LUNDSTROM ENVIRONMENTAL CONSULTANTS PTY LTD

ACN 600 398 945

896 Canning Hwy
Applecross
WA 6153

Mob:0417934863
email: admin@lundstrom-environmental.com.au
www.Lundstrom-Environmental.com.au

WATER MANAGEMENT PLAN

Prepared for The trustee for The Reynolds Family Trust
Lot 4579, 9104 Albany Highway, Crossman
Shire of Boddington

1. INTRODUCTION

This Water Management Plan (WMP) has been prepared for the purpose of an Extractive Industries Licence (EIL) application and a Development Approval (DA) application for gravel extraction on Lot 4579, 9104 Albany Highway, Crossman, Shire of Boddington.

An EIL is sought for a 25.5 ha area, as shown in Figure 2, of which 25.25 ha will be mined (Figure 2).

This WMP should be read in conjunction with the report entitled "Extractive Industries Licence Application and Environmental Management Plan Lot 4579, 9104 Albany Highway, Crossman, Shire of Boddington", prepared for The trustee for The Reynolds Family Trust (TRFT) by Lundstrom Environmental Consultants Pty Ltd in September 2025.

1.1 PROPERTY DESCRIPTION, OWNERSHIP AND LOCALITY

Property Description:	Lot 4579 on Deposited Plan 224816 Albany Highway, Crossman Shire of Boddington
Volume:	1717
Folio:	654
Area:	405.4986 ha
Ownership:	Russell Ernest Reynolds

The properties are situated within a farm in the Vegetation Complexes - South West forest region of Western Australia, approximately 132 kilometres south-east of Perth and approximately 5 kilometres western of the rural township of Crossman.

1.2 HISTORIC AND PRESENT LAND USE

Figure 1 is a recent aerial photograph showing the proposed and existing operations on the property.

The property and surrounding land comprise cleared agricultural land and pockets of remnant vegetation.

There is currently no gravel extraction on the property.

The area is zoned as "Rural" in terms of the Shire of Boddington Plains Planning Scheme (LPS) No. 3.

2. THE DEVELOPMENT PROPOSAL

2.1 PROPOSED EXTRACTION ACTIVITIES

TRFT proposes to extract lateritic gravel from two areas (Pit 1&2), as shown in Figure 2. Pit 1 is 18.7 ha, which will be divided into three stages (Stage 1 – 6.6 ha, Stage 2 – 6.2 ha and Stage 3 – 5.9 ha) as shown on Figure 3A. These would be mined consecutively. Pit 2 is 6.8 ha with 0.25 ha being left unmined to avoid clearing of native vegetation as shown on Figure 3B.

The total area to be mined is therefore 25.25 ha.

Annual gravel extraction is estimated to be around 80,800 tonnes/year, dependent on demand. Table 1 below summarises the actions that are to take place on the property over the next 5 years (2025 to 2031), however the lifespan of the pit could be up to 18 years. A summary of the actions is given below:

- Topsoil and overburden will be removed from the extraction area for pits 1&2 with only the areas targeted for immediate extraction being opened. Topsoil and over-burden will be stockpiled separately along the edges of the extraction area, with stockpiles being no higher than 2m.
- Extraction activity will result in the lowering of the ground level by approximately 1-2m.
- No screening will be undertaken.
- No crushing will be undertaken.
- Measures to limit dust will be undertaken.
- There will be no blasting.
- Rehabilitation and stormwater management measures will be implemented.
- The area will be returned to agricultural use.

Table 1: Stages of the Extraction Operation

Areas	Action	2025		2026		2027		2028		2029		2030		2031	
Pit 1	Strip and stockpile														
Pit 1	Load and truck out														
Pit 1	Progressive rehabilitation of 18.7ha														
Pit 2	Strip and stockpile														
Pit 2	Load and truck out														
Pit 2	Progressive rehabilitation of 6.55ha														
Pit 1-2	Monitoring and Maintenance of 25.25ha														

3. EXISTING ENVIRONMENT

3.1 TOPOGRAPHY, HYDROLOGY AND WETLANDS

The extraction area is located on land with slopes for pit 1 which range from 1:28 (3.5%) to 1:18 (5.5%) for pit 2 from 1:5 (20%) to 1:15 (6.6%). The elevation range for pit 1 is 315 to 290 m AHD and for pit 2, 245 to 275 m AHD (Figures 3 A,B).

The surrounding land slopes towards the south-east and south-west.

Drainage from the extraction area is to the south-east (pit 1) and south-west (pit 2). The surrounding area has multiple creeks and drainage lines which drain towards the Hotham River in the south. There are also multiple agricultural dams located along these drainage lines which provide water for agricultural activities (Figure 2).

The Hotham River is located approximately 590 m to the south of the extraction area (pit 2).

No known lakes or wetlands exist within 1 000 metres of the proposed extraction area (Landgate 2025).

The properties do not fall within a Public Drinking Water Source Area or a *Rights in Water and Irrigation (RIWI) Act 1914* Surface Water Proclamation Area.

3.2 GEOLOGY AND SOILS

The bedrock geology of the area is granitic basement rock which is overlain by a ferruginous duricrust known as "the laterite profile" to a depth of approximately 5-10m. The lateritic caprock has weathered to silty, nodular gravel which varies in thickness between 1 and 4m. Below the gravel is a sandy clay material.

Topsoil above the gravelly layer is a red sandy loam.

3.3 GROUNDWATER HYDROLOGY

The occurrence of groundwater under the site is likely to be very limited due to the impervious nature of the underlying granitic material. Small quantities of groundwater may be found within rock fractures.

The DWER water register indicates that there are no licenced water bores within the property or within a 12km radius (DWER, 2025).

The site does not fall within a Rights in Water and Irrigation (RIWI) Act 1914 Groundwater Proclamation Area.

3.4 RAINFALL

One of the closest rainfall recording stations is Boddington Shire (Station 9509) and it has a mean annual rainfall of 668.9 mm. The wettest months are June, July and August and the driest months are December, January and February. The highest recorded annual rainfall was 1166.3mm in 1955 and the lowest was 289.8mm in 2010.

Table 2 shows the average monthly and annual rainfall for Boddington Shire.

Table 2: Mean Rainfall Data (mm) for Boddington Shire for Period (Station 9509) 1915 to 2022 (BoM 2025a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
14.9	16.7	18.4	34.9	83.8	125.9	121.7	96.0	61.3	39.6	19.4	11.5	668.9

Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Rainfall Intensity-Frequency-Duration (IFD) data system (BoM 2025b), which yields the 2hr 10% Annual Exceedance Probability (AEP) (33.1mm). The DWER recommends that surface water runoff produced within the mined area from this rainfall event should be contained within the pit (DWER 2019). This aspect is discussed later in this document.

4. WATER MANAGEMENT

In all extraction operations the potential exists for impacts to be incurred on surrounding water resources, or by stormwater erosion of exposed areas. The water management strategies outlined below will ensure the mitigation of potential impacts.

4.1 Surface Water Management

Three surface water management areas (sub-catchments 1-3) have been defined around the extraction areas for pit 1 (Figure 2 A).

One surface water management area has been defined around the extraction areas for pit 2 (Figure 2 B).

Runoff generated within each sub-catchment for the 2hr 10% Annual Exceedance Probability (AEP) rainfall event has been calculated using the Rational Method as detailed in Table 3. Storm-water management infrastructure (detention ponds and contour bunds) will be designed to manage at minimum this runoff.

Runoff from areas outside the defined sub-catchments will be diverted away using diversion (cut-off) bunds. Diversion bunds will also be used in addition to contour bunds to help direct surface water flow towards detention ponds and prevent uncontrolled flow of surface water from mined areas to nearby streams.

Table 3: Surface Water Management Areas (Sub-catchments), Runoff Volumes and Detention Pond Dimensions

Sub-catchment	EIL Stages incorporated	Total Area (ha)	Extraction Area (ha)	Undisturbed Area (ha)	Design Storm Runoff* ($m^3 x 10^3$)	Detention Pond Storage ($m^3 x 10^3$)	Detention Pond Area (m^2)
Pit 1/1	1	6.6	6.6	0	1.76	1.800	900
Pit 1/2	2	6.2	6.2	0	1.65	1.700	850
Pit 1/3	3	5.9	5.9	0	1.55	1.600	800
Pit 2	1	6.8	6.55	0.25	1.76	1.800	900
TOTAL		**25.5**	**25.25**	**0.25**	**6.72**	**6.900**	**3,450**

*Calculated by Rational Method with a 2hr 10% AEP of 33.1mm obtained from the Bureau of Meteorology (BoM) website (BOM 2025b). Runoff coefficients used for Rational Method calculations were 0.8 for disturbed areas and 0.3 for undisturbed areas.

Based on the calculated storm design runoff shown in Table 3, the following measures will be used to achieve comprehensive onsite management of surface water runoff from the proposed EIL workings:

- Stormwater detention ponds with the capacity to hold at least a 2hr 10% AEP storm event as detailed in Section 4.2.

• As each extraction area is completed, narrow-based contour bunds might be constructed if necessary to a grade of between 0.2 and 0.4%. Contour bund design methodology is discussed further in Section 4.2.1 below.

• Diversion (cut-off) bunds will be formed along the northern and eastern edges of pit 1 and the northern, top parts of western and eastern edges of pit 2 to prevent runoff entering into mined areas as shown on Figure 2 A, B.

• Areas downstream of pit 1 should be mined first i.e. Stage 1 should be mined before Stage 2 1, Stage 2 should be mined before Stage 3.

• As part of the rehabilitation process, the ground will be ripped along the contour prior to fertilisation and seeding. This leaves a depression and low bund which will attenuate surface water flows and prevent rill erosion during the period that pasture grasses are becoming established. Surface water detention ponds and contour bunds will be retained until vegetation ground cover is sufficient to stabilise the ground surface and prevent erosion.

• Regular monitoring of the erosion control measures will be undertaken, and repairs implemented where necessary throughout the licence period or longer if necessary.

4.2 Storm Water Management

As each extraction stage is opened, stormwater detention pond(s) will be excavated below the workings (but within the extraction area) with the capacity to hold at least the 2hr 10% AEP storm event. Each sub-catchment will have one pond each. The positions of these detention ponds are shown on Figure 2 A, B and the storage capacities listed in Table 3.

4.2.1 Contour Bank/Bund Design

Basic design parameters for the contour bunds that will be used for stormwater management on this property have been taken from the Queensland Department of Environment and Resource Management guideline.

Contour bank design is dependent on the following factors:
- Land-use after rehabilitation
- Slope
- Soil erodibility

4.3 Groundwater Management

The project does not involve dewatering. The average depth of the extraction will be approximately 1 metre. Groundwater will not be exposed by the excavations.

When water is required for dust management, it will be abstracted from the existing farm dams on the property or off-site from the nearest available commercial (scheme) source.

No dewatering activities will be undertaken.

Due to the low scale nature of the operations and limited groundwater, no groundwater contamination is anticipated and there is no risk to any private groundwater supply. No fuel or lubricant storage will occur on the site. Refuelling will take place using a mobile refuelling vehicle which is equipped with a "snap-on snap-off, fast-fill and auto shut-off" facility. Plant will be refuelled each morning, leaving the vehicles almost empty overnight. No major servicing, which could lead to fuel and oil spills, will take place on the site. Minor spills which may occur occasionally will be neutralised by soil processes. TRFT has a Safety Practice document for Hydrocarbon Spill Response outlining their procedures for controlling, recovering, treating and reporting hydrocarbon spills (Annexure 1).

5. ACID SULFATE SOILS

A search of the CSIRO's Australian Soil Resource Information System (ASRIS) database determined there were no acid sulphate soil (ASS) sites identified in the vicinity of the proposed EIL area (CSIRO 2025).

6. REFERENCES

Bureau of Meteorology (BoM) (2025a). Rainfall records for Boddington Shire (Station 9509). Website: www.bom.gov.au

Bureau of Meteorology (BoM) (2025b). Rainfall frequency information. Website: www.bom.gov.au

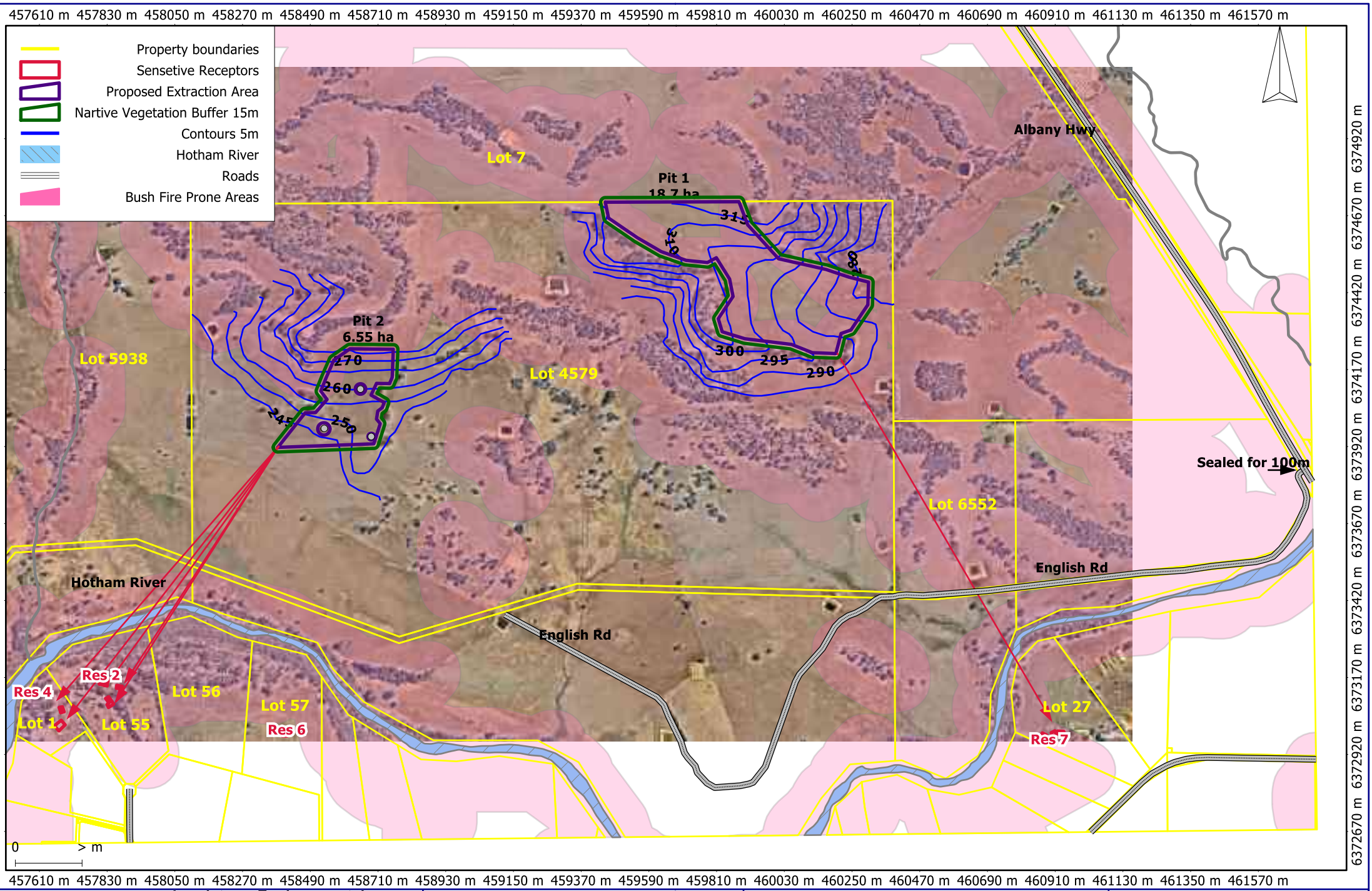
CSIRO (2025). Atlas of Australian Acid Sulphate Soils. https://data.csiro.au/collection/csiro:6181 September 2025.

Department of Water and Environment Regulation (DWER) (2019). Water quality protection note no. 15, Basic raw materials extraction. Government of Western Australia.

Geological Survey of Western Australia (GSWA) (1978) SH50-13,14 Perth WA Geological Map (1st Edition).

Landgate (2025). Locate V5. [Online] https://maps.slip.wa.gov.au/landgate/locate/. Accessed: September 2025.

FIGURES

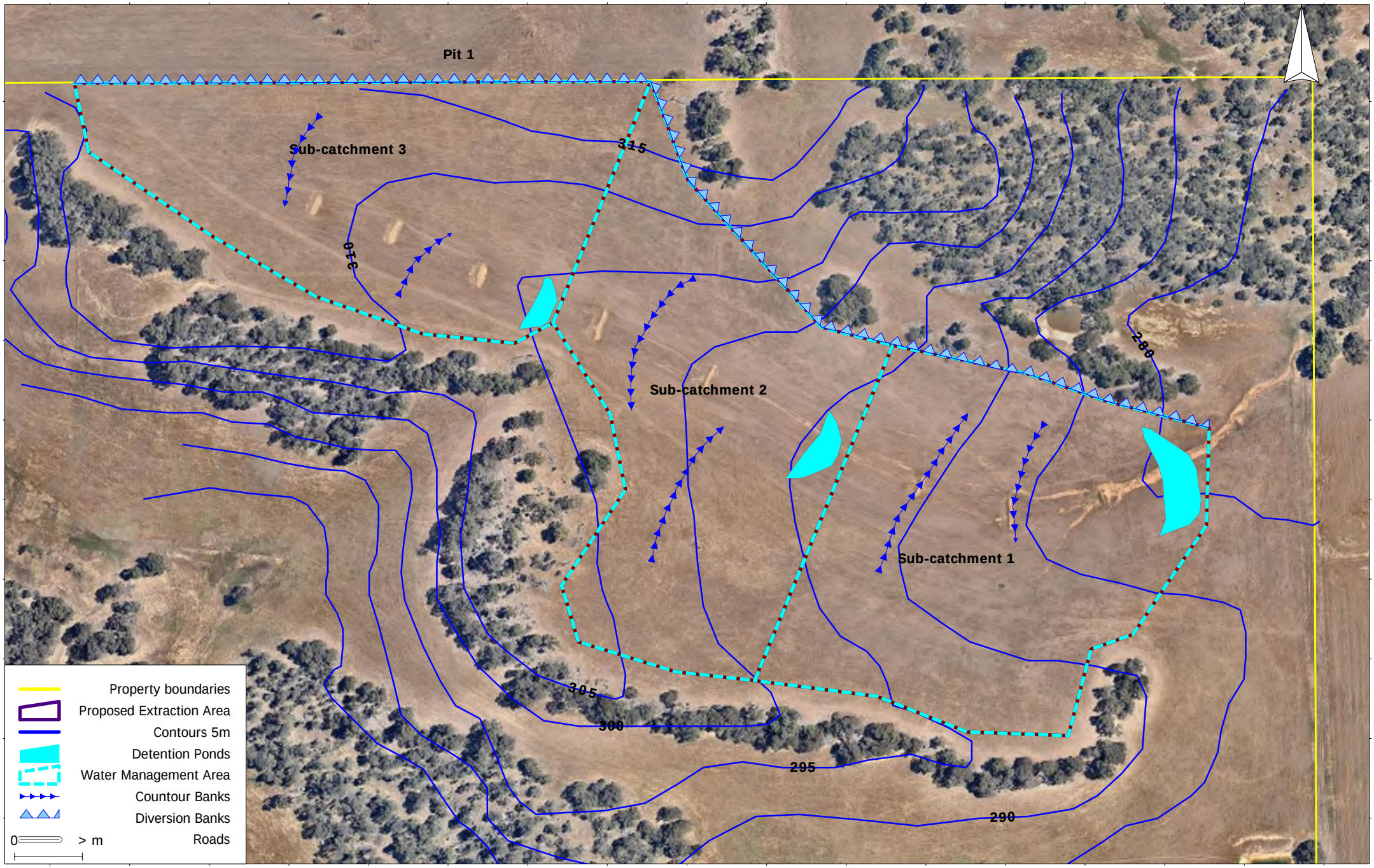


Lundstrom Environmental Consultants Pty Ltd
Applecross WA 6153
Mob: 0417934863
admin@lundstrom-environmental.com.au

Scale: 1:15000
Original Size: A4
Air Photo Source: Nearmap Nov 2014
Datum: GDA94
Projection: Australia MGA94 (50)

Client: The Reynolds Family Trust
Project: Gravel Extraction
Location: LOT 4579, 9104 ALBANY HIGHWAY, CROSSMAN

Figure 1:
Site and Surrounds

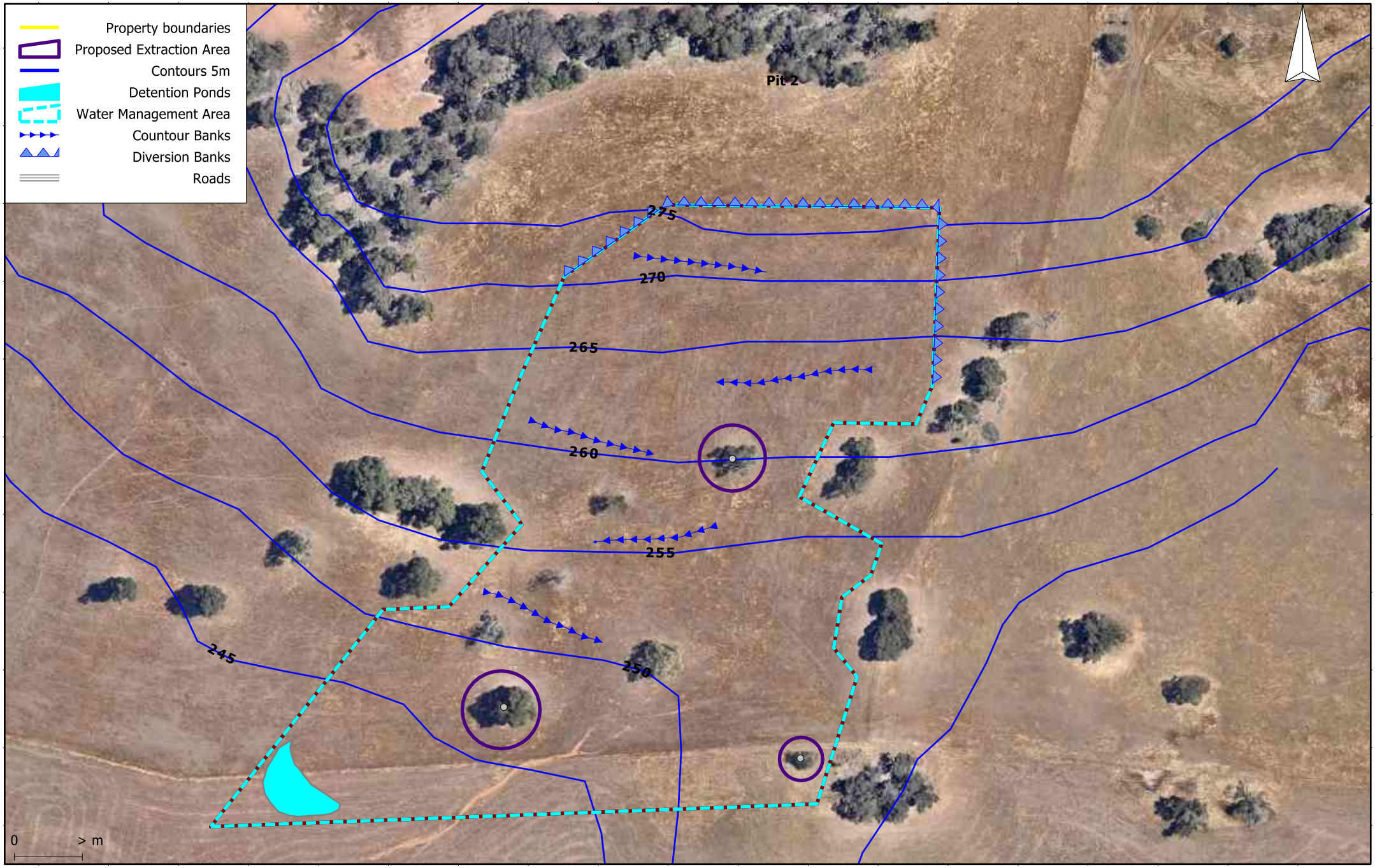


Lundstrom Environmental Consultants Pty Ltd
Applecross WA 6153
Mob: 0417934863
admin@lundstrom-environmental.com.au

Scale: 1:3600
Original Size: A4
Air Photo Source: Nearmap Nov 2014
Datum: GDA94
Projection: Australia MGA94 (50)

Client: The Reynolds Family Trust
Project: Gravel Extraction
Location: LOT 4579, 9104 ALBANY HIGHWAY, CROSSMAN

Figure 2A:
Stormwater MP Pit 1



Lundstrom Environmental Consultants Pty Ltd Applecross WA 6153 Mob: 0417934863 admin@lundstrom-environmental.com.au	Scale: 1:2500 Original Size: A4 Air Photo Source: Nearmap Nov 2014 Datum: GDA94 Projection: Australia MGA94 (50)	Client: The Reynolds Family Trust Project: Gravel Extraction Location: LOT 4579, 9104 ALBANY HIGHWAY, CROSSMAN	**Figure 2B:** **Stormwater MP Pit 2**

ANNEXURE 1

Hydrocarbon Spill Management Plan

The Trustee For The Reynolds Family Trust

Hydrocarbon Spill Management Plan

Purpose:

The purpose of this document is to describe the measures that The Trustee For The Reynolds Family Trust will implement in order to limit the impact of any hydrocarbon spills that may take place on any of their extraction and waste fill sites.

Proposed Measures:

The following preventative measures will be implemented:

- No fuel will be stored on site and all plant and equipment will be refuelled by a mobile fuel truck, as and when required. Refuelling is done in the morning and plant and equipment is empty during the night.
- Refuelling or any activities that carry a risk of spills will be carried out away from the detention basins and stormwater flow paths.
- All major servicing of plant and equipment will take place at the workshops off site.
- Refuelling trucks are fitted with automatic snap-off fuel nozzles, thus preventing overfilling and spillage.
- Operators/drivers are provided instruction on the need for hydrocarbon pollution prevention when induction courses are given.

The following actions will be taken in the event of a spill occurring:

- Stop the spill source immediately if it is safe to do so.
- Contain the spill and prevent any contact with water bodies and drains.
- Clean up the spill by digging up the contaminated soil and transporting it to a licensed waste disposal site. Replace the excavated material with clean fill.
- If possible a photographic record of the procedure should be kept.
- Report the incident to the Quarry Manager.