Appendix A **Local Water Management Strategy**

HARLEY DYKSTRA

LOT 564 GARVEY RD CROOKED BROOK

LOCAL WATER MANAGEMENT STRATEGY

October 2025
11815-C-R-001-B

WML
Consulting Engineers

Document History and Status				
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CONTENTS

APPENDICES

1 INTRODUCTION

WML has been engaged by Harley Dykstra Pty Ltd to prepare a Local Water Management Strategy (LWMS) for the proposed development at Lot 564 Garvey Road, Crooked Brook, hereafter referred to as "the site." The site, encompassing 40.5 hectares, is situated 2.5 kilometres southwest of the Dardanup townsite and is currently zoned for general farming.

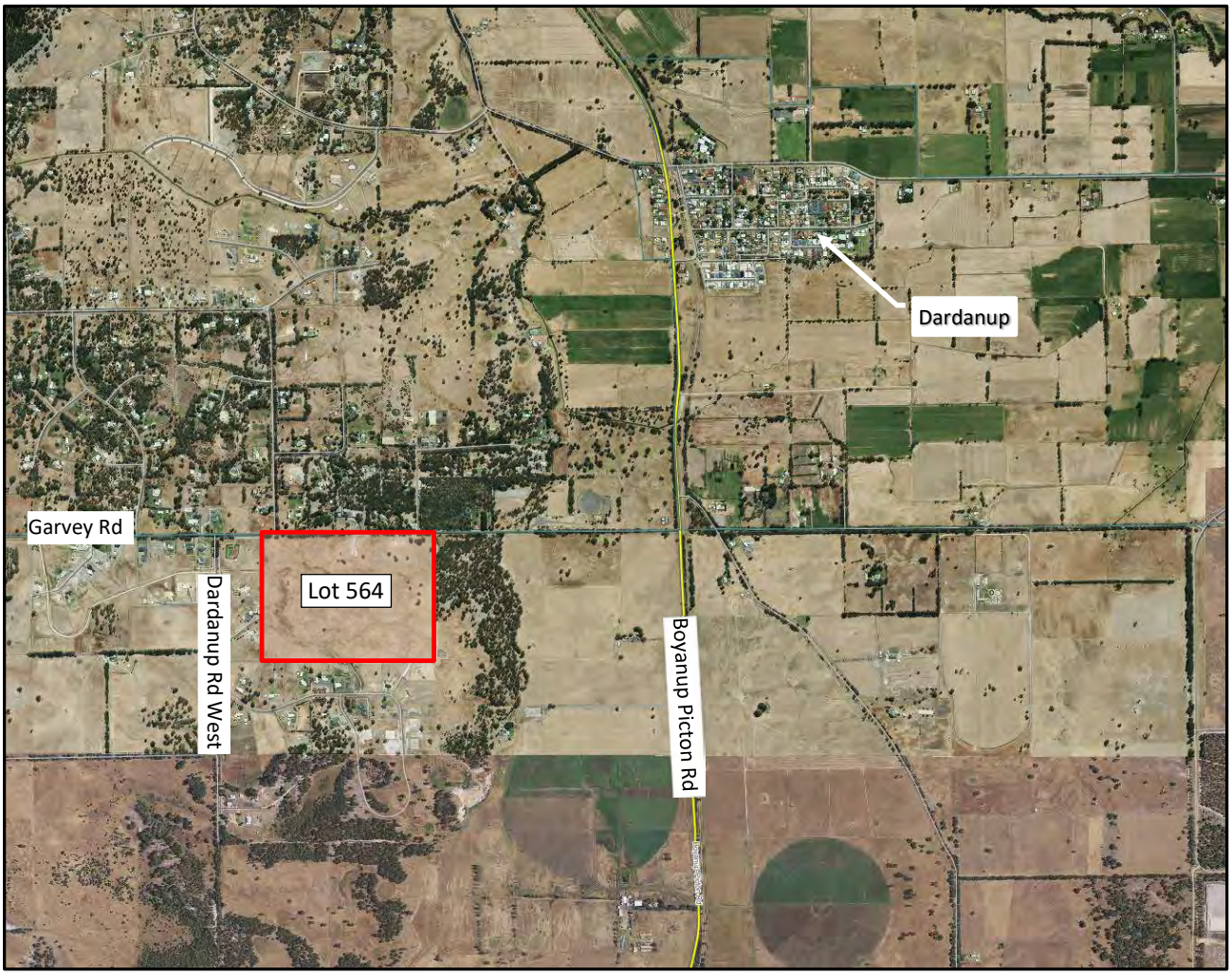

Figure 1: Locality Plan

1.1 Development Details

The proposed concept plan involves subdividing the site into 20 rural residential lots of varying sizes. Swales will be constructed along the new internal road to intercept upstream surface flows, which will be conveyed via culverts through designated drainage reserves. The existing channel will be realigned slightly to facilitate access to the lots. All building pads will be engineered to sit at least 500 mm above the estimated 1% AEP flood levels.

An illustration of the development concept plan is provided in Figure 2 and included in Appendix A.

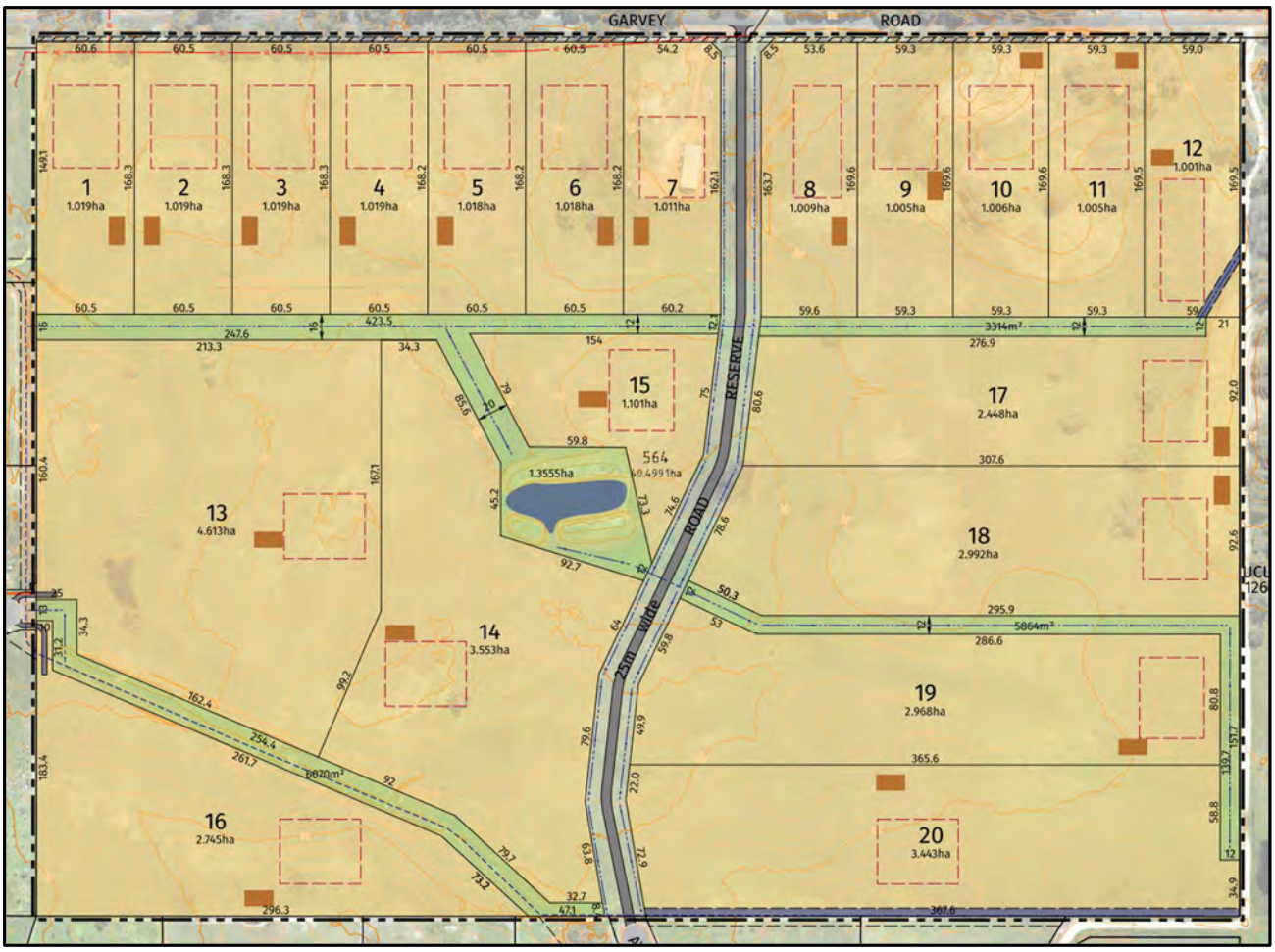

Figure 2: Site concept plan

1.2 LWMS Key Design Principles and Objectives

This LWMS employs the following key documents to define its content, key principles and objectives:

- Stormwater Management Manual for Western Australia (DWER 2022)
- Better Urban Water Management (WAPC (now DPLH) 2008)
- Stormwater Discharge from Buildings (Policy No. CP060, Shire of Dardanup)

Principle objectives for managing urban water in WA are stated in the DWER manual in the Chapter 1 Preface as follows:

- Water Quality: to maintain or improve the surface and groundwater quality within development areas relative to pre-development conditions.
- Water Quantity: to maintain the total water cycle balance within development areas relative to predevelopment areas.
- Water Conservation: to maximise reuse of water.
- Ecosystem Health: to retain natural drainage systems and protect ecosystem health.
- Economic Viability: to implement stormwater systems that are economically viable in the long-term.
- Public Health: to minimise public risk, including risk of injury or loss of life to the community.
- Protection of Property: to protect the built environment from flooding and water logging.
- Social Values: to ensure that social aesthetic and cultural values are recognised and maintained when managing stormwater.
- Development: to ensure the delivery of best practice stormwater management through planning and development of high-quality development areas in accordance with sustainability and precautionary principles.

2 PRE-DEVELOPMENT ENVIRONMENT

2.1 Site Features and Pre-Development Catchments

The subject site is rectangular, bordered by Garvey Road to the north and existing rural lots to the south and west. To the east, the property adjoins predominantly native bushland. The site contains poorly defined drainage lines and large areas prone to localised inundation. The proposed development areas are largely cleared, with several isolated mature trees located in the northeastern portion.

The topography is generally flat, with subtle undulations formed by sand ridges rising approximately 1 to 3 metres above the surrounding ground, exhibiting slopes of 3–5%. Site elevations range from 24 m AHD to 27 m AHD, with one prominent sand ridge reaching 30 m AHD. An open earth drainage channel, currently registered to the Water Corporation, traverses the site and is intended to be transferred to the Shire of Dardanup as part of the development.

Refer to Figure 3 and Appendix B for details on the pre-development catchment layout and existing culvert locations.

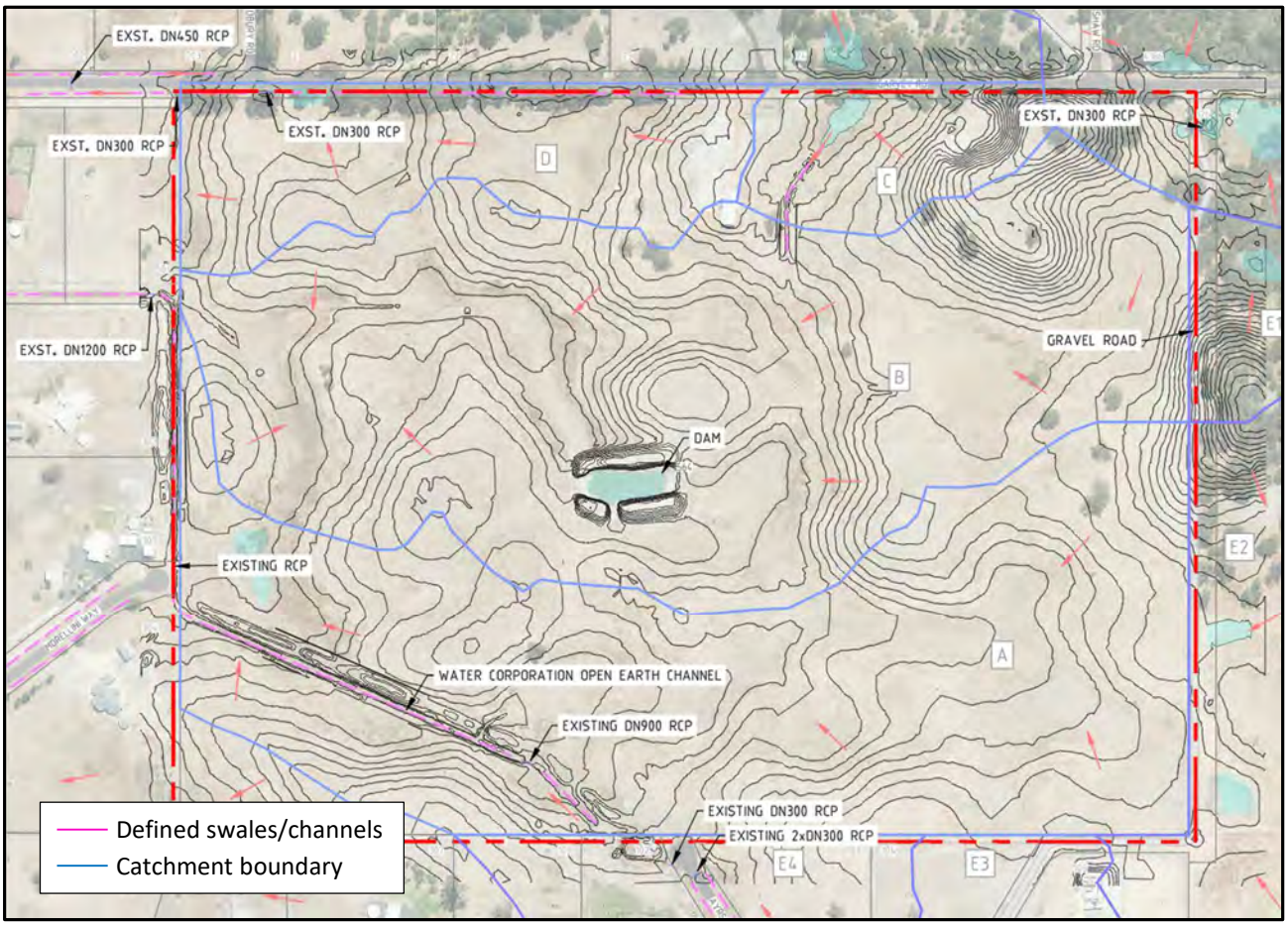

Figure 3: Catchments

Catchment details

- The site is divided into four prominent catchments, labelled A to D.
- Four external catchments were identified using available lidar data, labelled E1 to E4.
- Catchments E2, E3, and E4 convey runoff into the southern half of the site, known as Catchment A.
- Catchment E1 is unlikely to convey any runoff into Catchment B due to a large depression in elevation within Catchment E1.
- Similarly, Catchment E2 has large flat areas with minor elevation depressions. However, this catchment significantly impacts groundwater levels, causing waterlogging conditions that cross into Catchment A1.

- Catchments A and B convey runoff towards the western side of the site, both meeting at the same point and discharging into an open earth channel registered to the Water Corporation.
- Catchment C is subject to significant ponding due to a depression. Drainage rectifications, such as swales, have been made to alleviate these issues. Contour data suggests that without the swale, ponding would eventually cross over Garvey Road. This catchment conveys runoff to Catchment B.
- Catchment D conveys runoff towards the earth channels adjacent to Garvey Road.

2.2 Database Search

The Department of Biodiversity Conservation and Attractions Geomorphic Wetland Database indicates that portions of the site are classified as multiple use wetlands are present on the site, as well as a portion of "Not assessed Wetland". A screenshot from the Geomorphic Database is shown in Figure 4.

Figure 4: Geomorphic Wetland Database

The Department of Water and Environmental Regulation (DWER) Acid Sulphate Soil Risk Map for the proposed development area shows Moderate to low risk of ASS occurring within 3 m of natural soil surface but high to moderate risk of ASS beyond 3m of natural soil surface.

Samples from the ASS investigation carried out indicates that potential acid sulphate soils (PASS) are present on the site. Furthermore, the study recommends carrying out confirmatory laboratory testing on those samples to confirm if Actual ASS (AASS) is present and if an ASS management plan is required.

2.3 Geotechnical and Groundwater

Geotechnical Investigations were carried out for the site by WML (reference to 11207-G-R-002).

The investigation fieldwork was carried out in May and November 2023:

- Five solid auger boreholes were drilled extending to depths of 2.65 m, designated BH11 to BH15.
- Five dynamic cone penetrometer tests adjacent to each borehole.
- Three in-situ permeability tests using the Talsma-Hallam permeability method.
- The collection of soil samples for laboratory testing.

Refer to Figure 5 indicating the test locations.

Figure 5: Geotechnical Investigation Test Locations

The subsurface profile is typically consistent across the site. Three subsurface profiles have been identified on site with similar material compositions but varying sand thickness. The site has been divided into three subsurface profiles, denoted by Zones 1–3, as shown in Figure 6 and Appendix D.

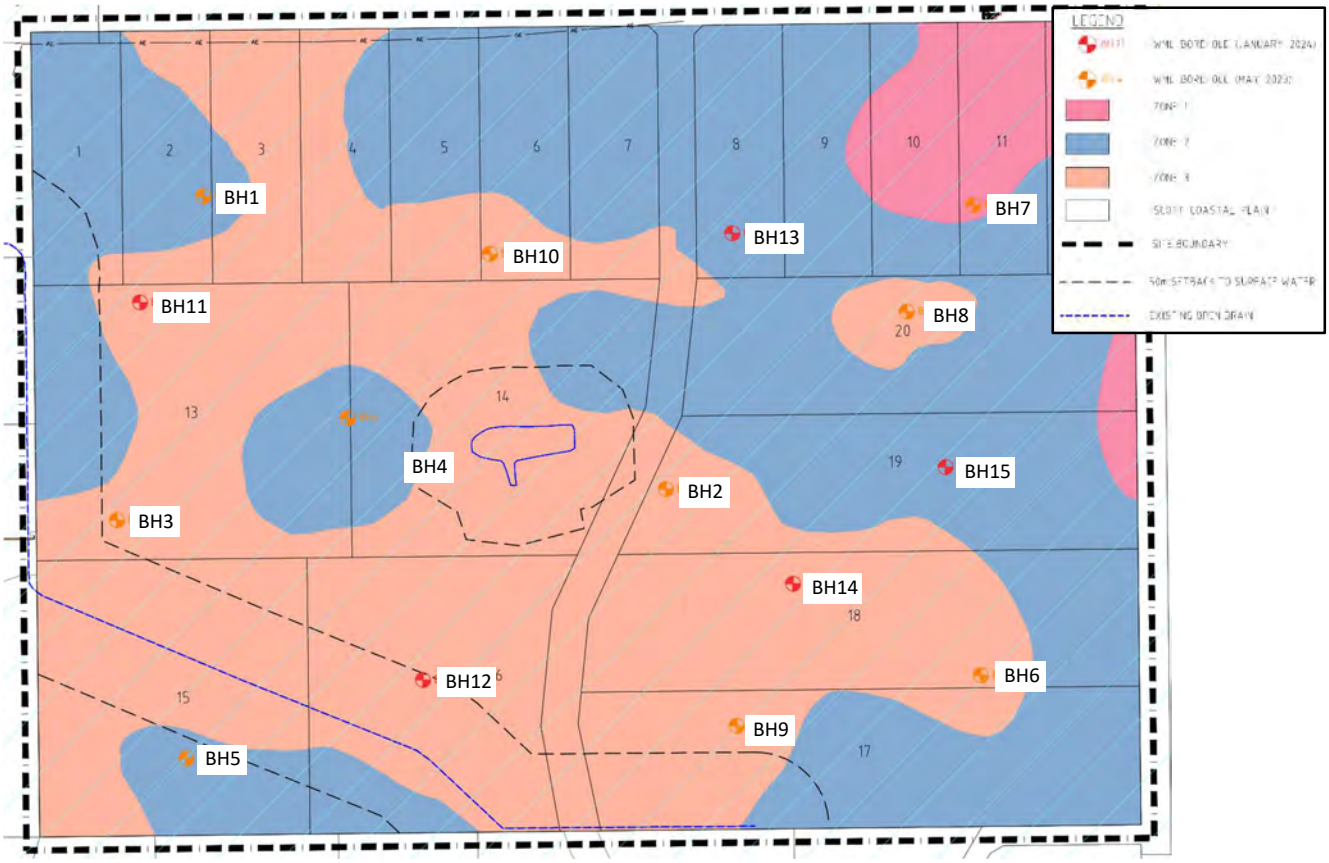

Figure 6: Soil profile zoning map

The encountered soil profiles for each zone are summarised below in **Table 1**, **Table 2** and **Table 3**.

Table 1: Generalised sub-surface soil profile for Zone 1

Depth (m)	Unit	Description
0.1 – 2.5	A	**SAND**/silty **SAND:** fine to medium-grained, moist, pale grey to dark orange, and loose to medium dense.

Table 2: Generalised sub-surface soil profile for Zone 2

Depth (m)	Unit	Description
0.1 – 1.0	A	**SAND**/silty **SAND:** fine to medium-grained, varying colour including pale to dark grey and brown-orange, moist, loose to medium dense. Some areas have slightly cemented lateritic sand.
1.0 – 2.6	B	Sandy **CLAY**/**CLAY**: medium to high plasticity, varying colour including yellow and brown/grey mottled red, trace medium-grained subrounded to subangular gravel, trace to some slightly cemented lateritic gravel, moist to wet, generally stiff to very stiff.

Table 3: Generalised sub-surface soil profile for Zone 3

Depth (m)	Unit	Description
0.1– 0.7	A	**SAND**/silty **SAND**: fine to medium-grained, pale grey to brown, with silt/clay, moist, loose to medium-dense. BH12 had shallow sands to the depths of 0.25 m. BH14 consisted of silty SAND with low to medium plastic clay to the depths of 1.25 m.
0.7 – 5.5	B	Sandy **CLAY**/**CLAY:** medium plasticity, varying colour including orange-brown and grey mottled orange; sand is fine to medium-grained, moist, generally stiff. Traces of lateritic orange sand clumps are occasionally present. BH3 and BH6 drilled from 2.6-5.5 m identified some gravel was identified within the stiff sandy clays.

During initial fieldwork in May 2023, ten monitoring wells were installed, BH1-10. Readings and measurements throughout winter indicated either shallow water table generally within 0.6 m or local inundation. The detailed summary of groundwater recorded during four different inspections during wet and dry seasons is presented below in **Table 4** and **Figure 7.**

Table 4: Summary of groundwater depths

Test ID	Depth of Groundwater (m)				[2]Expected peak groundwater level range (m ADH)
	Observed 1/06/2023	Observed 10/8/2023	Observed 15/9/2023	Observed 31/10/2023	
BH1	1.4	0.76	0.71	1.3	23.43
BH2	GNE	0.18	0.04	1.05	24.73
BH3	3.8	-0.10 (above ground)	-0.20 (above ground)	GNE	23.47
BH4	1.2	0.63	0.63	1.22	24.29
BH5	1.8	0.80	0.89	1.29	24.21
BH6	GNE	0.00[1]	0.00[1]	GNE	25.78
BH7	GNE	GNE	GNE	GNE	-
BH8	1.0	0.00	0.00	GNE	26.12
BH9	GNE	0.00	0.00	1.19	24.70
BH10	2.3	0.60	0.35	0.99	24.16

Notes: All depths are relative to the existing ground surface. Green cells highlight peak groundwater values for each location.
GNE = Groundwater not encountered,
[1]Groundwater not encountered in the borehole, but ponding was present in the area around the monitoring well.
[2] Based off RL of well location picked up by Thompson surveyor minus observed peak water table

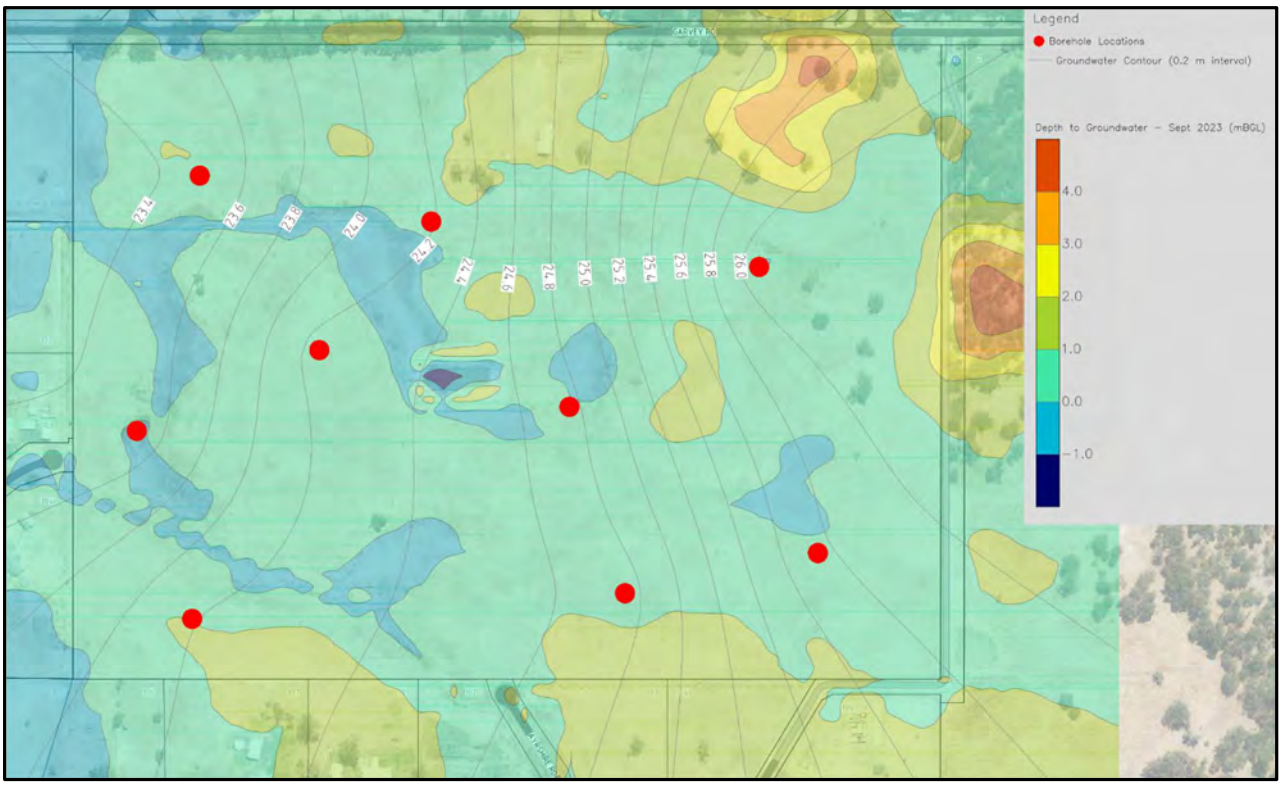

Figure 7: Groundwater depths

The groundwater data presented in Table 4 reflects monitoring undertaken during 2023, which was a comparatively dry year based on Bureau of Meteorology (BoM) records. Total annual rainfall at the nearest gauge (Dardanup East Station 9527) was 599.2 mm, representing approximately 62% of the long-term mean of 889.7 mm (1957–2025). This places 2023 below the 5th percentile of annual rainfall on record, meaning it was drier than 95% of recorded years.

Field observations confirmed that several areas of the site were already waterlogged or inundated during winter, with groundwater levels at or near the surface (<0.3 m bgl). Under these saturated conditions, additional rainfall would primarily discharge laterally as surface runoff along existing low-gradient flow paths toward the western drainage channel, rather than causing a significant rise in the water table. Based on contour data and the presence of local remedial drains, further ponding is considered unlikely.

Three permeability tests were undertaken adjacent to BH11, BH14, and BH15 on the material layer at the expected depth for on-site effluent treatment systems. A response zone of 250 mm from the base of the boreholes was applied at each test location. Testing was conducted at each location until a consistent flow rate of water through the soils was measured. A summary of the test results is presented below in Table 5.

Table 5: In-situ permeability test results

Location ID	Test soil	In-situ Permeability Test	
		m/s	m/day
BH11	SAND with clay (SP)	2.54×10^{-5}	2.20
BH14	Silty SAND (SM)	1.92×10^{-6}	0.17
BH15	SAND trace silt (SP)	7.30×10^{-5}	4.50[1]

Note: 1- conservative conversion

2.4 Pre-Development Runoff (Surface Hydrology)

Appendix B details four internal catchments and four external catchments associated with the site, as outlined in Section 4.1.

A site investigation conducted in July 2024 assessed the drainage conditions during the wet season. It is evident that the wider region is susceptible to waterlogging, with drainage channels along most roads containing standing water.

The photos below illustrate prominent hydrological entry and exit features of the site:

Photo 1: DN300 culvert within Ayrshire Rd discharging runoff into basin within catchment E4.

Runoff from external catchment E4 entering a basin as shown in **Photo 2** before discharging into the southern side of the site.

Photo 2: Basin bordering the site adjacent to Ayrshire Rd

Photo 3: Channel along western boundary at Morellini Way facing downstream

Photo 4: Channel along western boundary at Morellini Way facing upstream.

Photo 5: Surface condition inside boundary at Morellini Way.

Photo 6: DN300 culvert and Channel along Garvey Rd at northwest corner of site boundary facing downstream.

Photo 7: Channel along Garvey Rd at northwest corner of site boundary facing upstream.

Photo 8: DN450 Culvert entry point crossing Garvey Rd at Northwest corner of Lot 501.

Photo 9: DN450 Culvert exit point crossing Garvey Rd at southeast corner of Lot 202.

Photo 10: DN300 at northwest corner of site near Padbury Rd.

Photo 11: DN300 at southeast corner of site crossing gravel road into basin.

Photo 12: Surface conditions of southeast corner of site.

2.5 Pre-development Model Assumptions

Pre-development modelling assumes that external inflows will remain in its pre-development state and that additional runoff resulting from the development would be managed prior to entering the drainage structures downstream.

The pre-development hydrology was modelled in DRAINS using the Initial Loss/Continuous Loss (IL/CL) approach, in accordance with ARR 2019 recommendations. The model setup and assumptions are summarised below.

- Initial losses as 5mm adopted for pervious areas, following post submission review comments.
- No additional losses such as soak pits were included in.
- No continuous losses were assumed for impervious areas.

Table 6 summarises the adopted pre-development loss parameters.

Table 6: Pre-Development Losses

Surface Type	Initial Loss (mm)	Continual Losses (mm/hr)
Impervious Areas	1.0	0
Pervious Areas	5mm adopted	4.2

Table 7 summarises the pre-development surface types treated as Effective Impervious Area, Remaining Impervious Area and Pervious Area.

Table 7: Pre-Development Catchment Surface types

Catchment	Catchment Area (ha)	EIA (%)	RIA (%)	PA (%)
A	14.375	0	0	100
B	19.019	0	0	100
C	1.864	0	3.45	96.55
D	4.427	3.15	0	96.85
E1	1.925	0	0	100
E2	16.25	0	0	100

Table 8 presents the roughness coefficients adopted in DRAINS.

Table 8: Roughness Coefficient for Drains

Surface Type	Roughness Coefficient n
Channel	0.025
Short Grass Prairie (Veldt or Scrub)	0.2*

Notes: n is similar to Manning's n value but applied to shallow flow over a plane, rather than flow in a channel.*

2.6 Pre-development Model Results

Table 9 summarises the peak flows from combined upstream catchment areas under pre-development conditions.

Table 9: Pre-Development Modelling Results

Storm Event	Catchment	Area (ha)	Critical Storm Duration	Peak Flow, Q (m^3/s)
20% AEP pre-development	A + B + C + External (Channel Outlet)	66.74	4.5 hr	1.41
	D (Garvey Rd Outlet)	4.43	3.0 hr	0.178
1% AEP pre-development	A + B + C + External (Channel Outlet)	66.74	3.0 hr	3.62
	D (Garvey Rd Outlet)	4.43	1.5 hr	0.286

3 SURFACE WATER MANAGEMENT

The post-development runoff plan is provided in Appendix C. Key elements of the proposed surface water management strategy are summarised below.

3.1 Drainage Channel

The existing open channel, currently a Water Corporation asset, will be retained with minor realignment to facilitate access crossovers. It will continue to convey runoff through the existing DN 1200 culvert at the western boundary and will be transferred to the Shire of Dardanup upon subdivision.

3.2 Additional Drainage Reserves

Additional drainage channels are proposed to improve site drainage and manage upstream inflows, as shown on the Post-Development Plan (Appendix C). These reserves will be refined during detailed design and the UWMP to ensure grades and cross-sections appropriately manage both surface runoff and shallow groundwater conditions.

The proposed channels are intended to intercept and convey surface runoff efficiently, reducing local ponding and promoting shallow groundwater relief through lateral drainage.

Detailed design will confirm final invert levels and longitudinal grades based on updated groundwater monitoring and any adopted correction factors.

The +0.3 m groundwater adjustment identified in Section 2.3 will primarily apply to the design of land application areas, house pads, and other infrastructure requiring vertical clearance from the maximum groundwater level, rather than to the drainage reserves themselves.

3.3 Proposed Lot Drainage

Each lot will include rainwater tanks for roof-runoff collection. Overflow from tanks will discharge as overland flow following natural surface gradients.

Supplementary lot drainage measures, as shown on the Post-Development Plan (Appendix C), are proposed to direct surface runoff away from building envelopes and reduce localised inundation.

The +0.3 m groundwater correction discussed in Section 2.3 will be applied during the UWMP stage to confirm adequate separation between the maximum groundwater level and on-lot infrastructure, particularly land application areas and house pads.

3.4 Conceptual Earthworks

Swales:

Indicative swale locations are shown where existing low valleys will be regraded within the proposed drainage reserves. These swales are intended to intercept and convey surface runoff while also providing some degree of shallow groundwater relief. Final grades, profiles and side slopes will be confirmed during detailed design in the UWMP.

House Pads.

Further earthworks for house pads and internal roads will be addressed during the detailed design phase. Finished pad levels will ensure adequate separation from groundwater, incorporating the +0.3 m correction discussed in Section 2.3 where applicable.

The accompanying geotechnical report (Ref. 11207-G-R-002) provides recommendations for slab preparation, shallow footings, and low retaining walls. Key requirements include:

- Minimum 500 mm clearance below footings in Zones 2 and 3;
- Minimum 1.5 m clearance between the base of any on-site effluent disposal system and natural ground (Ref. 11207-G-R-003).

All building pads must be constructed at least 500 mm above the 1 % AEP flood level, as shown in Appendix C.

Roadworks.

Conceptual modelling simulated the road surface at approximately 1.1 m above existing ground, with overtopping occurring at one localised low point (shown on the Post-Development Plan).

During detailed design and UWMP preparation, road and drainage levels will be reassessed to ensure stormwater is safely conveyed and pavements remain protected.

A minimum 300 mm clearance between the maximum groundwater level and the road sub-base are to be maintained.

3.5 Runoff Treatment

The proposed roadside swales will provide both hydraulic attenuation and water-quality treatment for road runoff and minor upstream inflows. Table 10 summarises key design inputs.

Table 10: Swale Design Inputs

Parameter	Value
New impervious area	3 340 m²
1 EY design rainfall (30min)	14.2 mm
Required storage	47 m³
Swale depth	1.1 m
Side slopes	1:4
Approx. storage capacity	≈ 1 570 m³ (one side of road)

The swales will discharge at two low points into the downstream open channel. Refinement at the UWMP stage will consider driveway crossovers, and controlled outlets to optimise retention and maintain continuity with upstream flows.

Consistent with the Stormwater Management Manual for Western Australia (DWER, 2022), the vegetated swales will function as first-flush treatment systems, promoting:

- Filtration and sediment deposition through shallow vegetated flow;
- Nutrient uptake through native species.

These measures would retain and treat approximately the first 15 mm of rainfall before discharge to the Gully.

3.6 Post-Development Model Assumptions

Post-development modelling assumes that the existing channel will remain in its pre-development state and that additional runoff from the development will be managed before entering the channel. The modelling was completed as follows:

- Post-development hydrology was modelled in DRAINS using the Initial Loss/Continuous Loss (IL/CL) approach.
- Initial losses as 5mm were adopted for pervious areas following comments post submission.
- No additional losses were factored in for on lot storage.
- No continuous losses were assumed for impervious areas.

Table 11 below shows some of the pre-development parameters and assumptions used in the modelling.

Table 11: Post-Development Losses

Surface Type	Initial Loss (mm)	Continual Losses (mm/hr)
Impervious Areas	1.0	0.0
Pervious Areas	5.0	4.2

Table 12 summarises the post-development surface types treated as Effective Impervious Area, Remaining Impervious Area and Pervious Area.

Table 12: Post-Development Catchment Surface types

Catchment	Catchment Area (ha)	EIA (%)	RIA (%)	PA (%)
A1	9.391	0.7	0.8	98.5
A2	5.306	0	1.9	98.1
B1	7.021	1.1	5.4	93.5
B2	11.819	0.0	1.4	98.6
C	1.864	1.6	6.4	92.0
D	4.427	3.1	3.9	93.0

Table 13: Roughness Coefficient for DRAINS

Surface Type	Roughness Coefficient n
Roofs and paving	0.013
Gravel surfaces	0.02
Lawns	0.17*
Short Grass Prairie (Veldt or Scrub)	0.2*
Channel / Creek	0.025

Notes: n is similar to Manning's n value but applied to shallow flow over a plane, rather than flow in a channel.*

3.7 Post-development Model Results

Table 14 details the post development flows contributing runoff towards the channel and Garvey Rd.

Table 14: Post-Development Lot 6 Results (DRAINS)

Storm Event	Catchment	Area (ha)	Critical Storm Duration	Peak Flow, Q (m^3/s)
20% AEP post-development	A + B + C + External (Channel Outlet)	66.74	4.5 hr	1.42
	D (Garvey Rd Outlet)	4.43	3.0 hr	0.21
1% AEP post-development	A + B + C + External (Channel Outlet)	66.74	3.0 hr	3.54
	D (Garvey Rd Outlet)	4.43	1.5 hr	0.295

4 1% AEP FLOOD LEVELS

Preliminary flood modelling indicates that during a 1% AEP event, water levels will generally remain contained within the proposed drainage channels. However, some shallow overtopping is expected into lower-lying areas of proposed Lots 13 and 16.

The Post-Development Plan includes indicative building envelopes that are to maintain a minimum vertical separation of 0.5 metres above the adjacent swale or gully, measured from the upstream side. This clearance is intended to mitigate flood risk and ensure adequate freeboard above predicted flood levels.

5 GROUNDWATER MANAGEMENT STRATEGY

Swales will capture and divert runoff to protect road sub-bases, discharging at low points.

House pads and land application areas will maintain separation from the groundwater level, incorporating the +0.3 m correction discussed in Section 2.3.

Final effluent-system levels will be confirmed in the UWMP.

6 SUSTAINABLE WATER SERVICES STRATEGY

6.1 Water

No public drinking water sources are located on-site or within 100 m of the site. The nearest public drinking water source is approximately 700 m east of the subdivision (Public Drinking Water Source Areas Boundaries: Dardanup Water Reserve).

Lot owners will be responsible for the harvesting and treatment of roof runoff for potable water. Supplementary top-up supply may be required from time to time from accredited potable water suppliers.

Water Requirements over and above potable supply could be harvested by way of bore abstraction. Lot owners would be required to make application to Department of Water and test the underground quality to ensure that it is fit for the intended purpose.

6.2 Sewerage

Lot owners are to apply for on-site effluent disposal through a registered plumber and meet the requirements set out in the Site and Soil Evaluation (Ref 11207-G-R-003).

7 MONITORING

7.1 Construction Phase

Drainage control structures will be constructed with each stage of development to ensure water quality. This will include temporary stilling/attenuation basins, outlet sediment curtains (i.e. staked hay bales), lot and verge stabilisation and regular monitoring, if required.

7.2 Post-Construction Phase

The stormwater drainage system is designed to collect stormwater at source and integrates a network of vegetated drainage swales and basins that facilitates effective sediment control and water quality treatment before stormwater exits the site, eliminating the need for post-development surface water monitoring.

7.3 Implementation Plan

Attenuation/Treatment Basin			
Item	**Action**	**Frequency**	**Responsibility**
Irrigate planting	By hand	As required during summer and autumn months	Developer for two years year
Weed control	Manual removal and targeted waterway approved herbicide treatment	Bi-monthly for the first year and quarterly or as required for second year.	Developer for two years
Infill planting	Check plant condition and replace as required to achieve minimum 80% original plant density prior to handover	April / May of each year	Developer for two years
Inspection and Cleaning of drainage infrastructure	Remove any build-up of sediment and drainage infrastructure. Undertake road sweeping if required.	Quarterly	Developer for one year

Sediment Removal	Remove any build-up of sediment and in basin/swale areas.	Annually at the end of winter each year or more frequent if required.	Developer for one year
Litter Removal	Removal of litter and windblown builders waste etc.	Monthly	Developer for two years
Checks to inlets, outlets, weirs and swales	Check for erosion and potential blockages on all basin infrastructure. Remediate as required	Every three months	Developer for one year

8 UWMP REQUIREMENT

This Local Water Management Strategy establishes the framework for stormwater and groundwater management at the structure-planning stage.

A detailed Urban Water Management Plan (UWMP) will be prepared prior to subdivision approval to refine design details identified throughout this report and to demonstrate compliance with the Shire of Dardanup and DWER requirements.

The UWMP will specifically address and confirm the following items:

- Drainage infrastructure – detailed design of roadside swales and cross overs noted in Section 3.5, including final grades, cross-sections, storage volumes and outlet arrangements.
- Earthworks and finished levels – confirmation of pad and road levels described in Section 3.4, ensuring required freeboard above the 1% AEP flood level and maintaining a minimum 300 mm clearance between the road sub-base and the maximum groundwater level.
- Groundwater management – verification of the +0.3 m correction factor discussed in Section 2.3, and its application to house pads and land-application areas to maintain adequate separation from the seasonal high-water table.
- Flood assessment – mapping of inundation extents and top-water levels for 10% AEP and 1% AEP events as referenced in Section 4, including updated flood modelling and storage performance.
- Storage and hydraulic data – detailed tabulation of required storages, invert levels, top-water levels and discharge rates, consolidating assumptions outlined in Sections 3.5–3.7.
- Cross-sections and access – preparation of typical cross-sections for road and drainage reserves showing 0.3 m MGL-to-sub-base clearance, 1:6 batters and a 3 m-wide access track 1 m clear of the batter.
- Post-development groundwater contours – inclusion of an updated groundwater-level contour plan reflecting the adopted correction and any seasonal monitoring data collected prior to subdivision.
- Maintenance and implementation – confirmation of the short-term establishment and maintenance program presented in Section 7, adjusted as required for the final design.
- The UWMP will therefore provide the detailed engineering documentation necessary to support subdivision approval and construction, building upon the conceptual principles established in this LWMS.

9 REFERENCES

Stormwater Management Manual for Western Australia (DWER 2022)

Better Urban Water Management (WAPC (now DPLH) 2008)

Government of Western Australia, State Planning Policy 2.9 – Water Resources

State Planning Policy 2.5 (Rural Planning)

Bureau of Meteorology Climate Data

The Government Sewerage Policy (DPLH 2019)

The Department of Biodiversity Conservation and Attractions Geomorphic Wetland Database

Department of Water and Environmental Regulation (DWER) Acid Sulphate Soil Risk Map

National Water Quality Management Strategy (Australian and New Zealand Environment and Conservation Council 2000)

APPENDIX A

CONCEPT PLAN

YIELD SUMMARY			
Size	No. Lots	% Total Lots	Avg. Lot Size
1 ha - 2 ha	13	65%	1.0192ha
2 ha - 5 ha	7	35%	3.252ha
Number of Lots	**20**		
Reserve for Drainage			2.8803ha
Road Widening			2235m²
Road Reserves			1.3801ha
Minimum Lot Size 1.0006ha		Average Lot Size 1.8008ha	
Maximum Lot Size 4.6133ha		Total Area (20 Lots) 36.0152ha	

LEGEND

- Subject Area (40.4991ha)
- Proposed Residential Lot
- Proposed Reserve for Drainage
- Proposed Drainage Easement
- Indicative Building Envelope (2000m²)
- Indicative LAA (140m²-180m²)
- Road Widening
- Existing Lot Boundaries
- Existing Easement
- Existing Open Channel Drain
- Proposed Open Channel Drain
- E — Underground Electricity (BYDA)
- AE — Overhead Electricity (BYDA)
- T — Telecommunications (BYDA)

CONCEPT PLAN

Lot 546 on DP250872 Garvey Road,
CROOKED BROOK

Plan No.	23858-02
Date	24/02/25
Drawn	NP
Checked	KS
Revision	A
Scale	1:2000@A2

0 20m 40m 60m

NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey

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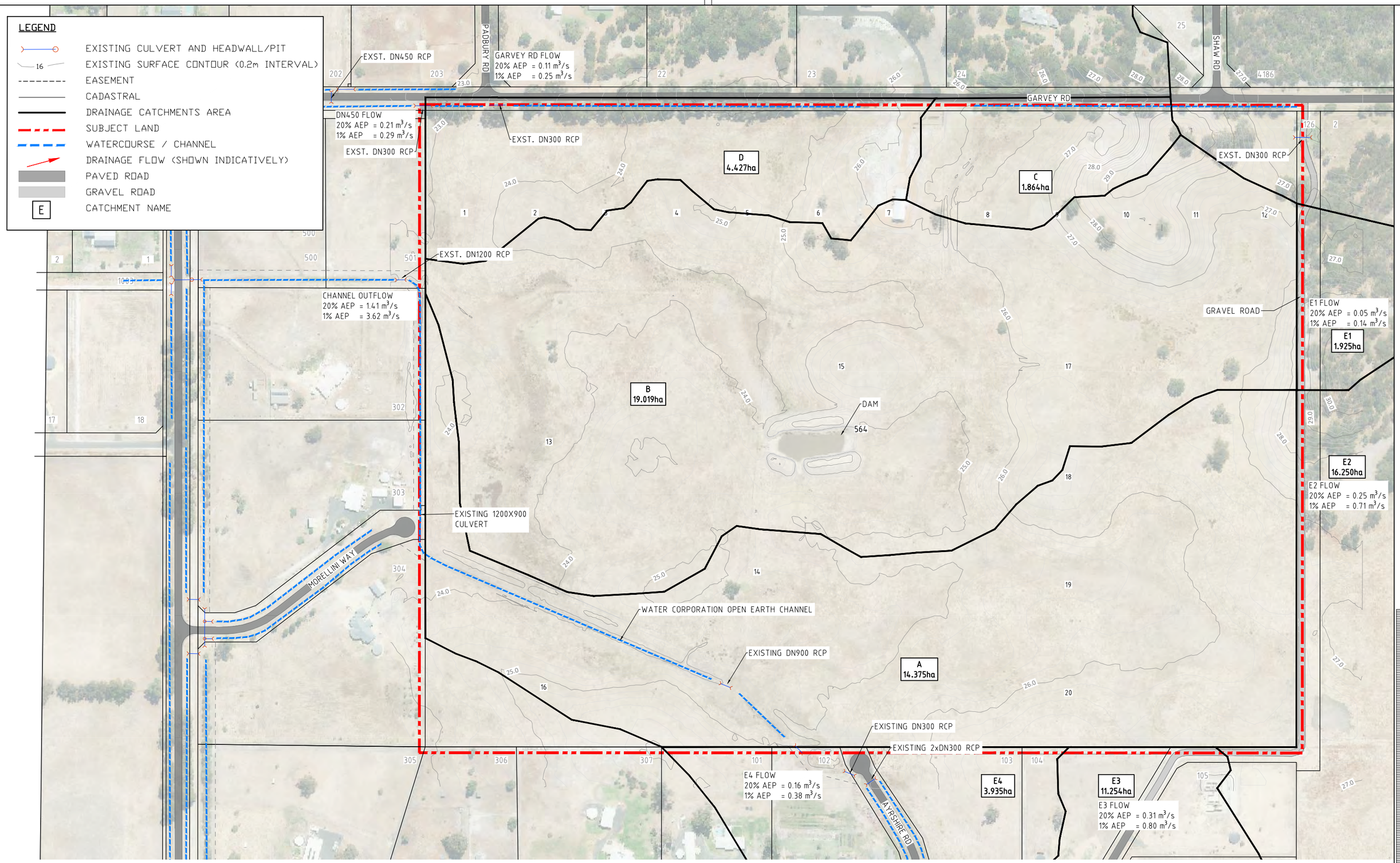
Harley Dykstra
PLANNING & SURVEY SOLUTIONS

APPENDIX B

PRE-DEVELOPMENT PLAN



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SCALE 1:1500 A1

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CONSULTANT DRAWING NUMBER 11815-C-DG-001

REVISIONS					
N°	DESCRIPTION	APPROVED	DATE	DRAWN	
A	ISSUED FOR REVIEW		11.04.2025	V.R	

NOTE: * INDICATES SIGNATURES ON ORIGINAL ISSUE OF DRAWING OR LAST REVISION OF DRAWING

	NAMES PRINTED IN FULL		DATE
DESIGNED	V. RODGERS		APRIL '25
DRAWN	V. RODGERS		04/25
VERIFIED	L. RUSCONI		04/25
APPROVED			

CLIENT: HARLEY DYKSTRA
PROJECT: LOT 564 GARVEY ROAD CROOKED BROOK
DRAWING TITLE: PRE-DEVELOPMENT PLAN

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DRAWING NUMBER 11815-D1-DG-001
REVISION A

J:\JOBS\11815 Lot 564 Garvey Road Dardanup West\AutoCad\Drawings\11815-C-DG-001.dwg 9 October 2025 8:18:06 AM

APPENDIX C

POST-DEVELOPMENT PLAN

LEGEND:

- SUBJECT LAND
- CADASTRAL
- 13.0 CONTOUR (1.0m Interval)
- DEFINED WATERCOURSE
- PROPOSED LOTS
- INDICATIVE BUILDING ENVELOPE (2000m2)
- PROPOSED LOT DRAINAGE
- DRAINAGE CATCHMENT AREA
- DRAINAGE DIRECTION
- ROADSIDE SWALE
- PROPOSED DRAINAGE RESERVE
- REMEDIAL EARTHWORKS
- (23.9) POST DEVELOPMENT 1% AEP FLOOD LEVELS

PADBURY RD

SHAW RD

GARVEY RD

MORELLINI WAY

JAYSHIRE RD

DN450 FLOW
20% AEP = 0.20 m^3/s
1% AEP = 0.30 m^3/s

CHANNEL OUTFLOW
20% AEP = 0.74 m^3/s
1% AEP = 2.69 m^3/s
OVERTOPPING
1% AEP = 0.88 m^3/s
= 0.10 m^2/s

PROPOSED 0.8m DEPTH SWALE 1:6 BATTERS, 4m BASE

GULLY REALIGNMENT

PROPOSED DN1200X900
20%AEP = 0.29m^3/s
1%AEP = 0.84m^3/s

GULLY

PROPOSED DN450 RCP
20%AEP = 0.07m^3/s
1%AEP = 0.26m3/s

PROPOSED 0.5m DEPTH SWALE 1:6 BATTERS

PROPOSED 2XDN525 RCP
20%AEP = 0.29m^3/s
1%AEP = 0.99m^3/s
OVERTOPPING
1% AEP = 0.78m^3/s
= 0.09m^2/s

PROPOSED 0.5m DEPTH SWALE 1:6 BATTERS

PROPOSED 1.1m DEPTH SWALE 1:4 BATTERS

PROPOSED DN450 RCP
20%AEP = 0.18m^3/s
1%AEP = 0.38m^3/s

PROPOSED LOT DRAINAGE

E4 FLOW
20% AEP = 0.16 m^3/s
1% AEP = 0.38 m^3/s

E1 FLOW
20% AEP = 0.05 m^3/s
1% AEP = 0.14 m^3/s

E2 FLOW
20% AEP = 0.25 m^3/s
1% AEP = 0.71 m^3/s

E3 FLOW
20% AEP = 0.31 m^3/s
1% AEP = 0.80 m^3/s

D 4.427ha
C 1.864ha
B2 11.819ha
B1 7.021ha
A2 5.306ha
A1 9.391ha
E1 1.925ha
E2 16.250ha
E4 3.935ha
E3 11.254ha

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DIAL BEFORE YOU DIG www.1100.com.au

SCALE 1:1500 A1

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CONSULTANT DRAWING NUMBER 11815-C-DG-002

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A	ISSUED FOR REVIEW		11.04.2025	V.R	
N°	DESCRIPTION	APPROVED	DATE	DRAWN	

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NAMES PRINTED IN FULL		DATE
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DRAWN	V. RODGERS	04/25
VERIFIED	L. RUSCONI	04/25
APPROVED		

CLIENT: HARLEY DYKSTRA

PROJECT: LOT 564 GARVEY ROAD CROOKED BROOK

DRAWING TITLE: POST-DEVELOPMENT PLAN

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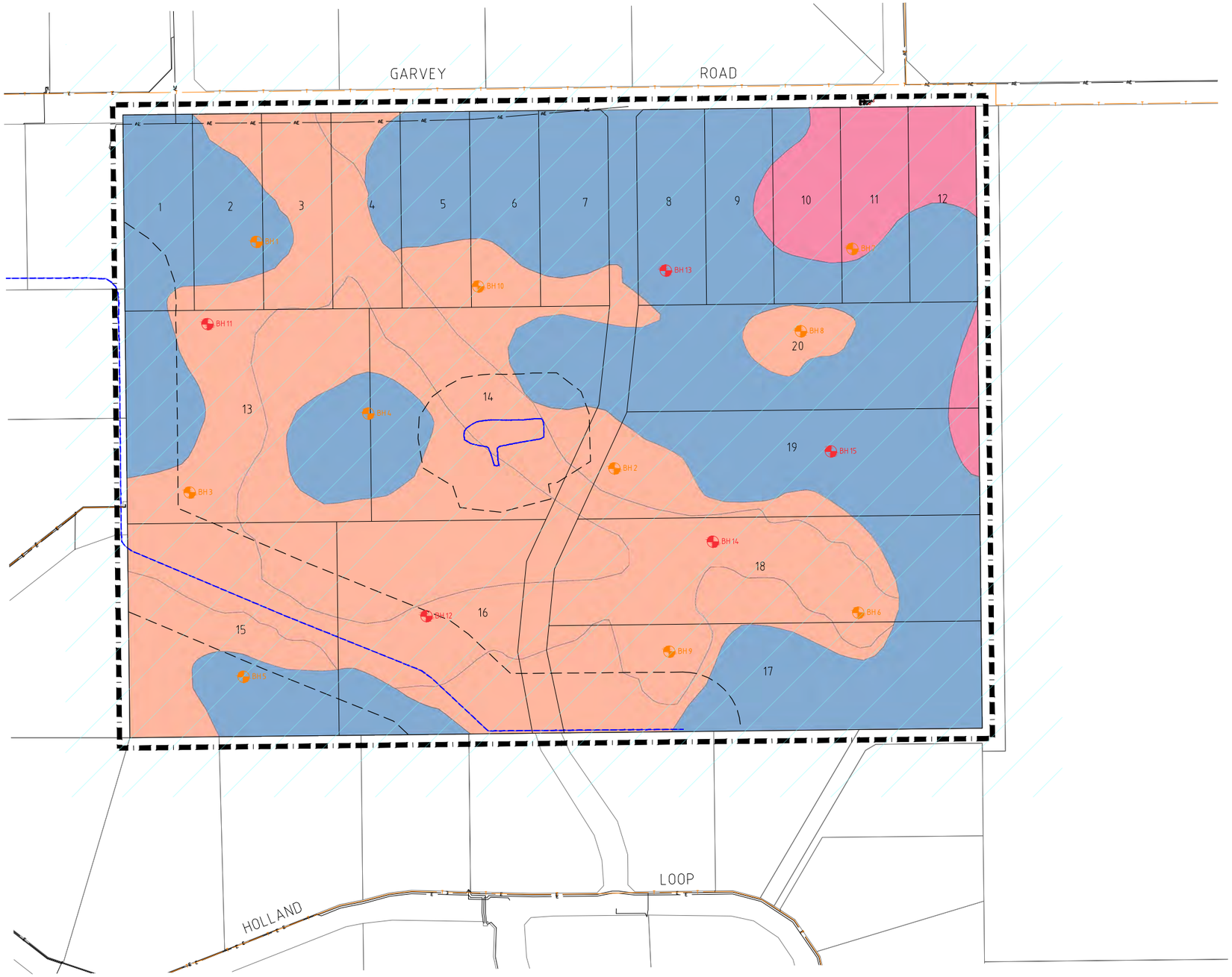
DRAWING NUMBER: 11815-D1-DG-002 REVISION: B

J:\JOBS\11815 Lot 564 Garvey Road Dardanup West\AutoCad\Drawings\11815-C-DG-002.dwg 9 October 2025 7:12:59 AM

APPENDIX D

SOIL SURVEY AND ANALYSIS AREAS

N



LEGEND

- BH 11 — WML BOREHOLE (JANUARY 2024)
- BH 4 — WML BOREHOLE (MAY 2023)
- ZONE 1
- ZONE 2
- ZONE 3
- SCOTT COASTAL PLAIN
- SITE BOUNDARY
- 50m SETBACK TO SURFACE WATER
- EXISTING OPEN DRAIN

PLAN

NOT TO SCALE

PRELIMINARY DRAWING

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SCALE NOT TO SCALE

A1

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CONSULTANT DRAWING NUMBER 11207-G1-DG-002

REVISIONS					
B	ISSUED FOR APPROVAL	A.G	18.06.24	C.H	
A	ISSUED FOR REVIEW	B.B	28.02.24	C.H	
N°	DESCRIPTION	APPROVED	DATE	DRAWN	

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NAMES PRINTED IN FULL		DATE
DESIGNED	B. BAJGAIN	FEB 2024
DRAWN	C. HICK	FEB 2024
VERIFIED		
APPROVED		

CLIENT
VA & MP WRIGHT & SON

PROJECT
LOT 564 GARVEY ROAD
GEOTECHNICAL INVESTIGATION

DRAWING TITLE
LOT 564 GARVEY ROAD
SUBDIVISION
SOIL SURVEY AND ANALYSIS AREAS

THIS DRAWING SHALL BE TREATED AS PRELIMINARY AND IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED.

DRAWING NUMBER 11207-G1-DG-002 B

REVISION B