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WATER MANAGEMENT PLAN

Prepared for Westwall Holdings Pty Ltd
2038 Donnybrook Boyup Brook Road, Yabberup
Shire of Donnybrook-Balingup

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 2038 Donnybrook Boyup Brook Road, Yabberup, Shire of Donnybrook-Balingup.

This WMP should be read in conjunction with the report entitled *"Extractive Industries Licence Application and Environmental Management Plan 2038 Donnybrook Boyup Brook Road, Yabberup, Shire of Donnybrook-Balingup"*, prepared for Westwall Holdings Pty Ltd by Lundstrom Environmental Consultants Pty Ltd in November 2022.

1.1 PROPERTY DESCRIPTION, OWNERSHIP AND LOCALITY

Property Description: 2038 Donnybrook Boyup Brook Road,
Yabberup
Shire of Donnybrook-Balingup

Ownership: Old Valley Pty Ltd

The properties are approximately 18km from the intersection of Donnybrook Boyup Brook Road and South-western Highway.

1.2 HISTORIC AND PRESENT LAND USE

The property is currently used as a vineyard. The extraction area will be rehabilitated back to pastures after completion of operations.

Lots 130 and 3671 are zoned as "Priority Agriculture, in terms of the Shire of Donnybrook-Balingup Local Planning Scheme (LPS) No. 7 (DPLH, 2022).

2. THE DEVELOPMENT PROPOSAL

2.1 PROPOSED EXTRACTION ACTIVITIES

Westwall Holdings intends to extract approximately 59,040 tonnes/year of gravel from the areas indicated on Figure 1 in Stages 1, 2, 3 and 4 of 4ha, 4.6ha, 4.6ha and 3.1ha respectively. The total area to be disturbed is approximately 16.4ha and excavation will proceed to a depth of approximately one metre. The EIL application is for 5 years.

The proposed extraction licence is required for the purpose of undertaking the following activities on the site:

- The proposed extraction area will be cleared of vine plantation in stages, with only the stage being worked on, being cleared, keeping the disturbed area exposed at any time to a practical minimum.
- Extraction of gravel from an area of 16.4ha in three stages as shown in Figure 2. Stages 1, 2, 3 and 4 will involve extraction of 295,200 tonnes of gravel in total but will be dependent on demand.
- Topsoil will be removed from the extraction area prior to the commencement of each stage, with only the area targeted for immediate extraction being open. Topsoil will be stockpiled separately along the edges of the extraction area, with stockpiles being no more than 2 metres high and 12 metres wide, with batter of 1:3.
- Within the current stage of extraction, a bulldozer will rip and blade material to a raw material stockpile. This material is loaded into the crusher after which a stacker creates a product stockpile. The product stockpile will be no more than 9 m high and 50m wide, with batter of 1:3 metres.
- A mobile crushing and screening plant will be used on site for approximately three to four weeks per year, dependent on the size of the campaign. Trucks will enter the pit and be loaded from the stockpile by a front-end loader.
- Product stockpiles will be placed in such a way that it will act as a noise buffer between the crusher and the sensitive receptors.
- Crusher and stockpile positions have been identified for each stage and are illustrated in Figures 2.
- Extraction activity will result in the lowering of the ground level by approximately one metre.

- At a time, only one stage of up to 5ha will be extracted and will be progressively rehabilitated back to pasture after completion of extraction activities and before moving to the next stage. This will ensure that the area of disturbed land is stabilized, and the disturbed area exposed at any time to a practical minimum.
- Trucks will enter the pit via an existing gravel access road off Donnybrook Boyup Brook Road and be loaded from the stockpile by a front-end loader.
- There will be no blasting in this operation.
- The lot boundary buffer of 20m will apply. However, the proposed extraction will excavate through the boundary between Lot 130 and 3671, thus avoiding the batter on both sides and an elevated boundary line.
- Batters of 1:6 meters will be maintained throughout the operation. Where possible, topsoil will be replaced and seeded with pastures on a progressive basis, in fully extracted areas, prior to the commencement of winter

Table 1: Stages of the Extraction Operation

Stage	Action	2023	2024	2025	2026	2027	2028	2029
1	Strip, crush and stockpile							
1	Load and truck out							
1	Progressive rehabilitation of 4ha							
2	Strip, crush and stockpile							
2	Load and truck out							
2	Progressive rehabilitation of 4.6ha							
3	Strip, crush and stockpile							
3	Load and truck out							
3	Progressive rehabilitation of 4.6ha							
4	Strip, crush and stockpile							
4	Load and truck out							
4	Progressive rehabilitation of 3.1ha							
1-4	Monitoring and Maintenance							

3. EXISTING ENVIRONMENT

3.1 TOPOGRAPHY, HYDROLOGY AND WETLANDS

The elevation of the subject areas ranges from 125m AHD and 156m AHD and generally falls towards the north, north-east and north-west.

Current slopes across the proposed EIL areas range between approximately 1:18 (5.7%) and 1:9 (11%).

The property is not situated within a *Rights in Water Irrigation Act 1914* (RIWI) Surface Water Proclamation Area. The Site lies does not lie within a *Rights in Water Irrigation Act 1914*(RIWI) Groundwater Proclamation Area (Landgate, 2022).

The Preston River is approximately 560m north of the closest boundary of the proposed extraction area. Preston River Tributaries flowing to the south, are adjoining the proposed extraction area on the west and east at approximately 40m and 122m respectively. The tributaries flow through the farm dams, as shown in Figure 1 (Landgate, 2022).

The site is located within the Leschenault Estuary – Preston River Catchment within the upper Preston sub catchment.

There are no wetlands present within 1.5km of the proposed extraction areas.

The site and does not fall in a Public Drinking Water Source Area (Landgate, 2022).

Details of the methods that will be used to manage stormwater and off-site sedimentation are discussed later in this report.

3.2 GEOLOGY AND SOILS

The underlying geology comprises metamorphic/granitic rocks of the Yilgarin craton. In places, weathered granitic materials are overlain by ferruginous duricrust, massive to rubbly and include iron-cemented reworked products. In some areas the laterite is covered by metre of sand and sandy loam ((GeoVIEW, 2022), (Dawe, 1998), (EPP, 2014)).

The soil profile comprises a thin layer of gravelly sand which overlies a gravelly loam which grades into laterite boulders and gravel.

The excavation depth would be one metre below current ground level.

3.3 GROUNDWATER HYDROLOGY

Due to presence of granitic material or rocks in the shallow subsurface, ground water occurrence is limited to localized small aquifers associated with deeper accumulations of sandy materials or in fractured rock aquifers. Water table is approximately 20m deep but is limited due to the impervious nature of the rock.

The Site is not situated within a *Rights in Water Irrigation Act 1914*(RIWI) Groundwater Proclamation Area (Landgate, 2022).

3.4 RAINFALL

One of the closest weather stations is The Wold (Station 009927) and it has a mean annual rainfall of 828.4 mm. The wettest months are June, July and August and the driest months are December, January and February. The station has been recording rainfall since 1974. The highest recorded annual rainfall was 1116.1mm in 1996 and the lowest was 441.4mm in 2010.

Table 2 shows the average monthly and annual rainfall for The Wold.

Table 2: Mean Rainfall Data (mm) for The Wold for Period (Station 009927) 1974 to 2021 (BoM 2021a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
16.3	15.1	20.8	46.9	109.9	137.1	153.0	130.3	93.4	54.1	36.4	15.3	828.4

Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Rainfall Intensity-Frequency-Duration (IFD) data system (BoM, 2022), which provides the 2hr 10% Annual Exceedance Probability (AEP) as 33.8mm. 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 planned surface water management actions for this site will be designed such that the nearby tributaries of the Preston River will not be further impacted by the proposed extractive activities.

4.1 Surface Water Management

Surface water management will be based on the Department of Water Guideline, “Water Quality Protection Note No. 15” (DWER, 2019) which considers both runoff within the extraction area and runoff from adjacent catchments.

During periods of heavy rainfall, stormwater runoff can be generated. Stormwater detention ponds will be installed to store accumulated runoff for the 2-hour 10% AEP rainfall event (ponds shown on Figure 2), with the stormwater generated being directed to the detention ponds via rip lines. These will serve as effective silt traps in times of high surface runoff. Where possible, topsoil and overburden stockpiles will be used to control stormwater runoff during these periods. Stockpiles will be strategically placed to reduce water flow within the extraction area. Topsoil stockpiles will be positioned in a gently sloped area along the stage boundary. Topsoil stockpiles stabilise quickly, and erosion from these is limited. However, if not stabilised naturally, polymer-based stabilizer will be used. Product (gravel) stockpiles will act as a barrier

to the storm water flow, and any water escaping the product stockpile will be captured by the constructed detention ponds.

Runoff generated within each extraction stage or 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 until such time as the land surface has recovered sufficiently for these structures to be removed.

Runoff from areas outside the extraction stages will be diverted away using diversion (cut-off) bunds. Diversion bunds will also be used to prevent surface water flow in between the stages. Contour bunds within each stage will help direct surface water flow towards detention ponds and prevent uncontrolled flow of surface water from mined areas to nearby streams.

As part of the rehabilitation process, the ground will be ripped along the contour at 6m intervals prior to fertilisation and seeding. This leaves a depression and low bund which will attenuate surface water flows and prevent soil erosion during the period that pasture grasses are becoming established. Surface water detention ponds and cut-off 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.

Table 3: Surface Water Management Areas, Runoff Volumes and Detention Pond Dimensions

Extraction Stage	Total Area (ha)	Extraction Area (ha)	Undisturbed Area (ha)	Design Storm Runoff* m^3	# Detention Ponds	Detention Pond Storage (m^3)	Detention Pond Area (With 2m depth) (m^2)
1	4	4	0.00	1081.6	2	540.8	270.4
2	4.6	4.6	0.00	1243.84	2	621.92	310.96
3	4.6	4.6	0.00	1243.84	2	621.92	310.96
4	3.1	3.1	0.00	838.24	2	419.12	209.56
TOTAL	**16.4**	**16.4**	**0.00**	**4407.52**	**8**	**-**	**-**

*Calculated by Rational Method with a 2hr 10% AEP of 33.8mm obtained from the Bureau of Meteorology (BoM) website (BOM, 2022). Runoff coefficients used for Rational Method calculations were 0.8 for disturbed areas and 0.3 for undisturbed areas.

4.1.1 Stormwater Detention Ponds

As each extraction stage is opened, stormwater detention ponds will be excavated deeper than the workings (but within the extraction area) with the capacity to hold at least a 2hr 10% AEP storm event. In total, 8 detention ponds will be constructed in Stage 1, 2, 3 and 4. The positions

of these detention ponds are shown on Figure 2 and the storage capacities listed in Table 3 above.

4.1.2 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, attached to this management plan as Annexure 1.

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

In this case, the site will be returned to its former agricultural land use post-extraction. The proposed contour bank type in this situation is "narrow-based" i.e., approximately 4m across.

Slopes on Stages 1, 2, 3 and 4 averages between 5% to 11%, hence according to the contour bund design guidelines (Annexure 1), it is recommended that contour banks are spaced approximately 30m apart in this situation, and with a fall within a range of 0.2 and 0.3%.

4.2 Runoff Management

Runoff from areas outside the defined stages will largely be diverted away naturally.

No un-managed surface water runoff will be allowed flow outside the defined extraction area.

In addition to the construction of the storm water detention ponds described above the following measures are proposed to achieve onsite management of surface water runoff from the proposed EIL working:

- As each extraction area is completed, narrow-based contour bunds will be constructed to a grade of between 0.2 to 0.5%. Contour bund design methodology as discussed in 4.1.2 above.
- Cut-off/ diversion bunds will be formed along the boundary of the proposed area, to prevent runoff entering the mined area.
- Drainage within the extraction area must be retained within the pit. Hence, the site supervisor will undertake a daily site inspection to ensure drainage is not impacting adjacent properties or any environmental or sensitive receptors.
- In case of contamination or discharge, an incident report will be completed, and investigation undertaken by the operations and/or OH&S Manager.
- Site boundaries will be carefully monitored on a fortnightly basis or during heavy rainfall to ensure no water flow is observed into the surrounding sensitive environmental and human receptors.
- Daily visual inspections of stockpiles and bunds will be conducted. If an erosion incident is noted, work will stop until the incident has been assessed and prevention control measures implemented.

- Stockpiles will be strategically placed to reduce water flow within the extraction area. Topsoil stockpile will be positioned in a gently slopped area along the stage boundary, topsoil stockpile stabilizes quickly, which will prevent any sedimentation. However, if not stabilized naturally, polymer-based stabilizer will be used.
- Product (gravel) stockpile will act as a barrier to the storm water flow, and any water escaping the product stockpile will be captured by the constructed detention ponds.
- The overflows of the sumps will have silt curtains to address the potential for sedimentation discharge properties.
- Initial post mining rehabilitation will involve the construction of contour bunds to control the flow of stormwater (including particulate matter) over the EIL area.

4.3 Groundwater Management

Ground water occurrence is limited to localized small aquifers associated with deeper accumulations of sandy materials or in fractured rock aquifers. The project does not involve dewatering or abstraction of groundwater.

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.

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.

Refuelling or any activities that carry a risk of spills will be carried out away from the detention basins and stormwater flow paths. No major servicing, which could lead to fuel and oil spills, will take place on the site. Contaminated material resulting from any minor spills will be extracted and disposed of offsite at an appropriate landfill facility.

Westwall Holding will implement a Hydrocarbon Spill Response, attached to this management plan as Annexure 2, outlining their procedures for controlling, recovering, treating, and reporting hydrocarbon spills.

4.4 Water Supplies for Bushfire Management

As per condition 4.41.3 of Local Planning Scheme 7, a water tanker is available for firefighting operations off site when bush fires are close by, and water availability is at the discretion of Westwall Holdings management. Water will be available from the constructed detention pond, as well as existing farm dams. A 15kl water cart will always be on site during the proposed extraction activities.

4.5 Monitoring and Management Measures

After pit closure and rehabilitation, monitoring of rehabilitated areas will ensure that any areas requiring remedial work are identified. Monitoring will be carried out on an annual basis to assess the:

- Physical stability of the landform in the rehabilitated areas.
- Success of pasture grasses.
- Emergence of weeds.

Monitoring will continue until the completion criteria have been fulfilled. Maintenance procedures will be carried out where necessary and may include:

- Repair of any erosion damage.
- Seeding areas that may not have regenerated.
- Weed control.

5. ACID SULFATE SOILS

A search of the CSIRO's Australian Soil Resource Information System (ASRIS) database identified the area has been provisionally classified as having an extremely low probability with very low confidence of occurrence for acid sulfate soils (CSIRO, 2022).

6. REFERENCES

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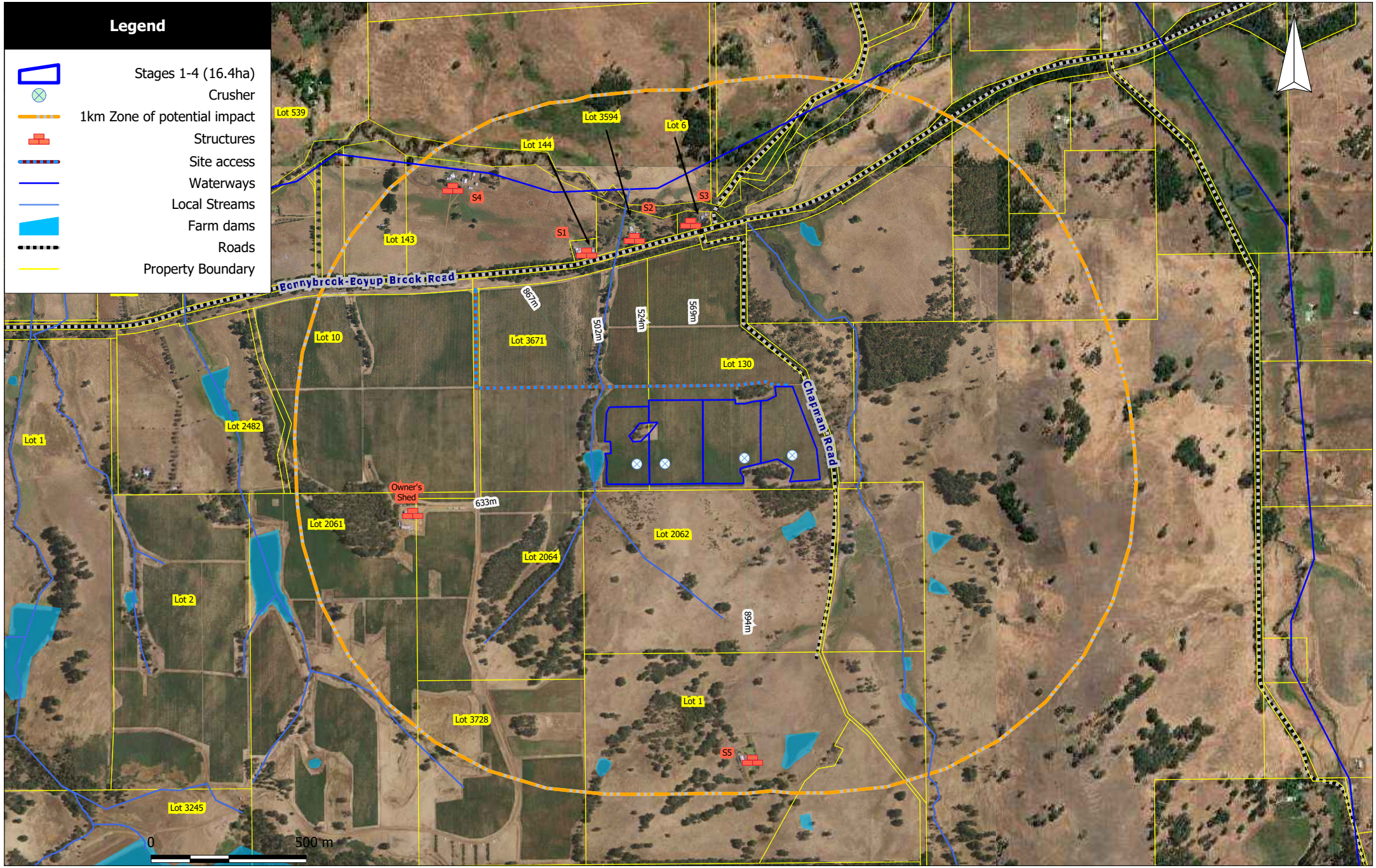
FIGURES



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Datum: GDA94
Projection: Australia MGA94 (50)

Client: Westwall Holdings
Project: Gravel Extraction
Location: 2038 Donnybrook Boyup Brook Road Yabberup

Figure 1:
Site and Surrounds

Z:\Other Clients and Projects\Westwall Holdings Yabberup\EIL\2022 New Area\Management Plans\4 Water Management\Drawings\F1 Site and Surroundings - New area to the east without lot buffer

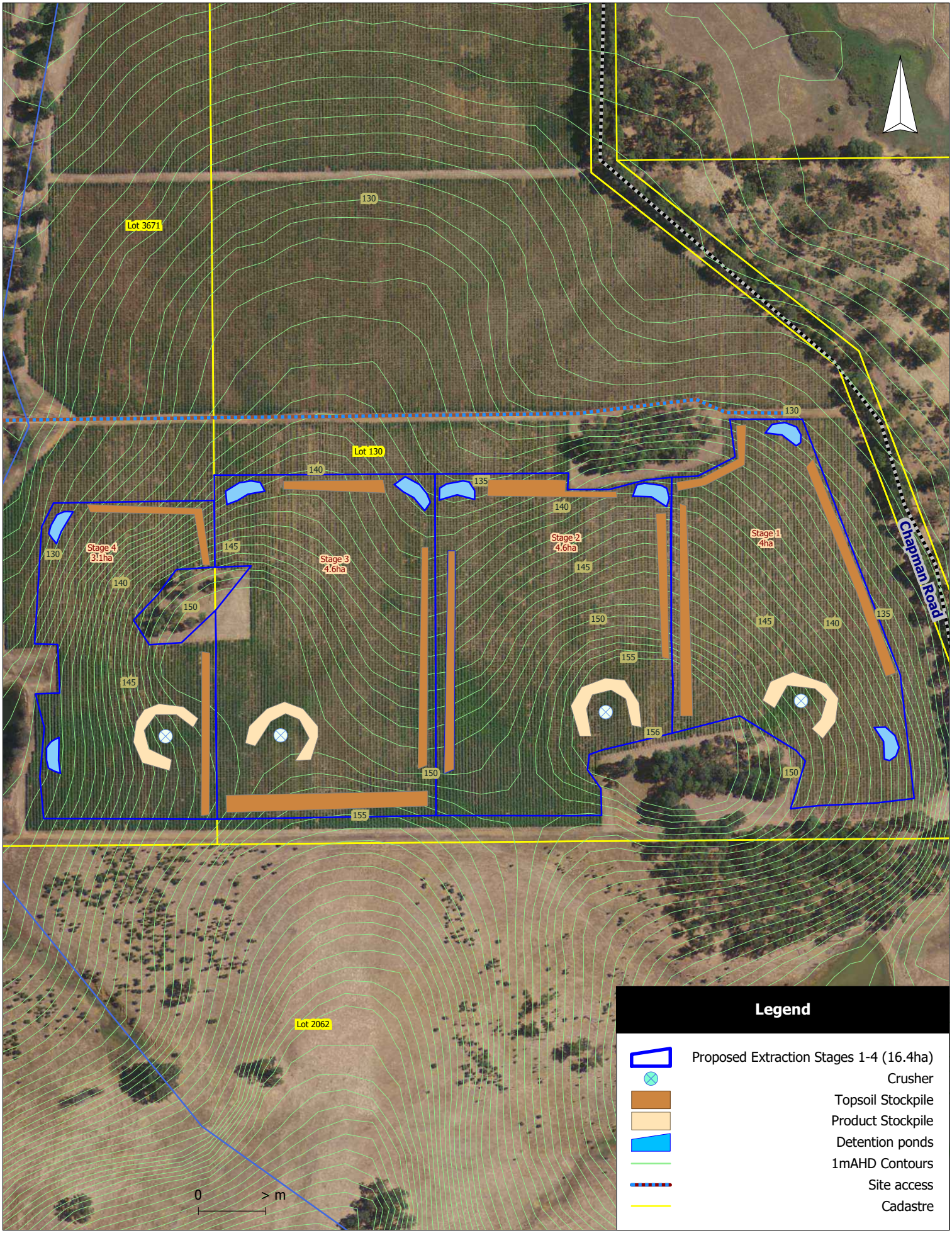

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Figure 2:

Proposed Extraction

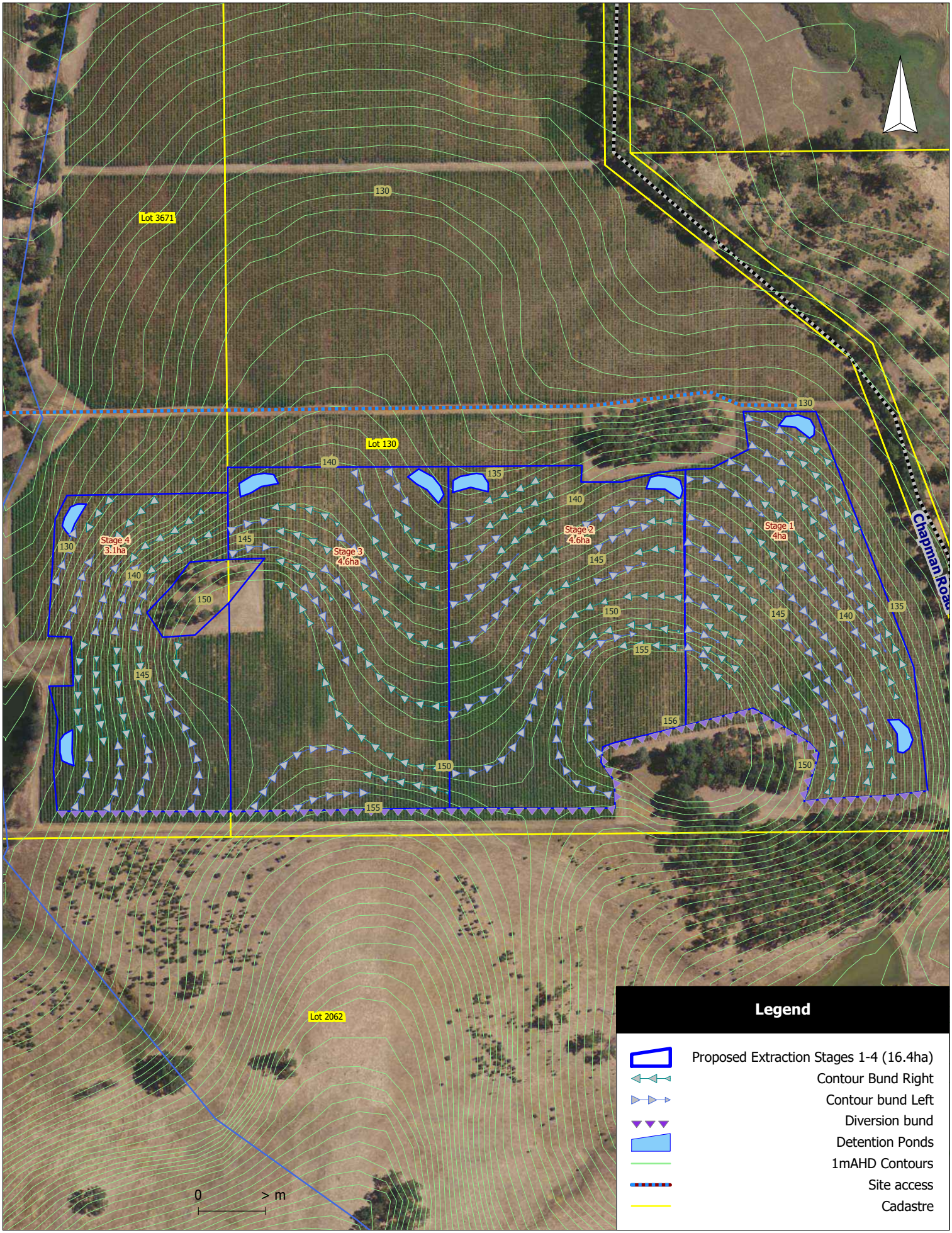

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Figure 3:

Water management Plan

Annexure 1

Contour bank specifications

Contour banks, combined with effective stubble management, are recommended to control erosion on sloping land used for growing crops.

Before building contour banks, decisions have to be made about the:

- gradient in the bank channel
- length of the banks
- spacing of the banks
- proposed bank shape and dimensions.

Contour bank specifications vary with the land slope. Most broad-acre cropping areas in Queensland are under three per cent. Slopes of up to eight per cent are cropped on the eastern Darling Downs, inland Burnett and the Atherton Tableland. Some horticultural crops in coastal areas are grown on steeper slopes.

Gradients

Contour bank gradients are normally expressed as a percentage. A bank with a gradient of 0.2 m in 100 m would have a gradient of 0.2 per cent. Selecting suitable gradients for contour banks has to be a compromise. If gradients are too high, bank channels with bare soil may erode. If gradients are too low, banks lined with crops may overtop or there may be excessive pondage in the bank following run-off.

Recommended contour bank gradients are shown in Table 1. Gradients are highest on steeper land where banks are shorter and have less capacity than banks on low sloping land. It is normal practice for a contour bank to be constructed to the same capacity for its entire length. Since the amount of run-off to be carried increases with the length of the contour bank, variable gradients can be used along a contour bank channel.

Table 1. Gradients for contour banks

Land slope (%)	Contour bank gradients (%)		
	Top section	Middle section	Outlet section
2	0.15	0.15	0.2
3–5	0.2	0.25	0.3
5–10	0.3	0.4	0.5

In intensive cropping areas (e.g. sugar cane), parallel contour bank systems are preferred. Such systems require flexibility in contour bank gradients. Gradients can be modified over short distances to improve workability of the layout. If the channel is permanently grassed, higher gradients can be used.

Gradients at bank outlets may need to be increased for the last 30 m if the waterway is stable and well grassed or the banks empty into an adjacent grassed area.

Length

Table 2 provides a guide to maximum bank lengths based on land slope. It is based on well maintained contour banks and the minimum contour bank spacings normally recommended on such slopes. It assumes that run-off is travelling in the one direction in the contour bank channel. On steeper landscapes, average contour bank lengths are likely to be shorter because the distance between natural drainage lines is less than on low slopes.

Table 2. Recommended maximum bank lengths for various land slopes and single contour bank spacing

Land slope (%)	Maximum bank length (metres)
1	2500
1.5	2000
2	1750
3	1500
4	1000
5	750
6	600
7	450
8	400
9	350
10	300

Spacing

There are no strict rules that determine the correct spacing for a particular situation. The concept of a single and double spacing has been used to allow variations in contour bank spacings—depending on the average conditions likely to be experienced in a paddock (Table 3).

Single spacings should be used where paddocks are seriously eroded and lower levels of ground cover are likely. Double spacings can be used where there is minimal erosion and high levels of cover are to be maintained. Spacings between single and double can be chosen when there is a need to compromise. For example, in the Central Highlands where high rainfall intensities often occur and dry seasons often lead to low cover levels.

Table 3. Recommended contour bank spacings

Slope (%)	Single spacing		Double spacing	
	VI (m)	HI (m)	VI (m)	HI (m)
1	0.9	90	1.8	180
2	1.2	60	2.4	120
3	1.4	45	2.8	90
4	1.6	40	3.2	80
5	1.8	36	3.6	72
6	1.9	32	3.8	64
7	2.1	30	4.2	60
8	2.4	30	4.8	60
9	2.7	30	5.4	60
10	3.0	30	6.0	60

VI = Vertical interval; HI = Horizontal interval

Shape and dimensions

Narrow-based banks normally have batters of 1:3 (VI:HI) while broad-based banks may have batters varying from 1:4 to1:8 (VI:HI). The amount of soil required to build a bank increases significantly as the bank batter becomes flatter.

The amount of run-off a contour bank has to handle depends on its length, the distance between banks, rainfall intensity, and the condition of the soil surface in terms of its ability to produce run-off.

Contour banks must be able to handle vastly different conditions in the channel. They vary from a smooth and bare channel (comparable to a highway) to one with a growing crop or standing stubble (comparable to a traffic jam).

Table 4. How flow depth affects velocities and flow rates in contour banks

Depth of flow in the channel (m)	Conditions in the contour bank channel			
	Standing wheat stubble		Bare cultivated channel	
	Velocity (m/s)	Flow rate (m^3/s)	Velocity (m/s)	Flow rate (m^3/s)
0.2	0.08	0.14	0.38	0.72
0.3	0.10	0.35	0.48	1.74
0.4	0.11	0.67	0.57	3.35
0.5	0.13	1.13	0.65	5.65

This data is based on a contour bank on a land slope of two per cent and a gradient of 0.2 per cent with the same shape as shown in Figure 1.

If necessary, a suitable design can be obtained by preparing a spreadsheet as shown in Table 4 (based on Mannings formula for a typical contour bank cross section). For a given cross section shape, velocities and flow rates can be compared for different flow depths and different channel conditions.

Erodible velocities (0.5–0.6 m/s) may occur once the depth of flow in a bare channel exceeds 0.3 m. However, when the channel has standing stubble a flow depth of 0.5 m will only be flowing at 0.13 m/s.

Contour banks are not normally individually designed. A bank that can handle a depth of flow of 0.4 to 0.5 m will provide satisfactory capacity for typical contour bank layouts. To accommodate such a flow, a contour bank needs to be constructed to a height of 60 to 70 cm to allow for settlement and some freeboard.

Table 5 shows some typical contour bank cross sections with a height of 0.5 m on slopes ranging from 2–5 per cent. Note how the capacity of a contour bank for a given height is very dependent on the land slope.

Table 5. Contour bank specifications for banks of a height of 0.5 m on a range of slopes

Land slope %	Batter on bank	Batter on inlet into channel	Bottom width (m)	Cross sectional area (m^2)
2	1:4	1:50	4	8.75
3	1:4	1:20	4	5.00
4	1:3	1:10	2	2.63
5	1:3	1:5	2	2.00

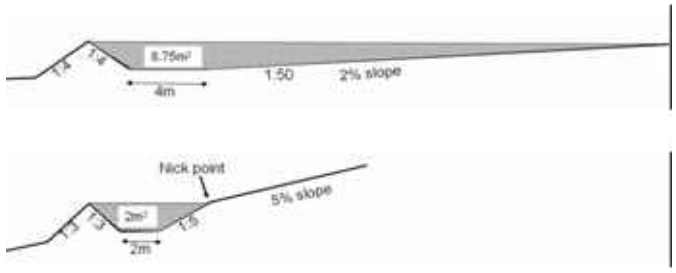

Figure 1. Contour bank cross sections for banks 0.5m high on a **2** percent and a **5 per cent slope**.

Further information

For further information visit the DERM website <www.derm.qld.gov.au> and refer to *Soil conservation measures—design manual for Queensland* (Chapter 9), and the following fact sheets:

- L202—*Maintaining contour banks*
- L13—*Erosion control in cropping land*
- L35—*Run-off control measures for soil conservation*.

July 2010
L205

For general enquiries contact the Queensland Government call centre 13 13 04 or visit www.derm.qld.gov.au

Annexure 2

WESTWALL HOLDINGS

Hydrocarbon Spill Management Plan

Purpose:

The purpose of this document is to describe the measures that Westwall Holdings 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.