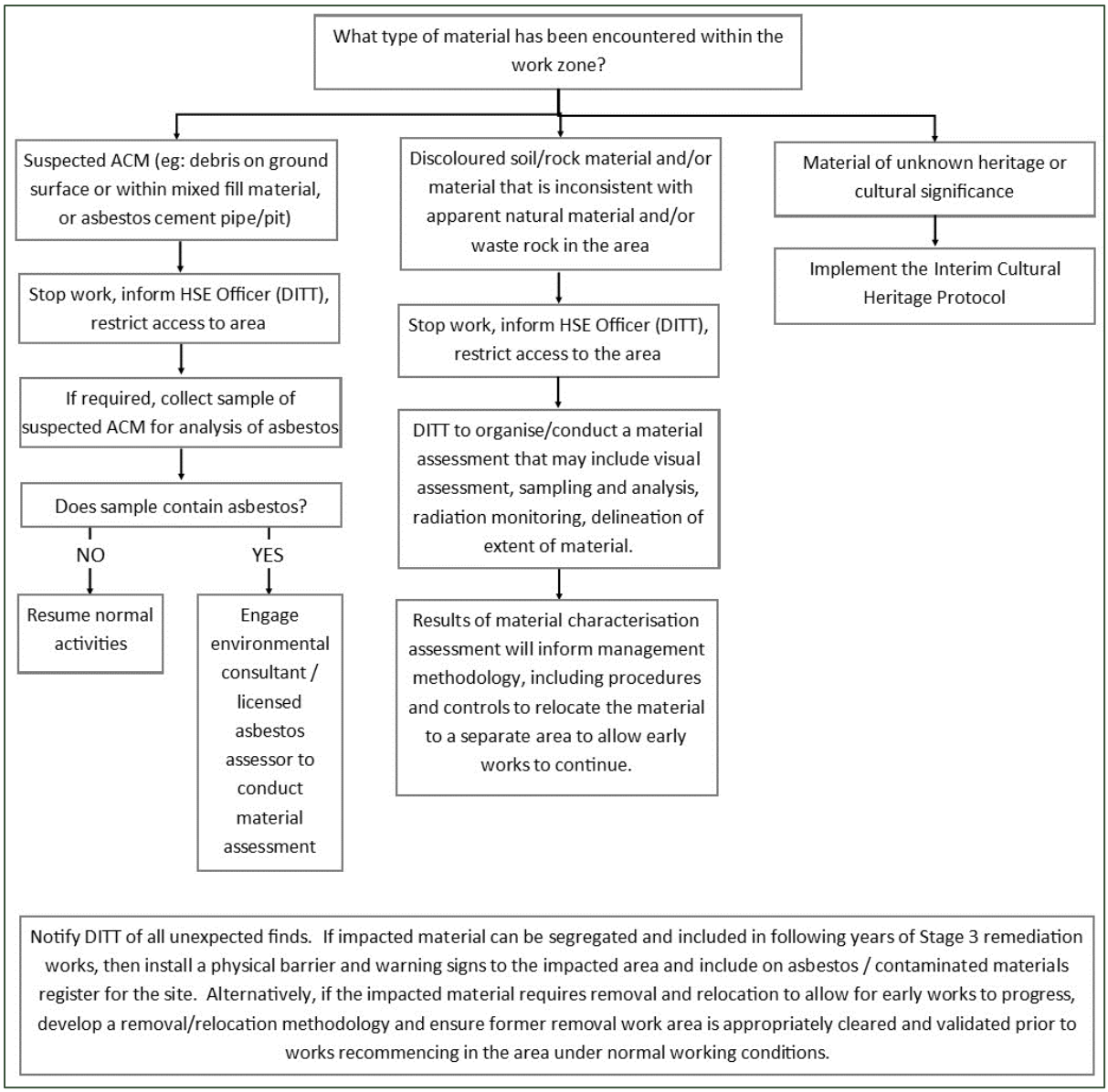
11.0 Unexpected Finds Protocol

An unexpected find refers to the discovery of any material that has not been previously identified and is not included in this PRAP as a contaminated area requiring management and later remediation. Examples include, but are not limited to, ACM and asbestos impacted fill material, tailings, anthropogenic waste.

To minimise the risk of personnel being exposed to potentially hazardous materials, as well as reducing the risk of excess contaminated impacted material being generated if it is not identified immediately upon encountering, the unexpected finds protocol provided in **Figure** 5 shall be implemented. All personnel conducting/overseeing any ground disturbance works shall be aware of and familiar with this unexpected finds protocol.

Note that for unexpected cultural heritage finds, the interim cultural heritage protocol (**Appendix D**) shall be followed.

Figure 5 Unexpected finds protocol



12.0 Notifications and Communications

12.1 Stakeholder Engagement

An Engagement and Communication Strategy (RJ3-3-P-010) has been prepared for the remediation project, which sets out the objectives for stakeholder engagement and communication during each phase of Stage 3 of the remediation project. The objectives for the preliminary phase (ie: early works), include the following:

- Ensure the Rum Jungle rehabilitation work plan remains transparent to the community and that local stakeholders are kept well informed of any developments
- Address stakeholder concerns regarding environmental, cultural and social issues
- Ensure full engagement of Traditional Owners and the local community with the vision and objectives of the rehabilitation of the mine site

- Promote local training, employment and business opportunities through all forms of digital media (email, social media platforms) and paper-based (flyers, posters etc.)
- Ensure community stakeholders are abreast of upcoming issues that might impact them (roadworks)

12.2 Report of Pollution Incidents

Any incidents that occur on the Site that are likely to cause material harm to the environment will be immediately reported to project personnel who will document the incident in accordance with the relevant procedures.

The NT EPA will be notified as soon as practicable after (and in any case within 24 hours after) first becoming aware of a pollution incident which has occurred during the works, in the following instances:

- The actual or potential harm to the health or safety of human beings or ecosystem is not trivial.
- The actual or potential loss or property damage (including clean-up costs) associated with a pollution Incident exceeds $10,000.

The NT EPA Pollution Response Line will be contacted on 1800 064 567 or 8999 3747, as relevant.

If any of the requirements of the NT Approval are contravened, the NT EPA will be notified via pollution@nt.gov.au and/or the NT EPA Pollution Response Line.

Community complaints will be managed by the DITT project team.

12.3 Internal Incident Reporting

The Construction Environmental Management Plan (CEMP) (RJ3-3-MP-003) that has been prepared for Stage 3 of the remediation project outlines the requirements for internal incident reporting. Incident management, including environmental incidents, will be part of DITT's Health, Safety and Environmental Management System.

Environmental incident reports are required for the following events that may occur during the early works:

- Uncontrolled spill or release of substance – eg: fuel, chemicals, contaminated water
- Entry into a restricted/no-go area – eg: culturally restricted areas, radiation control zone, areas beyond designated culvert creek crossing work area
- Discovery or disturbance to unknown culturally significant area or objects
- Identification/uncovering of potentially contaminated soil/rock material
- Excessive dust emissions observed and/or dust observed beyond site boundary considered to be attributable to site activities
- Water quality exceedances of locally derived water quality objectives
- Unexpected fauna mortality – eg: fish kills, bird deaths, multiple mammal deaths
- Bank erosion or instability within river channel
- New weed species detected attributed to construction activities
- Increase in extent of known weeds

The prompt and accurate reporting of incidents will be the responsibility of all employees and supervisors/management will be held accountable for compliance with this requirement. An

incident register will be maintained, and key incidents will be widely shared to reduce the likelihood of incident reoccurrence.

Each incident will be investigated to determine the root cause and how controls can be adjusted to prevent reoccurrence. Actions will be developed, assigned and tracked using the incident management system. Regular check and audits, with timeframes, will be undertaken following an incident to ensure that corrective actions are in place.

12.4 Data and Record Management

As outlined in the CEMP (RJ3-3-MP-003), a digital system will be utilised to store and manage all operational system documents, drawings and plans. Data management software will be utilised to manage all analytical data obtained during the remediation project.

13.0 Ongoing Management and Monitoring

13.1 Long Term Environmental Management Plan

To comply with condition 9-4(2) of the NT Approval, a long term environmental management plan (LTEMP) for the WSFs is required as part of the RAP. The LTEMP will detail ongoing monitoring and management requirements for the WSFs to minimise any risk to future land users.

As this document is a preliminary RAP in which no remediation works are scheduled to occur, a LTEMP that satisfies condition 15 of the NT Approval has not been included in this PRAP. As approved by the Auditor, a LTEMP that complies with condition 15 of the NT Approval will be prepared and included in the main/subsequent RAP.

13.2 Monitoring Plan (Commonwealth Approval)

To comply with condition 3 of the Commonwealth Approval, a monitoring plan must be developed and submitted to the Department of Climate Change, Energy, the Environment and Water at least 12 months prior to completion of Stage 3. The intent of the monitoring plan is to outline monitoring required to demonstrate whether the remediation project is progressing towards, or has achieved, the “State of the Environment” as defined in the Commonwealth Approval.

The monitoring plan required under the Commonwealth Approval will be prepared as a separate document, noting that there will be some overlap of monitoring requirements with the REMP, LTEMP and RvMP.

14.0 References

AS 1319-1994, "*Safety Signs for Occupational Environment*". Standards Australia.

CRC Care 2019, "*Remediation Action Plan: Implementation – Guideline on documentation, record keeping and reporting*", National Remediation Framework, CRC for Contamination Assessment and Remediation of the Environment, Newcastle Australia.

DITT 2021, "*Engagement and Communication Strategy – Rum Jungle Stage 2 Rehabilitation Works*", Document Ref: RJ3-3-P-010, version 1.0, dated 12 November 2021. Department of Infrastructure, Tourism and Trade.

DITT 2022a, "*Environmental Monitoring Plan – Rum Jungle Stage 3 Rehabilitation Works*", Document Ref: RJ3-4-P-018, version 0.4, dated 17 June 2022. Department of Infrastructure, Tourism and Trade.

DITT 2022c, "*Rum Jungle Rehabilitation Stage 2 – Construction Environmental Management Plan*", Document Ref: RJ3-3-MP-003, version 1.0, dated 27 January 2022. Department of Infrastructure, Tourism and Trade.

DITT 2022d, "*Draft Weed Management Plan – Rum Jungle Rehabilitation*", Document Ref: RJ3-4-MP-011, version 0.3, dated 28 January 2022. Department of Infrastructure, Tourism and Trade.

DITT 2022, "*Emergency Response Plan*", Document Ref: RJ3-4-MP-026, version 0.1, dated 13 January 2022. Department of Infrastructure, Tourism and Trade.

DITT 2023, "*Radiation Management Plan – Rum Jungle Stage 3 Rehabilitation Works*", Document Ref: RJ3-4-MP-029. Department of Infrastructure, Tourism and Trade.

DPIR 2019a, "*Draft Environmental Impact Statement – Rum Jungle Rehabilitation Project*". Department of Primary Infrastructure and Resources.

DPIR 2019b, "*Water Management Plan – Stage 3 – Rum Jungle Rehabilitation Project*", version 4, dated 27 November 2019. Department of Primary Industry and Resources.

IECA 2008, "*Best Practice Erosion & Sediment Control – Book 2 – Appendices A – G*". International Erosion Control Association (Australasia).

Martin-Stone 2020, "*Draft Rum Jungle Mine Rehabilitation Stage 2A – Cultural Heritage Management Plan (CHMP)*", version 1.0, dated 10 July 2020.

NEPC 2013, "*National Environment Protection (Assessment of Site Contamination) Measure 1999*", National Environment Protection Council, Amendment No. 1. National Environment Protection Council.

SLR 2022, "*Rum Jungle Rehabilitation – Stage 2A Detailed Engineering Design, Site Erosion and Sediment Control Measures*", Reference 680.10421-R01-v1.1, dated 28 February 2022. SLR Consulting Australia Pty Ltd.

Other references that have informed this report but not been referenced directly:

AECOM 2020, "*Environmental Impact Statement - Contaminated Land Auditor's Assessment Report, Rum Jungle Rehabilitation Program*", Ref: 60474472, Rev 00, dated 18 June 2020. AECOM Australia Pty Ltd.

GHD 2019b, "*Rum Jungle 2A – Air Noise & Vibration Baseline Monitoring Report*", dated May 2019.

Hughes, A & Bollhöfer, A 2010, "*Radiological investigations in the Rum Jungle and East Finniss River areas 2009*", Internal Report 584, November, Supervising Scientist, Darwin.

Robertson GeoConsultants 2023, "*DRAFT Technical Specifications: 2023 Drilling Program at Rum Jungle*", Letter dated 20 April 2023.

SLR 2020, "*Rum Jungle Rehabilitation – Stage 2A Detailed Design, Detailed Engineering Design Summary Report*", Reference 680.10421.900000-R01-v1.0, dated 19 June 2020. SLR Consulting Australia Pty Ltd.

Appendix A Culvert and Crossing Construction Drawings

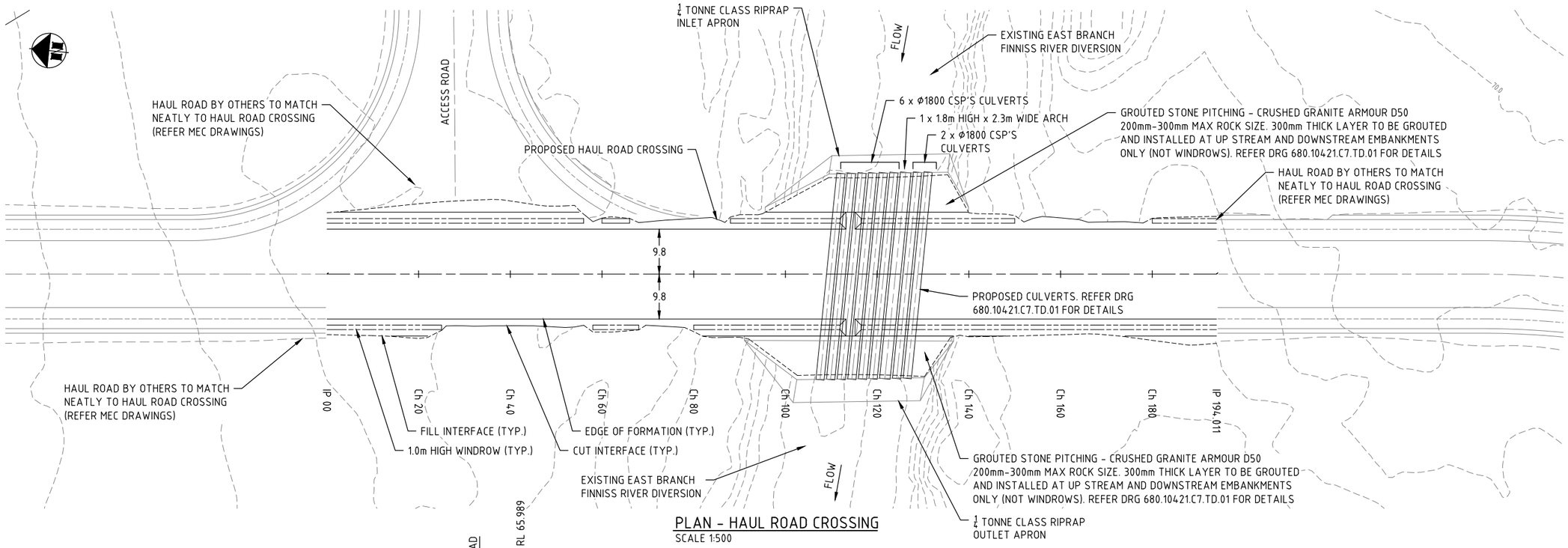
Preliminary Remediation Action Plan

Stage 3 Early Works – Rum Jungle Mine Site

Department of Industry, Tourism and Trade

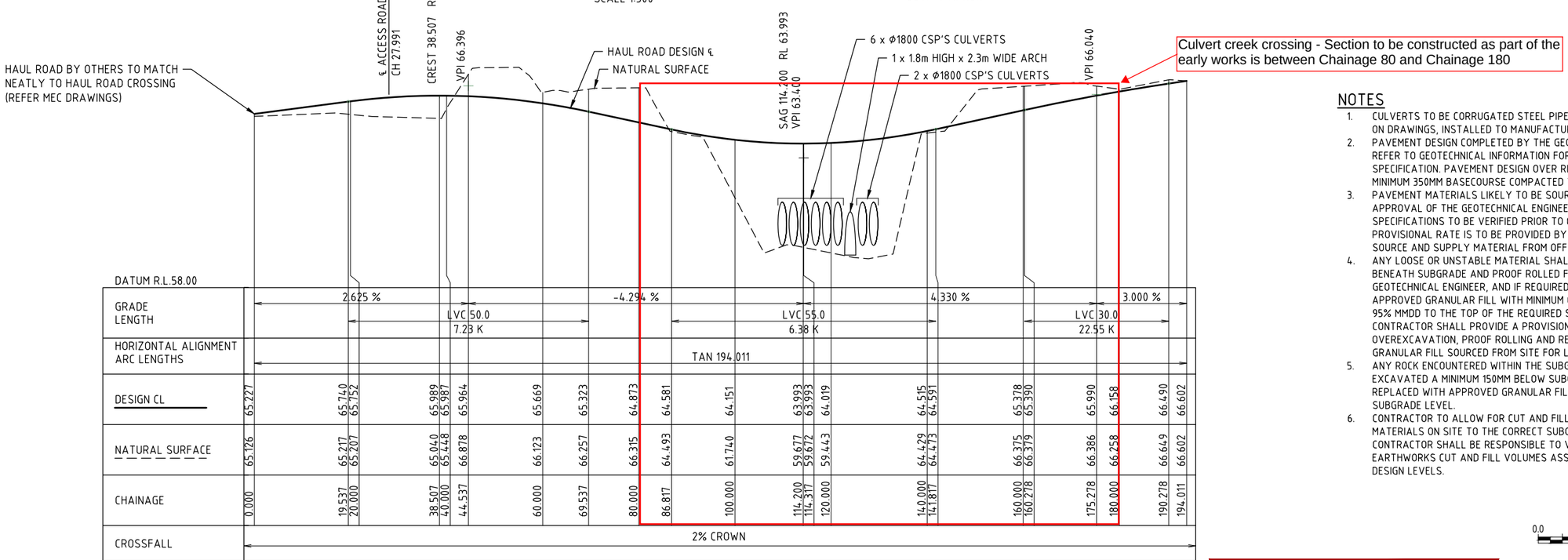
SLR Project No.: 680.30185.00000

27 September 2023



PLAN - HAUL ROAD CROSSING

SCALE 1:500



CHAINAGE	DESIGN CL	NATURAL SURFACE
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19.537	65.740	65.217
20.000	65.752	65.207
38.507	65.989	65.040
40.000	65.987	65.448
44.537	65.964	66.878
60.000	65.669	66.123
69.537	65.323	66.257
80.000	64.873	66.315
86.817	64.581	64.493
100.000	64.151	61.740
114.200	63.993	59.677
114.317	63.993	59.672
120.000	64.019	59.443
140.000	64.515	64.429
141.817	64.591	64.473
160.000	65.378	66.375
160.278	65.390	66.379
175.278	65.990	66.386
180.000	66.158	66.258
190.278	66.490	66.649
194.011	66.602	66.602

HAUL ROAD CROSSING - PROFILE

SCALE HOR 1:500 VER 1:100

NOTES

1. CULVERTS TO BE CORRUGATED STEEL PIPES AND ARCHES AS SHOWN ON DRAWINGS, INSTALLED TO MANUFACTURER'S REQUIREMENTS.
2. PAVEMENT DESIGN COMPLETED BY THE GEOTECHNICAL ENGINEER, REFER TO GEOTECHNICAL INFORMATION FOR DETAILS AND SPECIFICATION. PAVEMENT DESIGN OVER RIVER CROSSING TO BE MINIMUM 350MM BASECOURSE COMPACTED TO 98% MMDD.
3. PAVEMENT MATERIALS LIKELY TO BE SOURCED FROM SITE TO THE APPROVAL OF THE GEOTECHNICAL ENGINEER. ALL MATERIAL SPECIFICATIONS TO BE VERIFIED PRIOR TO CONSTRUCTION. A PROVISIONAL RATE IS TO BE PROVIDED BY THE CONTRACTOR TO SOURCE AND SUPPLY MATERIAL FROM OFF SITE.
4. ANY LOOSE OR UNSTABLE MATERIAL SHALL BE REMOVED FROM BENEATH SUBGRADE AND PROOF ROLLED FOR INSPECTION BY THE GEOTECHNICAL ENGINEER, AND IF REQUIRED RELACED WITH AN APPROVED GRANULAR FILL WITH MINIMUM CBR 15, COMPACTED TO 95% MMDD TO THE TOP OF THE REQUIRED SUBGRADE LEVEL. THE CONTRACTOR SHALL PROVIDE A PROVISIONAL RATE FOR OVEREXCAVATION, PROOF ROLLING AND REPLACING WITH APPROVED GRANULAR FILL SOURCED FROM SITE FOR LIFTS OF 200MM/M².
5. ANY ROCK ENCOUNTERED WITHIN THE SUBGRADE SHALL BE EXCAVATED A MINIMUM 150MM BELOW SUBGRADE LEVEL, AND REPLACED WITH APPROVED GRANULAR FILL TO THE FINISHED SUBGRADE LEVEL.
6. CONTRACTOR TO ALLOW FOR CUT AND FILL USING EXISTING MATERIALS ON SITE TO THE CORRECT SUBGRADE LEVELS. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY AND ALLOW FOR EARTHWORKS CUT AND FILL VOLUMES ASSOCIATED WITH ROAD DESIGN LEVELS.

0.0 5.0 10 15 20 METRES
SCALE 1:500

0.0 1.0 2 3 4 METRES
SCALE 1:100

FOR CONSTRUCTION

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	28/05/20	MFC	PFENG

AMENDMENTS Plot Date: 28/05/2020

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civil and structural engineering consultants
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Parap NT 0804
Telephone: (08) 7922 4100
nt@pfeng.com.au

DRAWN	CHECKED
M. CALLAGHAN	B. WASSINK
DATE: 18/05/2020	DATE: 18/05/2020
DESIGNED	CHECKED
M. CALLAGHAN	B. WASSINK
DATE: 18/05/2020	DATE: 18/05/2020
DESIGN PROJECT LEADER	NTG PROJECT MANAGER
D. O'TOOLE	J. HARTNETT
DATE: 28/05/2020	DATE: 28/05/2020

Northern Territory Government

DARWIN REGION
RUM JUNGLE
RUM JUNGLE REHABILITATION - STAGE 2A DETAILED DESIGN

HAUL ROAD CROSSING PLAN AND PROFILE

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	4 OF 5	680.10421.C5.RP.01	1	A1

Ver. Jan' 2020

PLOTTED ON: 28/May/2020 1:42 PM
USER: MATTHEW CALLAGHAN
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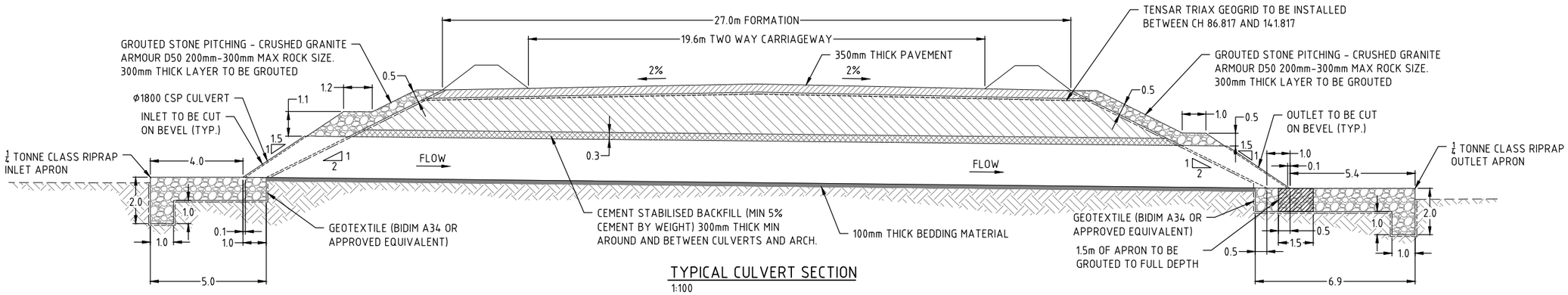

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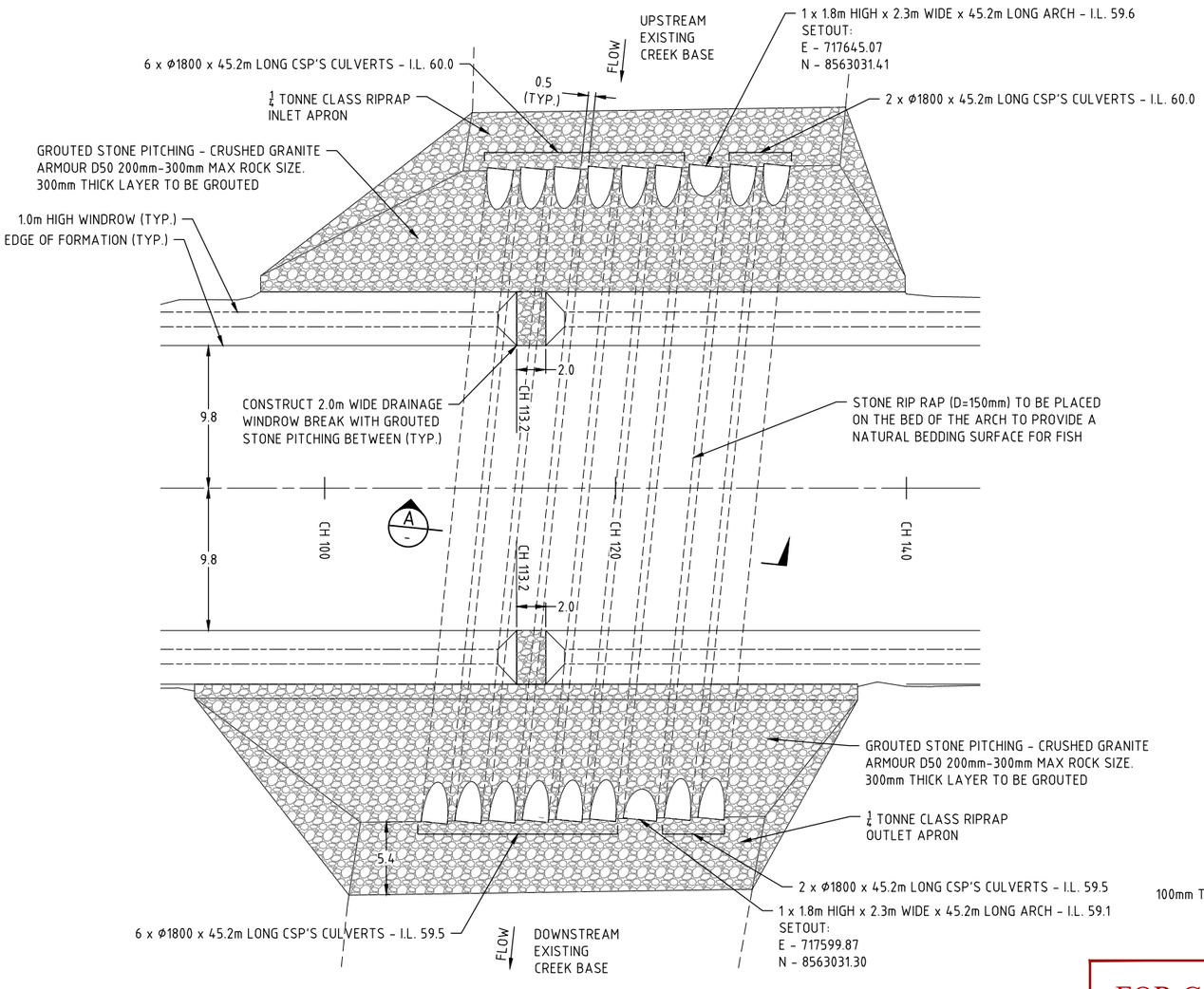

CULVERT SETOUT PLAN
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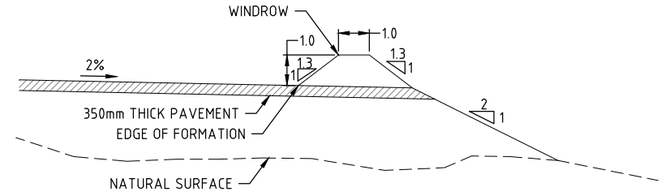
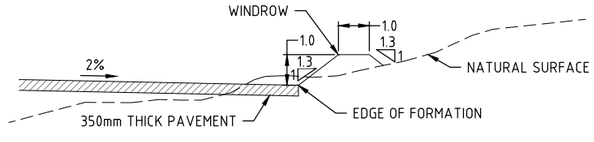
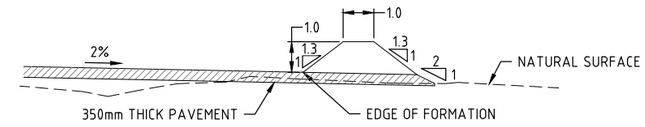


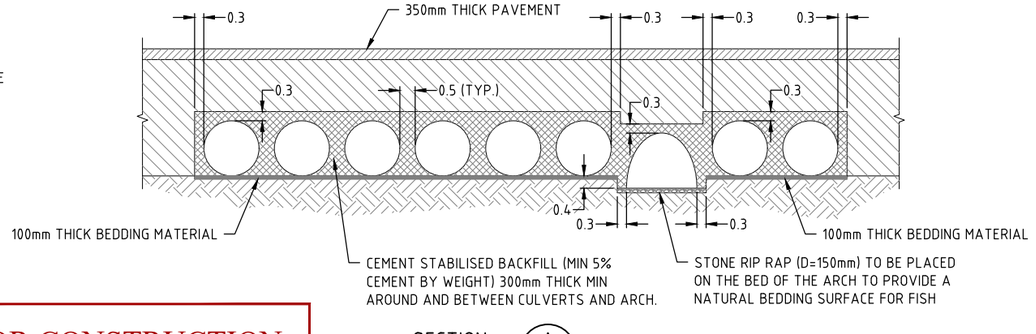
TYPICAL PAVEMENT DETAIL - NATURAL SURFACE BELOW PAVEMENT AT EDGE OF FORMATION
1:100



TYPICAL PAVEMENT DETAIL - NATURAL SURFACE ABOVE PAVEMENT AT EDGE OF FORMATION
1:100



TYPICAL PAVEMENT DETAIL - NATURAL SURFACE WITHIN PAVEMENT AT EDGE OF FORMATION
1:100



FOR CONSTRUCTION

SECTION A - SCALE 1:100

SCALE 1:100 (0.0, 1.0, 2, 3, 4 METRES)

SCALE 1:200 (0.0, 2.0, 4, 6, 8 METRES)

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	28/05/20	MFC	PFENG

AMENDMENTS — Plot Date: 28/05/2020

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DRAWN	CHECKED
M. CALLAGHAN DATE: 18/05/2020	B. WASSINK DATE: 18/05/2020
DESIGNED	CHECKED
M. CALLAGHAN DATE: 18/05/2020	B. WASSINK DATE: 18/05/2020
DESIGN PROJECT LEADER	NTG PROJECT MANAGER
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Northern Territory Government

DARWIN REGION
RUM JUNGLE
RUM JUNGLE REHABILITATION - STAGE 2A DETAILED DESIGN

HAUL ROAD CROSSING SECTIONS AND DETAILS

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	5 OF 5	680.10421.C7.TD.01	1	A1

Ver. Jan' 2020

PLOTTED ON: 28/May/2020 2:19 PM
USER: MATTHEW CALLAGHAN
FILE LOCATION: F:\2018\Projects\18-259 Rum Jungle Finnis River\Drawings\CIV\680.10421.C7.TD.01.dwg

Appendix B Health and Environmental Risk Assessment Matrix – Early Works

Preliminary Remediation Action Plan

Stage 3 Early Works – Rum Jungle Mine Site

Department of Industry, Tourism and Trade

SLR Project No.: 680.30185.00000

27 September 2023

Contaminant	Source	Receptor	Exposure pathway	Cause	Initial risk			Controls	Residual risk			Notes
					Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating	
Radiological soil	Identified radiological soil areas *Note: No early works are within known areas of radiological materials.*	Onsite workers	Inhalation	Emission of radionuclides within dust emissions from exposed surfaces due to wind erosion	Moderate	Possible	Medium	• All radiation areas or locations of potential elevated radiation levels near the early works site will be clearly signposted and delineated. All personnel working onsite shall be made aware of the presence and location of radiological soil areas and requirements for access. • Use of dust mitigation measures as required, which may include use of water spray on tracks and within culvert crossing construction area. Use of appropriate respiratory protection (ie: P2 face mask) if working in windy conditions. • Use of water spray as required to minimise dust generation.	Minor	Unlikely	Low	Due to minimal ground disturbance and earthworks scheduled to occur during the early works and given that no soil disturbance is planned within areas of identified radiological impact, the potential likelihood of detrimental impacts to human health is considered low. Residual risk consequence reduced to minor for all potential exposure pathways and causes as the controls to be implemented will reduce the duration of potential dust emissions and thus reduce exposure time. Note: The source pathway receptor linkage is not complete for members of the public to be exposed to radiation during the early works. This is due to the following: • Handling/disturbance of waste rock, which is a source of radon decay products and long lived alpha activity in dust) is not scheduled as part of the early works. Any dust generation from WRDs would be passive/incidental (ie: no additional dust generation from WRDs expected beyond background levels – additional dust generated during early works would be attributed to excavation and handling of material associated with construction of new internal haul road culvert section, vehicle movements onsite etc) • Exposure to gamma radiation is not currently a pathway for members of the public since gamma dose rate decreases by the square of the distance from the source. Gamma dose rates in the nearest occupied areas are not detectable above background levels.
				Unauthorised access into identified areas of radiological soil	Moderate	Possible	Medium		Minor	Unlikely	Low	
			Ingestion	Unauthorised access into identified areas of radiological soil	Moderate	Possible	Medium		Minor	Unlikely	Low	
PAF material	Waste rock – WRDs and WRD Levee	Aquatic ecosystems	Plant uptake and ingestion	Disturbance of waste rock and improper storage (eg: stockpiling adjacent to surface water or leaving exposed to the elements) during culvert construction	Moderate	Possible	Medium	• Stockpile locations must be approved by the DITT project team prior to storing soil or rock materials • Implementation and adherence to the erosion and sediment control outlined in this PRAP.	Moderate	Unlikely	Low	• No interaction with any other areas of identified PAF material is expected as part of the early works.
Asbestos	Asbestos containing building materials & ACM impacted soil material - dumped anthropogenic waste and tailings material to the north of the site	Onsite workers	Inhalation of asbestos fibres	Damage to existing buildings that include ACM, due to unauthorised access. Unauthorised access into identified areas of asbestos impacted soil	Minor	Unlikely	Low	• All buildings and areas where ACM have been identified at the site will be clearly signposted and delineated. All personnel working onsite shall be made aware of the presence and location of asbestos hazard areas and requirements for access. • Unexpected finds protocol for any chance finds of ACM debris during the early works	Minor	Unlikely	Low	• Active work areas for the early works will be a considerable distance away from areas where asbestos impacted / building materials have been identified. ACM within the old buildings is bonded and does not pose a health risk if it remains in situ in good condition. The areas where ACM impacted soil has been identified are over 1 km from the culvert crossing work area.
Sediment	Exposed soil surfaces across the site, particularly within culvert creek crossing area and adjoining tracks	Aquatic ecosystem	N/A – increased sediment loading has the potential to reduce water and habitat quality	Altered surface flow patterns due to slope of culvert creek crossing and adjoining sections of road – could result in an increased sediment load to the EBFR. Residual soil/rock material from road construction could erode to EBFR in wet season.	Moderate	Possible	Medium	• Implementation of erosion and sediment control • Schedule works for the dry season • Routine inspections during the wet season and periods of high rainfall • Supervision of contractors by DITT project team	Moderate	Unlikely	Low	Minimal alternation to surface flow patterns expected as a result of the culvert creek crossing. Given the crossing will be paved, sediment load in runoff from directly above/adjacent to this section of the EBFR is expected to be less than previously.

Consequence Descriptors					
Category of Impact	***Minor***	***Moderate***	***Serious***	***Major***	***Catastrophic***
Health	Reversible health effects of little concern First aid treatment	Reversible health effects of concern Medical treatment	Severe reversible health effects of concern Lost time illness	Single fatality or irreversible health effects or disabling illness	Multiple fatalities or serious disabling illness to multiple people
Safety	Low level short-term subjective inconvenience or symptoms First aid treatment	Reversible injuries requiring treatment, but does not lead to restricted duties Medical treatment	Reversible injury or moderate irreversible damage or impairment to one or more persons Lost time injury	Severe irreversible damage or severe impairment to one or more persons	One or multiple fatalities or permanent damage to multiple people
Onsite Environment	Near-source confined and promptly reversible impacts (Typically a shift)	Near-source confined and short-term reversible impact (Typically a week)	Near-source confined and medium-term recovery impact (Typically a month)	Impact that is unconfined and requiring long-term recovery, leaving residual damage (Typically years)	Impact that is widespread unconfined and requiring long-term recovery, leaving major residual damage (Typically years)
Off-site Environment	Not applicable	Near-source confined and promptly reversible impact. (Typically a shift)	Near-source confined and short-term reversible impact. (Typically a month)	Near-source confined and medium-term recovery impact (Typically a month)	Impact that is unconfined and requiring long-term recovery, leaving residual damage (Typically years)
Socio-economic	Local, small scale, easily reversible change on social characteristics or values of the communities of interest or communities can easily adopt or cope with change	Short-term recoverable changes to social characteristics and values of the communities of interest or community has substantial capacity to adapt and cope with change	Medium-term recoverable changes to social characteristics and values of the communities of interest or community has substantial capacity to adapt and cope with change	Long-term recoverable changes to social characteristics and values of the communities of interest or community has substantial capacity to adapt and cope with change	Irreversible changes to social characteristics and values of the communities of interest or community has substantial capacity to adapt and cope with change
Cultural Heritage	Reparable damage to site or item of low cultural significance	Irreparable damage to site or item of low cultural significance	Repairable damage to site or item of cultural significance	Irreparable damage to site or item of cultural significance	Irreparable damage to site or item of international cultural significance
****Terrestrial flora & fauna***	Localised (less than a hectare) and/or brief (days)	Small scale (few hectares) and/or short-term (weeks)	Medium scale (many hectares) and/or medium-term (months)	Large scale (many square kilometres) and/or long-term (years)	Regional and/or permanent, resulting in the dominance of only a few species
****Aquatic ecosystems***	Confined and/or brief (days)	Small scale (limited to watercourse within the project area) and/or short-term (weeks)	Medium scale (few kilometres downstream) hectares) and/or medium-term (months)	Large scale (many kilometres downstream) and/or long-term (years)	Regional and/or permanent, resulting in the dominance of only a few species

Likelihood Descriptors	
Descriptor	**Explanation**
Almost Certain	The event is expected to occur in most circumstances This event could occur at least once during a project of this nature 91-100% chance of occurring during the project
Likely	The event will probably occur in most circumstances This event could occur up to once during a project of this nature 51-90% chance of occurring during the project
Possible	The event could occur but not expected This event could occur up to once every 10 projects of this nature 11-50% chance of occurring during the project
Unlikely	The event could occur but is improbable This event could occur up to once every 10-100 projects of this nature 1-10% chance of occurring during the project
Rare	The event may occur only in exceptional circumstances This event is not expected to occur except under exceptional circumstances (up to once every 100 projects of this nature) Less than 1% chance of occurring during the project

Likelihood	Consequence Level				
	Minor	Medium	Serious	Major	Catastrophic
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium
Extreme	Intolerable - Risk reduction is mandatory wherever practicable. Residual risk can only be accepted if endorsed by senior management				
High	Intolerable or tolerable if managed to as low as reasonably practicable - Senior management accountability				
Medium	Intolerable or tolerable if managed to as low as reasonably practicable - Management responsibility				
Low	Tolerable - Maintain systematic controls and monitor				

Appendix C Example Material Movement Tracker

Preliminary Remediation Action Plan

Stage 3 Early Works – Rum Jungle Mine Site

Department of Industry, Tourism and Trade

SLR Project No.: 680.30185.00000

27 September 2023

Material Movement Tracker (soil and rock) - Early Works - Rum Jungle Mine Rehabilitation

Date	Material type	Source of material	Quantity (tonnes or cubic metres)	Reason for material movement	Location material is moved to	Stockpile ID (as required)	Notes

Appendix D Interim Cultural Heritage Protocol

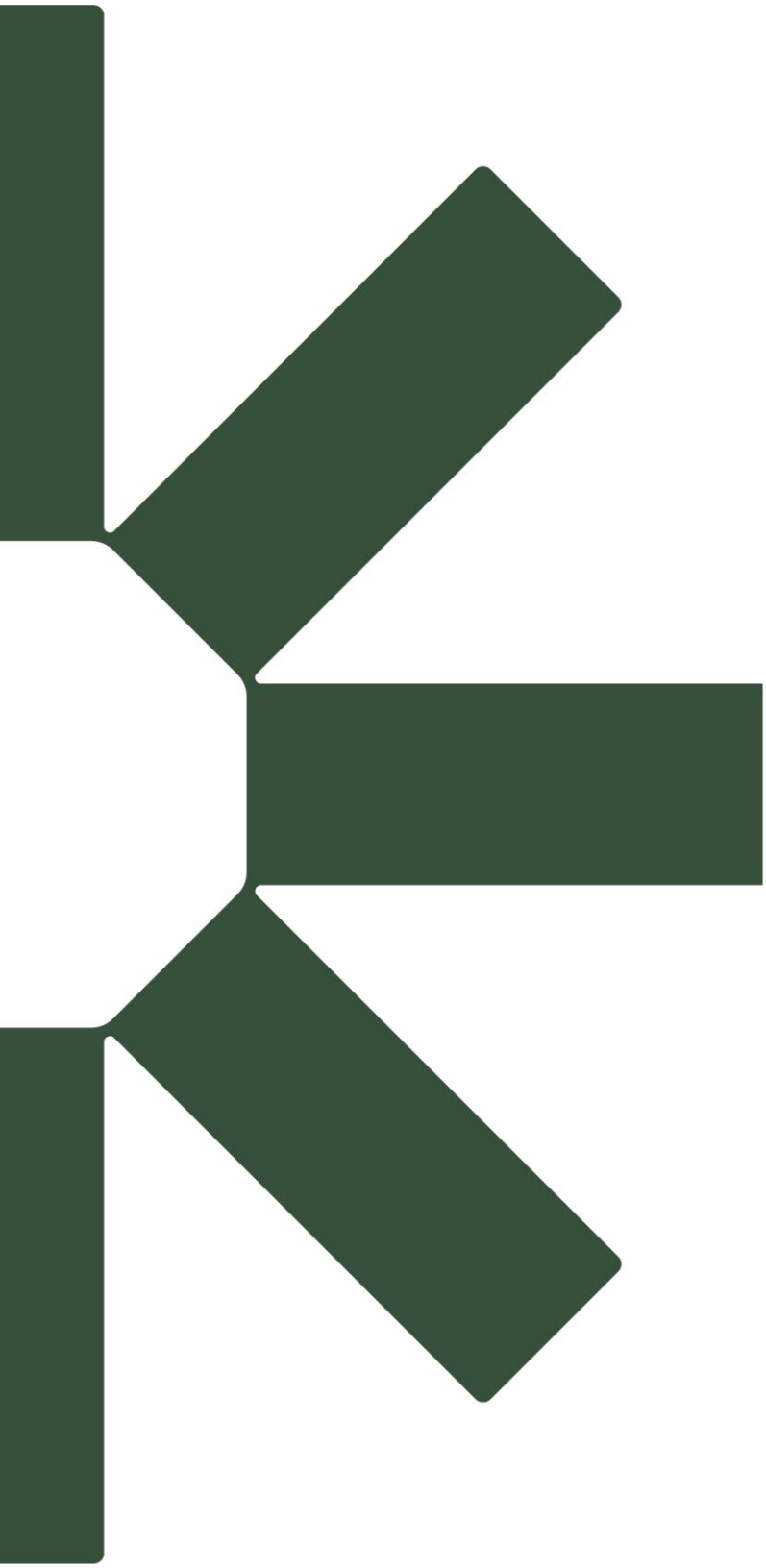
Preliminary Remediation Action Plan

Stage 3 Early Works – Rum Jungle Mine Site

Department of Industry, Tourism and Trade

SLR Project No.: 680.30185.00000

27 September 2023



Making Sustainability Happen

Interim Protocol – Cultural Heritage Protection for Preliminary Works

Rum Jungle Rehabilitation Project

NORTHERN TERRITORY GOVERNMENT

Document title	Interim Protocol – Cultural Heritage Protection for Preliminary Works
Contact details	Department of Industry Tourism and Trade
Approved by	Armando Padovan
Date approved	26 September 2023
Document review	As required
TRM number	NA

Version	Date	Author	Changes made
0.1	25 August 2023	Jackie Hartnett	New Document on advice of NLC. Incorporate additional mapping and details as requested by TOs and NLC.
0.2	01 September 2023	Paul Jones, Mark Mialszygrosz	Review
0.3	01 September 2023	To NLC for review	
0.4	12 September 2023	Paul Jones	To Auditor for review
0.9	26 September 2023	Jackie Hartnett	Draft pending Auditor review and endorsement
1.0	26 September 2023	Approved version	

Acronyms	Full form
CHMP	Cultural Heritage Management Plan
EIS	Environmental Impact Statement
NLC	Northern Land Council
NT	Northern Territory
PRAP	Preliminary Remediation Action Plan
TO	Traditional Owners of the land, Warai and Kungarakan people

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1. Introduction

The Environmental Approval for the Rum Jungle Rehabilitation Project issued on 29 March 2023 requires a remediation action plan to include a cultural heritage management plan (**CHMP**) (Condition 5-1, Condition 9-1, Condition 9-7). Consultation with Northern Land Council (NLC), Kungarakan and Warai in August 2023 found that Traditional Owners (TOs) wanted more time to consider the full CHMP and the NLC suggested an Interim Protocol be prepared. The project's Contaminated Sites Auditor agrees that the CHMP can be prepared in stages. This will allow time for all parties to more effectively involve Warai and Kungarakan people in completion of the full CHMP while allowing preliminary works to take place.

This Interim Protocol is to ensure compliance with Cultural Heritage protection requirements for the Preliminary Scope of Works and is in line with the existing Draft CHMP. For simplicity, non-works items have also been included in this Protocol to ensure transparency and clear communication with Warai and Kungarakan people and their representatives the NLC. The scope of works and non-civil works is described in the Preliminary Remediation Action Plan (PRAP) includes:

- Culvert crossing over the diversion channel onsite
- Temporary tool laydown area nearby to the diversion channel onsite
- Revegetation areas planned for this year
- Cycad relocation areas planned for this year

This document is a sub-document of the Preliminary Remediation Action Plan and was built from datasets and findings from multiple field archaeological surveys that have been conducted across the site and related areas.

2. Related Documents

Martin-Stone, KC and Wesley, D. 2011. *An archaeological and heritage survey of the former Rum Jungle mine site, Northern Territory*. Unpublished report by Earthsea Heritage Surveys to the Department of Resources, Northern Territory.

Martin-Stone, KC. 2019. *A report on the archaeological survey for the Rum Jungle Rehabilitation Project – Stage 2A*. Unpublished report to the NT Department of Primary Industry & Resources.

Martin-Stone, KC. 2020. *Rum Jungle Mine Rehabilitation Stage 2A – Cultural Heritage Management Plan*. Unpublished report to the NT Department of Primary Industry & Resources.

DITT. 2023. RJR3-FR-704 Ground & Vegetation Disturbance Request Form

DITT. 2023. RJR3-PR-507 Vegetation Clearing Procedure

DITT. 2023. RJR3-PR-507 Cycad Salvaging Procedure

SLR. 2023. Preliminary Remediation Action Plan

3. Work areas in relation to Cultural Heritage

The following maps show the preliminary works areas in relation to Cultural Heritage features. Note that the highest level of mitigation of impact to Cultural Heritage features is to avoid them. This highest principle has been applied to the planned work preliminary work areas. A description of the maps and features is listed here. *All work areas AVOID all known existing cultural heritage objects and places*.

3.1. Maps 1 and 2

Maps 1 and 2 include the location of the Sacred Site exclusion zone for ease of reference, the Sacred Site exclusion zone is protected under the *Sacred Sites Act* and in accordance with the Project's Sacred Sites Authority Certificate. The maps also include known heritage objects and places and their buffer zones.

The Maps include the location of the culvert crossing area and the planned temporary laydown area. Again both of these areas are former mine disturbed areas. The diversion channel was dug during mining works in the 1950s to pass East Branch water away from the Main and Intermediate wamining pits. The temporary tool laydown area was heavily disturbed previously with all top soils stripped ans d the area heavily trafficked historically. The purpose of the culvert is to relocate the current road away from the Sacred Site to a more suitable location to improve cultural safety without causing signficant additional environmental impacts.

Map 2 is a zoomed in scale to allow readers to more easily see the details of location in relation to important cultural heritage and sacred sites.

3.2. Map 3

The map shows the area planned for cycad relocation this year. As described throughout the Environmental Impact Statement documentation, and on request of some Custodians and Traditional Owners, the multi-stem cycads that are within, or nearby to, future work areas have been mapped for planned salvage. The area shown on Map 3 (green outline) is the work area planned for this year. Further work will take place in following years. This is to prepare for 2024 and 2025 earthworks. Multi stem cycads will be flagged by the Project's Land Management Team and then relocated to adjacent woodland onsite, a safe distance away from the future work areas. Additionally, single stem cycads and sand palms, while not culturally significant, will be salvaged and some relocated to the revegetation areas (Map 4) as good practice revegetation resource reuse. The Project will employ an NT expert in cycad salvaging through Territory Native Plants. There are not artefacts mapped in this area from previous archeological survey and there are patches of previous disturbance within and around this location.

3.3. Map 4

This map shows the location of the planned revegetation areas for this year. The northern area is the woodland revegetation area (3ha) and the southern area is for monsoon vine thicket revegetation type (1ha). It is intended that some of the single stem cycads and sand palms will be relocated to the woodland revegetation area. The revegetation areas are heavily disturbed from historic mining activities whereby all ground cover and soils have been previously stripped and in the case of the woodland area, this was once covered with tailings from the old uranium processing facility.

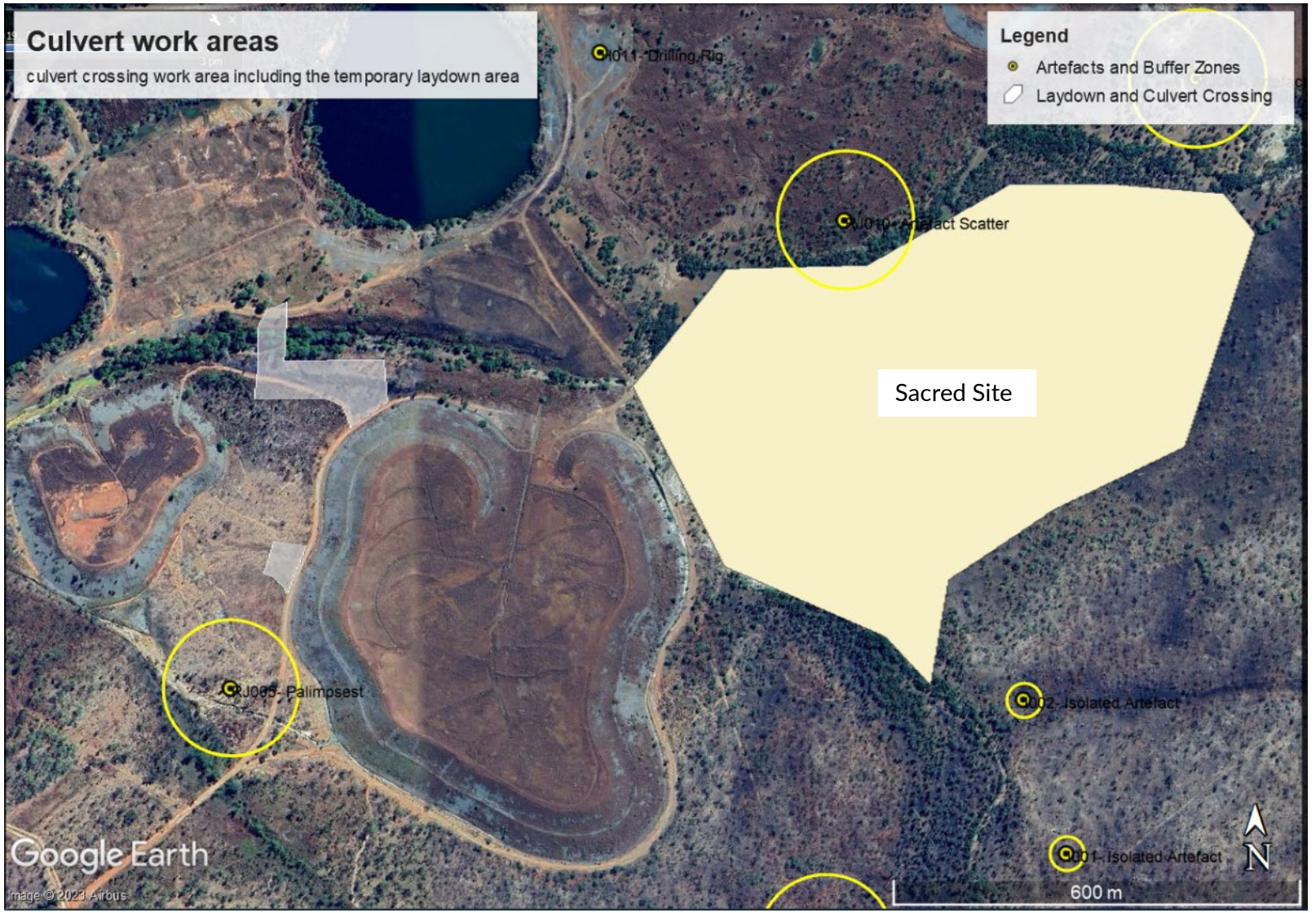

Figure 1 Map 1 Preliminary Works Areas

Figure 2 Map 2 Closer Bores and Culvert

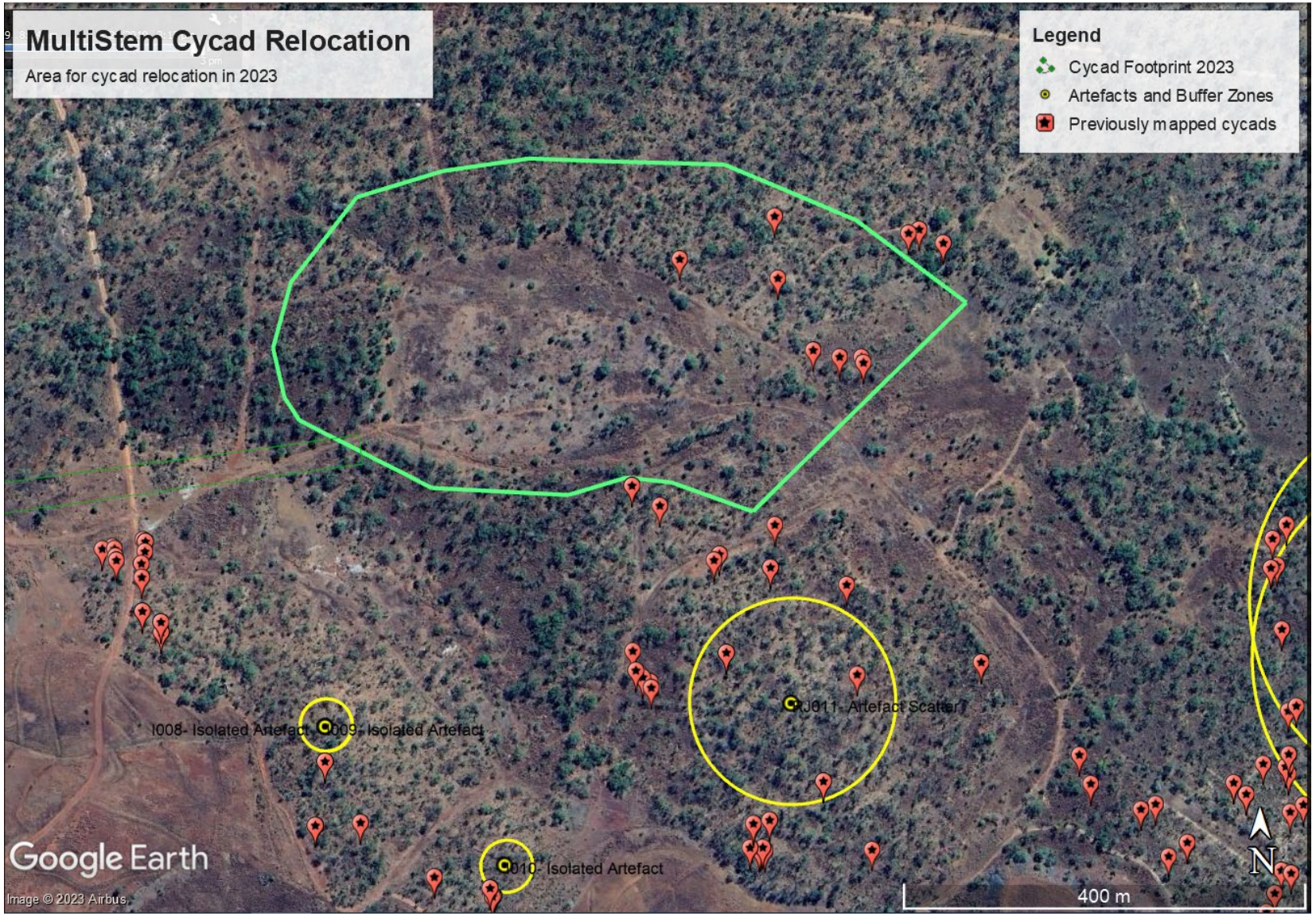

Figure 3 Map 3 Multistem Cycads for Relocation (Green Boundary)

Figure 4 Map 4 Revegetation Areas

4. Likelihood of Artefacts

The Maps above show the known cultural heritage features, their related buffer zones as per the Draft CHMP and the planned work areas. Note that all works *do not disturb known cultural heritage features*. Therefore this Interim Protocol focusses on identification and protocols for new unplanned finds.

As highlighted above, the scope of preliminary work is taking place on ground previously disturbed. The level of disturbance ranges from very highly to moderately disturbed. Historic disturbance affects the likelihood of cultural heritage items being present. A summary table of artefact likelihood for each work type is shown here:

Table 1 Likelihood of New Finds

Work Type	Historic Disturbance	Known CH Features within the new work area?	Nearby CH Features?	Likelihood of New Finds
Culvert and temporary tool laydown	Highly disturbed	No	No	Very low
Cycad Relocation	Low to Moderately disturbed	No	Yes	Moderate
Woodland Revegetation	Very highly disturbed	No	No	Very low
Forest Revegetation	Very highly disturbed	No	No	Low

4.1. Work Area Cultural Heritage Protection

For all areas noted in Table 1 as very low or low likelihood of new finds, the existing Project Ground Disturbance process will be followed by the Project Team. This includes a process to check the disturbance footprint against the mapped heritage objects and places and to walk over the ground for an additional pre-disturbance check. The site induction and work area risk assessment processes will include specific instructions to all workers to not disturb ground outside of their approved area, not walk or drive into restricted areas, only drive on existing tracks and report anything they think may be an artefact or object immediately to the Project Superintendent.

For the area identified as Moderate likelihood of new finds (the Cycad Relocation area), the following process will be followed by the Project Team in partnership with the Northern Land Council and Kungarakan and Warai people, as a field survey by Warai and Kungarakan persons will be required. This will also allow for better sharing of information with interested persons regarding the relocation process for the multistemmed cycads. The cycad relocation zone on Map 3 covers 4ha and has been previously surveyed for cultural heritage features. None were found. The perimeter of the green zone is approximately 800m.

1. Nominated Kungarakan and Warai representatitve to walk over and inspect the cycad relocation area prior to works commencing.
2. Project will discuss and explain the cycad relocation project with the nominated team.

3. Any potential items requiring specialist assessment will be marked in the field and by GPS for referral to an external specialist at a later date. Field flagging will show the cycad relocation team areas to avoid.
4. Flagged areas will also later be marked by the Project team with an adjacent star picket and additional flagging.
5. The nominated representatives team to be employed as per the NLC's Aboriginal Consultants framework.
6. After the field walk over, the Project team will provide the NLC a map of any flagged objects for record keeping purposes.
7. The Project will, at a later time, have the flagged objects assessed by an expert and the reporting and all data provided to the NLC.

4.2. Cultural Heritage Induction

All workers either employed directly by DITT or by a contractor performing work on their behalf under the PRAP will be required to complete the site induction. The induction includes the cultural heritage induction and provides information on:

- the Aboriginal Areas Protection Authority's Authority Certificate under the *Northern Territory Aboriginal Sacred Sites Act 1989 (NT)* ;
- the protection of the existing cultural heritage values within the Project footprint; and
- the locations and rules to protect Aboriginal heritage objects and Aboriginal heritage places.

Records of inductions will be held in the project's induction register.

4.3. Stop Work

The site cultural induction includes the direction to stop work and notify the project manager to report accidental disturbance immediately. Particularly in the event of suspected or actual unexploded ordinance, human remains, or Aboriginal archaeological places or objects are encountered.

4.4. Compliance

Compliance with this protocol will be monitored and investigated by the approval holder DITT's HSE team, Superintendent and the Project Services Manager. Any significant breaches of the protocol will be notified to the relevant government authorities.

RUM JUNGLE REHABILITATION - STAGE 2A DETAILED ENGINEERING DESIGN

Site Erosion and Sediment Control Measures

Prepared for:

Department of Primary Industry and Resources
PO Box 4550
DARWIN NT 0801

SLR Ref: 680.10421-R01
Version No: -v1.1
February 2022

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Department of Primary Industry and Resources (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
680.10421-R01-v1.1	28 February 2022	Stephane Peignelin	Duncan Barnes (CPESC) / Paul Delaney	Danielle O'Toole
680.10421-R01-v1.0	12 June 2020	Stephane Peignelin	Duncan Barnes (CPESC) / Paul Delaney	Danielle O'Toole

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1 Introduction

1.1 Project Background

The Northern Territory Government (NTG), represented by the Department of Primary Industry and Resources (DPIR), proposes the rehabilitation of the former Rum Jungle Mine site (the Project), located 6 km north of Batchelor, Northern Territory (NT). The project location and regional setting are shown on Figure 1.

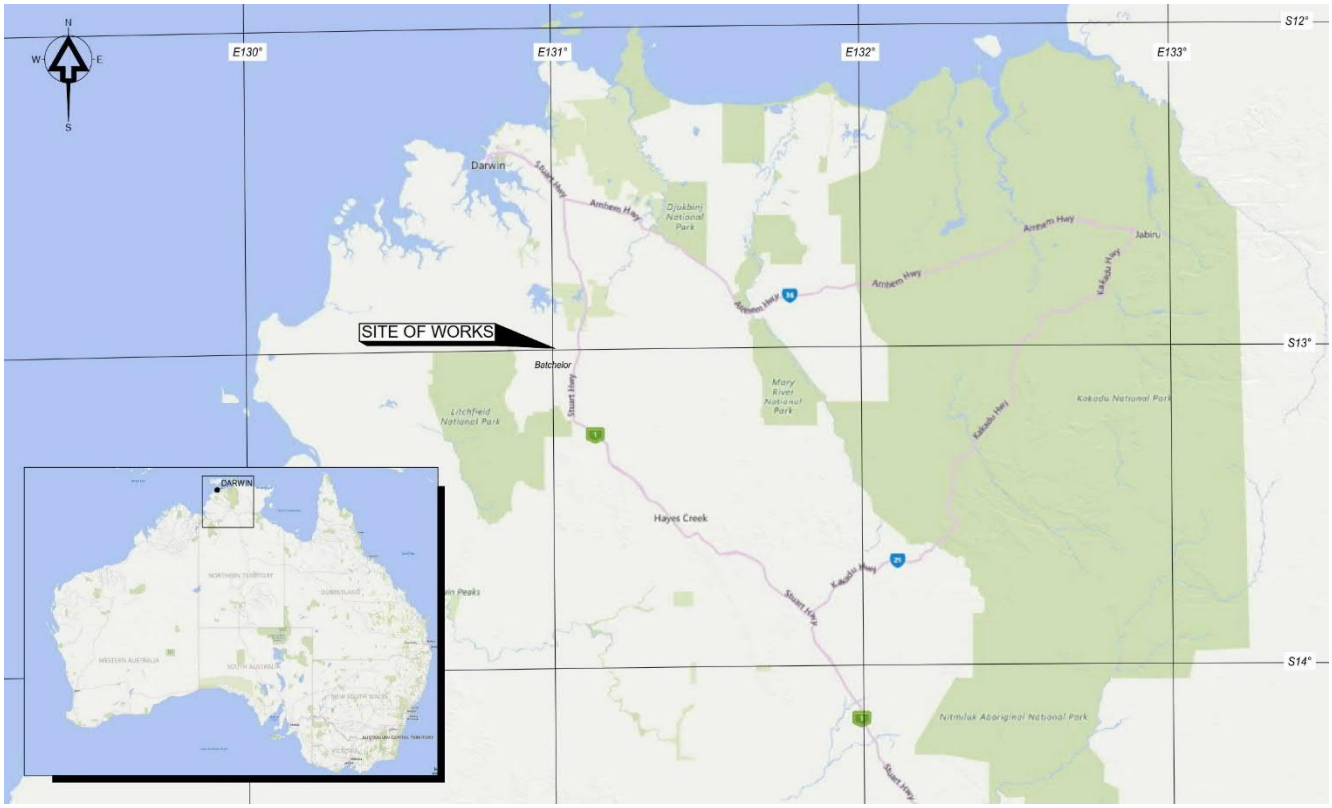

Figure 1 Project Location

The former Rum Jungle mine was rehabiliated in the 1980s, however recent studies indicate that not only has the site deteriorated and needs further rehabilitation, but that the traditional Aborignal owners cultural requirements have not been met. Since 2009, the NTG and the Australian Government have been working under a National Partnership arrangement to complete investigative work to inform a rehabilitation plan, deliver site maintenance and continue environmental monitoring. The results of these programs have been used to develop an improved rehabilitation strategy that is consistent with the views and interests of traditional Aboriginal owners and that meets contemporary environmental and mined land rehabilitation standards.

The Project's high-level objectives are two-fold and focus on environmental remediation and restoration of cultural values of the site as described below:

- Improve the environmental condition onsite and downstream of site within the East Branch Finniss River (EBFR). This includes the following key outcomes:
  - Improved surface water quality conditions within EBFR in accordance with locally derived water quality objectives (LDWQOs).

  - Achieve chemically and physically stable landforms.
  - Support self-sustaining vegetation systems within rehabilitated landforms.
  - Develop physical environmental conditions supportive of the proposed Land Use Plan.
- Improve site conditions to restore cultural values. This includes the following key outcomes:
  - Restoration of the flow of the EBFR to original course as far as possible.
  - Remove culturally insensitive landforms from adjacent to sacred sites and relocate ensuring a culturally safe distance from the sacred sites.
  - Return living systems including endemic species to the remaining landforms.
  - Preserve Aboriginal cultural heritage artefacts and places.
  - Isolate sources of pollution including radiological hazards.
  - Maximise opportunities for Traditional Owners to work onsite to aid reconnection to country.

1.2 Rehabilitation Strategy

The rehabilitation strategy has been developed from an understanding of current site conditions, contamination processes and a Land Use Plan goals as established with Traditional Owners. There are several key elements that have been incorporated in the strategy in order to satisfy the cultural needs of sacred site Custodians.

1.2.1 Remediation Action Plan

The actions planned to address contamination processes and improve prospects of future land use are:

- Slow down or halt the acid metalliferous drainage (AMD) production reactions from potentially acid forming (PAF) waste rock onsite by consolidating waste rock into one of three new facilities based on the PAF characteristics. These facilities are:
  - Within the Main Pit backfill zone – ~1.47 Mm3 storage for waste rock;
  - East Waste Storage Facility (WSF) – ~3.77 Mm^3 storage volume; and
  - West WSF – ~1.88 Mm^3 stored volume.
- Slow down or halt the future generation and transportation mechanisms for copper and other metals in the new WSFs by adopting leading practice methodology for storage of PAF waste rock.
- Treat existing groundwater sources (i.e. the Main and Intermediate Waste Rock Dumps (WRDs)) that contaminate the EBFR by pumping and treating these impacted waters.
- Treat other AMD-impacted groundwater that does not contribute to the EBFR copper load (i.e. old ore stockpile area) by pumping and treating these impacted waters.
- Isolate radiological, AMD or metal impacted soils at the Rum Jungle site, Mt Burton and Mt Fitch from environmental and human receptors by relocating these soils to the new WSFs on site.
- Isolate asbestos materials at the Rum Jungle site from environmental and human receptors by removing from surface soils and relocating to the new WSFs or by another approved means offsite.

1.2.2 Reestablishment of Cultural Values

The actions that are planned to address the compromised environmental and cultural values that are not related to contamination processes are:

- Return the EBFR to its original course as far as possible.
- Restore land parcels that are poorly vegetated such as the Old Tailings Dam area and vine thicket stand.
- Revegetate new landforms to stabilise the surface and restore ecological function as far as practicable.

The relevant Project locations are shown on Figure 2.

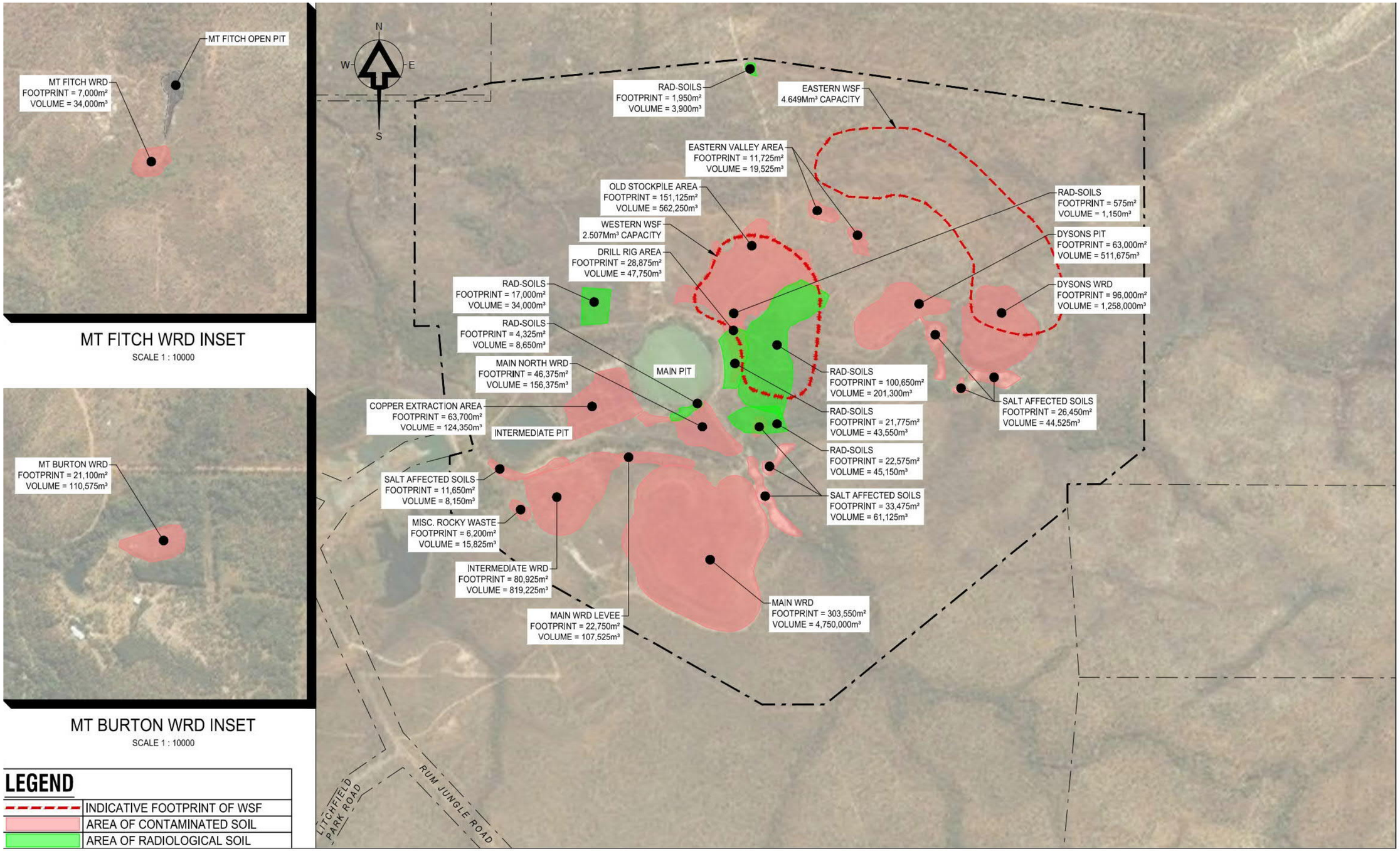

Figure 2 Waste Rock and Impacted Soil Areas

1.3 Stage 2A Detailed Engineering Design for Rehabilitation

SLR Australia Pty Ltd (SLR) has been engaged to deliver the Stage 2A detailed engineering design to meet the engineering requirements for construction of the rehabiliation strategy (referred to as Stage 3 Rehabiliation Construction). This report forms part of the design works. For full design details refer (SLR, 2020a).

1.4 Objectives and Scope of Works for Erosion and Sediment Control Measures

This report summarises the erosion and sediment control measures required for the proposed rehabilitation works during both the construction phase and for longer term after site works are complete. This Erosion and Sediment Control Plan (ESCP) report should be read in conjunction with drawings 680.10421-SUW -D01 to D12.

2 Battery Limits

This ESCP has been prepared to support construction and post-construction activities at the Rum Jungle site, including:

- Construction of the new WSFs;
- Construction of haul roads, including the EBFR diversion drain crossing, required during construction;
- Activities associated with the new Water Treatment Plant (WTP);
- Footprints associated with where existing waste rock dumps and impacted soils will be relocated from;
- Realignment of the EBFR to original alignment after construction works are complete; and
- Works required on the existing EBFR diversion when decommissioned.

3 Design Guideline/Standards

This ESCP has been prepared to manage potential erosion and sediment control (ESC) impacts of the proposed works in accordance with the 'Best Practice Erosion and Sediment Control' guideline (IECA, 2008), the Project Draft Environmental Impact Statement (NT-DPIR, December 2019) and best practice.

4 Assumptions

This ESCP report and the associated drawings 680.10421-SUW - D01 to D12 provide a reference design with preliminary strategies and details for the implementation of erosion and sediment controls during the construction works at Rum Jungle, and document minimum requirements. It is assumed that the Construction Contractor(s) will refine and update details of progressive ESCP's as the works take place.

Further assumptions made in preparing the ESCP are outlined in Sections 4.1 and 4.4.

4.1 General

- The WSF construction works will take around 5 to 7 years and during that period there will be progressive revegetation of the final surfaces;
- Sediment dams are considered temporary, but will be required during both the construction phase and monitoring phase (~15 years);
- Where practical, sediment dams will be located above the 5-year Average Recurrence Interval (ARI) flood level; and
- Run-off from the Western WSF will report to the Main Pit (rather than a separate sediment dam).

4.2 Construction and Deconstruction Approaches

With regard to WRD deconstruction an approach consistent with the Draft EIS (NT-DPIR, December 2019) has been assumed with regard to progressive staging and protection of works during the wet season.

The existing Main, Intermediate and Dyson's WRDs as well as Dysons Pit Overburden are to be deconstructed progressively over the Stage 3 works. The deconstruction methodology proposed has been developed to address, as far as practicable, the potential environmental and safety risks of handling AMD and low-grade uranium materials. The deconstruction of each facility is to be carried out in vertical segments rather than horizontal slices to reduce, as far as practicable, the exposed surface area of waste rock. Minimising exposed waste rock surfaces is important during the wet season as there is a high risk of mobilisation of existing contaminants and acid from the waste rock, resulting in further sulphide oxidation. This may create surface water runoff from the work area that has low pH and elevated heavy metals. The existing cover systems will remain in place for as long as possible and will be stripped progressively, as needed, as a new vertical segment is prepared for relocation.

Generally, the cellular WSF construction methodology is the same principle as that applied to the vertical segment deconstruction methodology described above for the WRDs. It is also noted that scheduling of high risk PAF-I waste rock material movement to the dry season. A surface water collection sump on each work area will collect runoff and allow treatment for pH and turbidity as required.

4.3 Specific Requirements

Sediment dams will be required outside of the facility footprints to capture and treat runoff from earthwork areas and final external batters. A reference design for the proposed sediment basins has been prepared based on the following assumptions:

- East WSF - Sediment dams will be provided assuming that the final stage and/or final external batters comprise catchment areas as shown in drawing 680.10421-SUW-D03, and that the final landform is progressively rehabilitated. Construction will proceed in 'vertical strips' and internal sumps should be utilised to manage runoff from the active work area.
- West WSF - Internal sediment sumps should be utilised as described above for initial stages of the facility construction. For the final stage and establishment of external batters, runoff can discharge directly to the Main Pit via a collection drain around the toe. Assumed catchment areas are shown in drawing 680.10421-SUW-D04.
- WRD deconstructions - Construction is to include internal sediment sumps as described above for all but the final stages and external slopes. This is consistent with the earthworks strategy for the waste rock decommissioning, which assumes staging in 'vertical strips' to limit the area of waste rock exposed to the elements. Sediment dams are to be provided to capture and treat runoff from the external batters of the WRDs, but assuming progressive revegetation of the final cover system.
- The extent of progressive revegetation assumed when sizing sediment basins for the above WRD's and WSF's is indicated by the green shaded 'rehabilitated catchment areas' shown on drawings 680.10421-SUW - D02 to D05.

4.4 Performance Specification

The Contractor is to ensure that all times during progression of the works, and when works are ceased during the wet season, that:

- Internal sumps are provided to collect and treat runoff from disturbed areas within the WSF's and WRD's; and/or
- An external sediment basin is provided to collect and treat runoff from the disturbance area plus any clean water run-on. External sediment basins may be constructed in accordance with the SLR Reference Designs shown on drawings 680.10421-SUW - D02 to D12, or where construction situation is altered from the assumptions documented above, the sediment basin provision must be altered to ensure compliance with the IECA Guidelines (IECA, 2008).

5 General ESC Principles

The proposed water management and ESC measures have been designed to minimise the potential impact on downstream water quality. Wind and water erosion of disturbance areas cannot be eliminated completely, however measures will be taken to minimise the impact by:

- Conducting best practice land clearing procedures for all proposed disturbance areas;
- Undertake disturbance works, as much as is practically possible, during the dry season (May to November) and during periods when good weather is forecast;
- Stabilised rock pads (vibration grid) and/or wash down facilities will be installed at all site entry / exit points during the construction and rehabilitation works (refer to the SUW Detailed Design Drawing set);
- Appropriate storage of soil stockpiles in areas away from roadways and other drainage lines. Suitable sediment control measures will be installed downslope of soil stockpiles and upslope clean water runoff diverted (where possible). Refer to the SUW Detailed Design Drawing set;
- Minimising the disturbance footprint;
- Coordinating works to minimise the exposure duration of disturbed soils;
- Separation/diversion of 'clean' water catchment runoff from disturbed areas (where practical) to minimise sediment-laden runoff volumes requiring treatment;
- Containment of all contaminated water on-site prior to treatment or disposal of in a suitable manner;
- Minimising soil erosion (i.e. rehabilitation, drainage and erosion control measures including rock mulching) at the source, rather than trapping resultant sediment;
- Ensuring sediment-laden runoff is treated via designated sediment control devices;
- Clearly identifying/communicating no-go areas to maintain disturbance areas and traffic movement to the designated areas;
- Conducting bank stabilisation works for vegetation clearing required at creek crossings;
- Revegetation of disturbed areas as soon as possible following the completion of ground disturbance activities;
- Effective dust suppression measures;
- Any liquid wastes, fuels and oils stored on-site will be sufficiently bunded to contain any potential spills. Accidental spillage or poor management of fuels, oils, lubricants, hydraulic fluids, solvents and other chemicals during the construction phase will be controlled through spill management actions (including the availability of spill kits) to prevent water quality and ecological impacts and no further mitigation measures are considered necessary. Captured liquid wastes, fuels and oils should be pumped out by a liquid waste contractor and disposed of at an appropriately licenced facility; and
- Implementing an effective monitoring and maintenance program for the site.

6 Soil Stripping and Stockpiling

Topsoil is a valuable resource for erosion control as it provides the basis for successful land stabilisation once earthworks have been completed. Topsoil can greatly increase the chances of groundcover germination and survival, and in many cases the topsoil will contain a viable seed bank that will germinate and survive well if appropriate conditions are maintained. This means that the correct management of topsoil can provide significant environmental and economic returns, as it is a cost-effective method of achieving land stabilisation without the need to import additional materials.

Best practice (IECA, 2008) soil management are implemented where appropriate:

- Topsoil should be preserved for reuse on the site wherever possible;
- Wherever reasonable and practicable, strip and stockpile topsoil immediately before bulk earthworks, and confine any soil disturbance to the immediate construction stage;
- Topsoil should be stripped only while in a light moisture condition. If the soil is too dry, stripping it will pulverise the soil, if too wet it may lead to clodding or hardsetting – particularly if the soil has a high silt or clay content;
- To the maximum degree practicable, topsoils should not be mixed with subsoils during the stripping and stockpiling procedure, especially if the subsoils are dispersive;
- If it is desirable to retain the seed content of the soil, then the stockpiling should consist of long low mounds no greater than 1 to 1.5 m in height, otherwise topsoils stockpiles should not exceed 3m in height. Long term stockpiles (i.e. >12 months) may need to be mulched or temporarily vegetated to prevent weed infestation;
- Stripped topsoil should be used as soon as possible, and preferably not stockpiled for more than 12 months. Long term stockpiling can degrade its biological and chemical qualities;
- Maintain all stockpiles in a free draining condition to avoid long-term soil saturation;
- All topsoil should be tested for fertility and adjusted (where necessary), even if the soil originated from the site;
- Soil should be removed from stockpiles in a manner that avoids vehicles travelling over the stockpiles if possible;
- Exposed sub-soils should be covered as soon as practicable, especially if dispersive;
- After spreading topsoil, ensure the surface is left in a scarified (roughened) condition to assist moisture infiltration and inhibit soil erosion;
- When working adjacent to a waterway, avoid spreading topsoil at a significantly different elevation form where it originated;
- Ensure all exposed sub-soils are covered, especially if dispersive; and
- Soil stockpile areas should be rehabilitated as soon as reasonable and practicable after the material has been removed.

7 Proposed ESCP

7.1 General Strategy

The site has been divided into number of sub-catchments as shown in drawing 680.10421-SUW-SERIES-D01. The ESCP strategy for the various catchments is summarised in the following sections.

7.1.1 Catchment 1

Catchment 1 is located just north of the main site. Using the Revised Universal Soil Loss Equation (RUSLE) for soil loss estimation as per the IECA Guidelines, Catchment 1 runoff can be managed using sediment fencing downstream of the proposed works without the need for a sediment dam. A clean water diversion is also proposed directly upstream of the proposed works to redirect runoff from upslope catchments.

7.1.2 Catchment 2

Catchment 2 is located west of the main site. Using the RUSLE equation for soil loss estimation as per the IECA Guidelines, Catchment 2 runoff can be managed using sediment fencing downstream of the proposed works (annual soil loss < 150m^3) without the need for a sediment dam. In order to satisfy the IECA requirements, Catchment 2 will require mulching over the entire catchment. A clean water diversion is also proposed directly upstream of the proposed works to redirect runoff from upslope catchments.

7.1.3 Catchment 3

Catchment 3 is associated to the Water Treatment Plant (WTP), this catchment is designed to be self-contained and ESC measures for this catchment constitute of sediment fencing and hydro-mulching (as required) of the batters.

7.1.4 Catchment 4

Catchment 4 is located between the Main and Intermediate Pits. Due to the close proximity of Main Pit, it is proposed to build a conveyance structure to the north of Catchment 4 which would discharge into Main Pit. Further ESC measures as such as mulching should be used over the proposed disturbance area to reduce potential erosion risks.

7.1.5 Catchment 5

Catchment 5 is located directly south of Main Pit and it is proposed to let the catchment discharge straight into Main Pit. Further ESC measures as such as mulching should be used over the proposed disturbance area to reduce potential erosion risks.

7.2 West WSF Catchment Area

The West WSF is located directly east of the main pit and it is proposed to use two toe drains (around the north and south of the west WSF) to direct the generated runoff towards Main Pit.

7.3 East WSF Catchment Areas

The East WSF has been divided into a north and a south sub-catchment and is proposed to be managed as follows:

7.3.1 North of East WSF

The north sub-catchment runoff will be managed by two toe drains redirecting flow to the proposed sediment dam SD1.

7.3.2 South of East WSF

The south sub-catchment, Dysons Pit Overburden and Dysons WRD runoff will be managed using a system of sediment dams (SD2, SD3 and SD4) and conveyance channels. Where runoff can't be redirected towards a sediment dam, it is proposed to use sediment fencing and mulching of the disturbed areas as required. Further ESC measures as such as mulching should be used over the proposed disturbance area to reduce potential erosion risks where typical ESC measures aren't adequate.

7.4 Main Waste Rock Dump Catchment Area

The Main WRD is located directly south of the EBFR diversion. This catchment will be managed by sediment dam SD5 using two conveyance channels to redirect runoff as well as sediment fencing and mulching where runoff can't be directed to SD5. A clean water diversion drain is also proposed to redirect flows from upslope catchments.

7.5 Intermediate Waste Rock Dump Catchment Areas

The Intermediate WRD is located just south of the Intermediate Pit separated by the EBFR diversion. This catchment will be managed by sediment dam SD6 using two conveyance channels to redirect runoff as required. A clean water diversion drain is also proposed to redirect flows from upslope catchments.

7.6 Mt Burton Waste Rock Dump

The Mt Burton WRD is approximately 2.5km west of the main Rum jungle mine site. The site is not large enough to warrant a sediment basin for erosion control. A clean water diversion drain is required to divert run-on from the work area.

7.7 Mt Fitch Waste Rock Dump

The Mt Fitch WRD is also remote from the main Rum jungle mine site. Clean water diversion drains are required to divert run-on from entering the work site, or in the longer term eroding the final landform. Sediment control will include two conveyance channels to convey water from the WRD site to a sediment basin located immediately downslope.

An extract from Drawing 680.10421.SUW.D02 indicating the overall arrangement of drains and basins is shown on Figure 3 the next page.

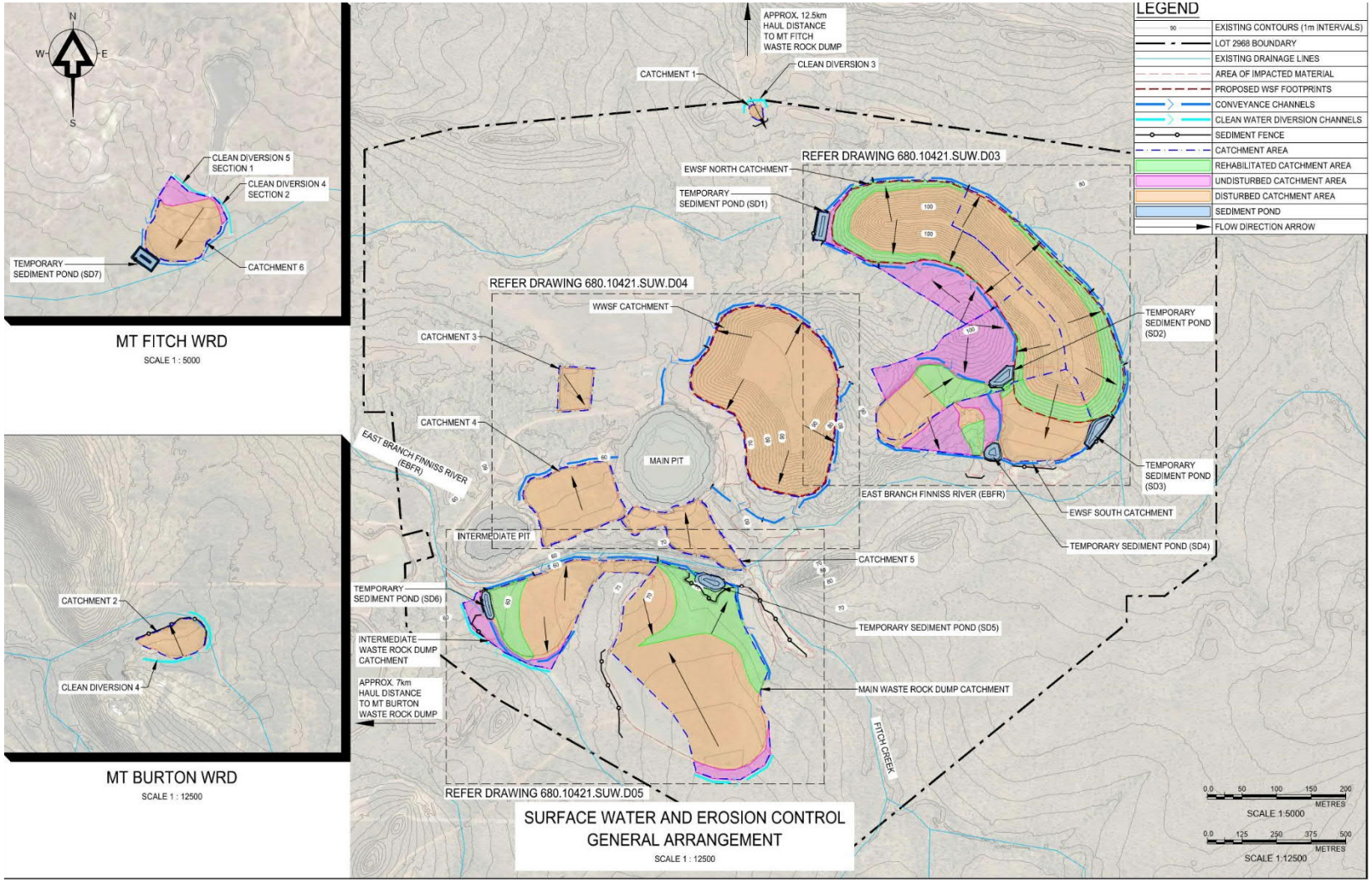

Figure 3 Overall scheme (Extract from drawing 680.10421.SUW.D02)

8 Sediment Dams

Due to the extent of the proposed disturbance areas, a number of sediment dams will be required to manage dirty water runoff in accordance with the IECA guideline.

Dam storage calculations were undertaken in accordance with (IECA, 2008) and include the following design criteria and assumptions:

- Capacity calculations based on a 5 day, 85th percentile rainfall depth of 46.7 mm derived from Equation B8 of the IECA Guideline;
- The respective catchment areas have been assumed to be approximately 25% rehabilitated for this assessment;
- Type F/D dams;
- Disturbed runoff coefficient of 0.69 in accordance with Table B7 of the IECA guideline for a type D hydrological group with rainfall between 40 – 50 mm;
- 'Clean' water runoff coefficient from undisturbed areas of 0.3;
- The sediment storage zone determined based on a management period of 12 months (i.e. the sediment dam would be desilted once a year);
- Sediment dams will be constructed with suitably designed spillways to manage overflows during significant storm events. The dams will also be constructed such that they are safe to people, vehicles and wildlife during their operation; and
- For construction purposes, it was assumed that the sediment dams will be cut in the natural surface allowing for an embankment above the dam spill levels (ie: freeboard).

Table 1 below shows the required sediment dams sizing as per the IECA Guidelines.

Table 1 Sediment Dams Capacity Requirements

	SEDIMENT DAM SIZING TABLE				
ID	Catchment Area (ha)	Design Storm	Settling Zone Capacity (ML)	Sediment Zone Capacity (ML)	Total Required Capacity (ML)
SD1	21.06	5 day 85th	5.22	2.61	7.84
SD2	18.12	5 day 85th	4.11	2.06	6.17
SD3	15.89	5 day 85th	4.41	2.21	6.62
SD4	14.83	5 day 85th	3.68	1.84	5.52
SD5	28.06	5 day 85th	7.70	0.68	8.38
SD6	12.25	5 day 85th	3.26	0.28	3.53
SD7	0.95	5 day 85th	0.3	0.1	0.4

9 Monitoring and Maintenance

9.1 Monitoring

The performance of ESC devices will decline if they are not maintained. All ESC devices (including sediment dams) will be inspected regularly as part of the site's environmental inspection program. Notifications of non-compliance will specify the type(s) of non-compliance, the corrective actions needed and a time schedule for achieving compliance.

Regular visual inspections of rehabilitated areas will be undertaken to ensure water is safely conveyed from the areas and that a stable landform is being created. The inspections will also include assessing vegetation cover to ensure that erosion potential is minimised.

Table 2 contains the inspection schedule used to ensure the ESC's are functioning effectively at the site. The inspections will also determine the scheduling of maintenance required for the ESC structures.

Table 2 ESC Inspection Schedule

To Be Inspected	Frequency
All ESC Structures and Stockpiles	Weekly (December to April), monthly (May to November) or following significant rainfall events (i.e > 15mm in 24hr period)
Rehabilitated Areas (Water Management Structures and Vegetation Cover)	Monthly or following heavy rainfall events (i.e > 15mm in 24hr period)
Road Drainage works	Quarterly or following heavy rainfall events (i.e > 15mm in 24hr period)
Equipment That Utilise Hydrocarbons	Daily for spills and leaks

Inspections of the proposed sediment dams, once constructed, will include the general condition of the dams, evidence of overflow, water colour, evidence of eroding surfaces, approximate retained capacity recorded and whether any desilting is required (if sediment has accumulated to the Sediment Storage Zone).

Water quality sampling shall also be undertaken prior to any controlled release of water to ensure that the water quality is suitable for release. Water quality parameters that are to be tested for and generally accepted water quality limits for offsite release within the region are described as the Construction Phase Locally Derived Water Quality Trigger Values. These values are reported within the EIS and supporting documentation.

Runoff that does not meet the relevant quality criteria will be contained on-site and will be treated, if required, to allow it to be discharged off-site. Flocculation of the water contained within the sediment dams can be undertaken with an approved flocculant to improve the TSS of the water prior to release. Similarly, pH dosing with approved substances can also be undertaken to improve the pH of the water prior to release.

9.2 Maintenance

All erosion and sediment control measures are to be maintained in a functioning condition until individual areas have been deemed "successfully" rehabilitated. Where controls are observed to not be functioning correctly, the controls are restored to meet the required standard. Where significant erosion is observed to be occurring on a regular basis, additional controls are to be implemented.

9.2.1 Sediment Dams

Sediment dams are to be regularly drawn down following rainfall (within 5 days) and desilted (if required) to ensure that the Settling Zone Volume is available within the dams to accept runoff from future rainfall events. This is to ensure that the dams are operated in accordance with the requirements of the IECA Guidelines to minimise the chances of an uncontrolled discharge. The drawn down water can be released downstream, provided the water quality requirements are met, or can be transferred into the Main Pit or the Water Treatment Plant (WTP).

If sediment does build up to the Sediment Zone Volume the dams will need to be desilted with the sediment disposed of in a suitable manner. It is recommended that depth markers are installed to assist with determining when the sediment dams require desilting. It is believed that the sediment dams will require desilting, on average, once a year which would typically be undertaken at the commencement of the wet season.

9.2.2 Drainage Channels

Any signs of erosion along the length of the drains should be noted and remedial works undertaken as required. Where significant erosion is observed, additional erosion controls are constructed e.g. establishment of vegetation cover, use of temporary sediment devices until the vegetation is established, scour protection (rock check dams) of the channel surface.

9.2.3 Temporary ESC Structures

Regular visual checks are to be made of any temporary sediment controls such as sediment fences, check dams etc to ensure that they are functioning adequately and repaired where required.

9.2.4 Roads / Access Tracks

Periodic maintenance of the haul roads and access tracks will include checking the drainage systems to remove any debris that may block culverts, cross drain outlets and table drains. Any erosion will be remediated with additional ESC measures implemented, as required.

9.2.5 Rehabilitated Areas

Regular visual inspections of the rehabilitated areas are to be undertaken in accordance with Table 2 This highlights any maintenance that needs to be undertaken to ensure water is safely conveyed from the areas and that a stable landform is being created. The inspections also include assessing vegetation cover to ensure that erosion potential is minimised. Where required, bald or patchy areas are either re-ripped and seeded or have a maintenance application of fertiliser to encourage growth.

10 Conveyance Channel Design

10.1 Rainfall – Runoff Modelling

A hydrological model (using XP-RAFTS) was developed to determine the peak flow rates expected to be generated from the Rum Jungle waste dump landforms so that the conveyance channels could be designed. Rainfall was estimated for the region based on Intensity – Frequency – Duration (IFD) data and design temporal patterns for the Rum Jungle area in accordance with the data presented in (ARR, 2016).

The hydrological model was based on the following data/assumptions/parameters:

- The proposed conveyance was developed using the 2016 Lidar for the design landform contours (provided by DPIR);
- Sub-catchments were modelled with grades varying from 1% to 30% depending on the location of the sub-catchment on the landform;
- The proposed conveyance channels were designed to safely convey the estimated runoff from a 10% AEP rainfall event in accordance with the ICEA Guideline. The proposed spillways were designed to safely convey the estimated runoff from a 5% AEP rainfall event;
- Runoff coefficient used for natural areas of the landform were modelled with an initial loss of 20mm and a continuing loss of 3.2mm/hr. The runoff coefficient used for the disturbed final landforms were an initial loss off 15mm and a continuing loss of 2.5mm/hr. There is little published data available for what runoff coefficient should be used for deep overburden dumps. The data that is available ranges widely which is a reflection of the range of infiltration rates applicable to overburden, subsoil and topsoil used in mine rehabilitation. The soil parameters used are based on SLR's recommended values from a review of the published data available;
- The Mannings 'n' roughness coefficient of the disturbed and rehabilitated landform was 0.06;
- The Mannings 'n' roughness coefficient of the natural landform was 0.066; and
- The Mannings 'n' roughness coefficient of the proposed conveyance channels and spillways was 0.035 and 0.045 respectively.

10.2 Conveyance Channels Design Results

The proposed conveyance channels were modelled in XP-RAFTS as shown in the design drawings. Cross-sectional dimensions of the proposed conveyance structures to convey the 10% AEP design storm event are provided in Table 3. All proposed conveyance channels have 3(H):1(V) side slopes. Design Drawings 680.10421.SUW. D01 to D11, further outline the design of the proposed conveyance channels (including construction notes).

Lining of the conveyance is recommended as per Table 3 to resist erosion and scouring caused by flow velocities and associated shear stresses. The water conveyance channels should be regularly monitored for signs of erosion (especially following construction and significant rainfall events). If significant erosion is observed, then appropriate rehabilitation and rectification measures should be undertaken.

Table 3 Recommended Minimum Conveyance Channels Dimensions and XP-RAFTS Results

Conveyance Channel	Section	Length	Slope (%)	Base Width (m)	XP-RAFTS Max 10yr ARI Flowrate (m^3/s)	XP-RAFTS Max 10yr ARI Velocity (m/s)	XP-RAFTS Max 10yr ARI Depth of Flow (m)	Channel Minimum Depth Required (m) [1]	Lining
1	1	384	1.9	3	1.46	1.39	0.3	0.8	Seeded
	2	213	1.6	3	2.01	1.47	0.3	0.8	Seeded
2	1	579	1.0	1	1.77	1.26	0.5	1.0	Seeded
	2	292	2.6	3	3.04	1.96	0.4	0.9	Jute Mesh
	3	205	1.0	3	4.27	1.54	0.6	1.1	Jute Mesh
3	1	479	1.8	3	2.36	1.59	0.4	0.9	Jute Mesh
	2	222	2.3	3	3.69	1.95	0.4	0.9	Jute Mesh
4	1	213	5.8	5	2.36	1.75	0.1	0.6	Jute Mesh
5	1	269	2.8	5	1.36	1.38	0.2	0.7	Seeded
6	1	395	1.0	1	1.14	0.46	0.7	1.2	Seeded
7	1	200	4.1	3	0.72	1.45	0.1	0.6	Seeded
8	1	339	1.2	5	5.94	1.77	0.5	1.0	Jute Mesh
9	1	461	1.0	0.5	0.36	0.94	0.3	0.8	Seeded
	2	186	1.2	1	0.75	1.1	0.3	0.8	Seeded
10	1	428	1.1	1	0.78	1.08	0.3	0.8	Seeded
11	1	415	1.2	1	1.44	1.31	0.5	1.0	Seeded
12	1	147	1.2	0.5	0.25	084	0.2	0.7	Seeded
13	1	676	3.9	4	1.84	1.83	0.2	0.7	Jute Mesh
	2	317	1.6	4	3.16	1.60	0.4	0.9	Jute Mesh
14	1	673	3.3	5	2.47	1.81	0.2	0.7	Jute Mesh
	2	219	1.2	5	3.78	1.48	0.4	0.9	Jute Mesh
15	Refer to River diversion drawings								
Clean Diversion 1	1	428	1.2	9	5.43	1.46	0.4	1.4	Seeded
Clean Diversion 2	1	330	1.2	0.5	0.42	0.97	0.3	0.8	Seeded
Clean Diversion 3	1	133	1.2	0.5	0.46	0.83	0.3	0.8	Seeded
Clean Diversion 4	1	420	1.3	12	6.49	1.48	0.3	1.3	Seeded
Clean Diversion 5	1	61	1.2	1	0.06	0.54	0.1	0.6	Seeded
	2	71	8.5	9	0.93	1.4	0.1	1.1	Seeded
16	1	86	8.3	1	0.15	1.37	0.1	0.6	Seeded
17	1	130	3.5	1	0.16	1.04	0.1	0.6	Seeded

[1] Includes recommended freeboard (varies between channels due to varying levels of risk)

10.3 Sediment Dam Spillway Design

The spillways of the proposed sediment dams were designed using the XP-RAFTS model to manage overflows during significant storm events. The spillway height was restricted for all sediment dams to 0.3m allowing 0.2m of freeboard between the maximum water level and reached during the 5% AEP storm event and the sediment dam crest level.

Table 4 below details the required dam spillway dimensions for each proposed sediment dam, to convey the estimated peak flow rates from the 50% AEP storm event. Further spillway design details are provided in Drawings 680.10421.SUW.d06 to D09 and D02.

Table 4 Dam Spillway Requirements and XP-RAFTS Results

Dam	XP-RAFTS Max 20yr ARI Flowrate (m^3/s)	Minimum Base Width (m)	Slope (%)	Side Slopes (H:V)	Depth Required Including 0.2m Freeboard (m)	Lining
SD1	6.27	13	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)
SD2	4.10	9	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)
SD3	4.70	10	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)
SD4	8.57	18	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)
SD5	1.85	4	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)
SD6	1.69	3.5	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)
SD7	0.40	0.5	2.5	3:1	0.5	Rip Rap (D50=150mm) (Min Rock Depth = 250mm)

11 Detailed Design Drawings

Detailed ESCP drawings are summarised in Table 5

Table 5 ESCP Drawings

Drawing No.	Title
680.10421.SUW.D01	CONSTRUCTION NOTES
680.10421.SUW.D02	GENERAL ARRANGEMENT
680.10421.SUW.D03	OVERVIEW PLAN 1 OF 3
680.10421.SUW.D04	OVERVIEW PLAN 2 OF 3
680.10421.SUW.D05	OVERVIEW PLAN 3 OF 3
680.10421.SUW.D06	SEDIMENT DAM DETAILED PLANS – SHEET 1 OF 3
680.10421.SUW.D07	SEDIMENT DAM DETAILED PLANS – SHEET 2 OF 3
680.10421.SUW.D08	SEDIMENT DAM DETAILED PLANS – SHEET 3 OF 3
680.10421.SUW.D09	SEDIMENT DAM TYPICAL SECTIONS
680.10421.SUW.D10	CONVEYANCE CHANNEL TYPICAL SECTIONS
680.10421.SUW.D11	SURFACE WATER AND EROSION CONTROL – PROPOSED EBFR REALIGNMENT

12 List of Supporting Documentation

12.1 Design Reports

This ESCP report is intended as a standalone report, however it forms part of a wider rehabilitation strategy for Rum Jungle and it is recommended that it be read in conjunction with the documentation listed in the Bibliography. Particular reference should be made to the overarching Detailed Engineering Design Report (SLR, 2020a).

1. Rum Jungle Rehabilitation – Stage 2A Detailed Engineering Design. Detailed Engineering Design Summary Report (SLR, 2020)

2. Rum Jungle Rehabilitation – Stage 2A Detailed Engineering Design. General Site Civil and Earthworks Work Package Technical Specification (SLR, 2020)

3. Rum Jungle Rehabilitation – Stage 2A Detailed Engineering Design. General Site Civil and Earthworks Work Package Bill of Quantities (SLR, 2020)

4. Rum Jungle Rehabilitation – Stage 2A Detailed Engineering Design. Waste Storage Facilities and General Site Civil Works Detailed Design and Construction Methodology Report (SLR, 2020)

12.2 Design Drawings

A summary of all drawings associated with these design works is given in Table 6.

Table 6 Supporting Design Drawings

Drawing No.	Title
GENERAL	
680.10421.GEN.D00	Locality Plan and Schedule of Drawings
680.10421.GEN.D01	Existing Site Conditions
680.10421.GEN.D02	Site Construction Works Layout
680.10421.GEN.D03	Rehabilitation General Arrangement Plan
680.10421.GEN.D04	Site Exclusion Zones
WASTE STORAGE FACILITY	
680.10421.WSF.D01	WSF General Arrangement Plan
680.10421.WSF.D02	EWSF Foundation Plan
680.10421.WSF.D03	EWSF Layout Plan
680.10421.WSF.D04	EWSF Staging Plan
680.10421.WSF.D05	EWSF Fill Elevation Plan
680.10421.WSF.D06	EWSF Sections
680.10421.WSF.D07	WWSF Foundation Plan Radiological Soil Treatment
680.10421.WSF.D08	WWSF Foundation Plan
680.10421.WSF.D09	WWSF Layout Plan

Drawing No.	Title
680.10421.WSF.D10	WWSF Staging Plan
680.10421.WSF.D11	WWSF Fill Elevation Plan
680.10421.WSF.D12	WWSF Sections
680.10421.WSF.D13	Typical Details
BULK EARTHWORKS	
680.10421.BEW.D01	Material Excavation Summary
680.10421.BEW.D02	Rip-Rap Scavenging Plan Summary
680.10421.BEW.D03	Detailed Excavation Plan – Sheet 1 of 4
680.10421.BEW.D04	Detailed Excavation Plan – Sheet 2 of 4
680.10421.BEW.D05	Detailed Excavation Plan – Sheet 3 of 4
680.10421.BEW.D06	Detailed Excavation Plan – Sheet 4 of 4
680.10421.BEW.D07	Detailed Excavation Sections – Sheet 1 of 4
680.10421.BEW.D08	Detailed Excavation Sections – Sheet 2 of 4
680.10421.BEW.D09	Detailed Excavation Sections – Sheet 3 of 4
680.10421.BEW.D10	Detailed Excavation Sections – Sheet 4 of 4
SITE REHABILIATION	
680.10421.REH.D01	Detailed Rehabilitation Plan – Sheet 1 of 4
680.10421.REH.D02	Detailed Rehabilitation Plan – Sheet 2 of 4
680.10421.REH.D03	Detailed Rehabilitation Plan – Sheet 3 of 4
680.10421.REH.D04	Detailed Rehabilitation Plan – Sheet 4 of 4
680.10421.REH.D05	Detailed Rehabilitation Sections – Sheet 1 of 4
680.10421.REH.D06	Detailed Rehabilitation Sections – Sheet 2 of 4
680.10421.REH.D07	Detailed Rehabilitation Sections – Sheet 3 of 4
680.10421.REH.D08	Detailed Rehabilitation Sections – Sheet 4 of 4
HAUL ROADS	
680.10421.CUL.D01	Reinstatement of East Branch Finniss River – Haul Road Additional Culvert Detail
680.10421.HR.D00	Haul Roads – Cover Sheet
680.10421.HR.D01	Haul Roads – Drawing List
680.10421.HR.D02	Haul Roads – Overview
680.10421.HR.D03	Haul Roads – Section A1 – Long Section
680.10421.HR.D04 and D05	Haul Roads – Section A1 – Cross Sections
680.10421.HR.D06	Haul Roads – Section A2 – Long Section
680.10421.HR.D07 to D09	Haul Roads – Section A2 – Cross Sections
680.10421.HR.D10	Haul Roads – Section A3 – Long Section
680.10421.HR.D11 to D16	Haul Roads – Section A3 – Cross Sections

Drawing No.	Title
680.10421.HR.D17	Haul Roads – Section A4 – Long Section
680.10421.HR.D18 to D20	Haul Roads – Section A4 – Cross Sections
680.10421.HR.D21	Haul Roads – Section A5 – Long Section
680.10421.HR.D22 to D23	Haul Roads – Section A5 – Cross Sections
680.10421.HR.D24	Haul Roads – Section A6 – Long Section
680.10421.HR.D25	Haul Roads – Section A6 – Cross Sections
680.10421.HR.D26	Haul Roads – Section A7 – Long Section
680.10421.HR.D27 to D29	Haul Roads – Section A7 – Cross Sections
680.10421.HR.D30	Haul Roads – Section A8 – Long Section
680.10421.HR.D31 to D33	Haul Roads – Section A8 – Cross Sections
680.10421.HR.D34	Haul Roads – Section A9 – Long Section
680.10421.HR.D35 to D39	Haul Roads – Section A9 – Cross Sections
DIVERSION DRAIN CROSSING	
680.10421.C0.CS.01	Haul Road Crossing – Cover Sheet and Drawing List
680.10421.C1.BD.01	Haul Road Crossing – Basis of Design
680.10421.C1.GN.01	Haul Road Crossing – General Arrangement
680.10421.C5.RP.01	Haul Road Crossing – Plan and Profile
680.10421.C7.TD.01	Haul Road Crossing – Sections and Details

The design drawings are not appended to this report, rather they are available as separate design packages.

13 Certification Statement

The ESC measures proposed in this document have been reviewed and approved by Duncan Barnes who is CPESC certified (CPESC No. 8494).

14 Bibliography

ARR. (2016). Australian Rainfall and Runoff, A Guide to Flood Estimation.

IECA. (2008). International Erosion Control Association 'Best Practice Erosion and Sediment Control' Book 2 (Appendices A-G).

NT-DPIR. (December 2019). Northern Territory Government, Department of Primary Industry and Resources - Draft Envirionmental Impact Statement.

SLR. (2020a). Rum Jungle Rehabilitation - Stage 2A Detailed Engineering Design - Design Report.

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RUM JUNGLE EROSION & SEDIMENT CONTROL PLAN
2A DETAILED DESIGN

GENERAL

G1 ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM (AHD) UNLESS NOTED OTHERWISE. CO-ORDINATE SYSTEM IS MGA ZONE 56.

G2 ALL DIMENSIONS AND SETTING OUT SHALL BE VERIFIED ON SITE BY THE CONTRACTOR BEFORE COMMENCING WORK. DO NOT OBTAIN DIMENSIONS BY SCALING FROM THE DRAWINGS.

G3 ANY DETAILS OF EXISTING SERVICES SHOWN ON THE DRAWINGS ARE NOT TO BE TAKEN AS INDICATING ALL EXISTING SERVICES OR LOCATIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO ADEQUATELY INFORM HIMSELF AS TO THE LOCATION OF ANY AND ALL SERVICES. THE CONTRACTOR SHALL EXERCISE DUE CARE WHEN UNDERTAKING ANY EXCAVATION. WHERE AN EXISTING SERVICE IS DAMAGED BY THE CONTRACTOR FOR ANY REASON WHATSOEVER, THE CONTRACTOR SHALL BEAR ALL COSTS AND ANY DELAYS FOR REPAIRING AND/OR DISCONNECTING THE SERVICES AS WELL AS ANY ASSOCIATED COSTS (E.G. DAMAGES, CLEAN UP, ETC.).

G4 SOURCE DATA FOR DESIGN PROVIDED BY DPIR.

ENVIRONMENTAL

EN1 TEMPORARY EROSION AND SEDIMENT CONTROL (ESC) MEASURES SHALL BE PROVIDED IN ACCORDANCE WITH IECA GUIDELINES AND BE MAINTAINED IN OPERATIVE CONDITION AT ALL TIMES AND SHALL REMAIN IN PLACE FOR THE DURATION OF THE WORK.

EN2 THE CONTRACTOR SHALL ENSURE THAT ALL ESC MEASURES ARE LOCATED AS INSTRUCTED.

EN3 THE CONTRACTOR AND ANY SUB-CONTRACTORS SHALL BE INFORMED OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION OF DOWNSLOPE LANDS AND WATERWAYS.

EARTHWORKS

E1 STRIP THE WORK AREA OF ALL GRASS, VEGETATIVE MATTER, FIBROUS ROOTS AND LOOSE MATERIAL AND HANDLE IN ACCORDANCE WITH RAVENSWORTH'S RELEVANT MANAGEMENT PLAN AND PROCEDURE. IT HAS BEEN ASSUMED THAT THE STRIPPED LAYER WILL BE 150mm UNIFORMLY THICK OVER THE WORK AREA AS SHOWN ON THE FOUNDATION EXCAVATION PLAN

E2 ESTABLISH EARTHWORK EXCESS STOCKPILES IN HEIGHTS NOT GREATER THAN 2 METRES.

E3 CREATE SEPARATE STOCKPILES FOR DIFFERENT SOIL TYPES. DO NOT MIX SUB-SOIL WITH TOPSOIL. PROVIDE ADEQUATE WATERING, DRAINAGE AND EROSION CONTROL.

E4 DO NOT ALLOW TRAFFIC ON STOCKPILES.

E5 ALL EXCAVATION SURFACES SHALL BE STRIPPED AS SPECIFIED AND LEVELLED TO TOLERANCES OF +0mm / -50mm OF THE DESIGN LEVELS.

E6 ALL FINAL SURFACES SHALL BE CONSTRUCTED AS SPECIFIED, AND LEVELLED TO TOLERANCES OF +25mm / -0mm OF THE DESIGN LEVELS.

E7 PERMANENT CUT EXCAVATION BATTERS SHOULD BE GRADED NO STEEPER THAN 3(H):1(V).

E8 CONDUCT FIELD TESTING FOR SOIL DISPERSIVITY AND STABILISE WHERE REQUIRED WITH 1kg/m² GYPSUM ON SUBGRADES, OR 5kg/m^3 IN FILL MATERIALS.

POND EMBANKMENT

EM1 MATERIAL FOR EMBANKMENT CONSTRUCTION SHALL BE SELECTED EXCAVATED MATERIAL, FREE FROM ORGANIC MATTER (E.G. DEBRIS, TRASH, ROOTS, LUMBER, TC.), BE WELL GRADED AND BE SUITABLE FOR HOLDING WATER.

EM2 FILL SHALL BE PLACED IN NEAR HORIZONTAL LAYERS NOT EXCEEDING 300mm LOOSE THICKNESS, AND SUITABLY COMPACTED THROUGHOUT TO ACHIEVE REQUIRED COMPACTED LEVELS.

EM3 COMPACTED SURFACES SHALL BE SCARIFIED AND WETTED AT THE START OF EACH DAY AND AFTER ANY CONSTRUCTION HIATUS AND PRIOR TO THE PLACEMENT OF ADDITIONAL LAYERS.

MATERIAL SPECIFICATIONS

GEOFABRIC

MS1 USE BIDIM A44 (MINIMUM) NON-WOVEN GEOTEXTILE FILTER CLOTH (GEOFABRIC)(OR SIMILAR) BETWEEN THE RIP RAP AND THE PARENT MATERIAL. MAXIMUM RESISTANCE BETWEEN THE RIP-RAP AND THE CLOTH IS REQUIRED. THIS CAN BE ACHIEVED BY:

- ENSURING PREPARATION OF THE BANK TO A ROUGH AND UNEVEN BATTER BEFORE PLACING THE CLOTH
- NOT STRETCHING CLOTH TIGHTLY OVER THE UNDERLYING BANK
- AVOIDING CLOTHS WITH LOW FRICTION SURFACES
- LAY GEOFABRIC IN "SHINGLE-FASHION", WITH THE END OF EACH UPSTREAM ROLL OVERLAPPING THOSE DOWNSTREAM. ENSURE EACH ROLL IS ANCHORED PROPERLY AT ITS UPSLOPE END.

MS2. GEOFABRIC SHALL BE INSTALLED BELOW ALL RIP-RAP PLACEMENT AREAS

ROCK RIP-RAP:

MS3. USE GRADED DURABLE RIP-RAP (ROCK) OVERLYING A SINGLE 300mm DEEP BASE OF STABILISED WELL COMPACTED MATERIAL THAT HAS BEEN TREATED WITH GYPSUM AT A RATE OF 5kg/m³ . RIP RAP SHOULD NOT BE SINGLE SIZED, BUT SHOULD BE A WELL-GRADED MIXTURE DESIGNED TO ENSURE THAT ALL GAP BETWEEN LARGE ROCKS ARE FILLED WITH ROCK OF PROGRESSIVELY SMALLER SIZE SO THAT NO SIGNIFICANT VOIDS OCCUR IN THE RIP-RAP BLANKET. GRADING RECOMMENDATIONS ARE PROVIDED IN **TABLE 1** BELOW.

MS4. ROCK FOR RIP RAP SHOULD BE HARD, TOUGH AND DURABLE WITH A CRUSHING STRENGTH OF AT LEAST 25MPA. THE ROCK SHOULD BE FREE OF DEFINED CLEAVAGE PLANES AND SHOULD NOT BE ADVERSELY AFFECTED BY REPEATED WETTING AND DRYING. ROCK SHOULD PREFERABLY BE PREDOMINANTLY ANGULAR IN SHAPE WITH NOT MORE THAN 25% OF ROCKS, DISTRIBUTED THROUGH THE GRADATION, HAVING A LENGTH MORE THAN TWICE THE BREADTH AND THICKNESS.

TABLE 1 - RIP-RAP GRADING RECOMMENDATIONS

EQUIVALENT SPHERICAL DIAMETER [1]	PER CENT (BY WEIGHT) OF RIP RAP OF SMALLER SIZE
1.5 -2.0 TIMES D_{50} [2]	100%
D_{50}	50%
0.3 D_{50}	15 - 25%
0.1 D_{50}	5 - 10%

[1] THE DIAMETER OF A SPHERE WITH AN EQUIVALENT VOLUME TO THE INDIVIDUAL ROCK.
[2] D_{50} IS THE MEDIUM RIP-RAP DIAMETER OF THE ROCK MIX. (I.E. 50% BY WEIGHT IS SMALLER THAN THIS SIZE).

SOURCE : DEPARTMENT OF LAND AND WATER CONSERVATION (1999)

NOTE:
MAXIMUM ROCK SIZE SHALL NOT EXCEED THE ROCK DEPTH SPECIFIED

JUTE-MESH INSTALLATION

JM1. THE PLACEMENT OF TOPSOIL IS TO OCCUR BELOW THE JUTE MESH.

JM2. EXCAVATE AN INITIAL ANCHOR TRENCH, MINIMUM 300mm DEEP AND MINIMUM 150mm WIDE, ACROSS THE START OF THE CHANNEL

JM3. INSTALL ANCHOR TRENCHES EVERY 60m DOWNSLOPE

JM4. FASTEN THE JUTE-MESH AT THE BOTTOM OF EACH TRENCH WITH STAPLES/PINS SPACED A MAXIMUM 450mm APART

JM5. THEN BACKFILL AND COMPACT THE ANCHOR TRENCHES IN A MANNER THAT DOES NOT DAMAGE THE JUTE-MESH

JM6. ONCE ANCHORED, DEPLOY THE JUTE-MESH BY ROLLING DOWN THE CHANNEL. ENSURE OVERLAPPING ROLES ARE SHINGLED IN THE DIRECTION OF WATER FLOW (UPSLOPE ROLE OVERLAPS DO WNSLOPE ROLE) AND OVERLAPPED BY 100mm TO 300mm.

JM7. FASTEN TO THE GROUND, THE JUTE-MESH EDGES AND OVERLAPS AT INTERVALS OF APPROXIMATELY 1m (DEPENDING ON GEOMETRY OF CHANNEL) USING 150mm PINS/STAPLES. A GUIDE SHOULD BE 2-3 FASTENERS PER SQUARE METRE. HOWEVER WHERE ROLLS OVERLAP PERPENDICULAR TO THE FLOW, INSTALL TWO ROWS OF STAPLES/PINS SPACED 450mm x 450m APART (FOR FURTHER DETAIL ON RECOMMENDED FASTENING FREQUENCY REFER TO THE JUTE-MESH MANUFACTURES GUIDELINES). PINS SHOULD BE INSTALLED FLUSH WITH THE SOIL SURFACE.

JM8. AFTER THE JUTE-MESH IS INSTALLED, GO BACK OVER AND INSTALL ADDITIONAL FASTENERS AS REQUIRED TO ENSURE THE JUTE-MESH IS IN CONTACT WITH THE SOIL IN ALL AREAS.

JM9. APPLY ANIONIC BITUMEN EMULSION TO THE SURFACE OF THE JUTE-MESH SURFACE AT A RATE OF 1 litre/m² TO COMPLETE THE PROTECTION.

STAPLES/PINS FOR JUTE-MESH

IT IS RECOMMENDED THAT U-PINS ARE USED AS FASTENERS. THE PINS SHOULD BE MADE FROM MINIMUM 4mm DIAMETER MILD STEEL NAIL WIRE. THE PIN LENGTH SHOULD BE MINIMUM 150mm TO HAVE A GROUND PENETRATION SUFFICIENT TO RESIST PULLING OUT ONCE INSTALLED.

JUTE-MESH

MATERIAL - 100% JUTE FIBRE (WOVEN WEAVE)

DIMENSIONS - 1.22m x 548m BALE

TYPICAL MESH SIZE - 13mm x 20mm

GROSS WEIGHT - 345kg/BALE

ANIONIC BITUMEN

USE A SLOW SETTING ANIONIC BITUMEN EMULSION. SHOULD BE AT LEAST 50% BITUMEN (REMAINING 50% WATER).

DRAINAGE AND DEWATERING

D1 PROVIDE ADEQUATE STANDBY DEWATERING EQUIPMENT IN CRITICAL AREAS WHERE FAILURE OF THE SYSTEM COULD LEAD TO DANGER TO LIFE OR DAMAGE TO PARTIALLY COMPLETED STRUCTURES

D2 DISPOSE OF THE WATER FROM THE WORK IN A SUITABLE MANNER IN ACCORDANCE WITH ENVIRONMENTAL REQUIREMENTS AND WITHOUT DAMAGING THE WORKS OR ADJACENT PROPERTY. NO WATER SHALL BE DRAINED INTO WORK BUILT OR UNDER CONSTRUCTION WITHOUT THE PRIOR CONSENT OF THE SUPERINTENDENT

DISPOSAL OF SURPLUS AND UNSUITABLE MATERIALS

DM1. DISPOSE OF ALL SURPLUS AND UNSUITABLE MATERIALS IN ACCORDANCE WITH RAVENSWORTH SPECIFICATIONS.

DM2. UNSUITABLE MATERIAL INCLUDES:

- ALL EXCAVATED MATERIAL WHICH DOES NOT SATISFY THE REQUIREMENTS FOR USE IN CONSTRUCTION OF THE WORKS (MATERIALS WHICH VISIBLY HEAVE WHEN TRAFFICKED BY EARTHWORKS PLANT, OR SUBGRADES WITH ASSESSED CBR OF LESS THAN 2%)
- ALL DISUSED MATERIALS RESULTING FROM CLEARING (SUCH AS TREES, STUMPS, BRUSH, FENCING AND STRUCTURAL DEBRIS); AND
- ALL RUBBISH.

MATERIAL SPECIFICATIONS

GEOFABRIC

MS1 USE BIDIM A44 (MINIMUM) NON-WOVEN GEOTEXTILE (OR SIMILAR) BETWEEN THE RIP RAP AND THE PARENT MATERIAL. MAXIMUM RESISTANCE BETWEEN THE RIP-RAP AND THE CLOTH IS REQUIRED.

THIS CAN BE ACHIEVED BY:

- ENSURING PREPARATION OF THE BANK TO A ROUGH AND UNEVEN BATTER BEFORE PLACING THE CLOTH
- NOT STRETCHING CLOTH TIGHTLY OVER THE UNDERLYING BANK
- AVOIDING CLOTHS WITH LOW FRICTION SURFACES
- LAY GEOFABRIC IN "SHINGLE-FASHION", WITH THE END OF EACH UPSTREAM ROLL OVERLAPPING THOSE DOWNSTREAM. ENSURE EACH ROLL IS ANCHORED PROPERLY AT ITS UPSLOPE END.

MS2. GEOFABRIC SHALL BE INSTALLED BELOW ALL RIP-RAP PLACEMENT AREAS

PLOTTED ON: 12/Jun/2020 3:47 PM
USER: JORDAN MUGFORD
FILE LOCATION: H:\Projects-SLR\620-BNE\680-DRW\680.10421 - Rum Jungle\CAD\JM-Working\Design Drawings\Implementation Issue - week 08062020\680.10421-SUW-SERIES-Part 1.dwg

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS Plot Date: 12/06/2020

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DRAWN J Mugford DATE: 12/06/2020	CHECKED P Delaney DATE: 12/06/2020	
DESIGNED S Peignelin DATE: 12/06/2020	CHECKED P Delaney DATE: 12/06/2020	
DESIGN PROJECT LEADER D OToole DATE: 12/06/2020	NTG PROJECT MANAGER J Hartnett DATE: 12/06/2020	

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

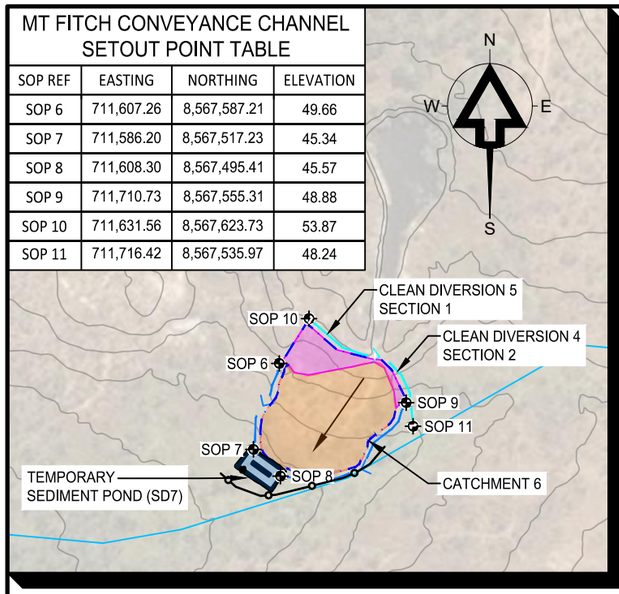
CONSTRUCTION NOTES

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	01 OF 12	680.10421.SUW.D01	1	A3

Ver. Jan' 2020

MT FITCH CONVEYANCE CHANNEL SETOUT POINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 6	711,607.26	8,567,587.21	49.66
SOP 7	711,586.20	8,567,517.23	45.34
SOP 8	711,608.30	8,567,495.41	45.57
SOP 9	711,710.73	8,567,555.31	48.88
SOP 10	711,631.56	8,567,623.73	53.87
SOP 11	711,716.42	8,567,535.97	48.24

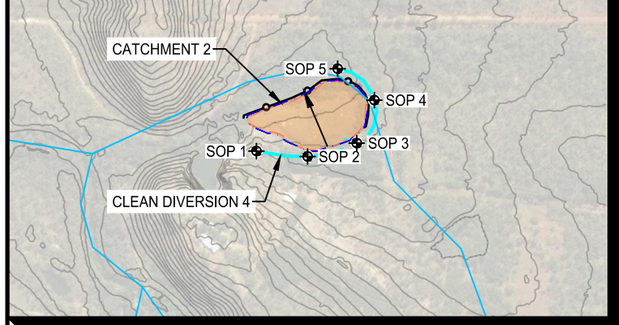


MT FITCH WRD

SCALE 1 : 5000

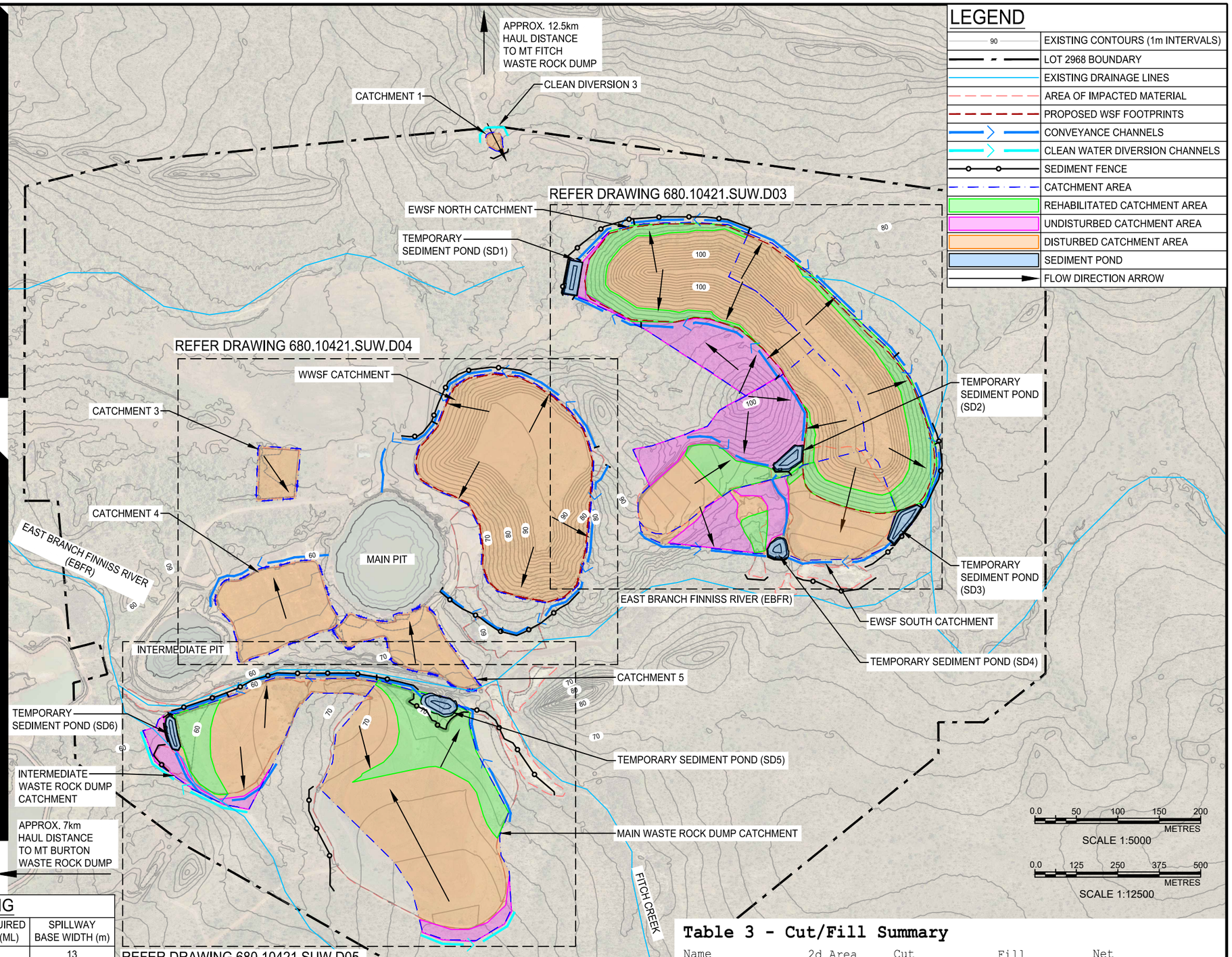
MT BURTON CONVEYANCE CHANNEL SETOUT POINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 1	713,104.24	8,564,317.44	52.69
SOP 2	713,208.30	8,564,306.37	50.97
SOP 3	713,308.69	8,564,333.79	50.23
SOP 4	713,344.55	8,564,421.27	49.17
SOP 5	713,269.69	8,564,485.24	46.80



MT BURTON WRD

SCALE 1 : 12500



LEGEND

- EXISTING CONTOURS (1m INTERVALS)
- LOT 2968 BOUNDARY
- EXISTING DRAINAGE LINES
- AREA OF IMPACTED MATERIAL
- PROPOSED WSF FOOTPRINTS
- CONVEYANCE CHANNELS
- CLEAN WATER DIVERSION CHANNELS
- SEDIMENT FENCE
- CATCHMENT AREA
- REHABILITATED CATCHMENT AREA
- UNDISTURBED CATCHMENT AREA
- DISTURBED CATCHMENT AREA
- SEDIMENT POND
- FLOW DIRECTION ARROW

0.0 50 100 150 200 METRES
SCALE 1:5000

0.0 125 250 375 500 METRES
SCALE 1:12500

TABLE 2 - SEDIMENT POND TABLE SIZING

ID	CATCHMENT AREA (ha)	DESIGN STORM	SETTLING ZONE CAPACITY (ML)	SEDIMENT ZONE CAPACITY (ML)	TOTAL REQUIRED CAPACITY (ML)	SPILLWAY BASE WIDTH (m)
SD1	21.06	5 DAY 85TH	5.23	2.61	7.84	13
SD2	18.12	5 DAY 85TH	4.11	2.06	6.17	9
SD3	15.89	5 DAY 85TH	4.41	2.21	6.62	10
SD4	14.83	5 DAY 85TH	3.68	1.84	5.52	18
SD5	28.06	5 DAY 85TH	7.70	0.68	8.38	4
SD6	12.25	5 DAY 85TH	3.25	0.28	3.53	3.5
SD7	0.95	5 DAY 85TH	0.30	0.10	0.40	0.5

Table 3 - Cut/Fill Summary

Name	2d Area	Cut	Fill	Net
SD1 Earthworks	4500sq.m	7425 Cu. M.	475 Cu. M.	6950 Cu. M.<Cut>
SD2 Earthworks	4425sq.m	6350 Cu. M.	925 Cu. M.	5425 Cu. M.<Cut>
SD3 Earthworks	5275sq.m	11650 Cu. M.	50 Cu. M.	11600 Cu. M.<Cut>
SD4 Earthworks	3375sq.m	6875 Cu. M.	600 Cu. M.	6275 Cu. M.<Cut>
SD5 Earthworks	5400sq.m	21025 Cu. M.	75 Cu. M.	20950 Cu. M.<Cut>
SD6 Earthworks	3150sq.m	3875 Cu. M.	250 Cu. M.	3625 Cu. M.<Cut>
SD7 Earthworks	775sq.m	550 Cu. M.	50 Cu. M.	500 Cu. M.<Cut>

SURFACE WATER AND EROSION CONTROL GENERAL ARRANGEMENT

SCALE 1 : 12500

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS — Plot Date: 12/06/2020

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DRAWN: J Mugford, DATE: 12/06/2020	CHECKED: P Delaney, DATE: 12/06/2020
DESIGNED: S Peignelin, DATE: 12/06/2020	CHECKED: P Delaney, DATE: 12/06/2020
DESIGN PROJECT LEADER: D OToole, DATE: 12/06/2020	NTG PROJECT MANAGER: J Hartnett, DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SURFACE WATER AND EROSION CONTROL GENERAL ARRANGEMENT

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	02 OF 12	680.10421.SUW.D02	1	A3

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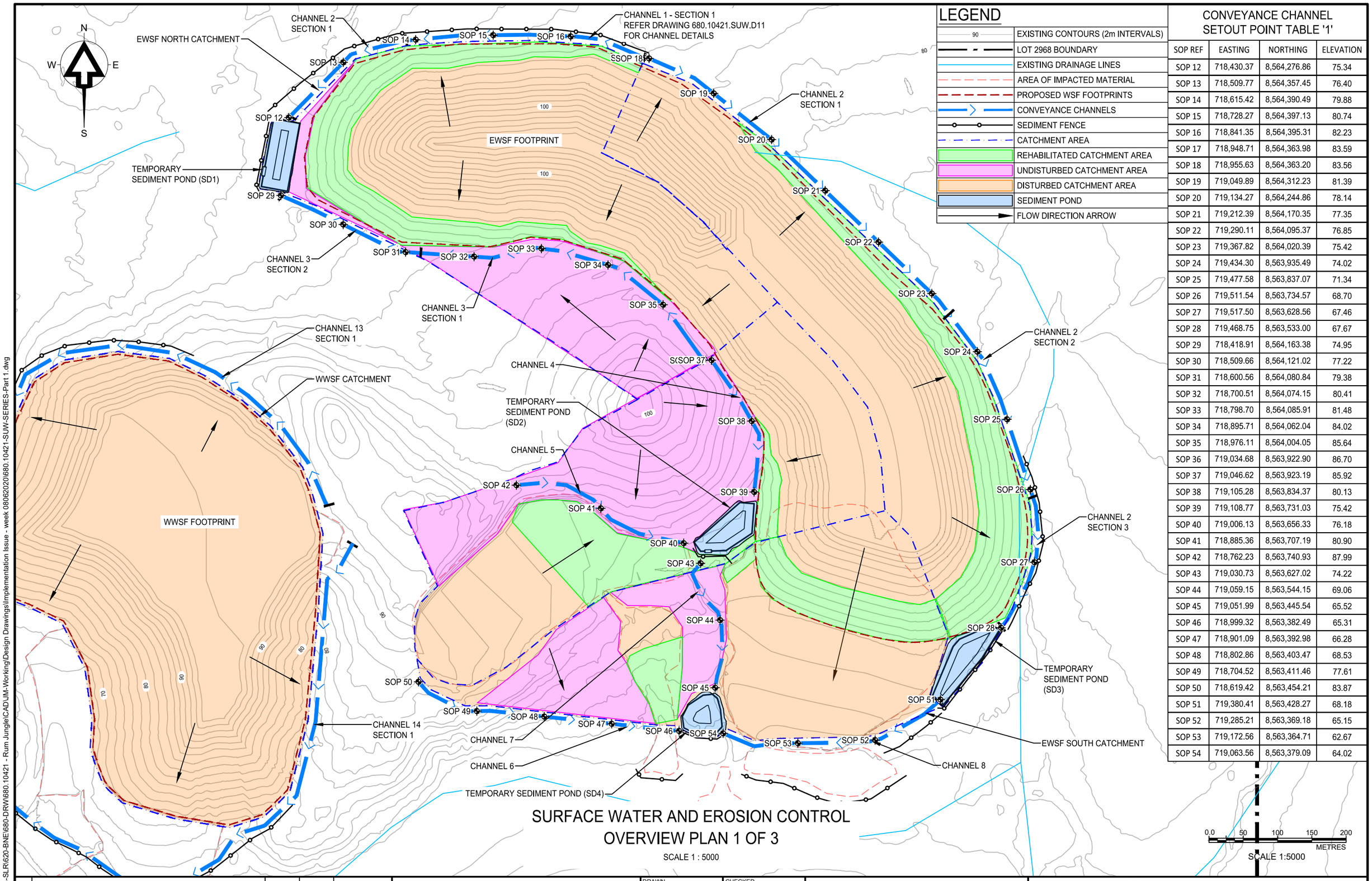

LEGEND

90	EXISTING CONTOURS (2m INTERVALS)
	LOT 2968 BOUNDARY
	EXISTING DRAINAGE LINES
	AREA OF IMPACTED MATERIAL
	PROPOSED WSF FOOTPRINTS
	CONVEYANCE CHANNELS
	SEDIMENT FENCE
	CATCHMENT AREA
	REHABILITATED CATCHMENT AREA
	UNDISTURBED CATCHMENT AREA
	DISTURBED CATCHMENT AREA
	SEDIMENT POND
	FLOW DIRECTION ARROW

CONVEYANCE CHANNEL SETOUT POINT TABLE '1'

SOP REF	EASTING	NORTHING	ELEVATION
SOP 12	718,430.37	8,564,276.86	75.34
SOP 13	718,509.77	8,564,357.45	76.40
SOP 14	718,615.42	8,564,390.49	79.88
SOP 15	718,728.27	8,564,397.13	80.74
SOP 16	718,841.35	8,564,395.31	82.23
SOP 17	718,948.71	8,564,363.98	83.59
SOP 18	718,955.63	8,564,363.20	83.56
SOP 19	719,049.89	8,564,312.23	81.39
SOP 20	719,134.27	8,564,244.86	78.14
SOP 21	719,212.39	8,564,170.35	77.35
SOP 22	719,290.11	8,564,095.37	76.85
SOP 23	719,367.82	8,564,020.39	75.42
SOP 24	719,434.30	8,563,935.49	74.02
SOP 25	719,477.58	8,563,837.07	71.34
SOP 26	719,511.54	8,563,734.57	68.70
SOP 27	719,517.50	8,563,628.56	67.46
SOP 28	719,468.75	8,563,533.00	67.67
SOP 29	718,418.91	8,564,163.38	74.95
SOP 30	718,509.66	8,564,121.02	77.22
SOP 31	718,600.56	8,564,080.84	79.38
SOP 32	718,700.51	8,564,074.15	80.41
SOP 33	718,798.70	8,564,085.91	81.48
SOP 34	718,895.71	8,564,062.04	84.02
SOP 35	718,976.11	8,564,004.05	85.64
SOP 36	719,034.68	8,563,922.90	86.70
SOP 37	719,046.62	8,563,923.19	85.92
SOP 38	719,105.28	8,563,834.37	80.13
SOP 39	719,108.77	8,563,731.03	75.42
SOP 40	719,006.13	8,563,656.33	76.18
SOP 41	718,885.36	8,563,707.19	80.90
SOP 42	718,762.23	8,563,740.93	87.99
SOP 43	719,030.73	8,563,627.02	74.22
SOP 44	719,059.15	8,563,544.15	69.06
SOP 45	719,051.99	8,563,445.54	65.52
SOP 46	718,999.32	8,563,382.49	65.31
SOP 47	718,901.09	8,563,392.98	66.28
SOP 48	718,802.86	8,563,403.47	68.53
SOP 49	718,704.52	8,563,411.46	77.61
SOP 50	718,619.42	8,563,454.21	83.87
SOP 51	719,380.41	8,563,428.27	68.18
SOP 52	719,285.21	8,563,369.18	65.15
SOP 53	719,172.56	8,563,364.71	62.67
SOP 54	719,063.56	8,563,379.09	64.02

SURFACE WATER AND EROSION CONTROL OVERVIEW PLAN 1 OF 3

SCALE 1 : 5000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS — Plot Date: 12/06/2020

SLR
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DRAWN: J Mugford DATE: 12/06/2020	CHECKED: P Delaney DATE: 12/06/2020
DESIGNED: S Peignelin DATE: 12/06/2020	CHECKED: P Delaney DATE: 12/06/2020
DESIGN PROJECT LEADER: D OToole DATE: 12/06/2020	NTG PROJECT MANAGER: J Hartnett DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SURFACE WATER AND EROSION CONTROL OVERVIEW PLAN 1 OF 3

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	03 OF 12	680.10421.SUW.D03	1	A3

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CONVEYANCE CHANNEL SETOUT POINT TABLE '2'

SOP REF	EASTING	NORTHING	ELEVATION
SOP 55	718,485.65	8,563,711.02	93.73
SOP 56	718,440.27	8,563,798.76	91.81
SOP 57	718,372.14	8,563,870.46	88.70
SOP 58	718,287.77	8,563,922.07	84.73
SOP 59	718,191.74	8,563,944.16	77.99
SOP 60	718,094.19	8,563,930.17	75.88
SOP 61	718,029.69	8,563,861.67	71.23
SOP 62	717,989.31	8,563,771.44	70.69
SOP 63	717,904.36	8,563,737.82	67.24
SOP 64	717,840.94	8,563,673.92	67.52
SOP 65	717,840.70	8,563,575.51	63.57
SOP 66	718,523.58	8,563,655.84	93.23
SOP 67	718,483.65	8,563,569.73	81.51
SOP 68	718,475.53	8,563,470.69	78.59
SOP 69	718,463.29	8,563,372.34	77.04
SOP 70	718,432.62	8,563,279.58	73.26
SOP 71	718,350.90	8,563,228.05	66.62
SOP 72	718,276.91	8,563,165.55	62.50
SOP 73	718,184.83	8,563,169.04	62.06
SOP 74	718,100.73	8,563,221.22	62.35
SOP 75	718,020.79	8,563,279.58	61.44
SOP 76	717,680.38	8,563,386.63	61.63
SOP 77	717,572.53	8,563,377.90	59.80
SOP 78	717,466.71	8,563,355.99	59.80
SOP 79	717,366.83	8,563,321.37	60.71
SOP 80	717,324.84	8,563,230.63	60.76

N
W E
S

LEGEND

- EXISTING CONTOURS (2m INTERVALS)
- LOT 2968 BOUNDARY
- EXISTING DRAINAGE LINES
- AREA OF IMPACTED MATERIAL
- PROPOSED WSF FOOTPRINTS
- CONVEYANCE CHANNELS
- SEDIMENT FENCE
- CATCHMENT AREA
- REHABILITATED CATCHMENT AREA
- UNDISTURBED CATCHMENT AREA
- DISTURBED CATCHMENT AREA
- SEDIMENT POND
- FLOW DIRECTION ARROW

WWSF CATCHMENT
CHANNEL 13 - SECTION 1
REFER DRAWING 680.10421.SUW.D11
FOR CHANNEL DETAILS
CHANNEL 13
SECTION 2
CATCHMENT 3
WWSF FOOTPRINT
CHANNEL 14
SECTION 1
CHANNEL 14
SECTION 2
CATCHMENT 4
CHANNEL 15
MAIN PIT
INTERMEDIATE PIT
CHANNEL 9
SECTION 1
CHANNEL 9
SECTION 2
CHANNEL 12
CATCHMENT 5
EWSF SOUTH CATCHMENT
CHANNEL 6
EAST BRANCH FINNISS RIVER

SOP 55 SOP 56 SOP 57 SOP 58 SOP 59 SOP 60 SOP 61 SOP 62 SOP 63 SOP 64 SOP 65 SOP 66 SOP 67 SOP 68 SOP 69 SOP 70 SOP 71 SOP 72 SOP 73 SOP 74 SOP 75 SOP 76 SOP 77 SOP 78 SOP 79 SOP 80

SURFACE WATER AND EROSION CONTROL OVERVIEW PLAN 2 OF 3

SCALE 1 : 5000

0.0 50 100 150 200 METRES
SCALE 1:5000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS Plot Date: 12/06/2020

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	DATE: 12/06/2020		DATE: 12/06/2020
DESIGNED	S Peignelin	CHECKED	P Delaney
	DATE: 12/06/2020		DATE: 12/06/2020
DESIGN PROJECT LEADER	D OToole	NTG PROJECT MANAGER	J Hartnett
	DATE: 12/06/2020		DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SURFACE WATER AND EROSION CONTROL
OVERVIEW PLAN 2 OF 3

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	04 OF 12	680.10421.SUW.D04	1	A3

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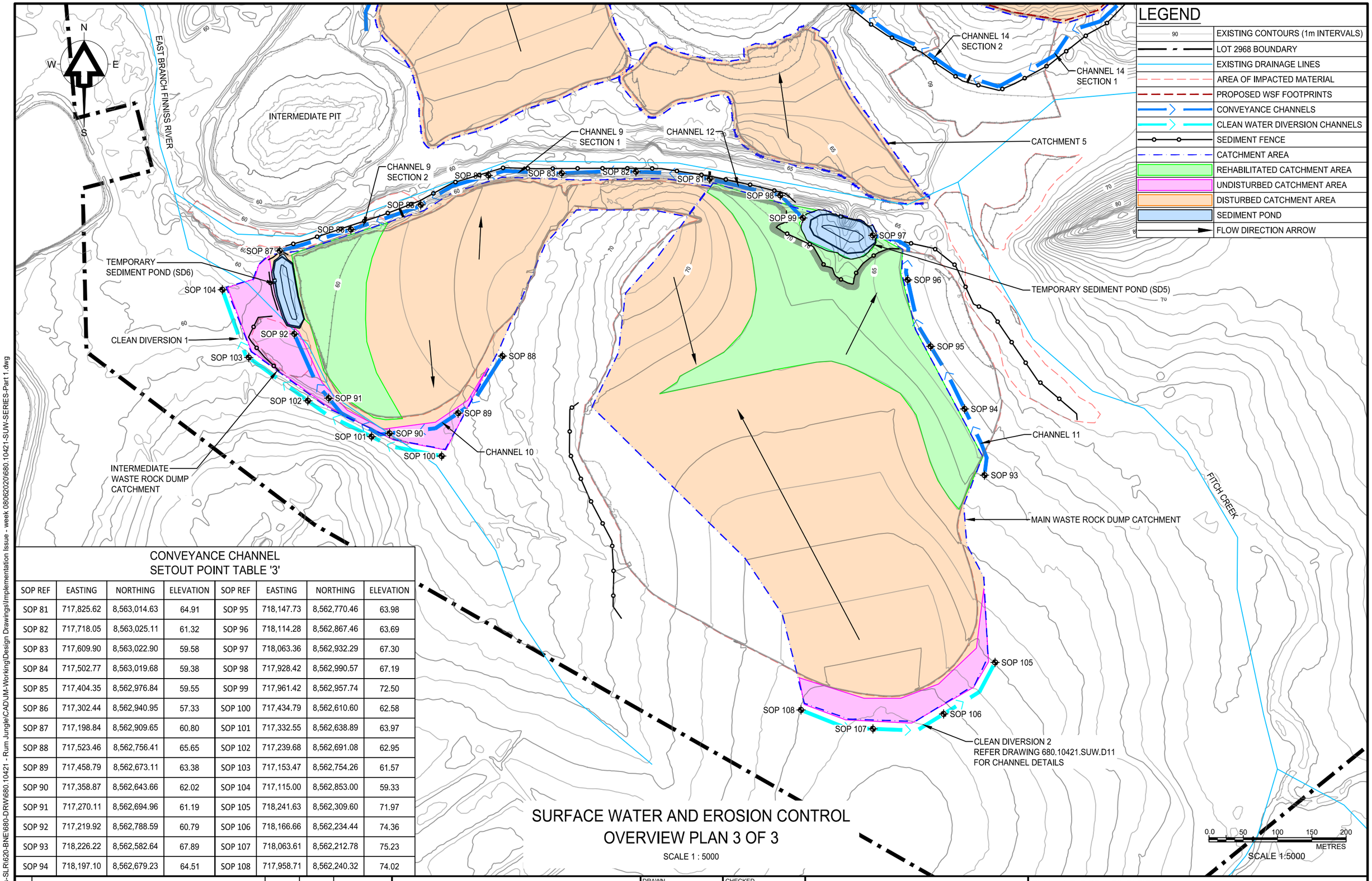

CONVEYANCE CHANNEL SETOUT POINT TABLE '3'

SOP REF	EASTING	NORTHING	ELEVATION	SOP REF	EASTING	NORTHING	ELEVATION
SOP 81	717,825.62	8,563,014.63	64.91	SOP 95	718,147.73	8,562,770.46	63.98
SOP 82	717,718.05	8,563,025.11	61.32	SOP 96	718,114.28	8,562,867.46	63.69
SOP 83	717,609.90	8,563,022.90	59.58	SOP 97	718,063.36	8,562,932.29	67.30
SOP 84	717,502.77	8,563,019.68	59.38	SOP 98	717,928.42	8,562,990.57	67.19
SOP 85	717,404.35	8,562,976.84	59.55	SOP 99	717,961.42	8,562,957.74	72.50
SOP 86	717,302.44	8,562,940.95	57.33	SOP 100	717,434.79	8,562,610.60	62.58
SOP 87	717,198.84	8,562,909.65	60.80	SOP 101	717,332.55	8,562,638.89	63.97
SOP 88	717,523.46	8,562,756.41	65.65	SOP 102	717,239.68	8,562,691.08	62.95
SOP 89	717,458.79	8,562,673.11	63.38	SOP 103	717,153.47	8,562,754.26	61.57
SOP 90	717,358.87	8,562,643.66	62.02	SOP 104	717,115.00	8,562,853.00	59.33
SOP 91	717,270.11	8,562,694.96	61.19	SOP 105	718,241.63	8,562,309.60	71.97
SOP 92	717,219.92	8,562,788.59	60.79	SOP 106	718,166.66	8,562,234.44	74.36
SOP 93	718,226.22	8,562,582.64	67.89	SOP 107	718,063.61	8,562,212.78	75.23
SOP 94	718,197.10	8,562,679.23	64.51	SOP 108	717,958.71	8,562,240.32	74.02

SURFACE WATER AND EROSION CONTROL OVERVIEW PLAN 3 OF 3

SCALE 1 : 5000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS — Plot Date: 12/06/2020

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DESIGNED: S Peignelin, DATE: 12/06/2020	CHECKED: P Delaney, DATE: 12/06/2020
DESIGN PROJECT LEADER: D OToole, DATE: 12/06/2020	NTG PROJECT MANAGER: J Hartnett, DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SURFACE WATER AND EROSION CONTROL
OVERVIEW PLAN 3 OF 3

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	05 OF 12	680.10421.SUW.D05	1	A3

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N
W
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CHANNEL 2
SECTION 1

POND BASE - RL. 71m

POND CREST - RL. 75.5m
TOP WATER LEVEL - RL. 75.0m
POND CAPACITY - 7.84ML
500mm FREEBOARD

SPILLWAY
REFER DRAWING
680.10421.SUW.D10
FOR DETAILS

SOP 1
SOP 2
SOP 3
SOP 4
SOP 5
SOP 6
SOP 7
SOP 8
TWL RL. 75.0m

EWSF
FOOTPRINT

CHANNEL 3
SECTION 2

SEDIMENT POND - SD2
SETOUT PINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 9	719,088.26	8,563,715.10	76.00
SOP 10	719,108.22	8,563,713.48	76.00
SOP 11	719,105.15	8,563,671.10	76.00
SOP 12	719,067.68	8,563,646.07	76.00
SOP 13	719,031.08	8,563,645.01	76.00
SOP 14	719,021.86	8,563,657.88	76.00
SOP 15	719,030.49	8,563,664.28	76.00
SOP 16	719,092.11	8,563,703.50	72.25
SOP 17	719,096.20	8,563,703.17	72.25
SOP 18	719,094.33	8,563,677.40	72.25
SOP 19	719,064.11	8,563,657.22	72.25
SOP 20	719,038.67	8,563,656.49	72.25
SOP 21	719,044.18	8,563,661.33	72.25

LEGEND

90	EXISTING CONTOURS (1m INTERVALS)
75	MAJOR POND CONTOURS
	MINOR POND CONTOURS
	AREA OF IMPACTED MATERIAL
	PROPOSED WSF FOOTPRINTS
	CONVEYANCE CHANNELS
	SEDIMENT FENCE
	TWL - TOP WATER LEVEL

CHANNEL 4

EWSF
FOOTPRINT

POND BASE - RL. 72.25m

POND CREST - RL. 76.0m
TOP WATER LEVEL - RL. 75.5m
POND CAPACITY - 6.17ML
500mm FREEBOARD

CHANNEL 5

SOP 9
SOP 10
SOP 11
SOP 12
SOP 13
SOP 14
SOP 15
SOP 16
SOP 17
SOP 18
SOP 19
SOP 20
SOP 21
TWL RL. 75.5m

EXISTING DYSONS
PIT OVERBURDEN

SPILLWAY
REFER DRAWING
680.10421.SUW.D10
FOR DETAILS

CHANNEL 7

EXISTING DYSONS
WASTE ROCK DUMP

SEDIMENT POND - SD1
SETOUT PINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 1	718,408.69	8,564,274.76	75.50
SOP 2	718,445.77	8,564,268.02	75.50
SOP 3	718,427.97	8,564,170.08	75.50
SOP 4	718,390.90	8,564,176.82	75.50
SOP 5	718,419.56	8,564,259.06	71.00
SOP 6	718,430.07	8,564,257.15	71.00
SOP 7	718,417.10	8,564,185.78	71.00
SOP 8	718,406.59	8,564,187.69	71.00

SEDIMENT POND 1 PLAN
SCALE 1 : 1000

SEDIMENT POND 2 PLAN
SCALE 1 : 1000

0 10 20 30 40
METRES
SCALE 1:1000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS Plot Date: 12/06/2020

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DRAWN J Mugford DATE: 12/06/2020	CHECKED P Delaney DATE: 12/06/2020
DESIGNED S Peignelin DATE: 12/06/2020	CHECKED P Delaney DATE: 12/06/2020
DESIGN PROJECT LEADER D OToole DATE: 12/06/2020	NTG PROJECT MANAGER J Hartnett DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SEDIMENT POND DETAILED PLANS
SHEET 1 OF 4

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	06 OF 12	680.10421.SUW.D06	1	A3

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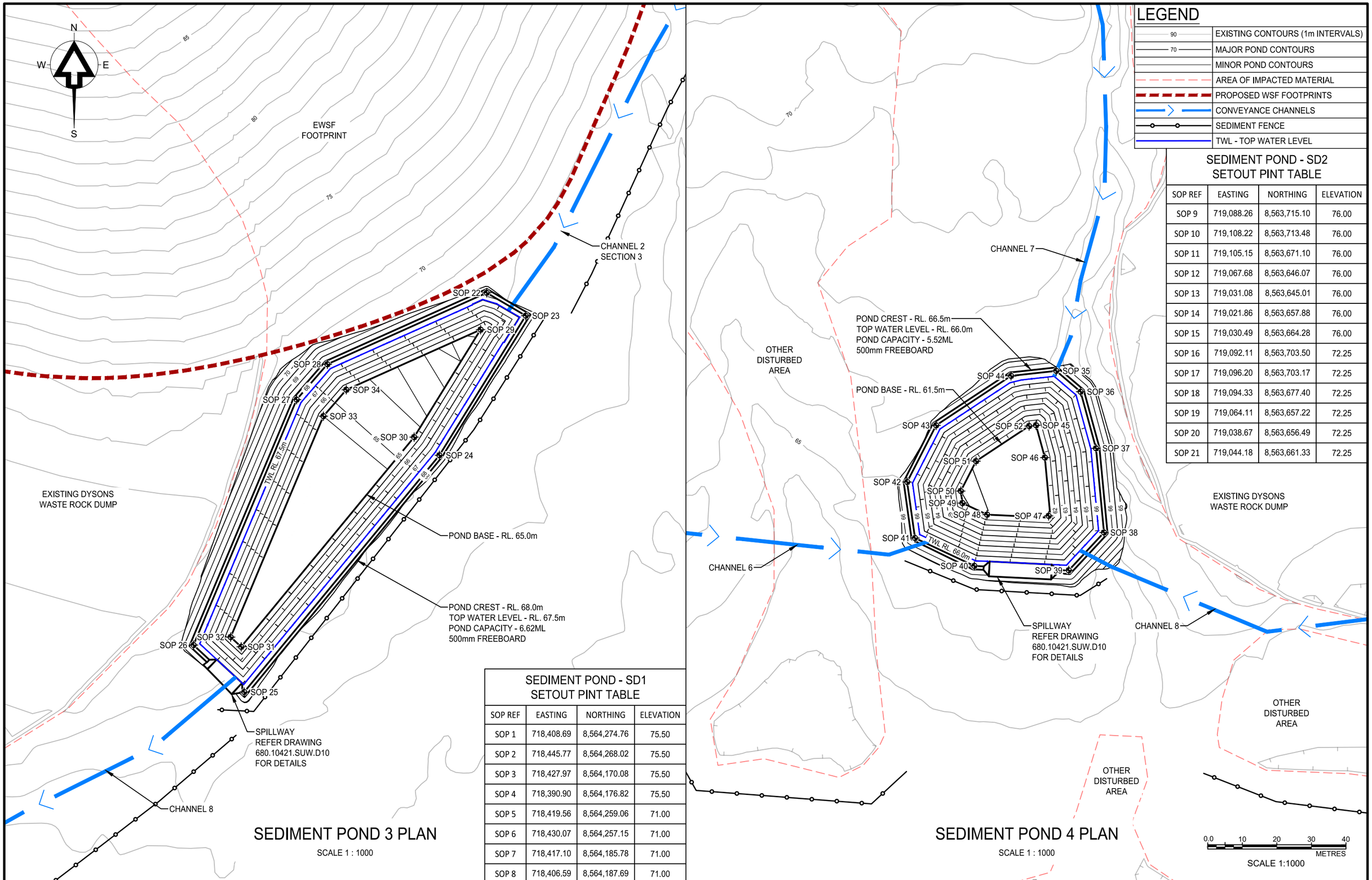

LEGEND

90	EXISTING CONTOURS (1m INTERVALS)
70	MAJOR POND CONTOURS
	MINOR POND CONTOURS
	AREA OF IMPACTED MATERIAL
	PROPOSED WSF FOOTPRINTS
	CONVEYANCE CHANNELS
	SEDIMENT FENCE
	TWL - TOP WATER LEVEL

SEDIMENT POND - SD2 SETOUT PINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 9	719,088.26	8,563,715.10	76.00
SOP 10	719,108.22	8,563,713.48	76.00
SOP 11	719,105.15	8,563,671.10	76.00
SOP 12	719,067.68	8,563,646.07	76.00
SOP 13	719,031.08	8,563,645.01	76.00
SOP 14	719,021.86	8,563,657.88	76.00
SOP 15	719,030.49	8,563,664.28	76.00
SOP 16	719,092.11	8,563,703.50	72.25
SOP 17	719,096.20	8,563,703.17	72.25
SOP 18	719,094.33	8,563,677.40	72.25
SOP 19	719,064.11	8,563,657.22	72.25
SOP 20	719,038.67	8,563,656.49	72.25
SOP 21	719,044.18	8,563,661.33	72.25

SEDIMENT POND - SD1 SETOUT PINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 1	718,408.69	8,564,274.76	75.50
SOP 2	718,445.77	8,564,268.02	75.50
SOP 3	718,427.97	8,564,170.08	75.50
SOP 4	718,390.90	8,564,176.82	75.50
SOP 5	718,419.56	8,564,259.06	71.00
SOP 6	718,430.07	8,564,257.15	71.00
SOP 7	718,417.10	8,564,185.78	71.00
SOP 8	718,406.59	8,564,187.69	71.00

SEDIMENT POND 3 PLAN

SCALE 1 : 1000

SEDIMENT POND 4 PLAN

SCALE 1 : 1000

SCALE 1:1000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS — Plot Date: 12/06/2020

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DESIGNED: S Peignelin — DATE: 12/06/2020	CHECKED: P Delaney — DATE: 12/06/2020
DESIGN PROJECT LEADER: D OToole — DATE: 12/06/2020	NTG PROJECT MANAGER: J Hartnett — DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SEDIMENT POND DETAILED PLANS
SHEET 2 OF 4

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	07 OF 12	680.10421.SUW.D07	1	A3

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SEDIMENT POND - SD5
SETOUT PINT TABLE

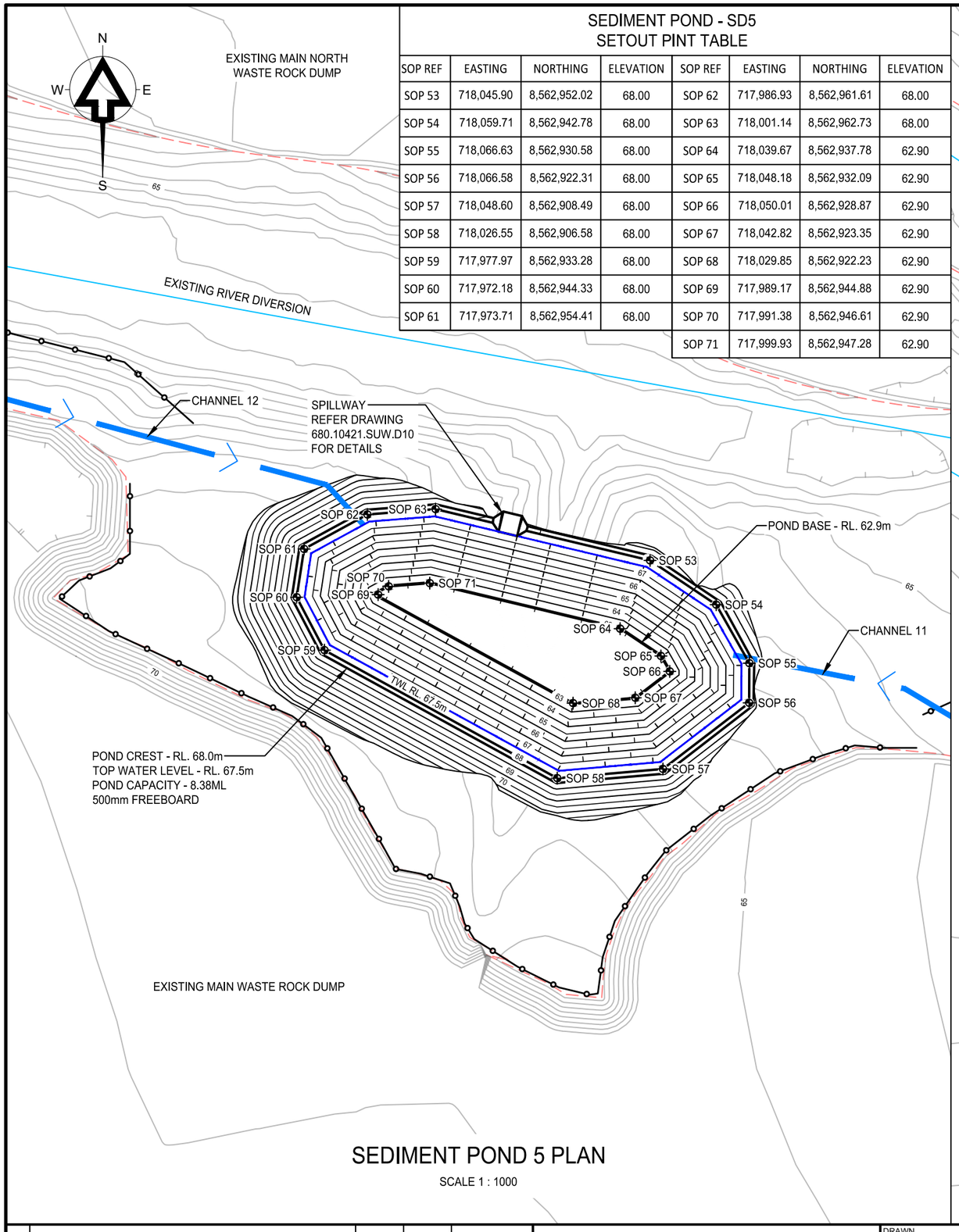
SOP REF	EASTING	NORTHING	ELEVATION	SOP REF	EASTING	NORTHING	ELEVATION
SOP 53	718,045.90	8,562,952.02	68.00	SOP 62	717,986.93	8,562,961.61	68.00
SOP 54	718,059.71	8,562,942.78	68.00	SOP 63	718,001.14	8,562,962.73	68.00
SOP 55	718,066.63	8,562,930.58	68.00	SOP 64	718,039.67	8,562,937.78	62.90
SOP 56	718,066.58	8,562,922.31	68.00	SOP 65	718,048.18	8,562,932.09	62.90
SOP 57	718,048.60	8,562,908.49	68.00	SOP 66	718,050.01	8,562,928.87	62.90
SOP 58	718,026.55	8,562,906.58	68.00	SOP 67	718,042.82	8,562,923.35	62.90
SOP 59	717,977.97	8,562,933.28	68.00	SOP 68	718,029.85	8,562,922.23	62.90
SOP 60	717,972.18	8,562,944.33	68.00	SOP 69	717,989.17	8,562,944.88	62.90
SOP 61	717,973.71	8,562,954.41	68.00	SOP 70	717,991.38	8,562,946.61	62.90
				SOP 71	717,999.93	8,562,947.28	62.90

LEGEND

90	EXISTING CONTOURS (1m INTERVALS)
	EXISTING DRAINAGE LINES
70	MAJOR POND CONTOURS
	MINOR POND CONTOURS
	AREA OF IMPACTED MATERIAL
	CONVEYANCE CHANNELS
	CLEAN WATER DIVERSION CHANNELS
	SEDIMENT FENCE
	TWL - TOP WATER LEVEL

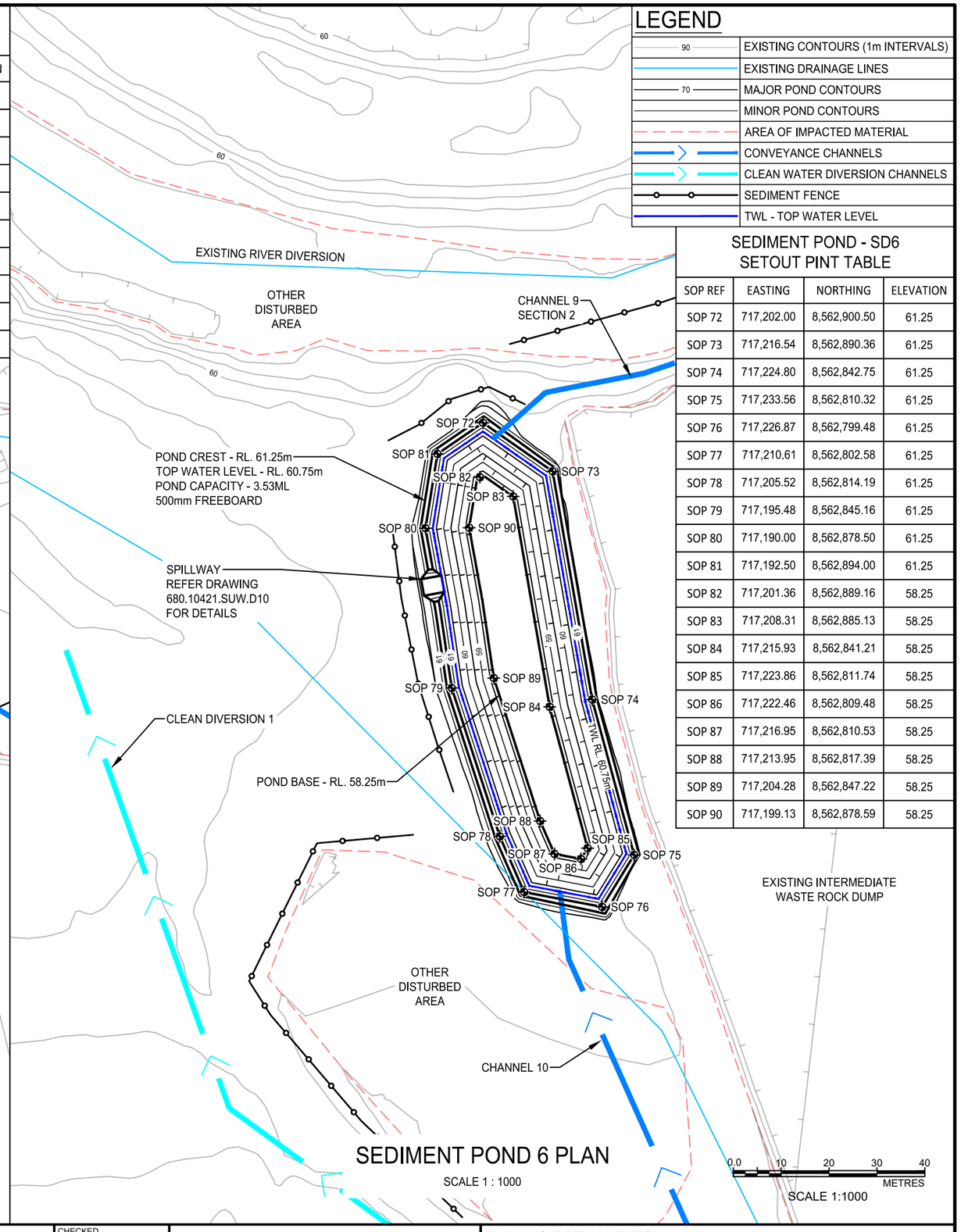
SEDIMENT POND - SD6
SETOUT PINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 72	717,202.00	8,562,900.50	61.25
SOP 73	717,216.54	8,562,890.36	61.25
SOP 74	717,224.80	8,562,842.75	61.25
SOP 75	717,233.56	8,562,810.32	61.25
SOP 76	717,226.87	8,562,799.48	61.25
SOP 77	717,210.61	8,562,802.58	61.25
SOP 78	717,205.52	8,562,814.19	61.25
SOP 79	717,195.48	8,562,845.16	61.25
SOP 80	717,190.00	8,562,878.50	61.25
SOP 81	717,192.50	8,562,894.00	61.25
SOP 82	717,201.36	8,562,889.16	58.25
SOP 83	717,208.31	8,562,885.13	58.25
SOP 84	717,215.93	8,562,841.21	58.25
SOP 85	717,223.86	8,562,811.74	58.25
SOP 86	717,222.46	8,562,809.48	58.25
SOP 87	717,216.95	8,562,810.53	58.25
SOP 88	717,213.95	8,562,817.39	58.25
SOP 89	717,204.28	8,562,847.22	58.25
SOP 90	717,199.13	8,562,878.59	58.25



SEDIMENT POND 5 PLAN

SCALE 1 : 1000



SEDIMENT POND 6 PLAN

SCALE 1 : 1000

0.0 10 20 30 40 METRES

SCALE 1:1000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

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	DATE: 12/06/2020		DATE: 12/06/2020
DESIGNED	S Peignelin	CHECKED	P Delaney
	DATE: 12/06/2020		DATE: 12/06/2020
DESIGN PROJECT LEADER	D OToole	NTG PROJECT MANAGER	J Hartnett
	DATE: 12/06/2020		DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SEDIMENT POND DETAILED PLANS
SHEET 3 OF 4

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	08 OF 12	680.10421.SUW.D08	1	A3

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N
W E
S

LEGEND

90	EXISTING CONTOURS (1m INTERVALS)
	EXISTING DRAINAGE LINES
70	MAJOR POND CONTOURS
	MINOR POND CONTOURS
	AREA OF IMPACTED MATERIAL
	CONVEYANCE CHANNELS
	CLEAN WATER DIVERSION CHANNELS
	SEDIMENT FENCE
	TWL - TOP WATER LEVEL

SEDIMENT POND - SD7
SETOUT PINT TABLE

SOP REF	EASTING	NORTHING	ELEVATION
SOP 91	711,584.43	8,567,517.79	45.50
SOP 92	711,610.67	8,567,498.81	45.50
SOP 93	711,600.55	8,567,484.83	45.50
SOP 94	711,574.31	8,567,503.81	45.50
SOP 95	711,586.11	8,567,507.32	43.00
SOP 96	711,600.19	8,567,497.13	43.00
SOP 97	711,598.87	8,567,495.30	43.00
SOP 98	711,584.78	8,567,505.49	43.00

CHANNEL 16

EXISTING MT FITCH
WASTE ROCK DUMP

POND CREST - RL. 45.5m
TOP WATER LEVEL - RL. 45.0m
POND CAPACITY - 0.40ML
500mm FREEBOARD

SOP 91
SOP 92
SOP 93
SOP 94
SOP 95
SOP 96
SOP 97
SOP 98

TWL RL 60.75m

50
45
44
43

BUND TO BE CONSTRUCTED
BETWEEN DISTURBANCE AREA
AND EXISTING DRAINAGE LINE

CHANNEL 17

SPILLWAY
REFER DRAWING
680.10421.SUW.D10
FOR DETAILS

POND BASE - RL. 43.0m

SEDIMENT POND 7 PLAN

SCALE 1 : 500

0,0 5,0 10 15 20
METRES
SCALE 1:500

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1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS Plot Date: 12/06/2020

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DRAWN J Mugford DATE: 12/06/2020	CHECKED P Delaney DATE: 12/06/2020
DESIGNED S Peignelin DATE: 12/06/2020	CHECKED P Delaney DATE: 12/06/2020
DESIGN PROJECT LEADER D OToole DATE: 12/06/2020	NTG PROJECT MANAGER J Hartnett DATE: 12/06/2020

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RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SEDIMENT POND DETAILED PLANS
SHEET 4 OF 4

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	08 OF 12	680.10421.SUW.D09	1	A3

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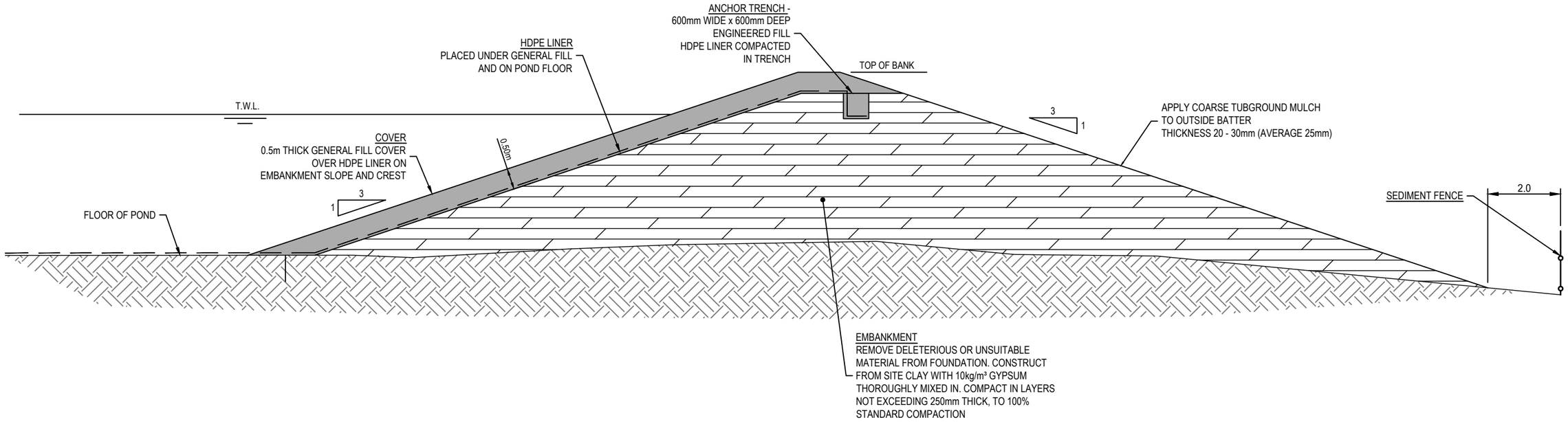
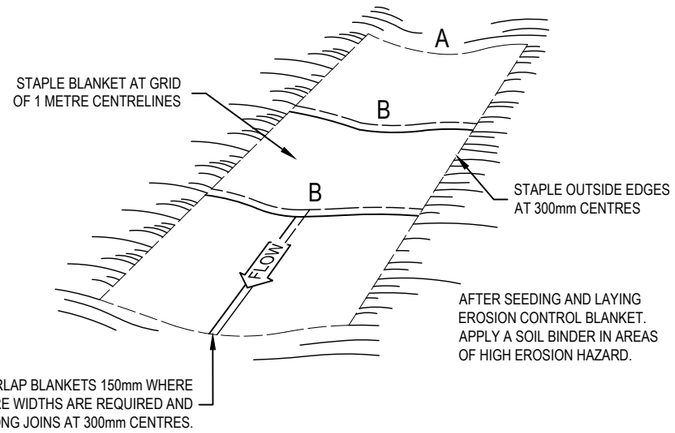
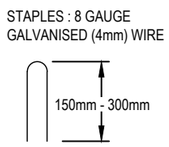
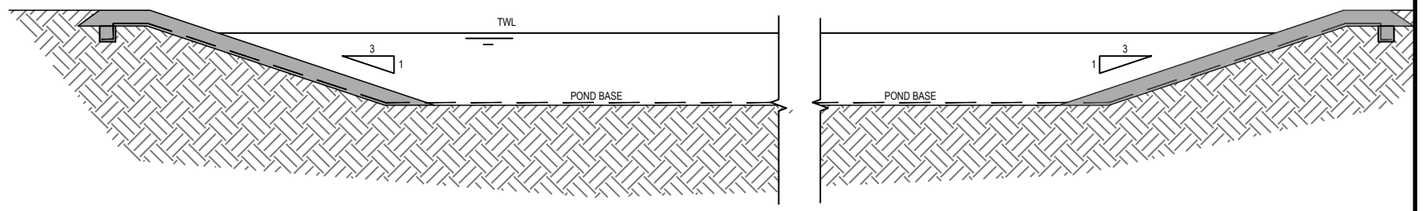


TYPICAL POND WALL CROSS SECTION

NOT TO SCALE







TYPICAL POND SECTION

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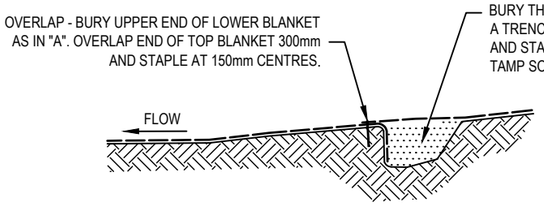
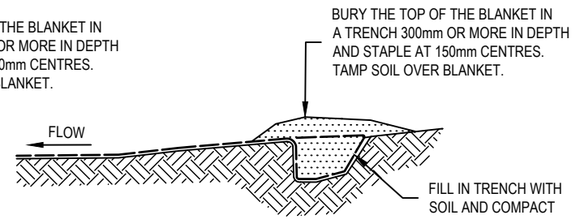


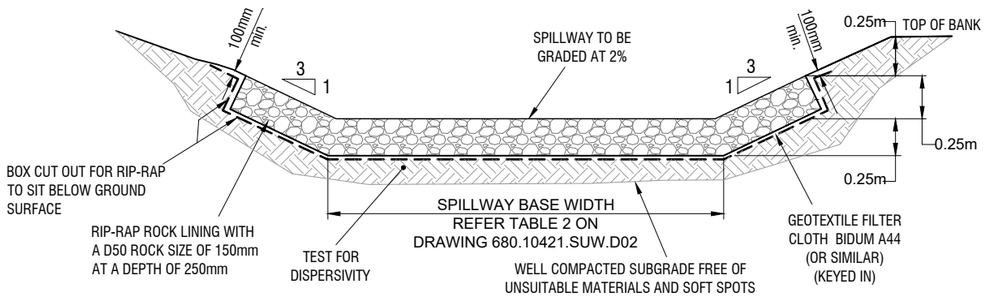
CENTRELINE SECTION AT POINT "B"



CENTRELINE SECTION AT POINT "A"

TYPICAL JUTE MESH DETAILS

NOT TO SCALE



TYPICAL SPILLWAY SECTIONAL DETAIL

NOT TO SCALE

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

AMENDMENTS — Plot Date: 12/06/2020

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DESIGN PROJECT LEADER: D OToole, DATE: 12/06/2020	NTG PROJECT MANAGER: J Hartnett, DATE: 12/06/2020

Northern Territory Government

RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SEDIMENT POND
TYPICAL SECTIONS

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	10 OF 12	680.10421.SUW.D10	1	A3

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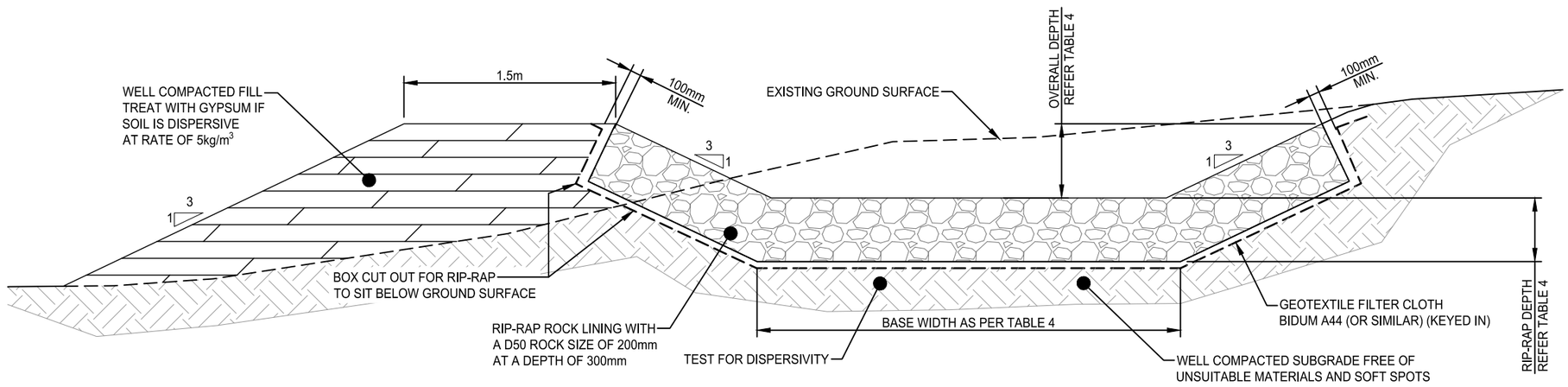


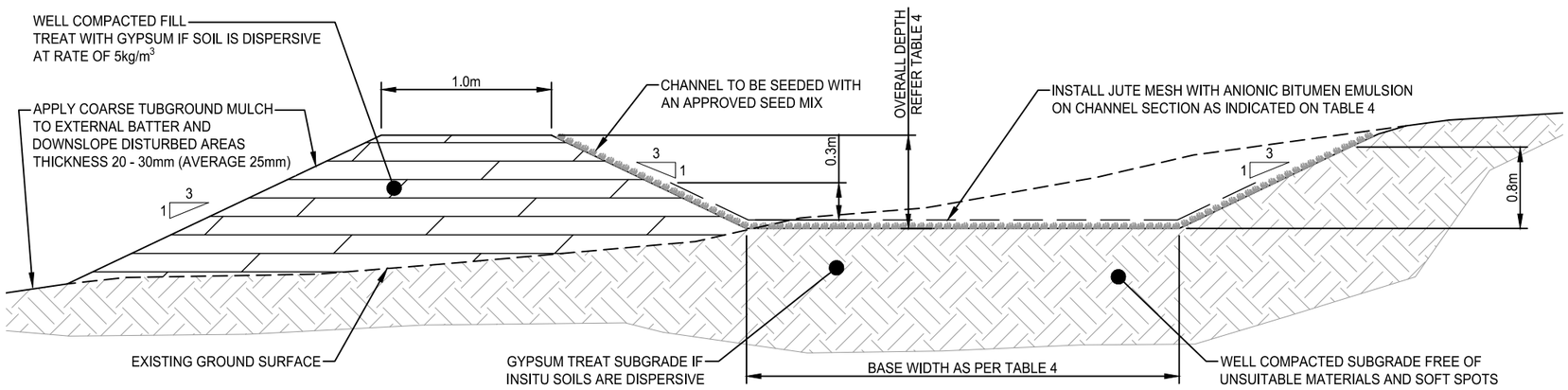
TYPICAL ROCK LINED CONVEYANCE CHANNEL SECTIONAL DETAIL

NOT TO SCALE

* INCLUDES 0.5m FREEBOARD
^ INCLUDES 1.0m FREEBOARD

TABLE 4 - CONVEYANCE CHANNEL TABLE SIZING

Conveyance Channel	Section	Length	Base Width (m)	Side Slopes H:V	Longitudinal Slope (%)	Channel Depth D m)*	Lining
Channel 1	1	384	3	3:1	1.9	0.8	Seeded
	2	213	3	3:1	1.6	0.8	Seeded
Channel 2	1	579	1	3:1	1	1	Seeded
	2	292	3	3:1	2.6	0.9	Jute Mesh
	3	205	3	3:1	1	1.1	Jute Mesh
Channel 3	1	479	3	3:1	1.8	0.9	Jute Mesh
	2	222	3	3:1	2.3	0.9	Jute Mesh
Channel 4	1	213	5	3:1	5.8	0.6	Jute Mesh
Channel 5	1	269	5	3:1	2.8	0.7	Seeded
Channel 6	1	395	1	3:1	1	1.2	Seeded
Channel 7	1	200	3	3:1	4.1	0.6	Seeded
Channel 8	1	339	5	3:1	1.2	1	Seeded
Channel 9	1	461	0.5	3:1	1	0.8	Seeded
	2	186	1	3:1	1.2	0.8	Seeded
Channel 10	1	428	1	3:1	1.1	0.8	Seeded
Channel 11	1	415	1	3:1	1.2	1	Seeded
Channel 12	1	147	0.5	3:1	1.2	0.7	Seeded
Channel 13	1	676	4	3:1	3.9	0.7	Jute Mesh
	2	317	4	3:1	1.6	0.9	Jute Mesh
Channel 14	1	673	5	3:1	3.3	0.7	Jute Mesh
	2	219	5	3:1	1.2	0.9	Jute Mesh
Channel 15	RETAIN EXISTING FLOW PATH UNTIL REALIGNMENT WORKS COMMENCE REFER TO RFR DRAWING SERIES FOR DETAILS						
Channel 16	1	86	1	3:1	8.3	0.6	Seeded
Channel 17	1	130	1	3:1	3.5	0.6	Seeded
Clean Diversion 1	1	428	9	3:1	1.2	0.9^	Seeded
Clean Diversion 2	1	330	0.5	3:1	1.2	0.8	Seeded
Clean Diversion 3	1	133	0.5	3:1	1.2	0.8	Seeded
Clean Diversion 4	1	420	12	3:1	1.2	0.8^	Seeded
Clean Diversion 5	1	61	1	3:1	1.2	0.6	Seeded
	2	71	9	3:1	8.5	1.1^	Seeded



TYPICAL SEEDED CONVEYANCE CHANNEL SECTIONAL DETAIL

NOT TO SCALE

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RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

CONVEYANCE CHANNEL
TYPICAL SECTIONS

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	11 OF 12	680.10421.SUW.D11	1	A3

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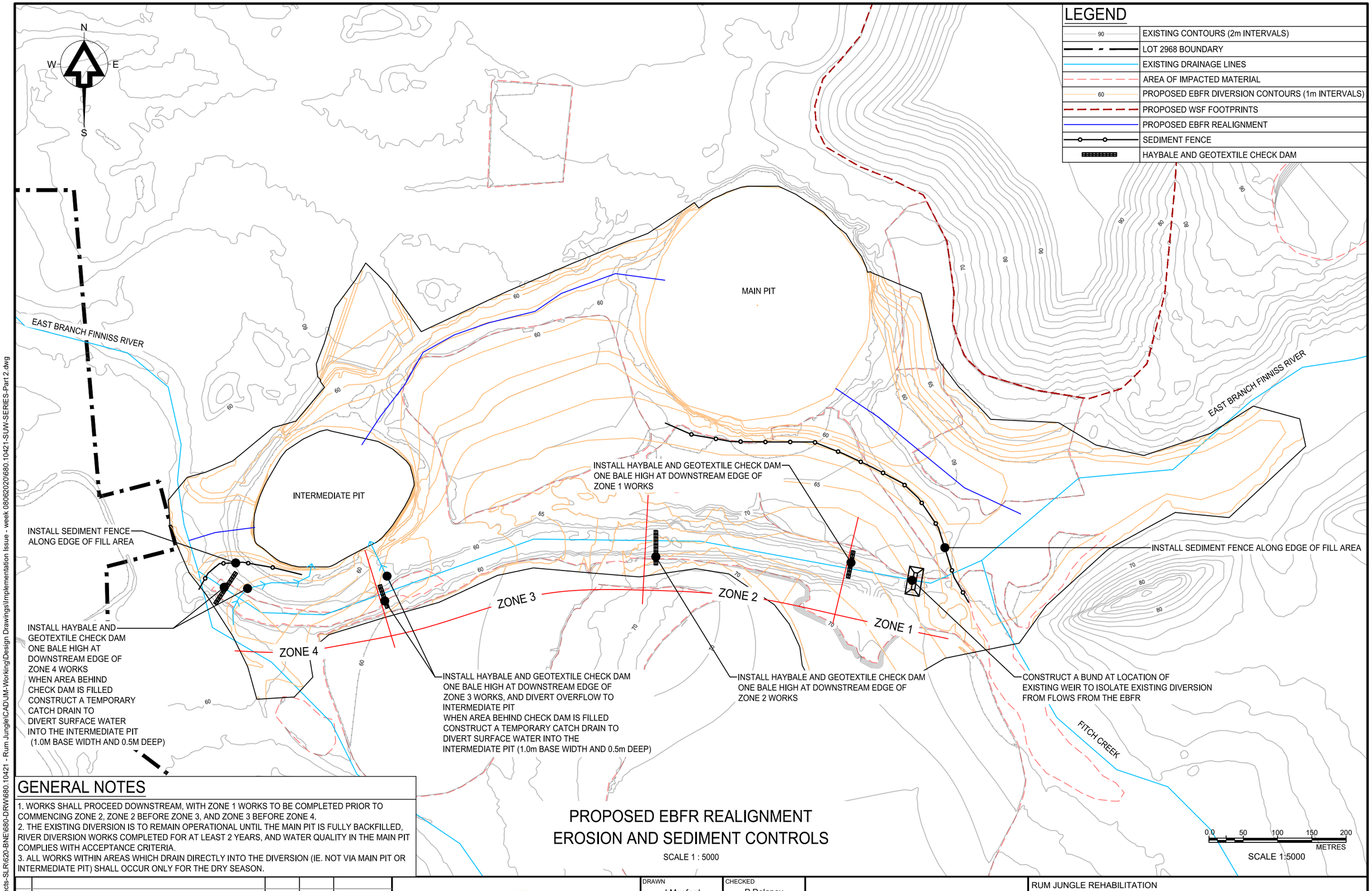

GENERAL NOTES

1. WORKS SHALL PROCEED DOWNSTREAM, WITH ZONE 1 WORKS TO BE COMPLETED PRIOR TO COMMENCING ZONE 2, ZONE 2 BEFORE ZONE 3, AND ZONE 3 BEFORE ZONE 4.
2. THE EXISTING DIVERSION IS TO REMAIN OPERATIONAL UNTIL THE MAIN PIT IS FULLY BACKFILLED, RIVER DIVERSION WORKS COMPLETED FOR AT LEAST 2 YEARS, AND WATER QUALITY IN THE MAIN PIT COMPLIES WITH ACCEPTANCE CRITERIA.
3. ALL WORKS WITHIN AREAS WHICH DRAIN DIRECTLY INTO THE DIVERSION (IE. NOT VIA MAIN PIT OR INTERMEDIATE PIT) SHALL OCCUR ONLY FOR THE DRY SEASON.

PROPOSED EBFR REALIGNMENT EROSION AND SEDIMENT CONTROLS

SCALE 1 : 5000

No.	DESCRIPTION	DATE	INIT.	DEPT/COMPANY.
1	ISSUED FOR IMPLEMENTATION	12/06/20	JM	SLR

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RUM JUNGLE REHABILITATION
STAGE 2A DETAILED ENGINEERING DESIGN

SURFACE WATER AND EROSION CONTROL
PROPOSED EBFR REALIGNMENT

NTG PROJECT No.	NTG ASSET No.	SHEET No.	NTG DRAWING No.	AMENDMENT	SHEET SIZE
N/A	N/A	12 OF 12	680.10421.SUW.D12	1	A3

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