



Oakhampton Planning Proposal

Stormwater Management Strategy

**Prepared for Walker Corporation
Pty Ltd**

15 June 2022



Document Information

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Document Title	Oakhampton Planning Proposal
Document Subject	Stormwater Management Strategy
Prepared For	Walker Corporation Pty Ltd
Project Name	Kezia Road, Oakhampton
Project Number	210129
File Name	rept001-210129-01-enspire-r02-220615-oakhampton stormwater management strategy

Transmittal

Revision	Date	Prepared by	Checked by	Approved by
01	13/06/2022	Elaria Zaki Shawn Hotong Matthew Lester	Matthew Lester	Matthew Lester
		Issue for Client Review		
02	15/06/2022	Elaria Zaki Shawn Hotong Matthew Lester	Matthew Lester	Matthew Lester
		Issue for Approval		



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Executive Summary

Enspire Solutions has been engaged by Walker Corporation Pty Ltd to develop a stormwater management strategy in support of a planning proposal to rezone a portion of land in Oakhampton located in the Maitland City Council Local Government Area. This strategy has been prepared in accordance with Attachment C of the LEP Making Guideline, Department of Planning, Industry and Environment, 2021 and pre-lodgement meeting minutes with Council dated 2nd May 2022.

Table 1 and Table 2 below summarise the outcomes of this strategy and demonstrates that the proposed stormwater management concept design can support the site.

Table 1 - Detention Basin Performance Summary

Control Point / Basin ID	1EY/50% AEP		1% AEP		Estimated Storage (m3)
	Pre-Dev (m3/s)	Post-Dev (m3/s)	Pre-Dev (m3/s)	Post-Dev (m3/s)	
CP1 / Basin A	0.637	0.604	2.75	2.67	2,000
CP 2 / Basin B	2.51	2.26	10.6	10.3	7,800
CP3 / Basin C	1.07	1.03	4.79	4.37	5,200
CP4 / Basin D	0.817	0.767	3.56	3.47	5,500

Table 2 - Water Quality Treatment Train Performance Summary

Control Node	GP Removal (%)	TSS Removal (%)	TP Removal (%)	TN Removal (%)	Bio – Retention System Filter Area (m ²)
Performance Target	70.0	80.0	45.0	45.0	
Basin A	100	86.6	63	47	300
Basin B	100	85.5	63.2	47.1	1600
Basin C	100	85.0	62.1	45.9	900
Basin D	100	85.2	61.8	45.5	900

1. Reductions in oil and grease are assumed to be achieved through the incorporation of oil pillows within GPT units.

The proposed development is positioned above existing 1% AEP extents and generally above the PMF event such that additional flood mitigation works beyond stormwater peak flow management up to the 1% AEP will not be necessary.

Control of post-development peak flows is to be managed through detention basins, and water quality improvements are to be controlled through a system of rainwater tanks, gross pollutant traps and bio-retention basins.

Based on the stormwater quantity and quality modelling, a concept design of each basin has been developed and confirms that spatially the stormwater management strategy can be accommodated as shown in Figure 1.

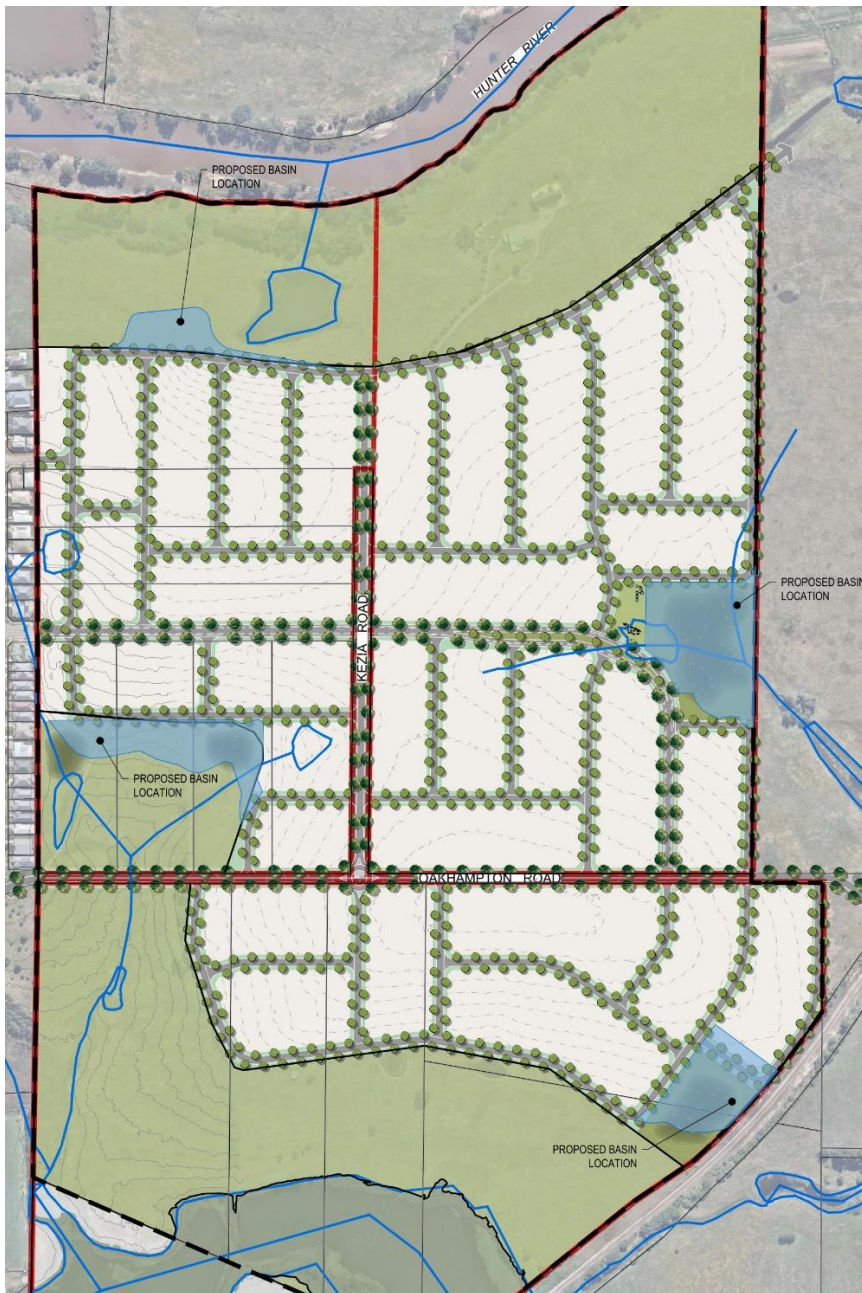


Figure 1 - Stormwater Management Spatial Allowance

Further this strategy has assessed possible infrastructure costs as summarised in the Table 3.

Table 3 - Stormwater Infrastructure Cost Summary

	Basin A	Basin B	Basin C	Basin D
Subtotal	\$521,069.13	\$1,406,838.67	\$1,277,463.07	\$884,073.72
Contingency (10%)	\$52,107.91	\$140,683.87	\$127,746.31	\$88,407.37
Fees Allowance (10.5%)	\$54,712.26	\$147,718.06	\$134,133.63	\$92,827.74
Total	\$627,888.30	\$1,695,240.60	\$1,539,343.00	\$1,065,308.83



1 Introduction

Enspire Solutions (**Enspire**) has been engaged by Walker Corporation Pty Ltd (**Walker**) to develop a stormwater management strategy to support the planning proposal to rezone a portion of land in Oakhampton located in the Maitland City Council (**Council**) Local Government Area. This strategy has been prepared in accordance with Attachment C of the LEP Making Guideline, Department of Planning, Industry and Environment, 2021 and pre-lodgement meeting minutes with Council dated 2nd May 2022. The site is shown approximately in **Figure 1**.

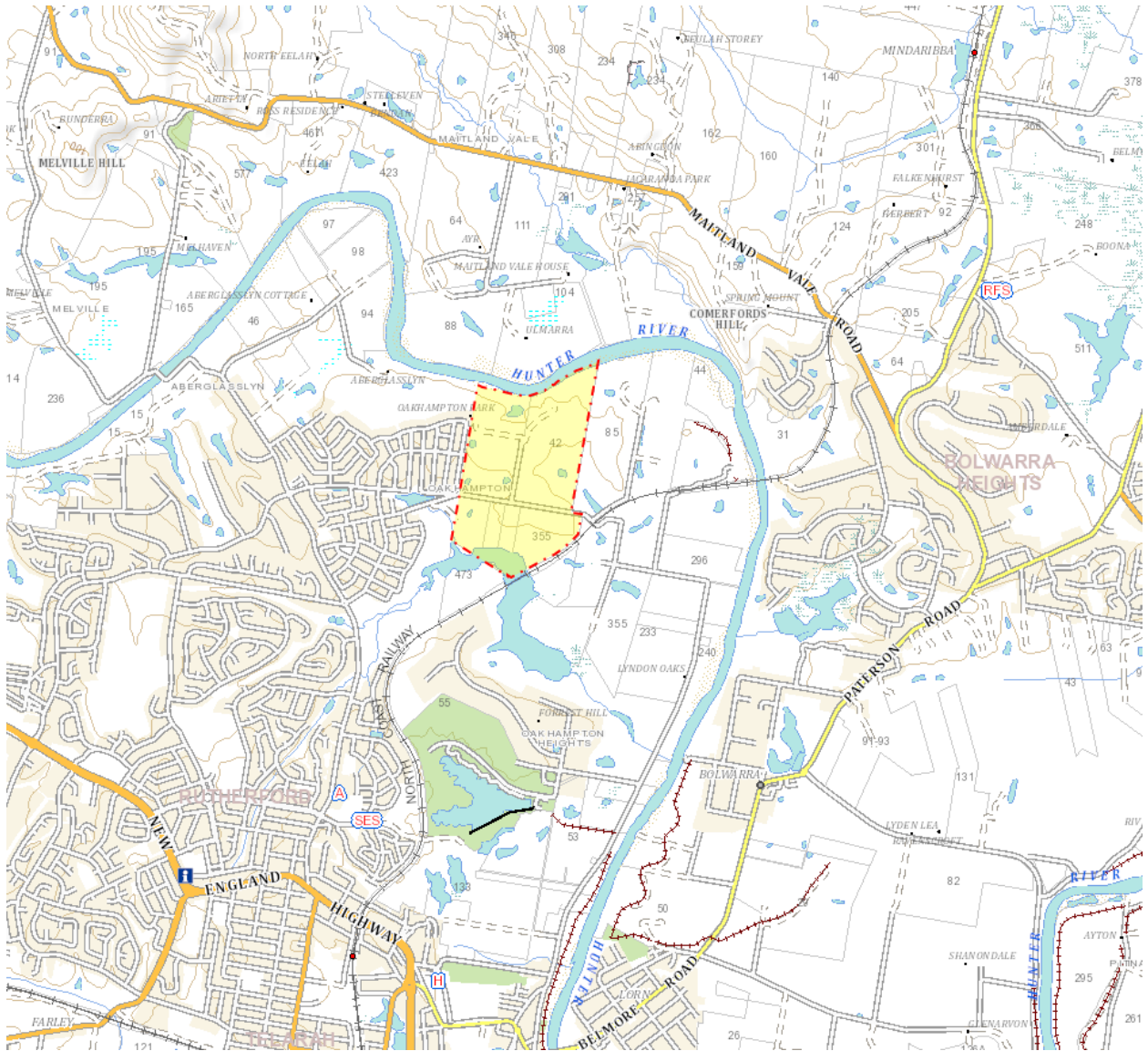


Figure 2 – Subject Site Locality Plan

Subject Site highlighted yellow.

The site consists of 14 properties (either wholly or in part) with a combined area of approximately 90ha subject to the planning proposal. The site is located south of the Hunter River with existing Oakhampton and Kezia Road bisecting the site.



Figure 3 – Subject Site Development Masterplan

Source: Concept Layout Plan – Option 1, 8 May 2022, Urbanco.



1.1 Existing Site Conditions

The Site is currently in use for rural residential and agriculture purposes and generally consists of short to medium length grassland with sparse alternative vegetation, typical of cattle grazing lands.

The site exhibits typical fall of approximately 3-4% to four (4) separate discharge locations:

- Outlet 1 – Located at the northern boundary of the site. Discharges to Hunter River via an existing farm dam;
- Outlet 2 – Located at the eastern boundary of the site. Discharges via an existing farm dam under Oakhampton Road and into at road/track-side drainage swale within the existing railway corridor;
- Outlet 3 – Located at the south-western boundary of the site. Discharges under Oakhampton Road via a pipe culvert to a large un-named water body (Lake A); and
- Outlet 4 – Located at the south boundary of the site. Discharges via overland surface runoff directly to Lake A.

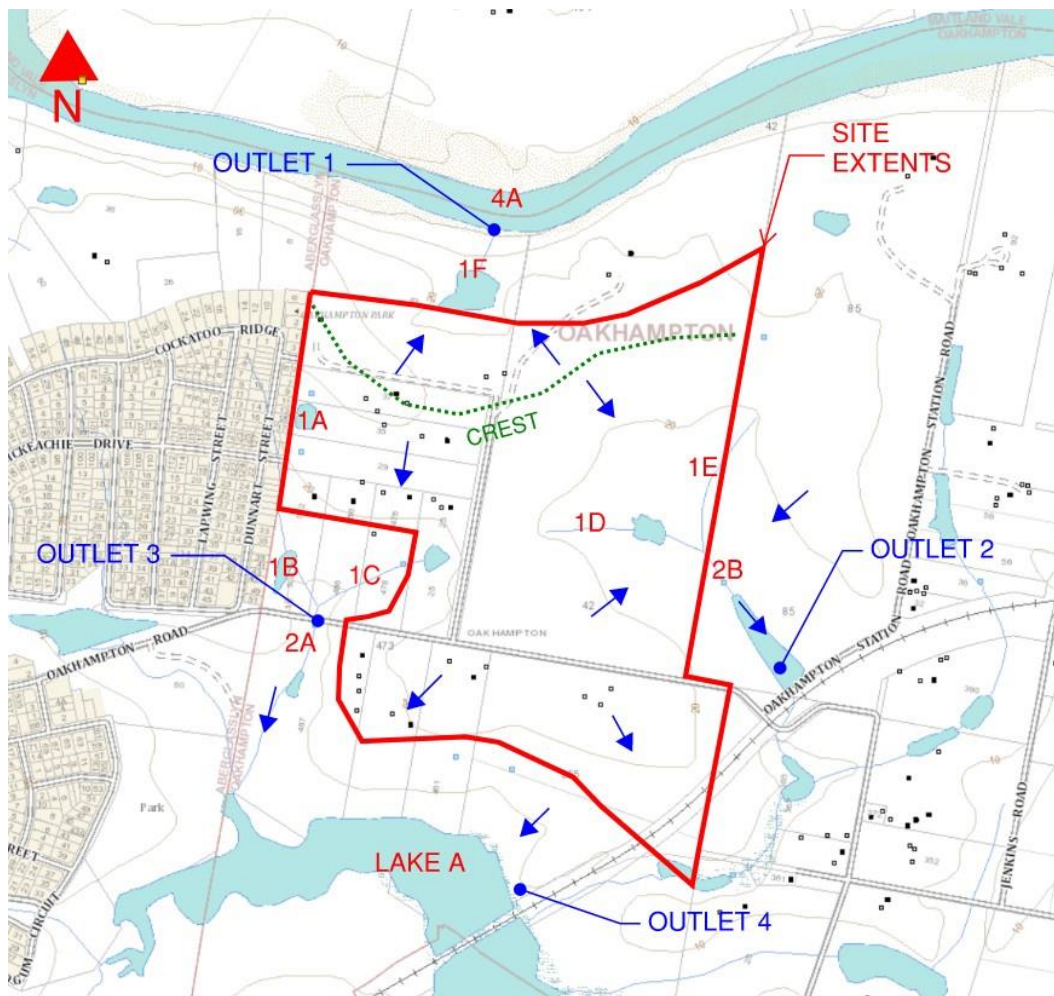


Figure 4 – Subject Site Existing Conditions Plan

Table 4 nominates available information and proposed action to all watercourses within the site extents.



Table 4 – Existing Watercourse Summary

Watercourse ID (Refer Figure 3)	Watercourse Name (If Applicable)	Stream Order	Comments
4A	Hunter River	Fourth	To be retained
2A	N/A	Second	To be retained
2B	N/A	Second	To be retained
1A	N/A	First	To be removed
1B	N/A	First	To be partially repurposed to a stormwater basin
1C	N/A	First	To be partially repurposed to a stormwater basin
1D	N/A	First	To be partially repurposed to a stormwater basin
1E	N/A	First	To be partially repurposed to a stormwater basin
1F	N/A	First	To be partially repurposed to a stormwater basin

Stream order classifications as per NRAR Guidelines for Controlled Activities on Waterfront Land.



2 Proposed Stormwater Management Strategy

The Stormwater Management Strategy (**The Strategy**) has been developed based on the following reference documentation to address the requirements of the LEP Making Guideline.

- Maitland City Council Manual of Engineering Standards:
 - Part 6 – Stormwater Drainage.
- NSW MUSIC Modelling Guidelines, August 2015, BMT WBM.

Key objectives of This Strategy based on the reference documentation have been defined as:

- To maximise safety of public spaces during storm events up to the 1% AEP event.
- To maximise safe passage of Probable Maximum Flood (PMF) flows.
- To minimise the erosion of existing waterways.
- To minimise the discharge of pollutants from operation of development sites.
- To minimise maintenance of stormwater management systems.

The Strategy proposed adopts a typical management system to demonstrate a functional outcome with optimisations to be considered as part of future design submissions (e.g. Development Applications). The typical management system incorporates a water quality treatment train consisting rainwater tanks, gross pollutant traps and bio-retention basins, and water quantity control infrastructure consisting of dry detention basins.



3 Flooding

3.1 Existing Conditions and Discussion

Figure 5 provides an overlay of the existing 1% AEP and PMF extent based on the Maitland City Council Hunter River Floodplain Risk Management Study and Plan, November 2015, WMA Water. This indicates the proposed development is positioned adequately above existing flood hazards and the proposed development with post-development stormwater detention control is very unlikely to generate meaningful impacts on existing flood behaviour. On this basis, the proposed development is capable of meeting statutory flood planning requirements.

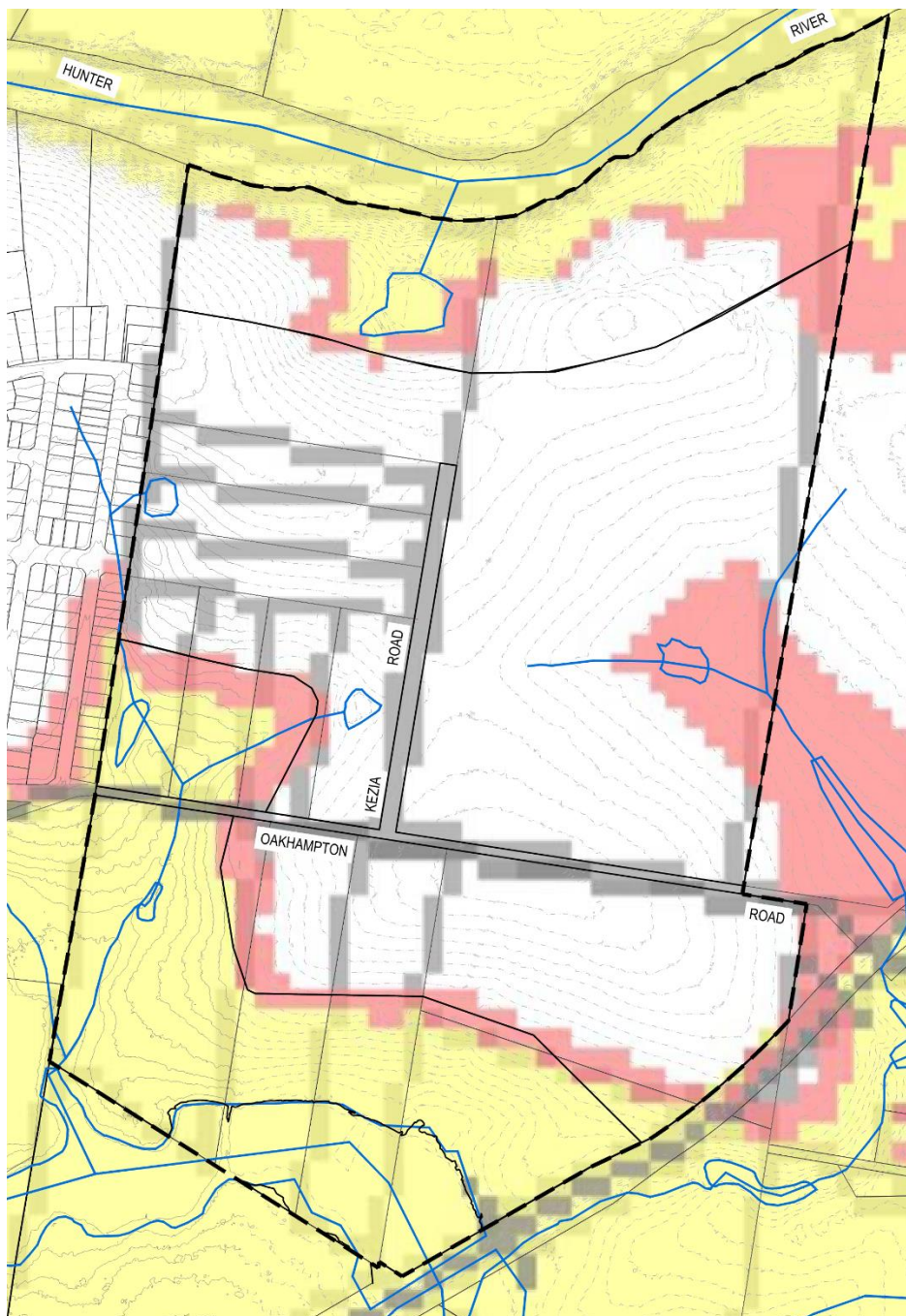


Figure 5 –Existing 1% and PMF AEP Flood Extent



4 Stormwater Quantity Controls

4.1 Performance Criteria

The stormwater quantity management strategy has been developed to meet the following objectives:

- Post-development discharge flow rates are to be controlled to not exceed pre-development discharge flow rates for typical storm events between the 50% AEP to 1% AEP events;
- Maximise safe passage of Probable Maximum Flood (PMF) flows; and
- Minimise the erosion of existing waterways.

4.2 Stormwater Quantity Management Strategy

The stormwater quantity management strategy adopts detention basins as the primary control of post-development discharge rates and velocities. Basin outlet configurations are assumed to consist of a pit inlet with piped discharge control for very frequent storm events and overtopping weir control for frequent to infrequent storm events. It is intended to adopt relatively wide overtopping weirs to control depth and velocities to protect downstream waterways.

Four (4) on-site stormwater detention basins are proposed to service the Site, to be located to suit natural topography and coincide with existing discharge locations. These discharge locations will be nominated as Control Points (CP) for the pre-to-post development flow analysis as shown in Figure 6.

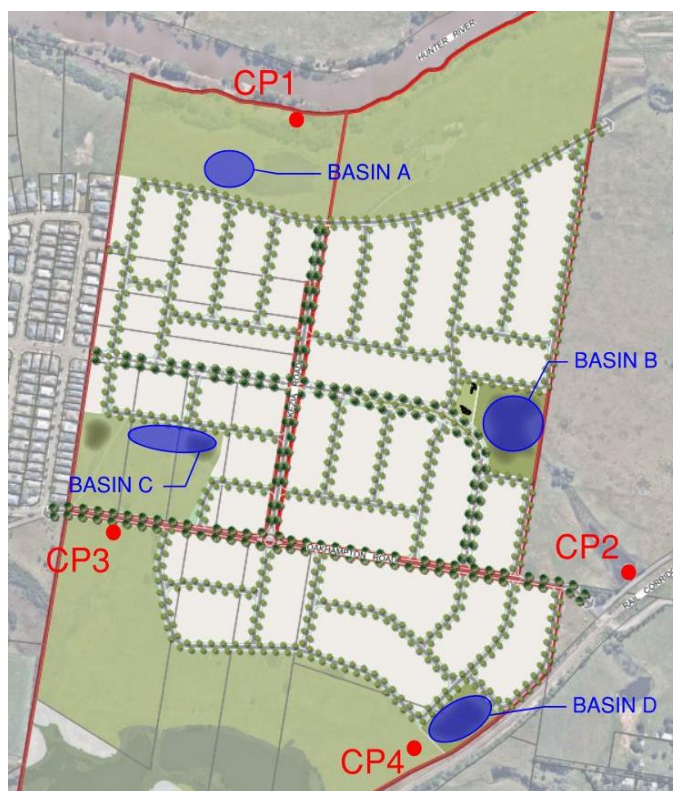


Figure 6 - Proposed On-Site Stormwater Detention Basin Locations



4.3 Modelling Methodology

The stormwater quantity management strategy has been modelled using the DRAINS v2022.01 software package adopting a RAFTS storage routing hydrological model. RAFTS hydrological modelling allows for the more accurate estimation of stormwater runoff from moderate to large catchment sizes (particularly rural catchments) while the DRAINS hydraulics calculations allow for more accurate estimations of basin performance. Australian Rainfall and Runoff 2019 procedures have been adopted.

To determine performance of The Strategy against the performance criteria the following methodology has been implemented:

1. Pre-development catchments have been determined adopting LiDAR contour data.
2. Pre-development catchments have then been modelled in DRAINS adopting a RAFTS hydrology model adopting parameters representative of the natural topography.
 - a. For catchments discharging to existing watercourses, existing flow rates for 50%AEP and 1%AEP have been assessed only.
3. Post-development catchments have been determined based on a preliminary design surface for The Site.
4. Post-development catchments have then been modelled in DRAINS adopting a RAFTS hydrology model adopting parameters representative of each catchment's urban topography.
5. Detention basins have been added to the model prior to discharge nodes and designed to not exceed pre-development flow rates and/or velocities.

Modelling of the 50%AEP and 1%AEP storm events only has been undertaken to inform this Strategy. This is adequate for the purpose of positioning and sizing of stormwater infrastructure at a strategic level and design to cater for all storm events between these will form part of future design development and is not anticipated to impact.

4.4 Catchment Hydrology

Catchment hydrology and design rainfall data for The Site has been obtained from the 2016 Design Rainfall Data System developed by the Australian Government Bureau of Meteorology (BoM) and the Australian Rainfall and Runoff 2019 (ARR2019) Data Hub.

Table 5 defines the adopted loss and surface roughness parameters to estimate catchment runoff.

Table 5 – Initial Loss – Continuous Loss Hydrology Parameters

	Pre-development Loss Factors	Post-development Loss Factors
Initial Loss Pervious (mm)	14.0	8.4
Continuing Loss Pervious (mm/hr)	0.92	0.92
Initial Loss Impervious (mm)	1.5	1.5
Continuing Loss Impervious (mm/hr)	0	0



4.5 Catchment Representation

Table 6 and Table 7 summarises the properties adopted to represent catchments in the pre-development and post-development scenarios respectively, with impervious proportions assumed based on Council Engineering Guidelines.

Existing farm dams have not been included in the pre-development modelling case, are assumed full and hence provide no detention affect in the existing scenario.

A catchment plan for stormwater quantity modelling is provided in **Appendix A**.

Table 6 – Pre-development Catchment Properties

Catchment	Area (ha)	Average Slope (%)	Impervious Area (%)
A	8.18	4.16	0
B1	14.79	3.88	0
B2	13.84	3.91	0
B3	10.67	2.89	0
C	15.90	4.18	0
D	10.91	4.40	0

Table 7 – Post-development Catchment Properties

Control Point	Catchment	Area (ha)	Impervious Area (%)
CP1	A1	4.49	70
	A2	2.74	0
	A3	0.85	0
CP2	B1	24.1	70
	B2	2.37	70
	B3	9.74	70
CP3	C1	14.20	70
	C2	2.36	0
CP4	D	14.37	70



4.6 Results and Discussion

Estimated pre-development and post-development peak flow rates and estimated storage requirement are summarised in Table 8 based on the modelling methodology described in the preceding sections.

As demonstrated, the proposed stormwater quantity management strategy can achieve performance criteria for the development, and with refinement as part of future detailed design has potential to create high amenity infrastructure connecting development and adjacent natural vegetation.

Table 8 – Detention Basin Volumes

Control Point / Basin ID	1EY/50% AEP		1% AEP		Estimated Storage (m3)
	Pre-Dev (m3/s)	Post-Dev (m3/s)	Pre-Dev (m3/s)	Post-Dev (m3/s)	
CP1 / Basin A	0.637	0.604	2.75	2.67	2,000
CP 2 / Basin B	2.51	2.26	10.6	10.3	7,800
CP3 / Basin C	1.07	1.03	4.79	4.37	5,200
CP4 / Basin D	0.817	0.767	3.56	3.47	5,500

5 Stormwater Quality Controls

5.1 Performance Criteria

The stormwater quality management strategy has been developed to meet the following objectives at discharge points into existing waterways:

- 70% reduction in average annual gross pollutant (GP) loads.
- 80% reduction in average annual total suspended solid (TSS) loads.
- 45% reduction in average annual total phosphorus (TP) loads.
- 45% reduction in average annual total nitrogen (TN) loads.
- 90% reduction in average annual oil and grease loads.

5.2 Stormwater Quality Management Strategy

The typical treatment strategy incorporates rainwater re-use tanks on every residential lot, gross pollutant traps (GPT) at each stormwater discharge point and tertiary treatment via vegetated bio-retention basins. To protect water quality infrastructure and minimise the size of proprietary treatment devices, it will be necessary to install splitter pits upstream of the treatment train to divert high flows directly to detention storages.

Figure 7 shows the locations of the nominated GPTs and bio-retention basins proposed for the site. Note that bio-retention basins are proposed to sit within the footprint of the on-site stormwater detention basins as presented in Section 4.



Figure 7 – Stormwater Quality Infrastructure Plan

5.3 Modelling Methodology

The stormwater quality management strategy has been assessed using the MUSIC v6.3 software package which is the industry standard software for modelling water quality and water sensitive urban design outcomes.

Post-development catchment boundaries adopted for modelling are like those that have been adopted for stormwater quantity modelling but have been further broken down into land use categories to appropriately model pollutant quantities and the proposed treatment train.

Catchment hydrology, pollutant generation and treatment device parameters adopted are detailed in the following sections and have been developed based on:

- NSW MUSIC Modelling Guidelines.
- Third party data where applicable.

It is noted that Maitland City Council has not released a MUSIC modelling guideline or MUSIC Link file to standardise modelling in the LGA and a first principles approach to modelling has been adopted for this strategy.

Figure 8 shows the MUSIC model layout.

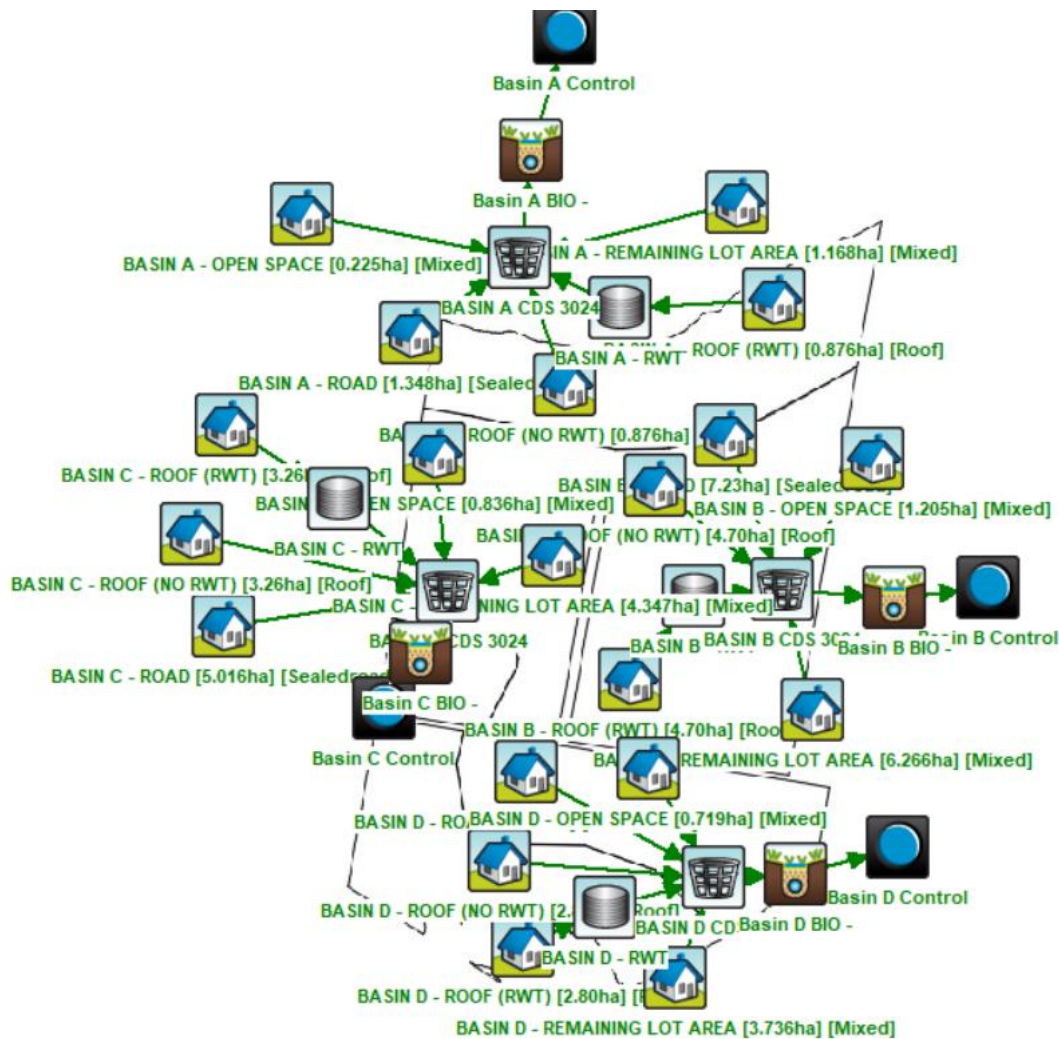


Figure 8 – Extract of MUSIC Modelling Layout

5.3.1 Catchment Hydrology

Rainfall data across numerous weather stations has been assessed with the rainfall data detailed in Table 9 and monthly Potential Evapotranspiration (PET) data in Table 10 adopted for modelling purposes. These rainfall parameters have been assessed based on:

- Proximity to the subject site (the closer the more relevant).
- Completeness of data (minimal to no data gaps)
- Period of data collection (ideally 40 years or more)
- Period appropriate for modelling typical climate conditions (generally a 10-year period with no extreme dry or wet conditions)
- Appropriate timestep for modelling evaporation and infiltration effects accurately (industry standard for water quality modelling is 6-minute).



Table 9 – MUSIC Model Rainfall Data

Variable	Adopted Value
Weather Station	61250 Paterson
Rainfall Period	1975-2005
Timestep	6-minute

Table 10 – MUSIC Model Monthly PET

Month	Protect PET (mm)
January	165
February	125
March	115
April	65
May	55
June	45
July	45
August	60
September	85
October	120
November	145
December	155

Catchment rainfall-runoff and groundwater properties for all catchment types has adopted the parameters in Table 11 which have taken into consideration to the typical soil profiles within The Site.

Table 11 – MUSIC Catchment Rainfall-Runoff Parameters

Parameter	Adopted Value
Impervious Areas	
Rainfall Threshold	1.0mm
Pervious Areas	
Soil Storage Capacity (mm)	120
Initial Storage (% of capacity)	25
Field Capacity (mm)	80
Infiltration Capacity Coefficient – a	200
Infiltration Capacity Coefficient – b	1
Groundwater	
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	10
Daily Deep Seepage Rate (%)	0



5.3.2 Catchment Representation

Post development catchments have been defined by the following general urban typologies:

- Roads
- Low Density
- Open Space

Table 12 details the land use breakdown adopted to generate nodes suitable for MUSIC modelling.

Table 12 – MUSIC Node Details Summary

Land Use	Sub Catchment	Adopted Impervious	Comments
Roads	N/A	85%	
Low Density	Roof (to rainwater tank)	100%	Roof assumed to represent 60% of total land use area. 60% of roof assumed to contribute to a rainwater tank.
	Roof (bypass)	100%	Roof assumed to represent 60% of total land use area. 50% of roof assumed to contribute to a rainwater tank.
	Remaining Lot Area	50%	Total percentage of low-density land use imperviousness equates to 80%
Open Space	N/A	50%	

5.3.3 Catchment Pollutant Generation

Catchment pollutant generation estimates have been based on Table 13 base flow and storm flow parameters adopting stochastic generation.

Table 13 – MUSIC Catchment Pollutant Generation Parameters

Land Use	Mean / Standard Deviation	Total Suspended Solids (mg/L-log10)		Total Phosphorus (mg/L-log10)		Total Nitrogen (mg/L-log10)	
		Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow
Road	Mean	1.20	2.43	-0.85	-0.30	0.11	0.34
	Standard Deviation	0.17	0.32	0.19	0.25	0.12	0.19
Roof	Mean	N/A	1.30	N/A	-0.89	N/A	0.30
	Standard Deviation	N/A	0.32	N/A	0.25	N/A	0.19
Residential	Mean	1.20	2.15	-0.85	-0.60	0.11	0.30
	Standard Deviation	0.17	0.32	0.19	0.25	0.12	0.19
Open Space	Mean	1.20	2.15	-0.85	-0.60	0.11	0.30
	Standard Deviation	0.17	0.32	0.19	0.25	0.12	0.19

5.3.4 Treatment Node Properties

5.3.4.1 Rainwater Tanks

Rainwater tanks have been modelled assuming the installation of a 2.5kL tank on each development lot but modelled in MUSIC with 2.0kL capacity taking into consideration storage inefficiencies.



Rainwater tank re-use rates adopted assume 0.1kL/day internal use and 25.0kL/year as PET-Rain.

5.3.4.2 Gross Pollutant Traps

Vortex type gross pollutant traps have been assumed to be adopted allowing for treatment up to the 3-month storm event. Larger storm events are assumed to bypass via splitter pit and be directed to detention basins. Given the range of proprietary products available this strategy has adopted the following treatment effectiveness for gross pollutant traps which is typical for industry leading units available in the market.

- 98% GP removal.
- 70% TSS removal for inflow concentrations greater than 75mg/L.
- 30% TP removal for inflow concentrations greater than 0.5mg/L.
- 0% TN removal.

It is part of this strategy that oil pillows will be installed in GPTs to capture hydrocarbon pollutants (oil and grease). Figure 9 shows a diagram of a typical vortex style GPT.

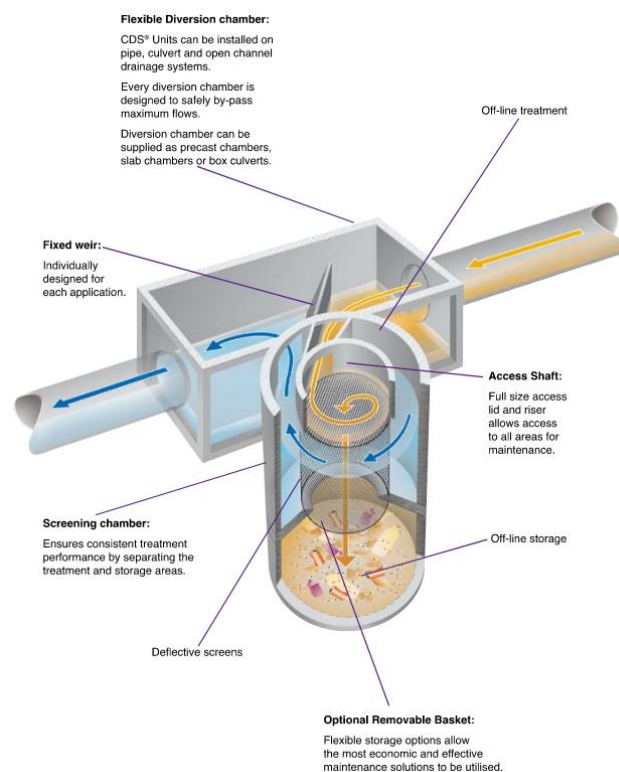


Figure 9 – Typical Vortex Type GPT Concept

Source: Rocla CDS Unit Technical Summary

5.3.4.3 Bio-Retention Basins

The predominant means of suspended solids and nutrient removal is to be through the construction of bio-retention basins. Bio-retention basins are to incorporate an engineered filtration media that promotes nutrient removal when appropriately vegetated. Bio-retention



basins have been modelled in MUSIC adopting the parameters detailed in Table 14. A typical bio-retention basin arrangement is presented in Figure 10.

Table 14 – Bio-Retention Basin Parameters

Parameter	Adopted Value
High Flow Bypass	3-month flow rate
Extended Detention Depth	300mm
Saturated Hydraulic Conductivity	125mm/hr
Filter Depth	500mm
TN Content of Filter Media	800mg/kg
Orthophosphate Content	40mg/kg
Exfiltration Rate	0mm/hr
Base liner	Yes
Vegetation	Effective nutrient removing plants assumed

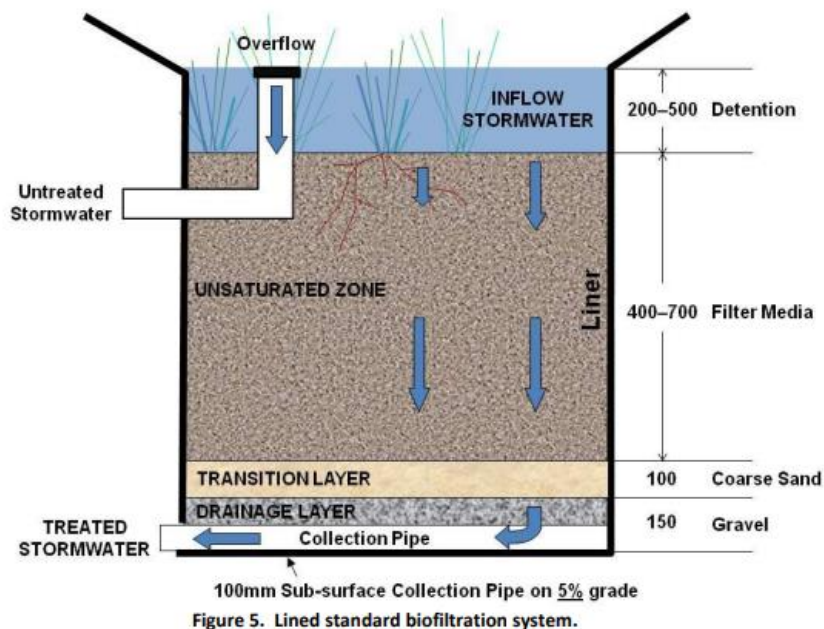


Figure 10 – Typical Bio-Retention Basin Arrangement

Source: Stormwater Biofiltration systems Adoption Guidelines, June 2009, FAWB.

5.4 Results and Discussion

Estimated post-development pollutant reductions and estimated bio-retention basin filter area requirement are summarised in Table 15 based on the modelling methodology described in the preceding Sections.

As demonstrated, the proposed stormwater quality management strategy is capable of achieving performance criteria for the development and with refinement as part of future detailed design has potential to create high amenity infrastructure connecting development and adjacent natural vegetation.



Table 15 – MUSIC Modelling Results

Control Node	GP Removal (%)	TSS Removal (%)	TP Removal (%)	TN Removal (%)	Bio – Retention System Filter Area (m ²)
Performance Target	70.0	80.0	45.0	45.0	
Basin A	100	86.6	63	47	300
Basin B	100	85.5	63.2	47.1	1600
Basin C	100	85.0	62.1	45.9	900
Basin D	100	85.2	61.8	45.5	900

2. Reductions in oil and grease are assumed to be achieved through the incorporation of oil pillows within GPT units.

6 Stream Erosion Index

To estimate potential impact on existing waterways due to changes in flow frequency behaviour, an assessment of Stream Erosion Index (**SEI**) has been undertaken. The following methodology has been adopted to calculate post-development SEI with a target SEI value of 3.5 or less (minimal impact).

- Critical stream forming flow has been estimated based on calculated pre-development 50% AEP flow rate multiplied by 50%. Critical stream forming flow indicates the threshold at which mobilisation of bed material and erosion of banks begins to occur.
- Mean pre-development annual runoff volume that exceeds the estimated critical flow has been determined through MUSIC software. With a SEI target of 3.5, this mean annual volume becomes the target in the post-development scenario.
- Mean post-development annual runoff volume that exceeds the estimated critical flow has been determined through MUSIC software. Detention and water quality improvement infrastructure has been modelled as part of the post-development scenario.
- SEI has been determined by dividing post-development mean annual runoff volume by pre-development mean annual runoff volume from the above steps.

Table 16 – Stream Erosion Index Assessment with Detention

Waterway	Calculated 50%AEP Pre-Development Peak Flow Rate (m ³ /s)	Estimated Critical Stream Forming Flow Rate (m ³ /s)	Mean Annual Runoff Volume Above Critical Flow (ML/year)		SEI
			Pre-Development	Post-Development	
4A	0.637	0.319	0.412	0.172	0.417
2B	2.510	1.255	2.550	0.782	0.307
2A	1.070	0.535	0.969	2.490	2.570
LAKE A	0.817	0.409	0.578	1.780	3.080

Waterway IDs and locations as per Figure 3.

As demonstrated in Table 16 the implementation of the proposed stormwater management strategy will achieve an SEI of less than 3.5 for all existing watercourses indicating that it is very unlikely the proposed development will generate accelerated changes in the geomorphology of these watercourses where this Strategy is in place.



7 Concept Designs and Opinion of Probable Costs

7.1 Concept Basin Designs

Based on the results of stormwater modelling for on-site stormwater detention and water sensitive urban design, concept basin designs have been developed to inform estimated land usage and asset cost. The following key assumptions were adopted in the development of the concept designs:

- Existing outlet levels based on available LiDAR;
- Minimum grade on proposed stormwater pipes 1%
- Basin base grade minimum 0.5%;
- Maximum top water level 1.5m;
- Minimum bio-retention basin depth 1.0m (0.5m filter, 0.1 transition layer, 0.4m drainage layer);
- Maximum batter slope 1:4;
- Minimum 4m wide concrete basin access track; and
- Allowance for hardstand GPT maintenance area located outside of the road carriageway.

Proposed basin concept design plans are presented in Appendix C.

7.2 Option of Probable Costs

Based on the proposed basin concept designs plans, Enspire have prepared an Option of Probable Costs, outlining estimated major stormwater infrastructure costs associated with the development.

Table 17 shows a summary of the estimated on-site stormwater / water quality basin costs.

Detailed cost estimates are presented in Appendix C.

Table 17 - Stormwater Infrastructure Cost Summary

	Basin A	Basin B	Basin C	Basin D
Subtotal	\$521,069.13	\$1,406,838.67	\$1,277,463.07	\$884,073.72
Contingency (10%)	\$52,107.91	\$140,683.87	\$127,746.31	\$88,407.37
Fees Allowance (10.5%)	\$54,712.26	\$147,718.06	\$134,133.63	\$92,827.74
Total	\$627,888.30	\$1,695,240.60	\$1,539,343.00	\$1,065,308.83



8 Conclusions and Recommendations

This stormwater management strategy report has demonstrated that the proposed Oakhampton development can be supported by stormwater control infrastructure to adequately achieve statutory performance targets to facilitate the development. In particular, this strategy has demonstrated a stormwater management outcome can be achieved in conformance with Attachment C of the LEP Making Guideline, Department of Planning, Industry and Environment, 2021 and Maitland City Council Manual of Engineering Standards.

The proposed development is positioned above existing 1% AEP flood extents and generally above the PMF event such that additional flood mitigation works beyond stormwater peak flow management up to the 1% AEP will not be necessary.

Control of post-development peak flows is to be managed through detention basins, and water quality improvements are to be controlled through a system of rainwater tanks, gross pollutant traps and bio-retention basins.

Based on the stormwater quantity and quality modelling, a concept design of each basin has been developed and confirms that spatially the stormwater management strategy can be accommodated within the land allocations nominated.

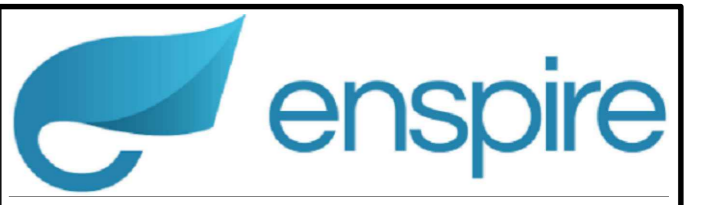
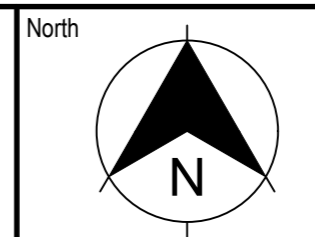
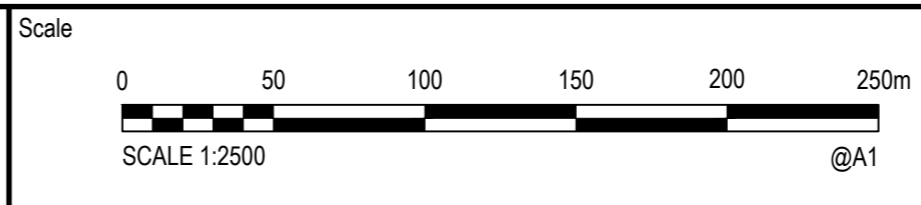
The concept designs have also informed an opinion of probable cost for the stormwater management strategy to assist in funding decisions.



Appendix A Catchment Plans

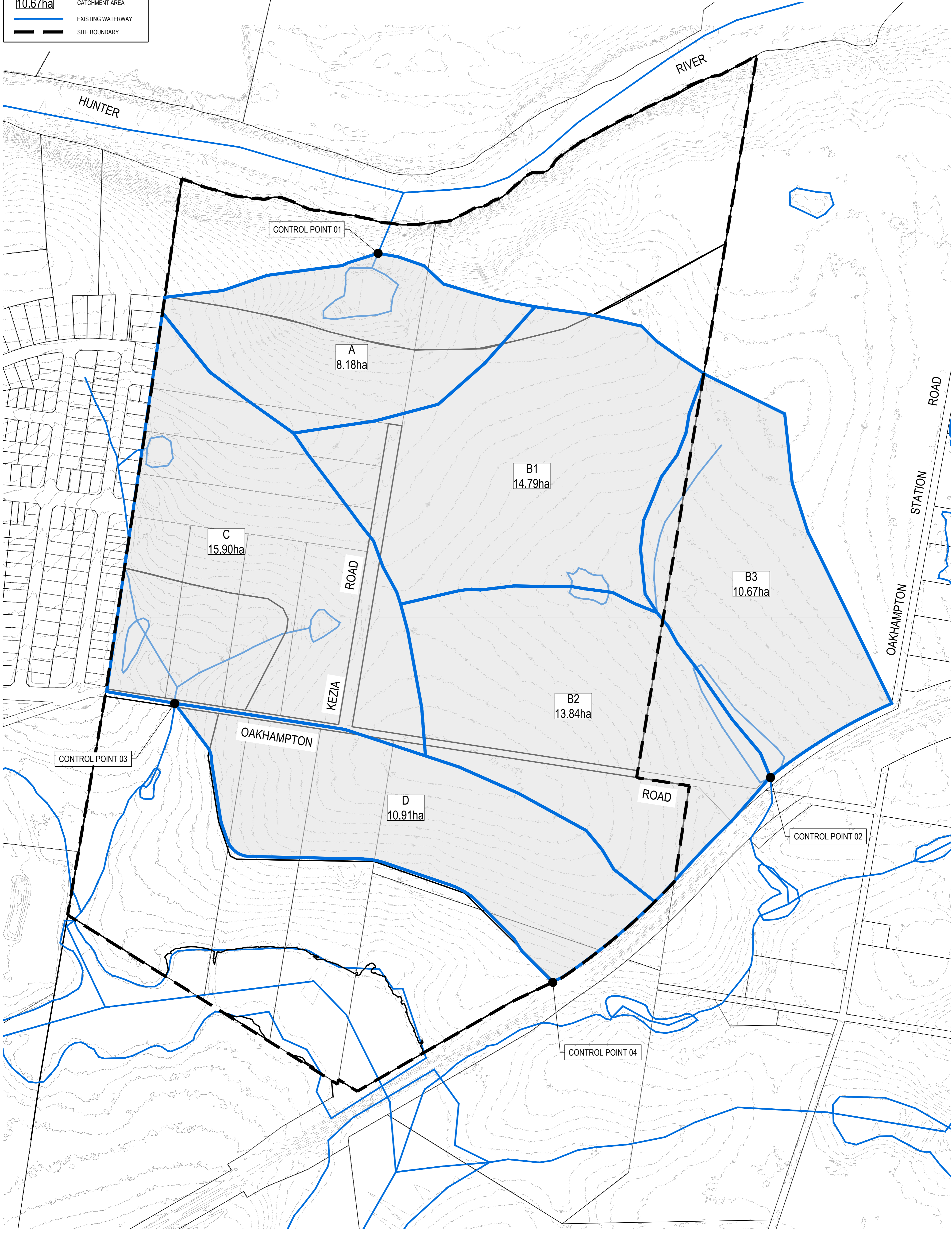
LEGEND

- EXISTING CATCHMENT BOUNDARY
- B3**
10.67ha CATCHMENT NAME
CATCHMENT AREA
- EXISTING WATERWAY
- SITE BOUNDARY



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1	15/06/2022	ISSUE FOR INFORMATION	EZ	MTL	MTL	

Client

Project
42 KEZIA ROAD, OAKHAMPTON

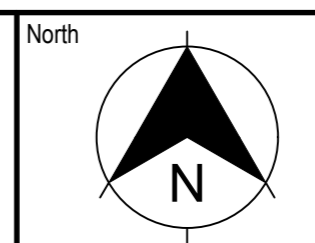
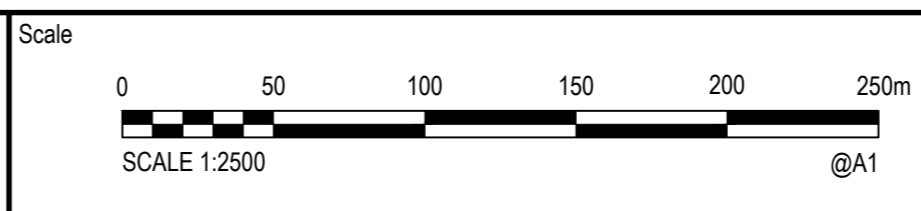
Stormwater Management Strategy

Title
EXISTING CATCHMENTS

Scale 1:2500	Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION
Date 15/06/2022	Project Number/Drawing Number 210129-01-SK-0001
Size A1	Revision 1
Datum MGA56	

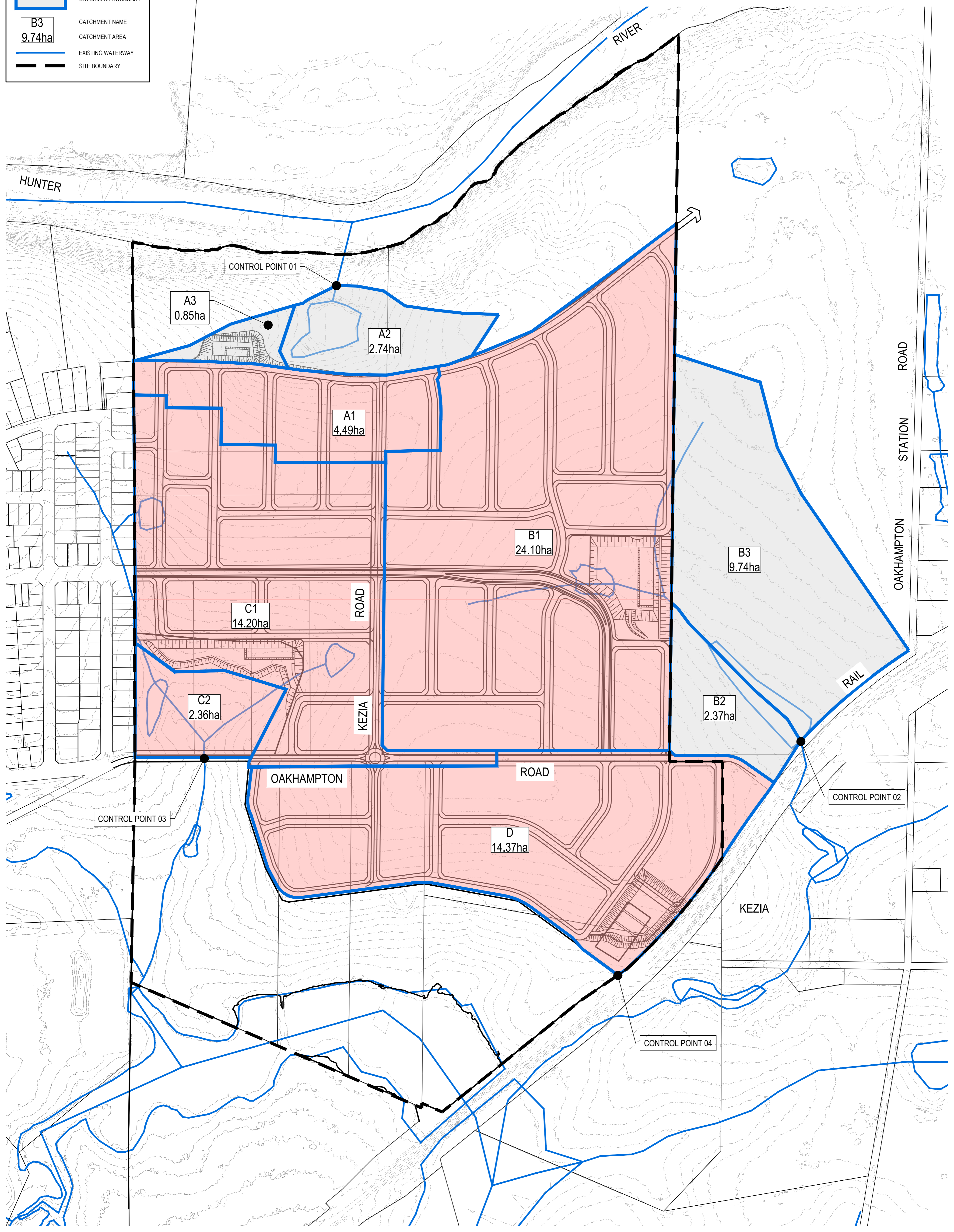
LEGEND

- PROPOSED CATCHMENT BOUNDARY
- PREDEVELOPMENT CATCHMENT BOUNDARY
- B3
9.74ha CATCHMENT NAME
CATCHMENT AREA
- EXISTING WATERWAY
- SITE BOUNDARY



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REV	DATE	DESCRIPTION	EZ	MTL	MTL
			DRN.	DES.	VERIF. APPD.
1	15/06/2022	ISSUE FOR INFORMATION			

Client

Project
42 KEZIA ROAD, OAKHAMPTON

Stormwater Management Strategy

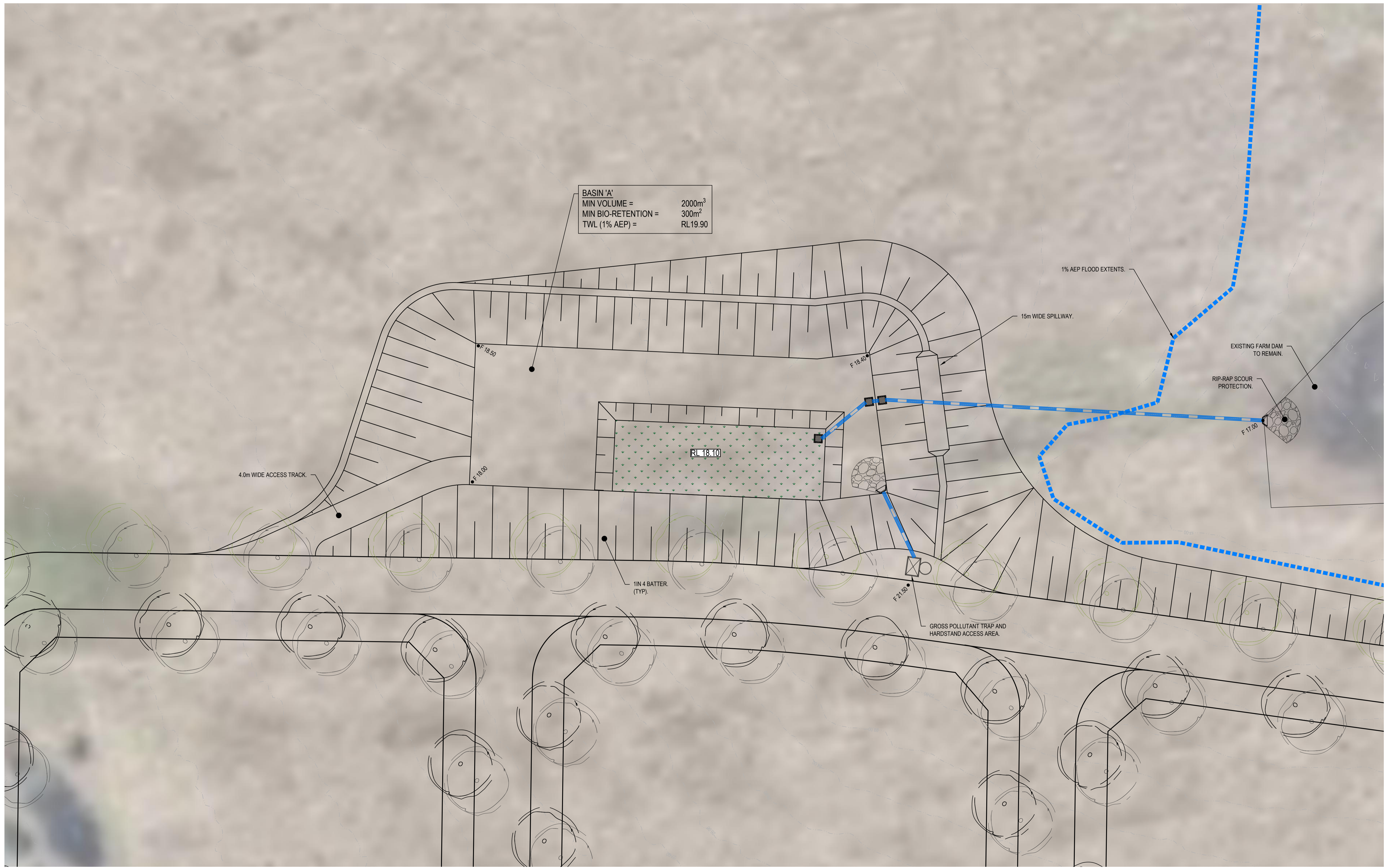
Title
PROPOSED CATCHMENTS

Scale 1:2500	Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION
Date 15/06/2022	Project Number/Drawing Number 210129-01-SK-0002
Size A1	Revision 1
Datum MGA56	



Appendix B Concept Plans





BASIN 'A'
 MIN VOLUME = 2000m³
 MIN BIO-RETENTION = 300m²
 TWL (1% AEP) = RL19.90

4.0m WIDE ACCESS TRACK.

1% AEP FLOOD EXTENTS.

15m WIDE SPILLWAY.

EXISTING FARM DAM TO REMAIN.

RIP-RAP SCOUR PROTECTION.

RL 18.10

1 IN 4 BATTER (TYP).

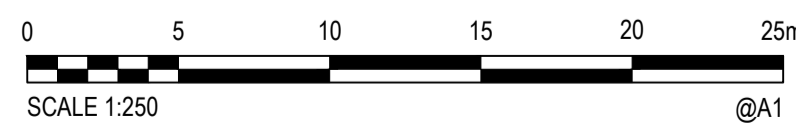
GROSS POLLUTANT TRAP AND HARDSTAND ACCESS AREA.

REV.	DATE	DESCRIPTION	CB	MTL	MTL
1	14/06/2022	ISSUED FOR INFORMATION	CB	MTL	MTL
			DRN	DES.	VERIF./APPD.

Client



Scale



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North




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Project
 42 KENZIA ROAD, OAKHAMPTON

CIVIL ENGINEERING WORKS

Title
 CONCEPT BASIN PLAN
 BASIN 'A'

Scale
 1:250

Date
 14/06/2022

Size
 A1

Datum
 MGA???

Status
FOR INFORMATION ONLY
 NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number
 210129-SK-0006

Revision
 1

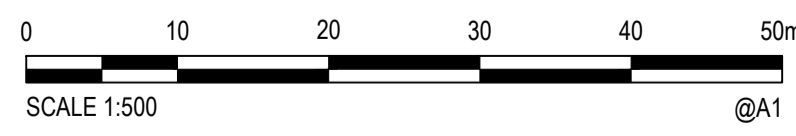


REV.	DATE	DESCRIPTION	CB	MTL	MTL
1	14/06/2022	ISSUED FOR INFORMATION			
			DRN	DES.	VERIF./APPD.

Client



Scale



SCALE 1:500 @A1

North



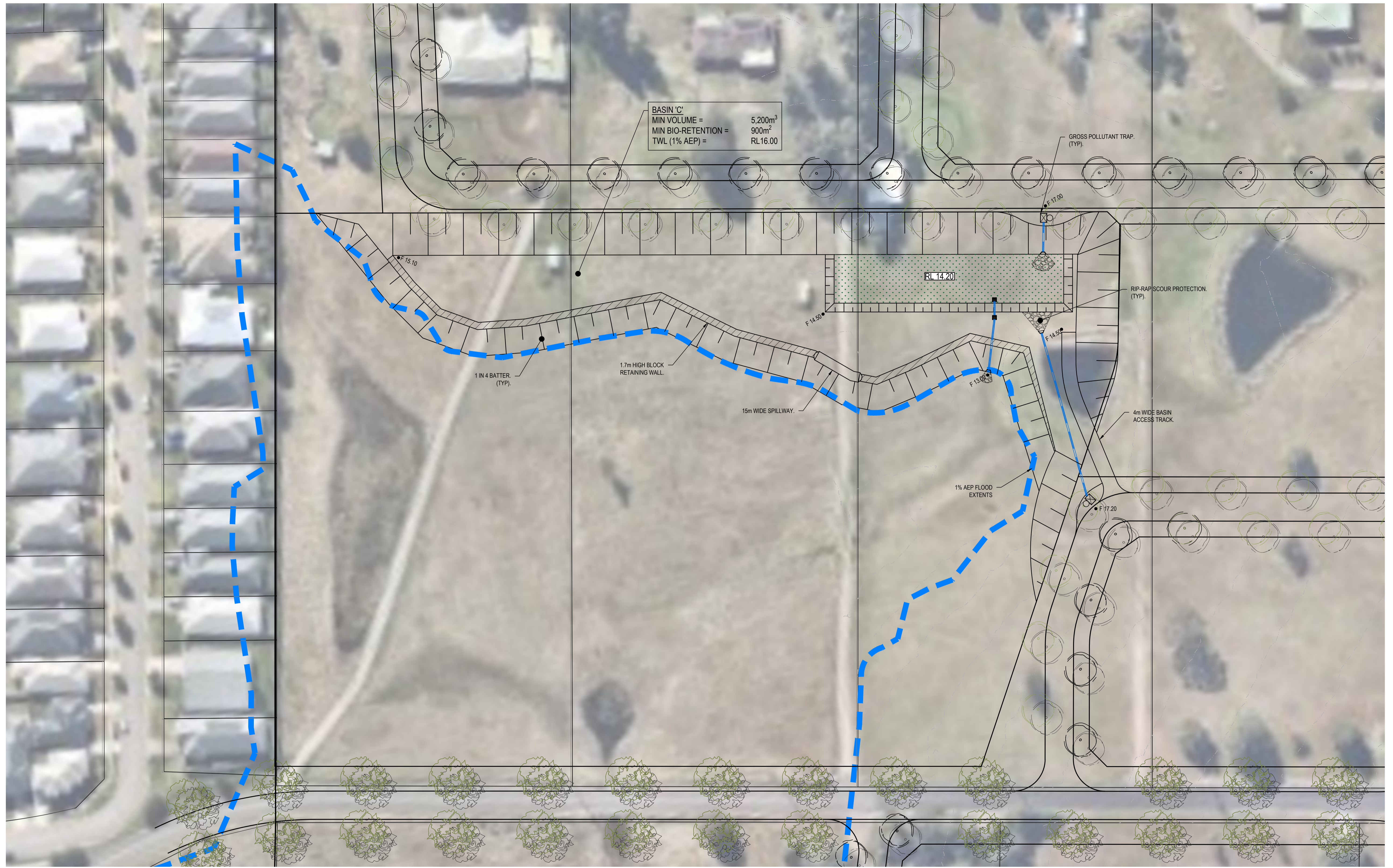

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CIVIL ENGINEERING WORKS

Title
CONCEPT BASIN PLAN
BASIN 'B'

Scale 1:500	Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION
Date 14/06/2022	Project Number/Drawing Number 210129-SK-0007
Size A1	Revision 1
Datum MGA???	



REV.	DATE	DESCRIPTION	CB	MTL	MTL
			DRN	DES.	VERIF. / APPD.
1	14/06/2022	ISSUED FOR INFORMATION			

Client

Scale

North

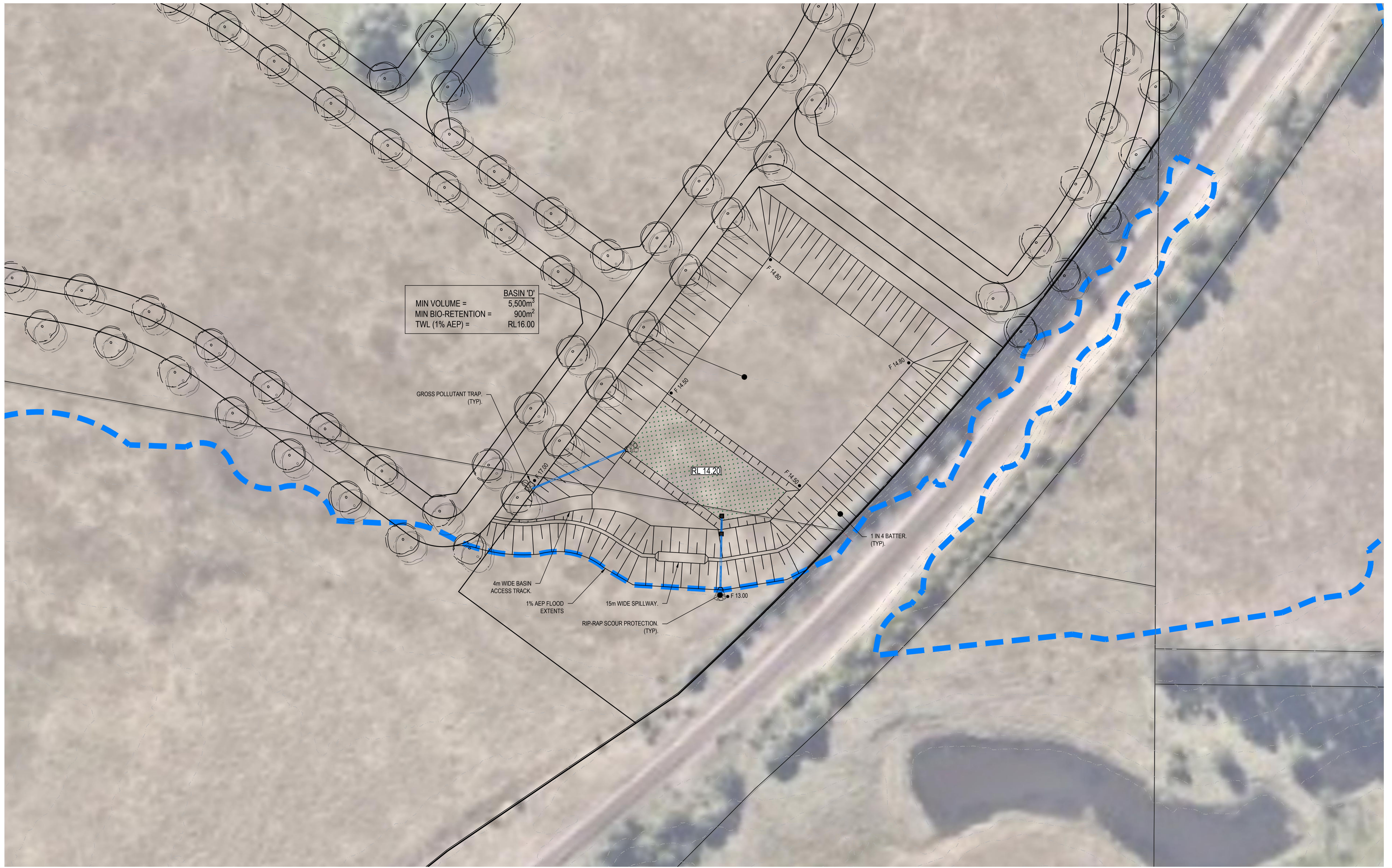
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Project
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CIVIL ENGINEERING WORKS

Title
 CONCEPT BASIN PLAN
 BASIN 'C'

Scale 1:500	Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION
Date 14/06/2022	Project Number/Drawing Number 210129-SK-0008
Size A1	Revision 1
Datum MGA???	



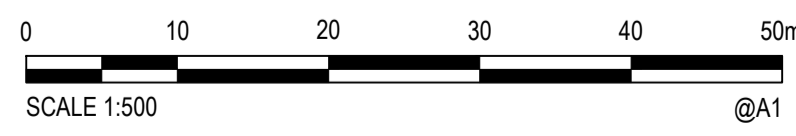
	BASIN 'D'
MIN VOLUME =	5,500m ³
MIN BIO-RETENTION =	900m ²
TWL (1% AEP) =	RL 16.00

REV.	DATE	DESCRIPTION	CB	MTL	MTL
			DRN	DES.	VERIF.
1	14/06/2022	ISSUED FOR INFORMATION			

Client



Scale



SCALE 1:500 @A1

North




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Project
42 KENZIA ROAD, OAKHAMPTON

CIVIL ENGINEERING WORKS

Title
CONCEPT BASIN PLAN
BASIN 'D'

Scale 1:500	Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION
Date 14/06/2022	Project Number/Drawing Number 210129-SK-0009
Size A1	Revision 1
Datum MGA???	



Appendix C Opinion of Probable Costs

Item: Oakhampton Planning Proposal Basin A
Revision: 1
Completed: M.Lester
Checked:
Notes:



Item No.	Description of Work	Quantity	Unit	Unit Cost	Cost
1	Preliminaries				
1.1	Establishment				
1.1.1	Site establishment, incl amenities, plant on site, construction, maintenance and dust control of access tracks etc	1	item	\$ 50,000.00	\$ 50,000.00
1.1.2	Traffic Management incl preparation of S. 138 certificate and gaining approval thereto	0	item	\$ 10,000.00	\$ -
1.1.3	Geotechnical - Earthworks	4200	sqm	\$ 0.25	\$ 1,050.00
1.1.4	Supply, erect and maintain "ATF" type temporary construction fencing and remove from site at completion of works. (must be stockproof)	270	L.m	\$ 30.00	\$ 8,100.00
1.1.5	Relocate existing "ATF" type temporary construction fencing	0	L.m	\$ 30.00	\$ -
1.1.6	Supply, erect and maintain "ATF" type double gates and remove from site at completion of works	1	each	\$ 2,000.00	\$ 2,000.00
1.1.7	Survey and setout of works	4200	sqm	\$ 0.50	\$ 2,100.00
1.1.8	Implement OH&S Plan, Safety Management Plan, Environmental Management Plan, Quality Management Plan	1	item	\$ 16,000.00	\$ 16,000.00
Preliminaries Subtotal					\$ 79,250.00
2	Earthworks				
2.1	Bulk Earthworks				
2.1.1	Topsoil Stripping to Stockpile	4200	sqm	\$ 0.60	\$ 2,520.00
2.1.2	Topsoil Stockpile to Placement	0	sqm	\$ 0.50	\$ -
2.1.3	Cut to Fill and compact	4200	cum	\$ 4.95	\$ 20,790.00
2.1.4	Import Fill, place and compact	0	cum	\$ 6.00	\$ -
2.1.5	Cut to Stockpile	0	cum	\$ 4.95	\$ -
2.1.6	Clay core	1	each	\$ 50,000.00	\$ 50,000.00
Earthworks Subtotal					\$ 73,310.00
3	Erosion and Sediment Control				
3.1	Erosion and Sediment Control Measures				
3.1.1	Dewater and desilt existing dam/basin	1	each	\$ 25,000.00	\$ 25,000.00
3.1.2	Temporary Sediment Basin Construction	1	each	\$ 25,000.00	\$ 25,000.00
3.1.3	Temporary Sediment Basin Maintenance	1	each	\$ 5,000.00	\$ 5,000.00
3.1.4	Sediment Fence	150	L.m	\$ 11.72	\$ 1,758.00
3.1.5	Stabilised construction entry/exit	1	each	\$ 4,850.00	\$ 4,850.00
3.1.6	Supply and place 1m wide turf strip at back of kerb	0	L.m	\$ 5.00	\$ -
3.1.7	Straw bale bund as per detail	0	item	\$ 58.49	\$ -
3.1.8	Interim Hydroseeding	0	sqm	\$ 0.20	\$ -
3.1.9	Interim Diversion channel	50	L.m	\$ 6.66	\$ 333.00
3.1.10	Level Spreader	1	each	\$ 100.00	\$ 100.00
3.1.11	Sediment Trap (at pits)	0	each	\$ 40.17	\$ -
3.1.12	Sand Bags (at lintels)	0	each	\$ 40.17	\$ -
Erosion and Sediment Control Subtotal					\$ 62,041.00
4	Stormwater Drainage				
4.1	Excavate, supply, bed, lay, joint and backfill RCP with RRJ:				
4.1.1	100mm dia uPVC	0	L.m	\$ 40.00	\$ -
4.1.2	150mm dia uPVC	0	L.m	\$ 45.52	\$ -
4.1.3	225mm dia uPVC	0	L.m	\$ 63.08	\$ -
4.1.4	300mm dia uPVC	0	L.m	\$ 82.50	\$ -
4.1.5	375mm dia RCP CLASS 2	15	L.m	\$ 207.48	\$ 3,112.20
4.1.6	450mm dia RCP CLASS 2	0	L.m	\$ 237.77	\$ -
4.1.7	525mm dia RCP CLASS 2	0	L.m	\$ 257.53	\$ -
4.1.8	600mm dia RCP CLASS 2	0	L.m	\$ 305.48	\$ -
4.1.9	675mm dia RCP CLASS 2	0	L.m	\$ 357.31	\$ -
4.1.10	750mm dia RCP CLASS 2	0	L.m	\$ 380.23	\$ -
4.1.11	825mm dia RCP CLASS 2	0	L.m	\$ 525.57	\$ -

4.1.12	900mm dia RCP CLASS 2	25	L.m	\$ 553.61	\$ 13,840.25
4.1.13	1050mm dia RCP CLASS 2	0	L.m	\$ 612.80	\$ -
4.1.14	1200mm dia RCP CLASS 2	15	L.m	\$ 689.01	\$ 10,335.15
4.1.15	1350mm dia RCP CLASS 2	0	L.m	\$ 750.00	\$ -
4.1.16	1500mm dia RCP CLASS 2	0	L.m	\$ 1,280.00	\$ -
4.1.23	CCTV Inspections	55	L.m	\$ 3.58	\$ 196.90
4.1.24	Drainage Channel	0	L.m	\$ 17.58	\$ -
4.2	Excavate for and construct drainage structures, including backfill, covers and grates and all necessary connections:				
4.2.1	Up to 900x900mm Chamber and <2000mm deep				
4.2.2	450 x 450 CLASS B FLUSH GRATE AND FRAME	0	each	\$ -	\$ -
4.2.3	600 x 600 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,156.69	\$ -
4.2.4	600 x 900 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,420.64	\$ -
4.2.5	900 x 900 CLASS B FLUSH GRATE AND FRAME	3	each	\$ 1,918.11	\$ 5,754.33
4.2.6	1200 x 1200 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 2,420.25	\$ -
4.2.7	1500 x 1500 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 4,439.37	\$ -
4.3	Special Pits - As per Pit Details				
4.3.1	Outlet Structure	0	each	\$ 150,000.00	\$ -
4.4	Pollutant Traps				
4.4.1	CDS 3000 series	1	each	\$ 110,000.00	\$ 110,000.00
4.5	Headwalls				
4.5.1	Concrete Headwall	1	each	\$ 2,500.00	\$ 2,500.00
4.5.2	Stacked Rock Headwall	1	each	\$ 1,500.00	\$ 1,500.00
4.6	RipRap and Scour Protection				
4.6.1	Riprap	100	sqm	\$ 130.00	\$ 13,000.00
Stormwater Drainage Subtotal					\$ 160,238.83
5	Detention and Water Quality Basins				
5.1	Filter Media				
5.1.1	Filter Media, incl. 100dia slotted PVC subsoil, flushing points, drainage layer and HDPE liner.	300	sqm	\$ 350.00	\$ 105,000.00
5.1.2	Spillway 15m wide with jute mesh scour protection.	100	sqm	\$ 80.00	\$ 8,000.00
Detention and Water Quality Basins Subtotal					\$ 113,000.00
6	Subsoil Drainage				
6.1	Excavate, supply, lay and backfill subsoil drain and all necessary connections				
6.1.1	100 dia. Slotted PVC pipe with filter sock.	0	L.m	\$ 42.00	\$ -
6.1.2	Concrete surround flushing point @ 50m spacing	0	each	\$ 56.70	\$ -
Subsoil Drainage Subtotal					\$ -
7	Pavements				
7.1	Road Pavements				
7.1.1	Pavement Type 1 - Concrete Maintenance Track and Maintenance Hardstand				
7.1.2	180mm concrete with SL82 mesh top and bottom	130	sqm	\$ 200.00	\$ 26,000.00
7.1.3	100mm DGB20	130	sqm	\$ 20.00	\$ 2,600.00
7.2	Minor Concrete				
7.2.1	150mm kerb & gutter (KG)	0	L.m	\$ 67.33	\$ -
7.2.2	Roll Kerb & Gutter (RK&G)	0	L.m	\$ 64.37	\$ -
7.2.3	Kerb Only (KO)	0	L.m	\$ 40.00	\$ -
7.2.4	Elsholz Kerb (ES)	0	L.m	\$ 367.50	\$ -
7.2.5	Mountable Kerb (MK)	0	L.m	\$ 66.00	\$ -
7.2.6	Median Kerb (MDK)	0	L.m	\$ 40.00	\$ -
7.2.7	Concrete Dish Drain (DD)	0	L.m	\$ 140.00	\$ -
7.2.8	Splitter Island infill	0	sqm	\$ 150.00	\$ -
7.2.9	Vehicular crossing	30	L.m	\$ 134.31	\$ 4,029.30
Pavements Subtotal					\$ 32,629.30
8	Roadworks Ancillaries				
8.1	Supply and install:				
8.1.1	Kerb Outlets	0	each	\$ 31.78	\$ -
8.1.2	1.5m Concrete Footpath	0	sqm	\$ 72.19	\$ -

8.1.3	2.5m Shared Cycleway including transitions and jointing	0	sqm	\$ 96.93	\$ -
8.1.4	1.5m Pram Ramps	0	each	\$ 180.00	\$ -
8.1.5	2.5m Pram Ramps	0	each	\$ 300.00	\$ -
Roadworks Ancillaries Subtotal					\$ -
9	Signage, Linemarking and barriers				
9.1	Signage Allowance				
9.1.1	Signage Allowance - Basin Warning Signage	3	each	\$ 200.00	\$ 600.00
9.2	Linemarking Allowance				
9.2.1	Linemarking Allowance	0	item	\$ 50,000.00	\$ -
9.3	Supply and install temporary barriers				
9.3.1	Concrete jersey barrier (12 mth hire)	0	each	\$ 905.63	\$ -
Signage, Linemarking and barriers Subtotal					\$ 600.00
10	Retaining Walls				
10.1	Retaining Walls				
10.1.2	Masonry Retaining Wall	0	sqm	\$ 610.00	\$ -
10.1.3	Stacked Rock Wall	0	sqm	\$ 500.00	\$ -
Retaining Walls Subtotal					\$ -
11	Maintenance				
11.1	No Allowances Made				
11.1.1	No Allowances Made	0	sqm	\$ -	\$ -
Maintenance Subtotal					\$ -

BASIN A Subtotal	\$ 521,069.13
Contingency (10%)	\$ 52,106.91
Professional Fees (8%)	\$ 41,685.53
Authority Fees (2.5%)	\$ 13,026.73
BASIN A Total	\$ 627,888.30

Item: **Oakhampton Planning Proposal Basin B**
 Revision: **1**
 Completed: **M.Lester**
 Checked:
 Notes:



Item No.	Description of Work	Quantity	Unit	Unit Cost	Cost
1	Preliminaries				
1.1	Establishment				
1.1.1	Site establishment, incl amenities, plant on site, construction, maintenance and dust control of access tracks etc	1	item	\$ 100,000.00	\$ 100,000.00
1.1.2	Traffic Management incl preparation of S. 138 certificate and gaining approval thereto	0	item	\$ 10,000.00	\$ -
1.1.3	Geotechnical - Earthworks	14500	sqm	\$ 0.25	\$ 3,625.00
1.1.4	Supply, erect and maintain "ATF" type temporary construction fencing and remove from site at completion of works. (must be stockproof)	450	L.m	\$ 30.00	\$ 13,500.00
1.1.5	Relocate existing "ATF" type temporary construction fencing	0	L.m	\$ 30.00	\$ -
1.1.6	Supply, erect and maintain "ATF" type double gates and remove from site at completion of works	1	each	\$ 2,000.00	\$ 2,000.00
1.1.7	Survey and setout of works	14500	sqm	\$ 0.50	\$ 7,250.00
1.1.8	Implement OH&S Plan, Safety Management Plan, Environmental Management Plan, Quality Management Plan	1	item	\$ 16,000.00	\$ 16,000.00
Preliminaries Subtotal					\$ 142,375.00
2	Earthworks				
2.1	Bulk Earthworks				\$ -
2.1.1	Topsoil Stripping to Stockpile	14500	sqm	\$ 0.60	\$ 8,700.00
2.1.2	Topsoil Stockpile to Placement	0	sqm	\$ 0.50	\$ -
2.1.3	Cut to Fill and compact	14500	cum	\$ 4.95	\$ 71,775.00
2.1.4	Import Fill, place and compact	0	cum	\$ 6.00	\$ -
2.1.5	Cut to Stockpile	0	cum	\$ 4.95	\$ -
2.1.6	Clay core	1	each	\$ 100,000.00	\$ 100,000.00
Earthworks Subtotal					\$ 180,475.00
3	Erosion and Sediment Control				
3.1	Erosion and Sediment Control Measures				
3.1.1	Dewater and desilt existing dam/basin	1	each	\$ 25,000.00	\$ 25,000.00
3.1.2	Temporary Sediment Basin Construction	1	each	\$ 25,000.00	\$ 25,000.00
3.1.3	Temporary Sediment Basin Maintenance	1	each	\$ 5,000.00	\$ 5,000.00
3.1.4	Sediment Fence	150	L.m	\$ 11.72	\$ 1,758.00
3.1.5	Stabilised construction entry/exit	2	each	\$ 4,850.00	\$ 9,700.00
3.1.6	Supply and place 1m wide turf strip at back of kerb	0	L.m	\$ 5.00	\$ -
3.1.7	Straw bale bund as per detail	0	item	\$ 58.49	\$ -
3.1.8	Interim Hydroseeding	0	sqm	\$ 0.20	\$ -
3.1.9	Interim Diversion channel	400	L.m	\$ 6.66	\$ 2,664.00
3.1.10	Level Spreader	0	each	\$ 100.00	\$ -
3.1.11	Sediment Trap (at pits)	0	each	\$ 40.17	\$ -
3.1.12	Sand Bags (at lintels)	0	each	\$ 40.17	\$ -
Erosion and Sediment Control Subtotal					\$ 69,122.00
4	Stormwater Drainage				
4.1	Excavate, supply, bed, lay, joint and backfill RCP with RRJ:				
4.1.1	100mm dia uPVC	0	L.m	\$ 40.00	\$ -
4.1.2	150mm dia uPVC	0	L.m	\$ 45.52	\$ -
4.1.3	225mm dia uPVC	0	L.m	\$ 63.08	\$ -
4.1.4	300mm dia uPVC	0	L.m	\$ 82.50	\$ -
4.1.5	375mm dia RCP CLASS 2	15	L.m	\$ 207.48	\$ 3,112.20
4.1.6	450mm dia RCP CLASS 2	0	L.m	\$ 237.77	\$ -
4.1.7	525mm dia RCP CLASS 2	0	L.m	\$ 257.53	\$ -
4.1.8	600mm dia RCP CLASS 2	0	L.m	\$ 305.48	\$ -
4.1.9	675mm dia RCP CLASS 2	0	L.m	\$ 357.31	\$ -

4.1.10	750mm dia RCP CLASS 2	0	L.m	\$ 380.23	\$ -
4.1.11	825mm dia RCP CLASS 2	0	L.m	\$ 525.57	\$ -
4.1.12	900mm dia RCP CLASS 2	40	L.m	\$ 553.61	\$ 22,144.40
4.1.13	1050mm dia RCP CLASS 2	0	L.m	\$ 612.80	\$ -
4.1.14	1200mm dia RCP CLASS 2	65	L.m	\$ 689.01	\$ 44,785.65
4.1.15	1350mm dia RCP CLASS 2	0	L.m	\$ 750.00	\$ -
4.1.16	1500mm dia RCP CLASS 2	0	L.m	\$ 1,280.00	\$ -
4.1.23	CCTV Inspections	120	L.m	\$ 3.58	\$ 429.60
4.1.24	Drainage Channel	0	L.m	\$ 17.58	\$ -
4.2	Excavate for and construct drainage structures, including backfill, covers and grates and all necessary connections:				
4.2.1	Up to 900x900mm Chamber and <2000mm deep				
4.2.2	450 x 450 CLASS B FLUSH GRATE AND FRAME	0	each	\$ -	\$ -
4.2.3	600 x 600 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,156.69	\$ -
4.2.4	600 x 900 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,420.64	\$ -
4.2.5	900 x 900 CLASS B FLUSH GRATE AND FRAME	2	each	\$ 1,918.11	\$ 3,836.22
4.2.6	1200 x 1200 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 2,420.25	\$ -
4.2.7	1500 x 1500 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 4,439.37	\$ -
4.3	Special Pits - As per Pit Details				
4.3.1	Outlet Structure	0	each	\$ 150,000.00	\$ -
4.4	Pollutant Traps				
4.4.1	CDS 3000 series	2	each	\$ 110,000.00	\$ 220,000.00
4.5	Headwalls				
4.5.1	Concrete Headwall	2	each	\$ 2,500.00	\$ 5,000.00
4.5.2	Stacked Rock Headwall	1	each	\$ 1,500.00	\$ 1,500.00
4.6	RipRap and Scour Protection				
4.6.1	Riprap	200	sqm	\$ 130.00	\$ 26,000.00
Stormwater Drainage Subtotal					\$ 326,808.07
5	Detention and Water Quality Basins				
5.1	Filter Media				
5.1.1	Filter Media, incl. 100dia slotted PVC subsoil, flushing points, drainage layer and HDPE liner.	1600	sqm	\$ 350.00	\$ 560,000.00
5.1.2	Spillway 15m wide with jute mesh scour protection.	100	sqm	\$ 80.00	\$ 8,000.00
Detention and Water Quality Basins Subtotal					\$ 568,000.00
6	Subsoil Drainage				
6.1	Excavate, supply, lay and backfill subsoil drain and all necessary connections				
6.1.1	100 dia. Slotted PVC pipe with filter sock.	0	L.m	\$ 42.00	\$ -
6.1.2	Concrete surround flushing point @ 50m spacing	0	each	\$ 56.70	\$ -
Subsoil Drainage Subtotal					\$ -
7	Pavements				
7.1	Road Pavements				
7.1.1	Pavement Type 1 - Concrete Maintenance Track and Maintenance Hardstand				
7.1.2	180mm concrete with SL82 mesh top and bottom	500	sqm	\$ 200.00	\$ 100,000.00
7.1.3	100mm DGB20	500	sqm	\$ 20.00	\$ 10,000.00
7.2	Minor Concrete				
7.2.1	150mm kerb & gutter (KG)	0	L.m	\$ 67.33	\$ -
7.2.2	Roll Kerb & Gutter (RK&G)	0	L.m	\$ 64.37	\$ -
7.2.3	Kerb Only (KO)	0	L.m	\$ 40.00	\$ -
7.2.4	Elsholz Kerb (ES)	0	L.m	\$ 367.50	\$ -
7.2.5	Mountable Kerb (MK)	0	L.m	\$ 66.00	\$ -
7.2.6	Median Kerb (MDK)	0	L.m	\$ 40.00	\$ -
7.2.7	Concrete Dish Drain (DD)	0	L.m	\$ 140.00	\$ -
7.2.8	Splitter Island infill	0	sqm	\$ 150.00	\$ -
7.2.9	Vehicular crossing	60	L.m	\$ 134.31	\$ 8,058.60
Pavements Subtotal					\$ 118,058.60
8	Roadworks Ancillaries				

8.1	Supply and install:					
8.1.1	Kerb Outlets	0	each	\$ 31.78	\$ -	
8.1.2	1.5m Concrete Footpath	0	sqm	\$ 72.19	\$ -	
8.1.3	2.5m Shared Cycleway including transitions and jointing	0	sqm	\$ 96.93	\$ -	
8.1.4	1.5m Pram Ramps	0	each	\$ 180.00	\$ -	
8.1.5	2.5m Pram Ramps	0	each	\$ 300.00	\$ -	
Roadworks Ancillaries Subtotal					\$ -	
9	Signage, Linemarking and barriers					
9.1	Signage Allowance					
9.1.1	Signage Allowance - Basin Warning Signage	10	each	\$ 200.00	\$ 2,000.00	
9.2	Linemarking Allowance					
9.2.1	Linemarking Allowance	0	item	\$ 50,000.00	\$ -	
9.3	Supply and install temporary barriers					
9.3.1	Concrete jersey barrier (12 mth hire)	0	each	\$ 905.63	\$ -	
Signage, Linemarking and barriers Subtotal					\$ 2,000.00	
10	Retaining Walls					
10.1	Retaining Walls					
10.1.2	Masonry Retaining Wall	0	sqm	\$ 610.00	\$ -	
10.1.3	Stacked Rock Wall	0	sqm	\$ 500.00	\$ -	
Retaining Walls Subtotal					\$ -	
11	Maintenance					
11.1	No Allowances Made					
11.1.1	No Allowances Made	0	sqm	\$ -	\$ -	
Maintenance Subtotal					\$ -	

BASIN B Subtotal	\$ 1,406,838.67
Contingency (10%)	\$ 140,683.87
Professional Fees (8%)	\$ 112,547.09
Authority Fees (2.5%)	\$ 35,170.97
BASIN B Total	\$ 1,695,240.60

Item: Oakhampton Planning Proposal Basin C
 Revision: 1
 Completed: M.Lester
 Checked:
 Notes:



Item No.	Description of Work	Quantity	Unit	Unit Cost	Cost
1	Preliminaries				
1.1	Establishment				
1.1.1	Site establishment, incl amenities, plant on site, construction, maintenance and dust control of access tracks etc	1	item	\$ 100,000.00	\$ 100,000.00
1.1.2	Traffic Management incl preparation of S. 138 certificate and gaining approval thereto	0	item	\$ 10,000.00	\$ -
1.1.3	Geotechnical - Earthworks	10000	sqm	\$ 0.25	\$ 2,500.00
1.1.4	Supply, erect and maintain "ATF" type temporary construction fencing and remove from site at completion of works. (must be stockproof)	560	L.m	\$ 30.00	\$ 16,800.00
1.1.5	Relocate existing "ATF" type temporary construction fencing	0	L.m	\$ 30.00	\$ -
1.1.6	Supply, erect and maintain "ATF" type double gates and remove from site at completion of works	1	each	\$ 2,000.00	\$ 2,000.00
1.1.7	Survey and setout of works	10000	sqm	\$ 0.50	\$ 5,000.00
1.1.8	Implement OH&S Plan, Safety Management Plan, Environmental Management Plan, Quality Management Plan	1	item	\$ 16,000.00	\$ 16,000.00
Preliminaries Subtotal					\$ 142,300.00
2	Earthworks				
2.1	Bulk Earthworks				\$ -
2.1.1	Topsoil Stripping to Stockpile	10000	sqm	\$ 0.60	\$ 6,000.00
2.1.2	Topsoil Stockpile to Placement	0	sqm	\$ 0.50	\$ -
2.1.3	Cut to Fill and compact	10000	cum	\$ 4.95	\$ 49,500.00
2.1.4	Import Fill, place and compact	0	cum	\$ 6.00	\$ -
2.1.5	Cut to Stockpile	0	cum	\$ 4.95	\$ -
2.1.6	Clay core	1	each	\$ 100,000.00	\$ 100,000.00
Earthworks Subtotal					\$ 155,500.00
3	Erosion and Sediment Control				
3.1	Erosion and Sediment Control Measures				
3.1.1	Dewater and desilt existing dam/basin	1	each	\$ 25,000.00	\$ 25,000.00
3.1.2	Temporary Sediment Basin Construction	1	each	\$ 25,000.00	\$ 25,000.00
3.1.3	Temporary Sediment Basin Maintenance	1	each	\$ 5,000.00	\$ 5,000.00
3.1.4	Sediment Fence	300	L.m	\$ 11.72	\$ 3,516.00
3.1.5	Stabilised construction entry/exit	2	each	\$ 4,850.00	\$ 9,700.00
3.1.6	Supply and place 1m wide turf strip at back of kerb	0	L.m	\$ 5.00	\$ -
3.1.7	Straw bale bund as per detail	0	item	\$ 58.49	\$ -
3.1.8	Interim Hydroseeding	0	sqm	\$ 0.20	\$ -
3.1.9	Interim Diversion channel	300	L.m	\$ 6.66	\$ 1,998.00
3.1.10	Level Spreader	0	each	\$ 100.00	\$ -
3.1.11	Sediment Trap (at pits)	0	each	\$ 40.17	\$ -
3.1.12	Sand Bags (at lintels)	0	each	\$ 40.17	\$ -
Erosion and Sediment Control Subtotal					\$ 70,214.00
4	Stormwater Drainage				
4.1	Excavate, supply, bed, lay, joint and backfill RCP with RRJ:				
4.1.1	100mm dia uPVC	0	L.m	\$ 40.00	\$ -
4.1.2	150mm dia uPVC	0	L.m	\$ 45.52	\$ -
4.1.3	225mm dia uPVC	0	L.m	\$ 63.08	\$ -
4.1.4	300mm dia uPVC	0	L.m	\$ 82.50	\$ -
4.1.5	375mm dia RCP CLASS 2	15	L.m	\$ 207.48	\$ 3,112.20
4.1.6	450mm dia RCP CLASS 2	0	L.m	\$ 237.77	\$ -
4.1.7	525mm dia RCP CLASS 2	0	L.m	\$ 257.53	\$ -
4.1.8	600mm dia RCP CLASS 2	0	L.m	\$ 305.48	\$ -
4.1.9	675mm dia RCP CLASS 2	0	L.m	\$ 357.31	\$ -

4.1.10	750mm dia RCP CLASS 2	0	L.m	\$ 380.23	\$ -
4.1.11	825mm dia RCP CLASS 2	0	L.m	\$ 525.57	\$ -
4.1.12	900mm dia RCP CLASS 2	45	L.m	\$ 553.61	\$ 24,912.45
4.1.13	1050mm dia RCP CLASS 2	0	L.m	\$ 612.80	\$ -
4.1.14	1200mm dia RCP CLASS 2	0	L.m	\$ 689.01	\$ -
4.1.15	1350mm dia RCP CLASS 2	20	L.m	\$ 750.00	\$ 15,000.00
4.1.16	1500mm dia RCP CLASS 2	0	L.m	\$ 1,280.00	\$ -
4.1.23	CCTV Inspections	120	L.m	\$ 3.58	\$ 429.60
4.1.24	Drainage Channel	0	L.m	\$ 17.58	\$ -
4.2	Excavate for and construct drainage structures, including backfill, covers and grates and all necessary connections:				
4.2.1	Up to 900x900mm Chamber and <2000mm deep				
4.2.2	450 x 450 CLASS B FLUSH GRATE AND FRAME	0	each	\$ -	\$ -
4.2.3	600 x 600 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,156.69	\$ -
4.2.4	600 x 900 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,420.64	\$ -
4.2.5	900 x 900 CLASS B FLUSH GRATE AND FRAME	2	each	\$ 1,918.11	\$ 3,836.22
4.2.6	1200 x 1200 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 2,420.25	\$ -
4.2.7	1500 x 1500 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 4,439.37	\$ -
4.3	Special Pits - As per Pit Details				
4.3.1	Outlet Structure	0	each	\$ 150,000.00	\$ -
4.4	Pollutant Traps				
4.4.1	CDS 3000 series	2	each	\$ 110,000.00	\$ 220,000.00
4.5	Headwalls				
4.5.1	Concrete Headwall	2	each	\$ 2,500.00	\$ 5,000.00
4.5.2	Stacked Rock Headwall	1	each	\$ 1,500.00	\$ 1,500.00
4.6	RipRap and Scour Protection				
4.6.1	Riprap	200	sqm	\$ 130.00	\$ 26,000.00
Stormwater Drainage Subtotal					\$ 299,790.47
5	Detention and Water Quality Basins				
5.1	Filter Media				
5.1.1	Filter Media, incl. 100dia slotted PVC subsoil, flushing points, drainage layer and HDPE liner.	900	sqm	\$ 350.00	\$ 315,000.00
5.1.2	Spillway 15m wide with jute mesh scour protection.	100	sqm	\$ 80.00	\$ 8,000.00
Detention and Water Quality Basins Subtotal					\$ 323,000.00
6	Subsoil Drainage				
6.1	Excavate, supply, lay and backfill subsoil drain and all necessary connections				
6.1.1	100 dia. Slotted PVC pipe with filter sock.	0	L.m	\$ 42.00	\$ -
6.1.2	Concrete surround flushing point @ 50m spacing	0	each	\$ 56.70	\$ -
Subsoil Drainage Subtotal					\$ -
7	Pavements				
7.1	Road Pavements				
7.1.1	Pavement Type 1 - Concrete Maintenance Track and Maintenance Hardstand				
7.1.2	180mm concrete with SL82 mesh top and bottom	350	sqm	\$ 200.00	\$ 70,000.00
7.1.3	100mm DGB20	350	sqm	\$ 20.00	\$ 7,000.00
7.2	Minor Concrete				
7.2.1	150mm kerb & gutter (KG)	0	L.m	\$ 67.33	\$ -
7.2.2	Roll Kerb & Gutter (RK&G)	0	L.m	\$ 64.37	\$ -
7.2.3	Kerb Only (KO)	0	L.m	\$ 40.00	\$ -
7.2.4	Elsholz Kerb (ES)	0	L.m	\$ 367.50	\$ -
7.2.5	Mountable Kerb (MK)	0	L.m	\$ 66.00	\$ -
7.2.6	Median Kerb (MDK)	0	L.m	\$ 40.00	\$ -
7.2.7	Concrete Dish Drain (DD)	0	L.m	\$ 140.00	\$ -
7.2.8	Splitter Island infill	0	sqm	\$ 150.00	\$ -
7.2.9	Vehicular crossing	60	L.m	\$ 134.31	\$ 8,058.60
Pavements Subtotal					\$ 85,058.60
8	Roadworks Ancillaries				

8.1	Supply and install:					
8.1.1	Kerb Outlets	0	each	\$ 31.78	\$ -	
8.1.2	1.5m Concrete Footpath	0	sqm	\$ 72.19	\$ -	
8.1.3	2.5m Shared Cycleway including transitions and jointing	0	sqm	\$ 96.93	\$ -	
8.1.4	1.5m Pram Ramps	0	each	\$ 180.00	\$ -	
8.1.5	2.5m Pram Ramps	0	each	\$ 300.00	\$ -	
Roadworks Ancillaries Subtotal					\$ -	
9	Signage, Linemarking and barriers					
9.1	Signage Allowance					
9.1.1	Signage Allowance - Basin Warning Signage	8	each	\$ 200.00	\$ 1,600.00	
9.2	Linemarking Allowance					
9.2.1	Linemarking Allowance	0	item	\$ 50,000.00	\$ -	
9.3	Supply and install temporary barriers					
9.3.1	Concrete jersey barrier (12 mth hire)	0	each	\$ 905.63	\$ -	
Signage, Linemarking and barriers Subtotal					\$ 1,600.00	
10	Retaining Walls					
10.1	Retaining Walls					
10.1.2	Masonry Retaining Wall	0	sqm	\$ 610.00	\$ -	
10.1.3	Stacked Rock Wall	400	sqm	\$ 500.00	\$ 200,000.00	
Retaining Walls Subtotal					\$ 200,000.00	
11	Maintenance					
11.1	No Allowances Made					
11.1.1	No Allowances Made	0	sqm	\$ -	\$ -	
Maintenance Subtotal					\$ -	

BASIN C Subtotal	\$ 1,277,463.07
Contingency (10%)	\$ 127,746.31
Professional Fees (8%)	\$ 102,197.05
Authority Fees (2.5%)	\$ 31,936.58
BASIN C Total	\$ 1,539,343.00

Item: Oakhampton Planning Proposal Basin D
 Revision: 1
 Completed: M.Lester
 Checked:
 Notes:



Item No.	Description of Work	Quantity	Unit	Unit Cost	Cost
1	Preliminaries				
1.1	Establishment				
1.1.1	Site establishment, incl amenities, plant on site, construction, maintenance and dust control of access tracks etc	1	item	\$ 100,000.00	\$ 100,000.00
1.1.2	Traffic Management incl preparation of S. 138 certificate and gaining approval thereto	0	item	\$ 10,000.00	\$ -
1.1.3	Geotechnical - Earthworks	8500	sqm	\$ 0.25	\$ 2,125.00
1.1.4	Supply, erect and maintain "ATF" type temporary construction fencing and remove from site at completion of works. (must be stockproof)	380	L.m	\$ 30.00	\$ 11,400.00
1.1.5	Relocate existing "ATF" type temporary construction fencing	0	L.m	\$ 30.00	\$ -
1.1.6	Supply, erect and maintain "ATF" type double gates and remove from site at completion of works	1	each	\$ 2,000.00	\$ 2,000.00
1.1.7	Survey and setout of works	8500	sqm	\$ 0.50	\$ 4,250.00
1.1.8	Implement OH&S Plan, Safety Management Plan, Environmental Management Plan, Quality Management Plan	1	item	\$ 16,000.00	\$ 16,000.00
Preliminaries Subtotal					\$ 135,775.00
2	Earthworks				
2.1	Bulk Earthworks				\$ -
2.1.1	Topsoil Stripping to Stockpile	8500	sqm	\$ 0.60	\$ 5,100.00
2.1.2	Topsoil Stockpile to Placement	0	sqm	\$ 0.50	\$ -
2.1.3	Cut to Fill and compact	8500	cum	\$ 4.95	\$ 42,075.00
2.1.4	Import Fill, place and compact	0	cum	\$ 6.00	\$ -
2.1.5	Cut to Stockpile	0	cum	\$ 4.95	\$ -
2.1.6	Clay core	1	each	\$ 100,000.00	\$ 100,000.00
Earthworks Subtotal					\$ 147,175.00
3	Erosion and Sediment Control				
3.1	Erosion and Sediment Control Measures				
3.1.1	Dewater and desilt existing dam/basin	0	each	\$ 25,000.00	\$ -
3.1.2	Temporary Sediment Basin Construction	1	each	\$ 25,000.00	\$ 25,000.00
3.1.3	Temporary Sediment Basin Maintenance	1	each	\$ 5,000.00	\$ 5,000.00
3.1.4	Sediment Fence	170	L.m	\$ 11.72	\$ 1,992.40
3.1.5	Stabilised construction entry/exit	1	each	\$ 4,850.00	\$ 4,850.00
3.1.6	Supply and place 1m wide turf strip at back of kerb	0	L.m	\$ 5.00	\$ -
3.1.7	Straw bale bund as per detail	0	item	\$ 58.49	\$ -
3.1.8	Interim Hydroseeding	0	sqm	\$ 0.20	\$ -
3.1.9	Interim Diversion channel	150	L.m	\$ 6.66	\$ 999.00
3.1.10	Level Spreader	0	each	\$ 100.00	\$ -
3.1.11	Sediment Trap (at pits)	0	each	\$ 40.17	\$ -
3.1.12	Sand Bags (at lintels)	0	each	\$ 40.17	\$ -
Erosion and Sediment Control Subtotal					\$ 37,841.40
4	Stormwater Drainage				
4.1	Excavate, supply, bed, lay, joint and backfill RCP with RRJ:				
4.1.1	100mm dia uPVC	0	L.m	\$ 40.00	\$ -
4.1.2	150mm dia uPVC	0	L.m	\$ 45.52	\$ -
4.1.3	225mm dia uPVC	0	L.m	\$ 63.08	\$ -
4.1.4	300mm dia uPVC	0	L.m	\$ 82.50	\$ -
4.1.5	375mm dia RCP CLASS 2	20	L.m	\$ 207.48	\$ 4,149.60
4.1.6	450mm dia RCP CLASS 2	0	L.m	\$ 237.77	\$ -
4.1.7	525mm dia RCP CLASS 2	0	L.m	\$ 257.53	\$ -
4.1.8	600mm dia RCP CLASS 2	0	L.m	\$ 305.48	\$ -
4.1.9	675mm dia RCP CLASS 2	0	L.m	\$ 357.31	\$ -

4.1.10	750mm dia RCP CLASS 2	0	L.m	\$ 380.23	\$ -
4.1.11	825mm dia RCP CLASS 2	0	L.m	\$ 525.57	\$ -
4.1.12	900mm dia RCP CLASS 2	20	L.m	\$ 553.61	\$ 11,072.20
4.1.13	1050mm dia RCP CLASS 2	0	L.m	\$ 612.80	\$ -
4.1.14	1200mm dia RCP CLASS 2	20	L.m	\$ 689.01	\$ 13,780.20
4.1.15	1350mm dia RCP CLASS 2	0	L.m	\$ 750.00	\$ -
4.1.16	1500mm dia RCP CLASS 2	0	L.m	\$ 1,280.00	\$ -
4.1.23	CCTV Inspections	60	L.m	\$ 3.58	\$ 214.80
4.1.24	Drainage Channel	0	L.m	\$ 17.58	\$ -
4.2	Excavate for and construct drainage structures, including backfill, covers and grates and all necessary connections:				
4.2.1	Up to 900x900mm Chamber and <2000mm deep				
4.2.2	450 x 450 CLASS B FLUSH GRATE AND FRAME	0	each	\$ -	\$ -
4.2.3	600 x 600 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,156.69	\$ -
4.2.4	600 x 900 CLASS B FLUSH GRATE AND FRAME	0	each	\$ 1,420.64	\$ -
4.2.5	900 x 900 CLASS B FLUSH GRATE AND FRAME	2	each	\$ 1,918.11	\$ 3,836.22
4.2.6	1200 x 1200 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 2,420.25	\$ -
4.2.7	1500 x 1500 CLASS C CAST IRON FRAME CONCRETE INFILL	0	each	\$ 4,439.37	\$ -
4.3	Special Pits - As per Pit Details				
4.3.1	Outlet Structure	0	each	\$ 150,000.00	\$ -
4.4	Pollutant Traps				
4.4.1	CDS 3000 series	1	each	\$ 110,000.00	\$ 110,000.00
4.5	Headwalls				
4.5.1	Concrete Headwall	1	each	\$ 2,500.00	\$ 2,500.00
4.5.2	Stacked Rock Headwall	1	each	\$ 1,500.00	\$ 1,500.00
4.6	RipRap and Scour Protection				
4.6.1	Riprap	200	sqm	\$ 130.00	\$ 26,000.00
Stormwater Drainage Subtotal					\$ 173,053.02
5	Detention and Water Quality Basins				
5.1	Filter Media				
5.1.1	Filter Media, incl. 100dia slotted PVC subsoil, flushing points, drainage layer and HDPE liner.	900	sqm	\$ 350.00	\$ 315,000.00
5.1.2	Spillway 15m wide with jute mesh scour protection.	100	sqm	\$ 80.00	\$ 8,000.00
Detention and Water Quality Basins Subtotal					\$ 323,000.00
6	Subsoil Drainage				
6.1	Excavate, supply, lay and backfill subsoil drain and all necessary connections				
6.1.1	100 dia. Slotted PVC pipe with filter sock.	0	L.m	\$ 42.00	\$ -
6.1.2	Concrete surround flushing point @ 50m spacing	0	each	\$ 56.70	\$ -
Subsoil Drainage Subtotal					\$ -
7	Pavements				
7.1	Road Pavements				
7.1.1	Pavement Type 1 - Concrete Maintenance Track and Maintenance Hardstand				
7.1.2	180mm concrete with SL82 mesh top and bottom	280	sqm	\$ 200.00	\$ 56,000.00
7.1.3	100mm DGB20	280	sqm	\$ 20.00	\$ 5,600.00
7.2	Minor Concrete				
7.2.1	150mm kerb & gutter (KG)	0	L.m	\$ 67.33	\$ -
7.2.2	Roll Kerb & Gutter (RK&G)	0	L.m	\$ 64.37	\$ -
7.2.3	Kerb Only (KO)	0	L.m	\$ 40.00	\$ -
7.2.4	Elsholz Kerb (ES)	0	L.m	\$ 367.50	\$ -
7.2.5	Mountable Kerb (MK)	0	L.m	\$ 66.00	\$ -
7.2.6	Median Kerb (MDK)	0	L.m	\$ 40.00	\$ -
7.2.7	Concrete Dish Drain (DD)	0	L.m	\$ 140.00	\$ -
7.2.8	Splitter Island infill	0	sqm	\$ 150.00	\$ -
7.2.9	Vehicular crossing	30	L.m	\$ 134.31	\$ 4,029.30
Pavements Subtotal					\$ 65,629.30
8	Roadworks Ancillaries				

8.1	Supply and install:					
8.1.1	Kerb Outlets	0	each	\$ 31.78	\$ -	
8.1.2	1.5m Concrete Footpath	0	sqm	\$ 72.19	\$ -	
8.1.3	2.5m Shared Cycleway including transitions and jointing	0	sqm	\$ 96.93	\$ -	
8.1.4	1.5m Pram Ramps	0	each	\$ 180.00	\$ -	
8.1.5	2.5m Pram Ramps	0	each	\$ 300.00	\$ -	
Roadworks Ancillaries Subtotal					\$ -	
9	Signage, Linemarking and barriers					
9.1	Signage Allowance					
9.1.1	Signage Allowance - Basin Warning Signage	8	each	\$ 200.00	\$ 1,600.00	
9.2	Linemarking Allowance					
9.2.1	Linemarking Allowance	0	item	\$ 50,000.00	\$ -	
9.3	Supply and install temporary barriers					
9.3.1	Concrete jersey barrier (12 mth hire)	0	each	\$ 905.63	\$ -	
Signage, Linemarking and barriers Subtotal					\$ 1,600.00	
10	Retaining Walls					
10.1	Retaining Walls					
10.1.2	Masonry Retaining Wall	0	sqm	\$ 610.00	\$ -	
10.1.3	Stacked Rock Wall	0	sqm	\$ 500.00	\$ -	
Retaining Walls Subtotal					\$ -	
11	Maintenance					
11.1	No Allowances Made					
11.1.1	No Allowances Made	0	sqm	\$ -	\$ -	
Maintenance Subtotal					\$ -	

BASIN D Subtotal	\$ 884,073.72
Contingency (10%)	\$ 88,407.37
Professional Fees (8%)	\$ 70,725.90
Authority Fees (2.5%)	\$ 22,101.84
BASIN D Total	\$ 1,065,308.83