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## **STORMWATER MANAGEMENT PLAN**

**STORMWATER MANAGEMENT STRATEGY AND DRAINAGE**

DEVELOPMENT SITE

**PROPOSED INDUSTRIAL ESTATE**

**485 COOPER STREET**

**EPPING VIC**

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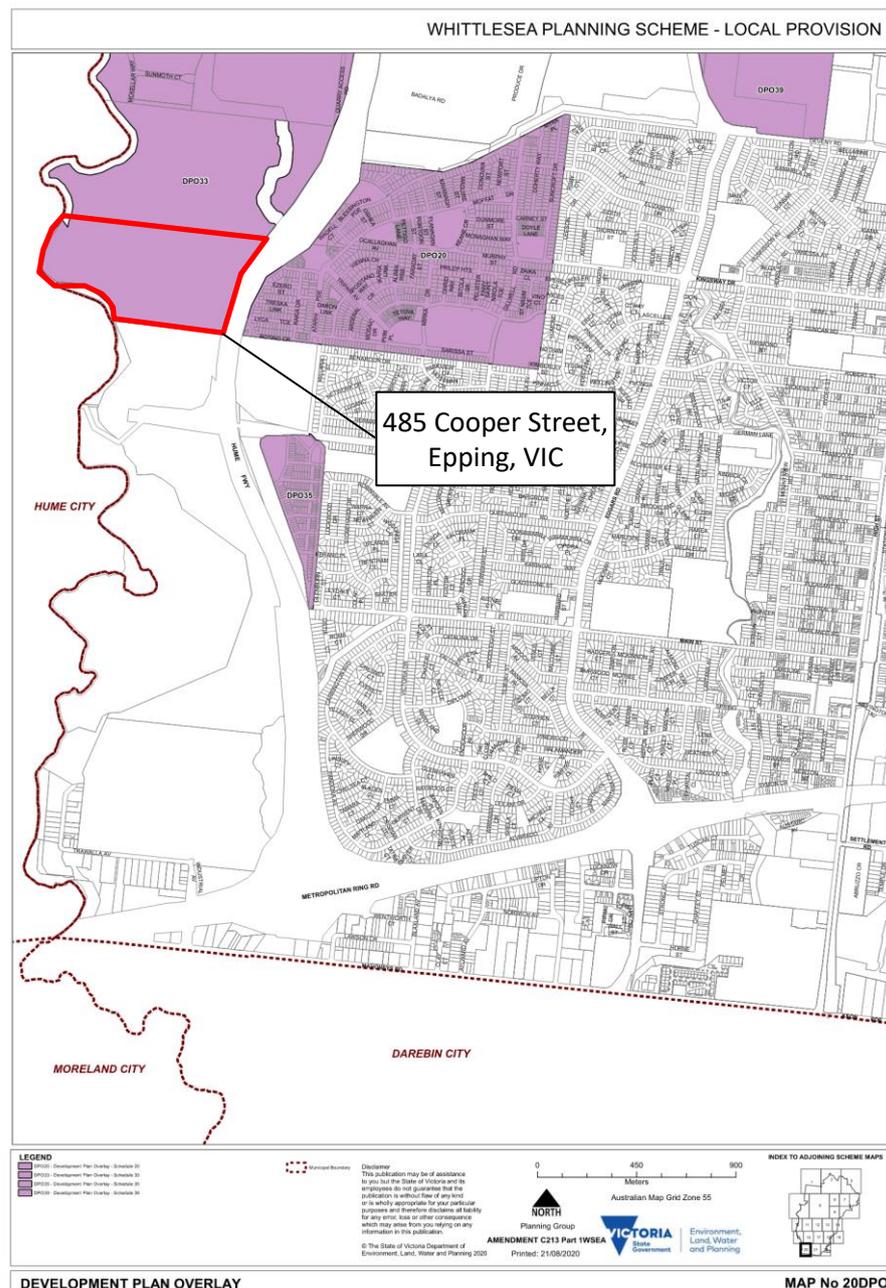
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# 1 INTRODUCTION & SCOPE

## 1.1 Introduction

Costin Roe Consulting Pty Ltd has been commissioned by The GPT Group to undertake a *Stormwater Management Plan* to accompany a Planning Application for the future industrial development of the land located on 485 Cooper Street, Epping (Lot 1 PS519650). The 35.25Ha parcel of land is located within the City of Whittlesea's Development Plan Overlay zone DPO33 as shown in **Figure 1.1** below.



**Figure 1.1 Whittlesea Planning Scheme – Local Provisions – Development Plan Overlay Map No. 20DPO (Source: [https://planning-schemes.api.delwp.vic.gov.au/data/assets/pdf\\_file/0004/483430/whittlesea20dpo.pdf?ga=2.53761579.2031416760.1676249672-1919920911.1663299556](https://planning-schemes.api.delwp.vic.gov.au/data/assets/pdf_file/0004/483430/whittlesea20dpo.pdf?ga=2.53761579.2031416760.1676249672-1919920911.1663299556))**



**Figure 1.2 Development Site – 485 Cooper Street, Epping, Victoria (Lot size = 35.25Ha)**

This report presents a civil engineering assessment of the stormwater drainage and -management at 485 Cooper Street, Epping (Lot 1 PS519650). This report provides an assessment of the civil engineering characteristics of the development site and technical considerations of the Water Cycle Management Strategy (WCMS). The Stormwater Management Strategy and Drainage Report shall be prepared in accordance with Schedule 33 to Clause 43.04 Development Plan Overlay within the Whittlesea Planning Scheme.

The proposed development site is not located within a Melbourne Water Development Services Scheme, with the closest drainage scheme being the *Edgars Creek Draining Scheme* approximate 715m north of 485 Cooper Street. The Development Plan application however have been referred to Melbourne Water under the Planning and Environment Act (1987) and the Subdivisions Act (1988). Refer to **Figure 2.2**.

The WCMS comprises several key areas of stormwater and water management which are provided below. These key areas have been established with the aim to reduce impacts from the development on the surrounding environment and neighbouring properties. The water cycle management strategy identifies the management measures required to meet the targets set. The key water cycle management areas assessed in this report are:

- Storm Water Quantity;
- Storm Water Quality;
- Flooding; and
- Erosion and Sediment Control

This engineering analysis is based on development for industrial warehouse and logistic facilities consistent with industrial estates in the surrounding areas and indicative Masterplan provided by The GPT Group.

## 1.2 Consultation

Consideration to the anticipated development levels, road and drainage alignments on the adjacent site to the north contemplated by adjoining landowner/ developers Vaughan Constructions has been made through consultation and shared information. The shared information has been used to coordinate alignments of road connections and interfacing of levels on boundaries and ensuring coordination of strategy pertaining the development, noting access to the site is required through the 481 Cooper Street development site.

Consultation with Whittlesea Council and Melbourne Water has been undertaken via formal applications, telephone discussions as well as meetings during which the submitted Development Application was discussed. The preliminary comments received from both Whittlesea Council and Melbourne Water was discussed in detail and resolved as summarised in the letter referenced CO14681.00-10.ltr dated 16 February 2023, and the updated comments received on 3 October 2023 was responded to in the letter reference CO14681.00-13.ltr dated 16 October 2023, with both letters attached to this report under **Appendix G**. Additional comments were received from Melbourne Water on 23 May 2023, which is attached to **Appendix H**. Our response to Melbourne Water’s comment no 6 regarding Condition 1 MWA-1274358 is shown below:

*“6. Condition 1 MWA-1274358 has not been addressed adequately to include a robust sediment capture asset. The following information is required:*

*The sediment forebays appear to be undersized in relation to the catchments they are to treat, sediment forebays are generally designed for catchment areas >2ha – 5ha (refer to CS1 of MW “Biofiltration systems in DSS guideline 2020”) and all of these proposed catchment areas are above 5ha. A sediment pond is the preferred asset to treat coarse particles sufficiently without prematurely undermining the performance of the bioretention system. It must be clearly explained as to why a sediment pond has not been incorporated into the design, if the proposed sediment forebays are to remain, it must be demonstrated that the sizing of the sediment forebays are sufficient for the catchment areas, including estimated dimensions and relevant modelling and calculation (e.g. MUSIC) results. Unless otherwise specified by City of Whittlesea.”*

The proposed primary treatment system, prior to the bio-retention system, is based on a vortex type gross pollutant trap (GPT) coupled with a sediment forebay.

The deemed to comply method included in CS1 of MW “Biofiltration systems in DSS guideline 2020” is noted to comprise a treatment train which includes a sediment pond only (i.e. the guide does not consider the sediment removal from the proposed GPT). The requirement of the “Biofiltration systems in DSS guideline 2020” is to ensure that circa 95% of coarse sediments (>125um) are removed from the system in a 3-month ARI storm. The intent of the guide is to ensure coarse sediments are removed prior to the bio-retention such that the bio-retention system is not overloaded and reduced performance of the system is mitigated.

We consider the proposed GPT/Sediment forebay treatment train meets the intent of the guideline, with improved ability for the proponent to regularly maintain the primary treatment systems over that of a sediment basin (noting the GPT can be readily maintained

by a contractor with suction truck, compared to a sediment pond which requires excavator, truck and specialised contractors).

The proposed GPT, the Ocean Save GPT, is based on the Contech CDS GPT previously distributed by Rocla. We have reviewed several research/ testing papers and there is no direct testing on the 125um particle as required by Melbourne Water, however there are various tests of other particle sizes which shows the intent of the DSS Guideline can be met. Research by Sansalone (2004) shows that between 80-90% of particles >75um will be captured in the GPT. Further studies (Slominski, Wells & Berger 2002) show >95% removal of particles >215um will be captured in the GPT. This document further notes that between 80% of particles in the 150-215um range will be captured in the GPT depending on the flow rate. Noting some variance in the testing results, we would conservatively estimate that at least 80% of coarse sediments >125um would be captured within the GPT. The final 15% of coarse sediments would be captured within the proposed sediment forebay (noting final sizing of the forebay would be completed at detail design phase based on the requirements of Melbourne Water).

We note the overall objective for total suspended solids removal is only 80% at the point of discharge (compared to 95% of coarse sediment in the primary system), which has been confirmed via MUSIC. The MUSIC model does not separate coarse and fine sediment removal and as such cannot be directly quantified in MUSIC. The TSS removal as modelled in MUSIC removed by the GPT is >60%, with the final 20% being achieved within the bio-retention system.

Noting the removal efficiencies of coarse sediment as confirmed by research in the GPT, and the inclusion of a sediment forebay, the assessment above confirms the intent of the DSS Guideline deemed to comply solution for pre-treatment of the bio-retention system has been met.

The City of Whittlesea's Development Engineer, Paul Angelkoski, confirmed that a Stormwater Management Strategy and Drainage Report shall be prepared to accompany any Development Plan application in accordance with Schedule 33 to Clause 43.04 Development Plan Overlay within the Whittlesea Planning Scheme. Please refer to **Appendix F** for Whittle Sea Council's initial comments on the proposed point of discharge.

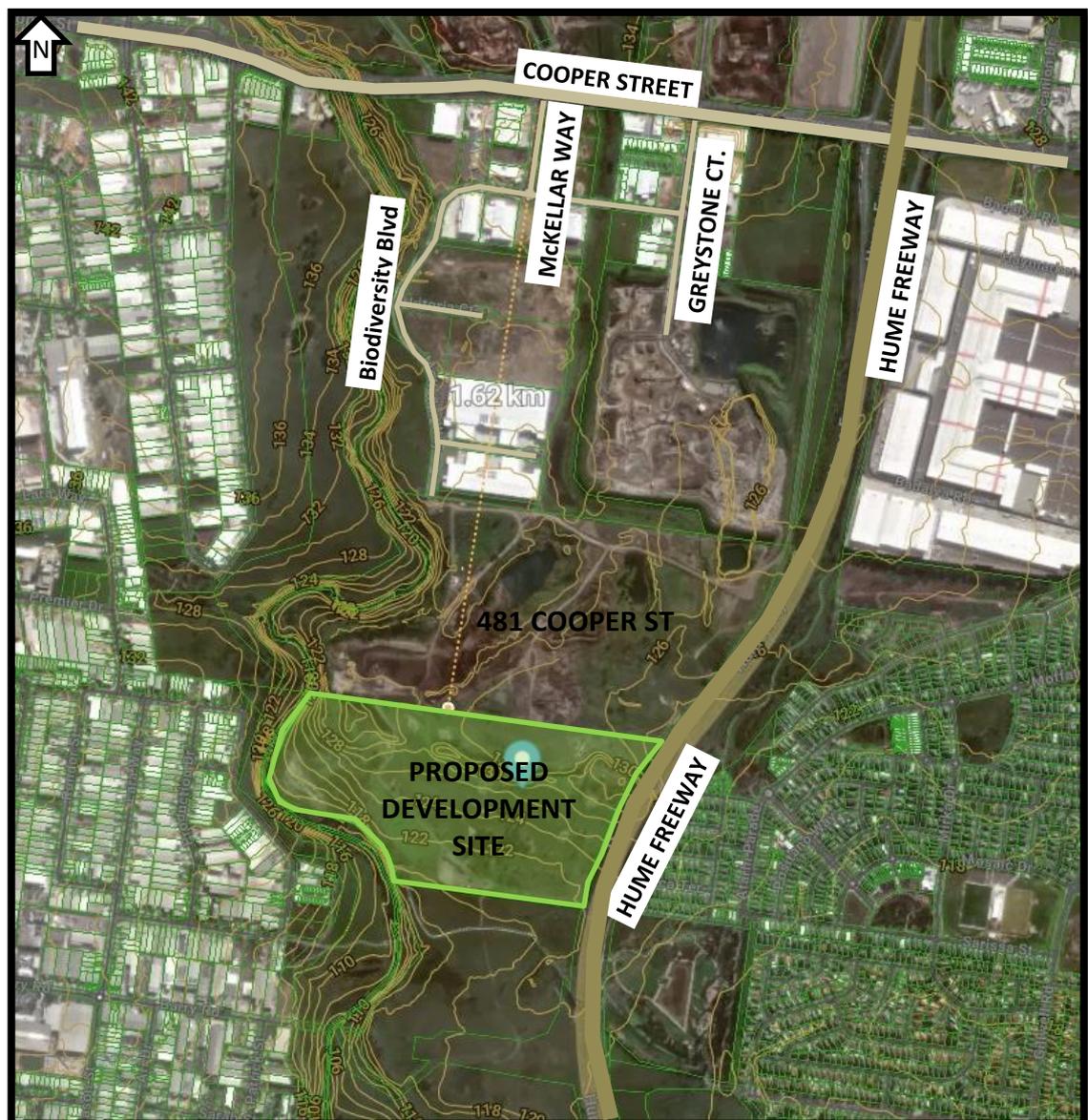
## 2 DEVELOPMENT SITE

### 2.1 Location

The proposed development is located in the suburb of Epping with an address of 485 Cooper Street as shown in **Figure 2.1**. The site is noted to be approximately 1600m south of Cooper Street, and access to the site will be via extension of McKellar Way and Greystone Court.

The site is bounded on the west by Merri Creek and industrial development, undeveloped industrial land to the north (481 Cooper Street), the Hume Freeway to the east and undeveloped industrial land to the south.

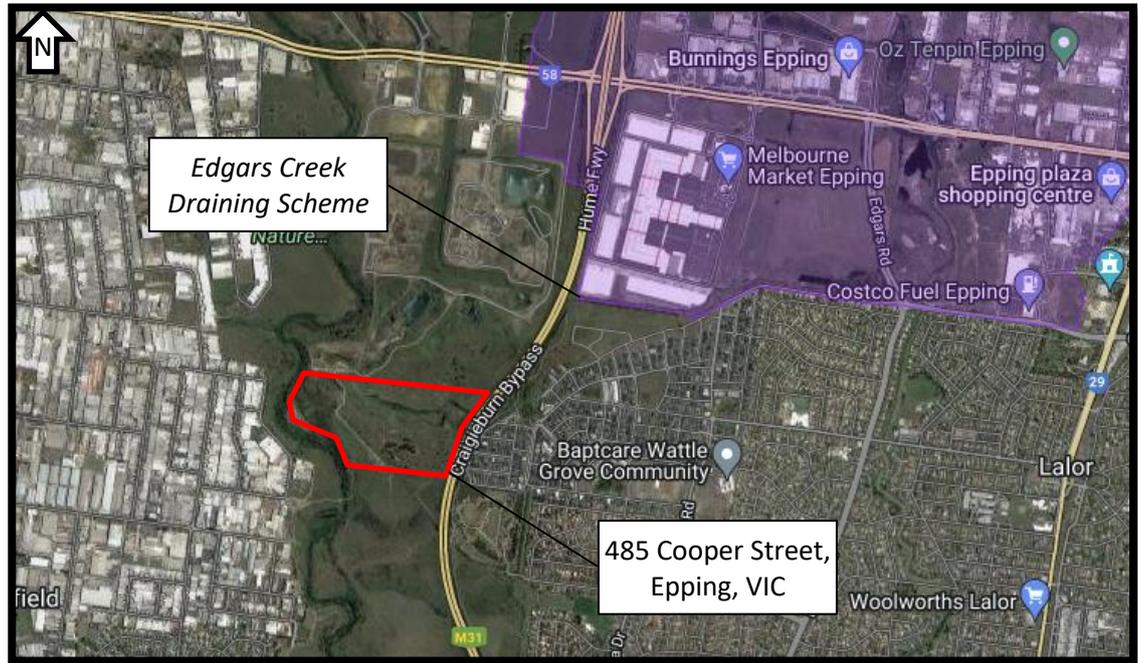
The nearest residential receivers are noted to be 100m east of the property, however these residential receivers are separated from the property by the Hume Freeway and associated acoustic fencing.



**Figure 2.1 Locality Plan**

The site is covered by the City of Whittlesea's Development Plan Overlay DPO33 and zoned INDUSTRIAL 1 ZONE (IN1Z). The site is not located within Melbourne Water Development

Services Scheme (see **Figure 2.2** below), however, will be referred to Melbourne Water under the Planning and Environment Act (1987) and the Subdivisions Act (1988).



**Figure 2.2** Site shown to be outside the Melbourne Water’s Drainage Scheme (<https://www.melbournewater.com.au>)

## 2.2 Existing Site

The property is currently undeveloped land. We understand former use of the land comprising agriculture, quarrying between mid 1970’s to mid 1990’s, a golf course from mid 1990’s to the early 2000’s then discontinued use following closure of the golf course.

The site is noted to be located to the south of continuing industrial development noting recent development of the industrial precinct south of Cooper Street and recent submission for approval of the land (481 Cooper Street) immediately north of the subject property.

The site is four sided and generally rectangular in shape, other than the western boundary which follows the alignment of Merri Creek. The northern boundary is 900m in length and the width of the property is 450m. The area of the development site is approximately of 35.25 Ha.

Levels on the site vary between RL 132m AHD on the north, to RL 114m on the south. The levels on the site generally drain toward Merri Creek.



**Figure 2.3 Aerial photograph of proposed development site (seen east to west)**

Two large quarry pits are located on the north of the site. The eastern quarry pit is approximately 450m long and varies in width between 50m and 100m. The depth of the eastern quarry is up to 10m. The western quarry pit is smaller measuring approximately 125m long and 70m wide. The western pit has a slightly shallower depth of 9m. The quarry pits are noted to be centred around outcrops of volcanic basalt.



**Figure 2.4 Aerial photograph of proposed development site (seen north to south)**



Figure 2.5 Aerial photograph of a section of the proposed development site (seen west to east)

Refer Figure 2.6 showing the site survey and features noted above.

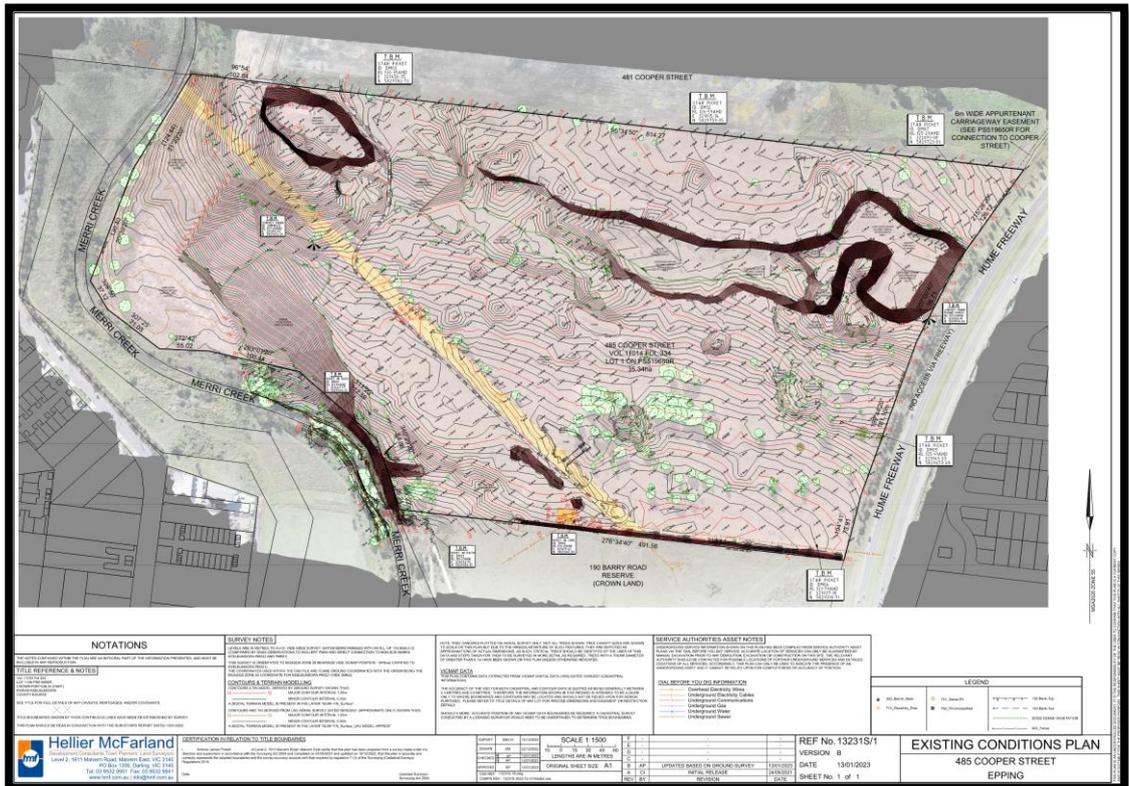


Figure 2.6. Site Survey

### 2.3 Proposed Development

The proposed development is for an industrial estate, earthworks, and infrastructure for future industrial development over an area of 28.48Ha of the 35.25Ha property.

The Masterplan Layout is shown in **Figure 2.7**. Infrastructure works will include bulk earthworks, provision of services, road & intersection construction, and stormwater management.

The preliminary masterplan layout shows the staged development in four stages. Siting of the development lots will be sympathetic to the topography of the land, access, and flood planning requirements.

Access to all lots would be made via connections to extensions of McKellar Way and Greystone Court proposed for 481 Cooper Street. The new access roads will be constructed to the Whittlesea City Council requirements and ownership transferred to Council upon development of the estate.

Open space to be embellished appropriately with visitor infrastructure by the developer in alignment with City of Whittlesea's Open Space Strategy 2016 and handed over to Council after a maintenance period as requested by Whittlesea Council.

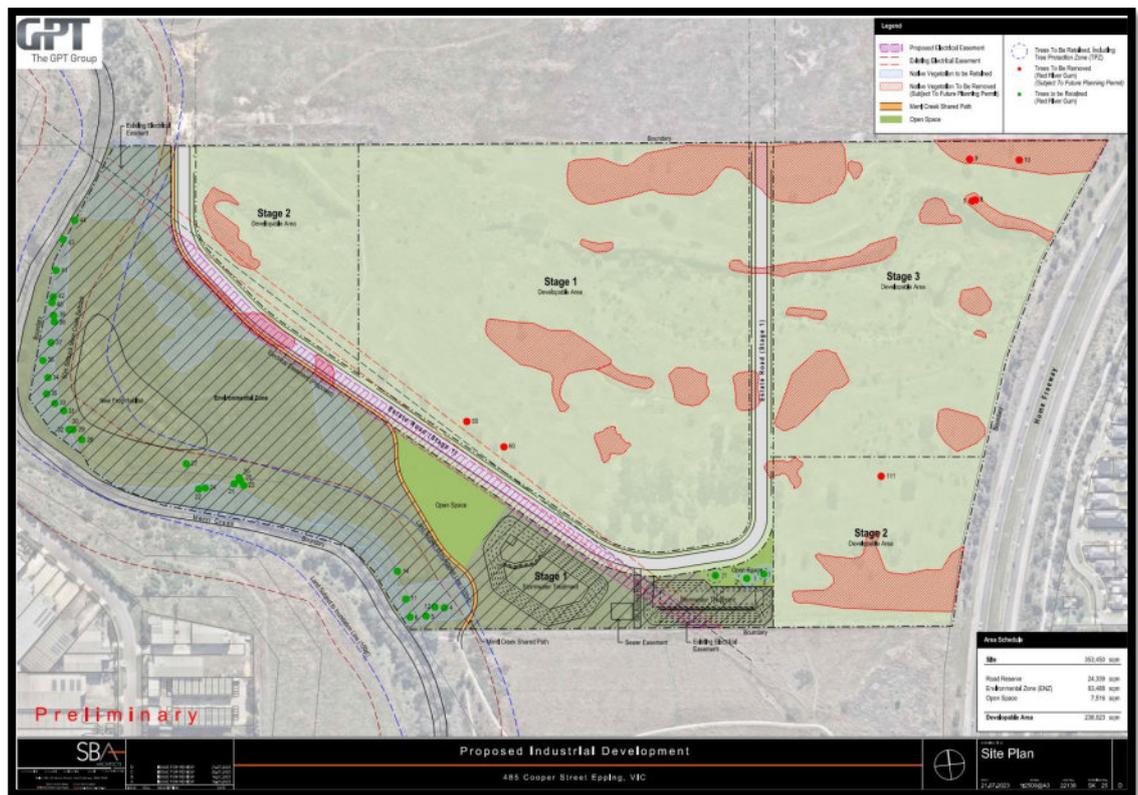


Figure 2.7. Site Plan (Source: SBA Architects)

### 3 STORMWATER (WATER CYCLE) MANAGEMENT STRATEGY & DRAINAGE METHODOLOGY

#### 3.1 Key Areas and Objectives

Water Cycle Management (WCM) is a holistic approach that addresses competing demands placed on a region’s water resources, whilst optimising the social and economic benefits of development in addition to enhancing and protecting the environmental values of receiving waters.

Developing a WCMS at the Development Stage of the land development process provides guidance on urban water management issues to be addressed for the estate and development as a whole. This assists urban rezoning and estate infrastructure planning for the industrial development proposed on the land.

This WCMS has been prepared to inform Council, Melbourne Water and the Department of Energy, Environment and Climate Action (DEECA) that the development is able to provide and integrate WCM measures into the stormwater management strategy for the estate and for future development sites in the estate. It presents guiding principles for WCM across the precinct which includes establishing water management targets and identifying management measures required for future building developments to meet these targets.

Several WCM measures have been included in the WCMS and engineering design, which are set out in this report and the attached drawings. The key WCM elements and targets which have been adopted in the design are included in **Table 3.1** following.

**Table 3.1. WCM Targets**

Element	Target	Reference										
<b>Water Quantity</b>	<p>Maintaining the 1.5yr ARI Flow from WSUD Measures</p> <p>Maintaining a PSD based on the 5yr ARI flow based on 0.35 pre-development to the 100yr ARI event based on 1.0 post-development impervious factor.</p>	<p><i>Section 13.7 of City of Whittlesea Guidelines for Urban Development</i></p> <p>Water Sensitive Urban Design Guidelines Addendum City of Whittlesea</p>										
<b>Water Quality</b>	<p>Load-based pollution reduction targets based on an untreated urbanised catchment:</p> <table border="0"> <tr> <td>Gross Pollutants</td> <td>70%</td> </tr> <tr> <td>Total Suspended Solids</td> <td>80%</td> </tr> <tr> <td>Total Phosphorus</td> <td>45%</td> </tr> <tr> <td>Total Nitrogen</td> <td>45%</td> </tr> <tr> <td>Total Hydrocarbons</td> <td>90%</td> </tr> </table>	Gross Pollutants	70%	Total Suspended Solids	80%	Total Phosphorus	45%	Total Nitrogen	45%	Total Hydrocarbons	90%	<p>Water Sensitive Urban Design Guidelines Addendum City of Whittlesea</p>
Gross Pollutants	70%											
Total Suspended Solids	80%											
Total Phosphorus	45%											
Total Nitrogen	45%											
Total Hydrocarbons	90%											

Element	Target	Reference
<b>Major/ Minor System</b>	1% AEP (Q100 ARI) Major/ 10% AEP (Q10 ARI) Minor	<i>Section 13.7 of City of Whittlesea Guidelines for Urban Development</i>
	1% AEP (Q100 ARI) Major/ 5% AEP (Q20 ARI) Minor	The GPT Group Brief
<b>Flooding</b>	Buildings and road set 600mm above 1% AEP. No affectation to upstream downstream or adjoining properties as a result of development	Section 13.10.6 of City of Whittlesea Guidelines for Urban Development
<b>Water Supply</b>	Reduce Demand on non-potable water uses. Rainwater reuse will aim to reduce demand on non-potable uses by at 50-70%.	Whittlesea Council
<b>Construction Stormwater Management &amp; Erosion and Sediment Control</b>	A construction stormwater management plan and appropriate associated erosion and sedimentation control measures must be described in the environmental assessment for all stages of construction to mitigate potential impacts to surrounding properties.	IECA Whittlesea Council Vic EPA Melbourne Water

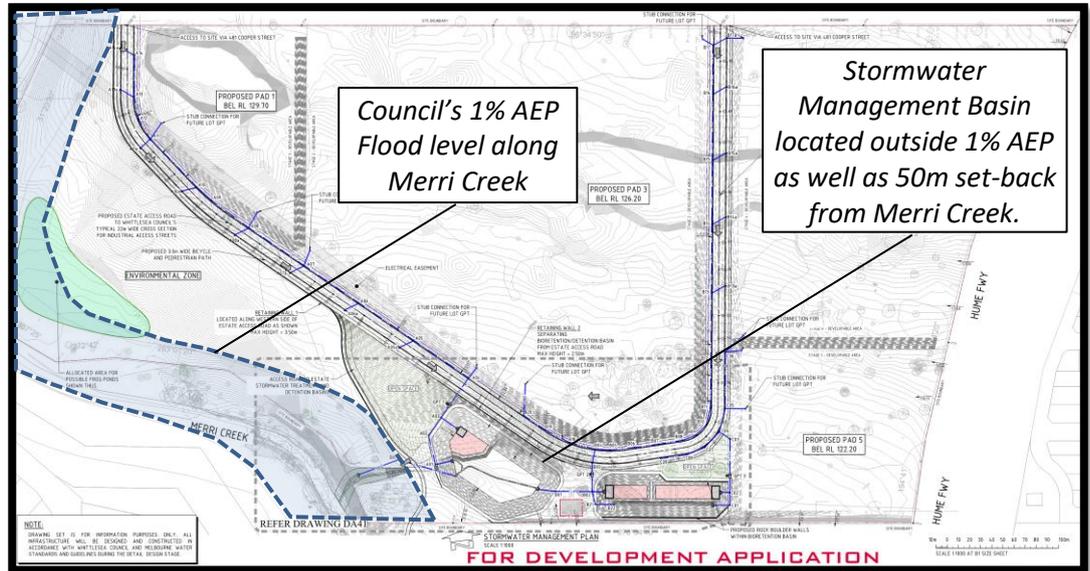
A summary of the how each of the WCM objectives will be achieved are described below. Reference to the relevant sections of the report should be made for further and technical details relating to the WCM measures:

- **Stormwater Quantity Management (Refer Section 4)**

The intent of this criterion is to reduce the impact of urban development on existing drainage system by limiting post-development discharge within the receiving waters to the pre-development peak, and to ensure no affectation of upstream, downstream or adjacent properties.

Attenuation of stormwater runoff from the development is proposed to be managed in one combined estate level basin. The intention is for no water quantity measures (other than rainwater reuse) to be provided on individual development lots. This will mean that future building developments can be assessed, approved and constructed without the need for site specific detention, based on the provision of the estate level detention basin.

The proposed basin is located on the south-west of the development site between development areas of the site and above the 1% AEP flood level of Merri Creek as shown in **Figure 3.1** below.



**Figure 3.1. Proposed location of Stormwater Quantity and Quality Management Infrastructure on development site (refer drawing CO14565.00-DA40 under Appendix A)**

Sizing of the detention systems has been completed using DRAINS modelling software in accordance with the Whittlesea City Council Policy for the 1.5yr ARI, and 5yr ARI PSD with storages up to the 10yr ARI event. The modelling accounts for the drainage system provided for the adjacent sites and conveyance of upstream catchments around the site.

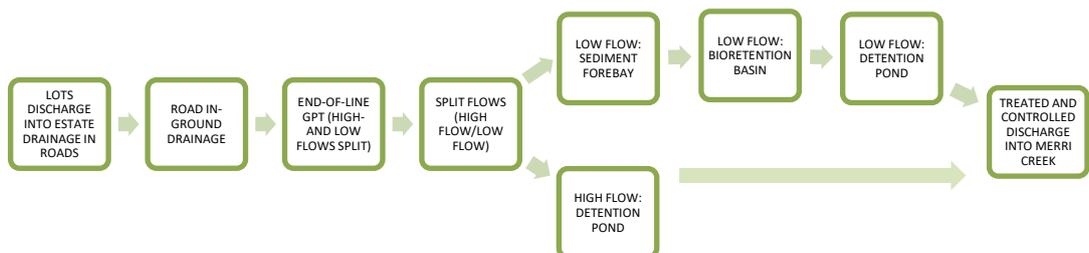
Refer to **Section 4** of the document for detailed sizing of detention systems.

- **Stormwater Quality Management (Refer Section 5)**

There is a need to target pollutants that are present in stormwater runoff to minimise the adverse impact these pollutants could have on downstream receiving waters.

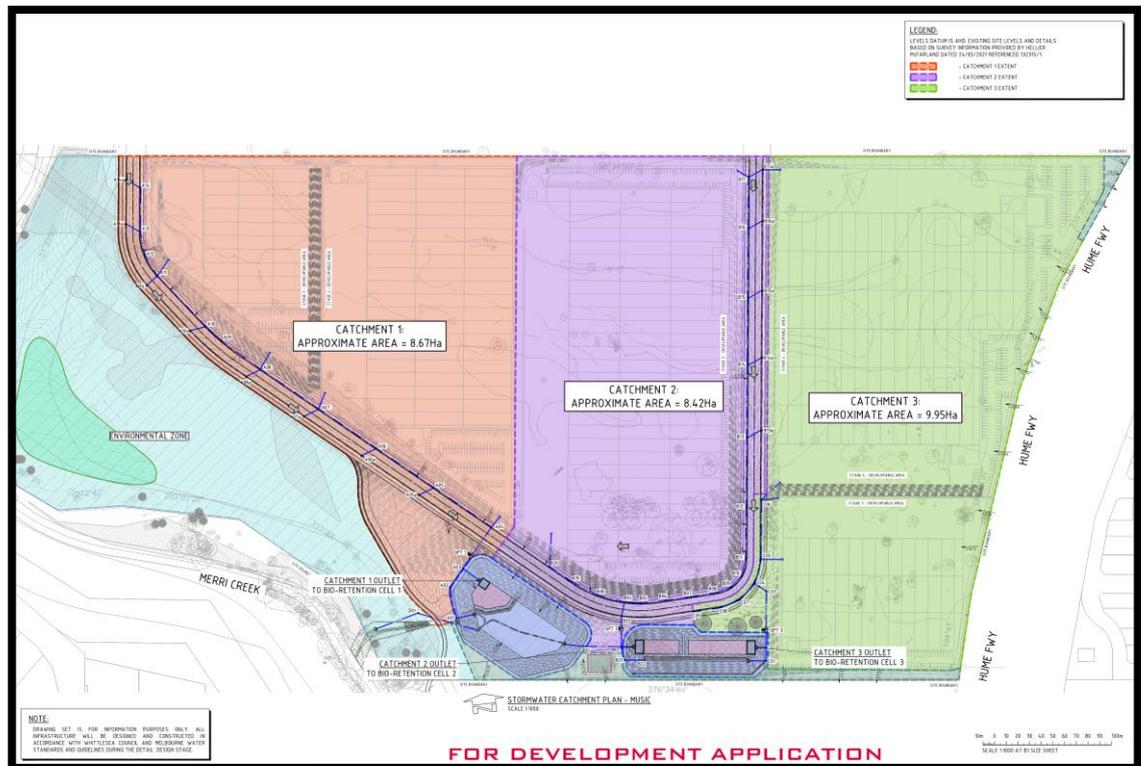
The required pollutant reductions are included in **Table 3.1** of this document and MUSIC modelling has been completed to confirm the reduction objectives can be met for the estate.

A series of Stormwater quality improvement devices (SQID's) have been incorporated in the design of the estate. The proposed management strategy will include the following measures:



**Figure 3.2. Proposed Stormwater Treatment Train**

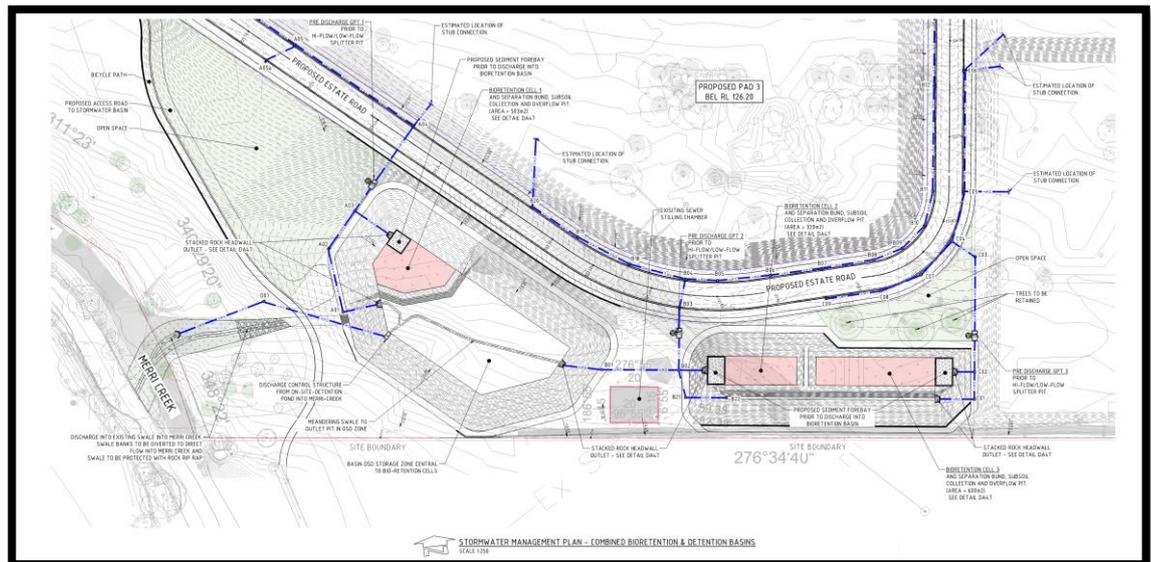
- The site is divided into three catchments, each sized to be less than 10Ha and which drains via the estate level in-ground drainage system in the new access road towards the larger estate level stormwater management system. All development lots in each catchment will discharge directly into the new estate level drainage infrastructure along the new estate access road without any primary treatment.



**Figure 3.3. Proposed Catchment Plan (see Drawing CO14681.00-DA42)**

- Each catchment will discharge into an appropriately sized end-of-line GPT immediately prior to discharging into a sediment forebay prior to the bioretention basins. GPTs will be designed with an outlet that provides a dry waste chamber suitable for cleansing by suction hose from a tanker as required by the Council GUD and shall be designed accordingly.
- The high- and low-flows from each catchment's end-of-line GPT will be split to direct the low flows to a sediment forebay immediately prior to the bioretention basins and to direct the high-flow to bypass the bioretention ponds, discharging into the estate level detention system. It should be noted that a 11m x 3m concrete slab will be provided at each GPT unit for maintenance requirements, as required by Whittlesea Council.
- Tertiary treatment of each of the development catchments will be made via the estate level bio-retention basins within the combined stormwater management basin. Bio-retention basins are sized to provide tertiary treatment for the each of the estate catchments including the roadways. Refer to drawings **Co14681.00-DA40, DA41, DA47 & DA48**.
  - We note the provision of a sediment forebay will be provided prior to the bio-retention basin for pre-treatment of sediments from the roadway drainage. Refer **Section 1.2** for the confirmation that the intent of the DSS Guideline deemed to comply solution for pre-treatment of the bio-retention system has been met via the combination of the GPT unit and the sediment forebays provided. The bioretention basins will all be aligned along the road reserved as shown in **Figures 3.1 and 3.4**.

- Some treatment will also be present by provision of rainwater reuse tanks on development sites through reuse and settlement within the tanks. Allowance for this treatment is noted to not be included in MUSIC modelling produced for the development.
- Maintenance access tracks will be provided to all basins and GPT units as shown on the civil engineering drawings.



**Figure 3.4. Proposed combined stormwater quality and quantity management basin (refer drawing CO14565.00-DA41 under Appendix A)**

Reference to **Section 5** of this document should be made for detailed Stormwater Quality modelling and measures.

- **Flood Management (refer Section 6)**

The proposed development considered flooding and large rainfall events in relation to nearby waterways.

It is noted that this site is clear of the Merri Creek and Central Creek floodplains however, forms part of a contributing catchment of Merri Creek. Refer **Section 6** for details.

The following measures have been incorporated in the design:

- All buildings are sited 600mm above the 1% AEP design flood level of Merri Creek.
  - Requirements of Council development guidelines have been met regarding works in and around flooding areas;
  - Stormwater detention measures have been included to manage pre and post development runoff as discussed above; and
  - Overland flow paths to manage runoff in large storm events have been made including achieving at least 500mm freeboard to building levels from the flow paths.
- **Water Demand Reduction/ Rainwater Reuse (refer Section 5.4)**

Rainwater reuse measures will be provided as part of future building development designs. Rainwater reuse will be required to reduce demand on non-potable uses by at 50-70%. The reduction in demand will target non-potable uses such as toilet flushing and irrigation.

Further to discussions with Whittlesea Council, Smart tank system specifications will be requested during the detail design stage. **Refer Section 5.4.**

- *Stormwater Management During Construction (refer Section 7)*

A construction stormwater management plan and associated erosion and sediment control measures is proposed based on IECA *Best Practice Erosion and Sediment Control Document* (The White Book), EPA publication 1834 - *Civil construction, building and demolition guide Management During Construction (2020)*, Melbourne Water Land Development Manual – *Site Management Plans* and Whittlesea Council requirements. The management measures take a staged approach from initial site establishment, construction stages and the period between the completion of the estate infrastructure works and development of individual lots.

### 3.2 Existing Drainage System & Overland Flows

The site is currently undeveloped land with undulating topography which has been described in **Section 2.2**. There is no formal drainage currently on the site however several local depressions, quarry pits and depressions are present on the land due to the previous quarry and golf course activities on the land.

The site is not affected by overland flows. A small part of the site was shown to previously drain north to central creek, however this catchment is minor and overall falls are generally to the south-west and Merri Creek.

### 3.3 Proposed Estate Drainage System

As per general engineering practice and the guidelines of Council, the proposed stormwater drainage system for the estate development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development to the legal point of discharge.

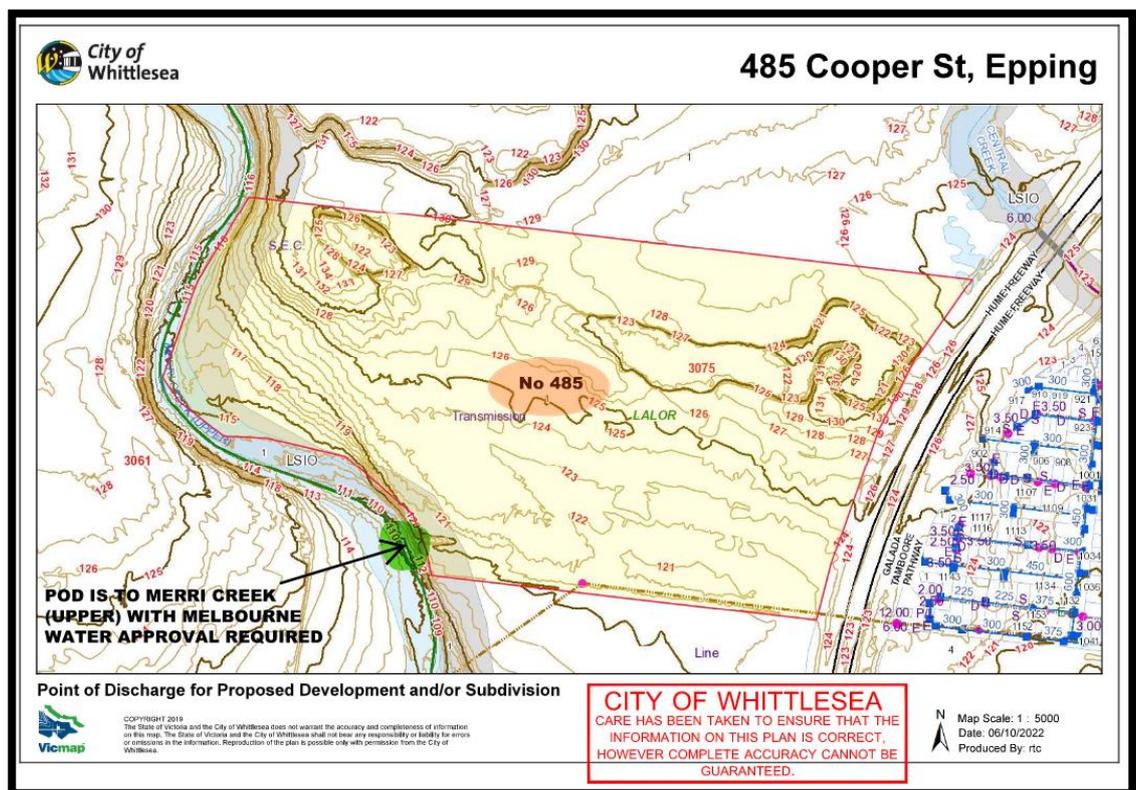
The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. It is noted that the estate drainage capacity will exceed council's minimum requirement for the minor event (Q10) due to expected minimum tenant requirements for users of the estate and GPT Group brief requirements. The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, the standards of Whittlesea Council and accepted engineering practice. Runoff from buildings will generally be designed in accordance with AS 3500.3 *National Plumbing and Drainage Code Part 3 – Stormwater Drainage*. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "*Australian Rainfall and Runoff*" (2019 Edition), Volumes 1 and 2 (AR&R).

Water quality and re-use are to be considered in the design to ensure that any increase in the detrimental effects of pollution is mitigated, Council and Melbourne Water, Water Quality Objectives are met and that the demand on potable water resources is reduced.

The proposed drainage system will be required to convey the overland flow from upstream catchments east of the property through the site.

The legal point of discharge (LPD) is a point specified by Council where stormwater from a property can be discharged. The legal point of discharge is usually Council's stormwater infrastructure (where available), the street kerb and channel for smaller developments or downstream receiving waters like an existing stream or gully, lake, pond or waterbody. A LPD application has been made to Whittlesea Council to which Council responded on their letterhead on 5 October 2022 confirming that no appropriate drainage infrastructure is available in the vicinity of the property and that the Point of Discharge for this property is to Merri Creek (Upper) at the western boundary of the property as shown in **Figure 3.4** below, and which need to be confirmed and approved by Melbourne Water.



**Figure 3.4. Council’s confirmed Point of Discharge as per letter dated 5 October 2022.**

We note the north-eastern portion of the existing site that naturally drains in a north-eastern direction towards Central Creek is approximately 1Ha in size of the 35.2Ha (2.8%) site. We propose that this small portion of the site’s catchment be included in the 485 Cooper Street development SWMS (treated, retained and discharged into Merri Creek). Bulk earthworks will be undertaken across the site to provide large flat building pads, hardstand areas, car parking areas and an estate access road through the site.

The drainage of this natural depression in the north-eastern corner will be achieved by drainage stormwater from the created flat pads with inground drainage systems, gravitating to the southern boundary of the development site to discharge into the proposed combined bioretention- and detention pond shown on drawings **CO14681.00-DA40-B & CO14681.00-DA41-B**.

The drainage system proposed can be described as follows:

- Stub connections for all development lots connecting to road drainage.
- Road drainage system designed to the 5% AEP (1 in 20yr ARI).
- All road drainage and development site drainage directed to the end-of-line GPT units prior to discharge into sediment forebays.
- All stormwater (high-flows and low-flows) will be directed to sediment forebays prior to discharge into the bioretention basins and detention pond.
- Stormwater management basin comprising stormwater detention to limit post development runoff to pre-development runoff and bio-retention system to complete final stormwater polishing.
- It is noted that the design of stormwater management systems proposes integration of bio-retention elements within the stormwater detention basins. The bio-retention elements are noted to be sited such that a maximum depth of inundation of 1.2m occurs during infrequent major storms, and generally less than 0.6m during the majority of storm events.
- The main detention storage areas are noted to be sited at a level approximately 1m below the bio-retention elements. This will ensure effective discharge of bio-retention filtration, however, also assists in ensuring maximum storage capacity can be realized within the basin area. Further, this enables depth of water over the bio-retention elements to be limited to less than 0.6m generally as noted above and below.
- Based on the design, the water level over the bio-retention elements of the basin would have maximum ponding of 0.4m (being the extended detention depth) for >90% of all runoff events (i.e. events between the 6 month and 1yr ARI). The detention storage would be at 1.4m at the same time the ponding of the bio-retention elements is only 0.4m.
- A maximum depth of 0.75m would be realised for all events up to the 5% AEP (1 in 20 ARI), and maximum depths between 0.75m to 1.2m only occur very infrequently for storms > 5% AEP to the 1% AEP event. Depths greater than 0.75m would be considered to occur only several times throughout the life of the system.

### **3.4 Hydrologic Modelling and Analysis**

#### **3.4.1 General Design Principles**

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Whittlesea City Council and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with *AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage*.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (1987 Edition), Volumes 1 and 2 (AR&R).

Storm events for the 2 to 100 Year ARI events have been assessed.

#### **3.4.2 Minor/ Major System Design**

The piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

### 3.4.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 2 to 100 Year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

### 3.4.4 Runoff Models

In accordance with the recommendations and standards of Whittlesea City Council, the calculation of the runoff from storms of the design ARI has been calculated with the catchment modelling software DRAINS for internal drainage only. Refer **Section 7** for discussion pertaining to overland flow runoff models.

Detailed hydraulic assessment of the internal drainage system will be calculated at detail/ construction certificate stage.

The design parameters for the DRAINS model are to be based on the recommendations as defined by council and parameters for the area and are as follows:

**Table 3.2. DRAINS Parameters**

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	

## 3.5 **Hydraulics**

### 3.5.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

### 3.5.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground/ grate level, for the peak runoff from the Minor System runoff.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building/ development pads.

### 3.5.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

### 3.5.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

### 3.5.5 Overland Flow (development lots)

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the detention systems prior to discharge.

## 4 WATER QUANTITY MANAGEMENT

### 4.1 Water Quantity Management Objectives

Whittlesea City Council adopts the principles of water quantity management, also known as “On-site Detention (OSD)”, to ensure the cumulative effect of development does not have a detrimental effect on the existing stormwater infrastructure and watercourses located within their LGA downstream from the particular site.

The requirements for OSD are set out in *Section 13.11* of *City of Whittlesea Guidelines for Urban Development* and the Melbourne Water Document *Water Sensitive Urban Design Guidelines Addendum City of Whittlesea*.

These documents require the 1.5yr ARI Flow from WSUD Measures to be maintained (to address frequent flows) and to maintain a PSD based on the 5yr ARI flow and a 0.35 pre-development to the 100yr ARI event based on 1.0 post-development impervious factor.

### 4.2 Methodology

A hydrological analysis was undertaken to estimate the impact of the development of the site on peak flows at the downstream extent of the site. Modelling of stormwater runoff quantity was considered for the pre-existing case and for the operational phase of the development. DRAINS modelling software has been used to assess the site detention discharge and storage relationship.

In order to assess the existing and operational phase peak discharges from the development site, a DRAINS hydrological model was used to estimate peak flows from catchments on the site for various storm durations for Q5 year ARI to Q100 year ARI events.

### 4.3 Existing & Post Development Peak Flows

Intensity/Frequency/Duration (IFD) data was adopted from the Bureau of Meteorology used in conjunction with DRAINS ILSAX modelling to estimate peak flows for the site catchments. **Table 4.1** shows the existing pre-developed and proposed post-developed flows at the downstream boundary for the existing catchments on the property.

**Table 4.1. Q2, Q5, Q10, Q20, Q50 & Q100 ARI Peak Flows from proposed development site**

ARI	Design Storm Duration (hours)	Peak Flow (m3/s)		
		Undeveloped		Developed
		Site	Site (no atten.)	Site (+ atten.)
2	12	0.177	1.120	0.175
5	0.5	0.410	3.442	0.156
	6	0.210	1.612	0.211
	12	0.721	1.437	0.245
	24	0.389	0.934	0.234
	48	0.351	0.719	0.245
10	0.5	1.120	4.180	0.165
	6	0.917	1.928	0.258
	12	1.47	1.717	0.283

	24	0.868	1.117	0.276
	48	0.533	0.858	0.287
<b>20</b>	0.5	2.010	5.09	0.174
	6	1.550	2.297	0.291
	12	2.080	2.052	0.347
	24	1.150	1.332	0.317
	48	0.738	1.016	0.381
<b>50</b>	0.5	3.350	6.15	0.218
	6	2.320	2.681	0.502
	12	2.480	2.351	0.808
	24	1.380	1.508	0.539
	48	0.890	1.132	0.792
<b>100</b>	0.5	4.520	7.260	0.261
	6	3.120	3.146	0.753
	12	2.980	2.729	1.130
	24	1.670	1.729	0.867
	<b>48</b>	<b>1.08</b>	<b>1.274</b>	<b>1.07</b>

Post development site discharge volume, as well as the provided detention volume and depth for the open basin detention system are provided in **Tables 4.2** below.

**Table 4.2. Q5, Q20, Q50 & Q100 ARI Storage Volumes**

ARI	Duration (mins)	Peak Flow (m <sup>3</sup> /s)					Depth (mm)	Storage (m <sup>3</sup> )
		No Attenuation	With Attenuation					
			Orifice 1 & 2	Weir	Emergency	Total		
5	6 Hr	1.612	0.211	0.000	0.000	0.211	1.621	8,115
5	12 Hr	1.437	0.245	0.000	0.000	0.245	1.765	9,190
5	24 Hr	0.934	0.235	0.000	0.000	0.235	1.722	8,865
20	6 Hr	2.297	0.291	0.000	0.000	0.291	2.106	11,895
20	12 Hr	2.052	0.317	0.031	0.000	0.347	2.344	13,925
20	24 Hr	1.332	0.314	0.003	0.000	0.317	2.310	13,630
50	6 Hr	2.681	0.325	0.177	0.00	0.502	2.441	14,795

50	12 Hr	2.351	0.336	0.473	0.00	0.809	2.572	15,990
50	24 Hr	1.508	0.326	0.213	0.00	0.539	2.460	14,960
100	6 Hr	3.146	0.333	0.419	0.00	0.753	2.551	15,800
100	12 Hr	2.729	0.343	0.786	0.00	1.130	2.681	17,020
100	24 Hr	1.729	0.337	0.531	0.00	0.867	2.593	16,190

## 5 STORMWATER QUALITY, REUSE AND MAINTENANCE

### 5.1 Stormwater Quality Objectives

There is a need to provide a design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by Whittlesea Council and Melbourne Water.

The requirements for stormwater quality to be performed for the entire estate catchment. The reduction objectives noted in **Section 3.1** and **Table 3.1** of this report are presented in terms of annual percentage pollutant reductions on a developed catchment.

Assessment of compliance of the water quality objectives has been made using MUSIC as set out in the following sub-sections of the report.

### 5.2 Proposed Stormwater Treatment System

Developed impervious areas including roof, hardstand, car parking, roads and other extensive impervious areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development. The STM's for the development shall be based on a treatment train approach to ensure that all the objectives above are met.

Components of the treatment train for the development are as follows:

- Primary treatment to each catchment is via an end-of-line vortech type GPT (Rocla CDS, OceanSave or similar approved) prior to discharging into a sediment forebay prior to the bioretention basins. Pre-treatment of the stormwater will assist in mitigating the potential for early onset sedimentation of the bio-retention systems;
- Tertiary treatment to the catchment will be provided by bio-retention system within each of the three proposed estate detention systems. As noted, the effective performance of bio-retention systems combined with on-site detention systems is described in detail in **Section 4.3** of this report.
- Sediment forebays will be provided prior to runoff from lots and roadway drainage into bio-retention systems.

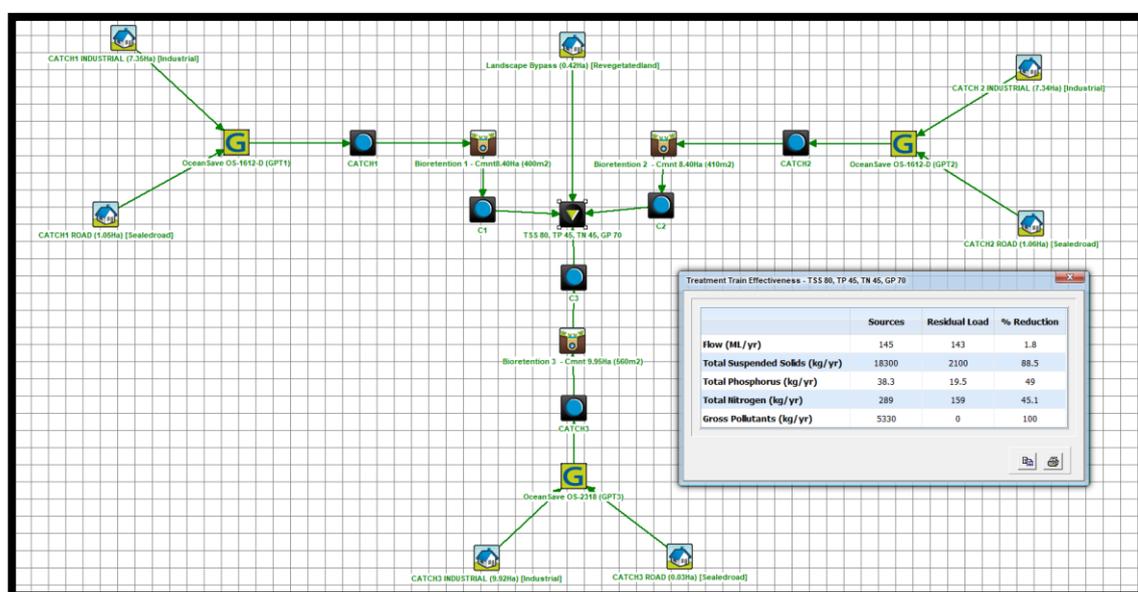
It is intended that ownership and maintenance of the estate detention and water quality basin is transferred to Whittlesea Council following completion of works and development of the land. All treatment infrastructure will be designed and sized to achieve the required treatment and detention targets at an estate level. Additionally, a portion of the future sub-divided lots' roofs will be partially treated via rainwater reuse and settlement within the rainwater tank. No other treatment measures is proposed on the future sub-divided lots.

### 5.3 Stormwater Quality Modelling

The MUSIC model was chosen to model water quality. By simulating the performance of stormwater management systems, MUSIC can be used to predict if the proposed systems and changes to land use are appropriate for their catchments and capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC, of relevance to this report, include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria set out in the WSUD Guidelines and nominated in **Section 3.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The parameters used in the MUSIC model are presented in **Appendix B**. **Figure 5.1** below shows the MUSIC model layout.



**Figure 5.1. MUSIC model layout**

**Table 5.1** shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

**Table 5.1. MUSIC analysis results - % reductions**

	Source	Residual Load	% Reduction	% Reduction Target
<b>Total Suspended Solids (kg/yr)</b>	18,300	2100	88.50	80.00
<b>Total Phosphorus (kg/yr)</b>	38.30	19.50	49.00	45.00
<b>Total Nitrogen (kg/yr)</b>	289.00	159.00	45.10	45.00
<b>Gross Pollutants (kg/yr)</b>	5,330.00	0.00	100.00	70.00

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements have been met.

The modelling shows that treatment objectives are noted to be met by the precinct for GP's, TSS, TP and TN. Overall, the proposed water quality system is considered to be robust and provides adequate water quality outcomes.

Given the expected low source loadings of hydrocarbons and oil/grease and removal efficiencies of the treatment devices we consider that the requirements of the Whittlesea City Council have been met. Further discussion on hydrocarbons can be found in **Appendix B**.

Further to the additional comments received from Melbourne Water on 23 May 2023, attached to **Appendix H**, regarding the demonstration that the sizing of the sediment forebays are sufficient in combination with the GPT units prior to discharge into the bioretention basins, our response shown below and in Section 1.2:

*“6. Condition 1 MWA-1274358 has not been addressed adequately to include a robust sediment capture asset. The following information is required:*

*The sediment forebays appear to be undersized in relation to the catchments they are to treat, sediment forebays are generally designed for catchment areas >2ha – 5ha (refer to CS1 of MW “Biofiltration systems in DSS guideline 2020”) and all of these proposed catchment areas are above 5ha. A sediment pond is the preferred asset to treat coarse particles sufficiently without prematurely undermining the performance of the bioretention system. It must be clearly explained as to why a sediment pond has not been incorporated into the design, if the proposed sediment forebays are to remain, it must be demonstrated that the sizing of the sediment forebays are sufficient for the catchment areas, including estimated dimensions and relevant modelling and calculation (e.g. MUSIC) results. Unless otherwise specified by City of Whittlesea.”*

The proposed primary treatment system, prior to the bio-retention system, is based on a vortex type gross pollutant trap (GPT) coupled with a sediment forebay.

The deemed to comply method included in CS1 of MW “Biofiltration systems in DSS guideline 2020” is noted to comprise a treatment train which includes a sediment pond only (i.e. the guide does not consider the sediment removal from the proposed GPT). The requirement of the “Biofiltration systems in DSS guideline 2020” is to ensure that circa 95% of coarse sediments (>125um) are removed from the system in a 3-month ARI storm. The intent of the guide is to ensure coarse sediments are removed prior to the bio-retention such that the bio-retention system is not overloaded and reduced performance of the system is mitigated.

We consider the proposed GPT/Sediment forebay treatment train meets the intent of the guideline, with improved ability for the proponent to regularly maintain the primary treatment systems over that of a sediment basin (noting the GPT can be readily maintained by a contractor with suction truck, compared to a sediment pond which requires excavator, truck and specialised contractors).

The proposed GPT, the Ocean Save GPT, is based on the Contech CDS GPT previously distributed by Rocla. We have reviewed several research/ testing papers and there is no direct testing on the 125um particle as required by Melbourne Water, however there are various tests of other particle sizes which shows the intent of the DSS Guideline can be met. Research by Sansalone (2004) shows that between 80-90% of particles >75um will be captured in the GPT. Further studies (Slominski, Wells & Berger 2002) show >95% removal of particles >215um will be captured in the GPT. This document further notes that between 80% of particles in the 150-215um range will be captured in the GPT depending on the flow rate. Noting some variance in the testing results, we would conservatively estimate that at least 80% of coarse sediments >125um would be captured within the GPT. The final 15% of coarse sediments would be captured within the proposed sediment forebay (noting final sizing of the forebay would be completed at detail design phase based on the requirements of Melbourne Water).

We note the overall objective for total suspended solids removal is only 80% at the point of discharge (compared to 95% of coarse sediment in the primary system), which has been confirmed via MUSIC. The MUSIC model does not separate coarse and fine sediment removal and as such cannot be directly quantified in MUSIC. The TSS removal as modelled in MUSIC removed by the GPT is >60%, with the final 20% being achieved within the bio-retention system.

Noting the removal efficiencies of coarse sediment as confirmed by research in the GPT, and the inclusion of a sediment forebay, the assessment above confirms the intent of the DSS Guideline deemed to comply solution for pre-treatment of the bio-retention system has been met.

#### 5.4 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater, where the flow is from roof areas only, or stormwater where the flow is from all areas of the development.

Rainwater harvesting is not proposed for the estate development, however future individual development lots will require re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the water demand for the development to between 50-70% of non-potable demand. Objectives have been set out in **Section 3.1** of this document.

In general terms the rainwater harvesting system will be an in-line tank for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system.

Rainwater tanks for future development lots and application will need to have harvesting systems sized using either a simple water balance analysis to balance the supply and demand, or other acceptable methods such as Greenstar, based on the base water demands, or via MUSIC.

The objectives, as included in **Section 3.1**, are to provide a reduction in non-potable water demand with a minimum demand reduction of 50-70% based on a rainwater balance assessment.

#### 5.5 Maintenance and Monitoring

It is important that each component of the stormwater system and water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared and included as **Appendix D** to assist in the effective operation and maintenance of the various water quality components.

Inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the below nominated frequency it is recommended that inspections are made following large storm events.

It is reiterated that the ownership and management of the estate basin will be transferred to Whittlesea Council.

## **6 FLOODING AND OVERLAND FLOW**

### **6.1 Introduction & Flood Behaviour**

The site is noted to be located adjacent to Merri Creek and Central Creek.

We note that the site is clear of the both the Merri Creek and Central Creek Floodplain however the site contributes to Merri Creek and ultimately runoff from the property drains to Merri Creek.

A flood advise letter was obtained from Melbourne Water to confirm the flood extent and level of the 1% AEP (1 in 100yr ARI) storm event. Refer to **Appendix E** for the flood advise letter.

An excerpt of the flood model extent provided by Melbourne Water is shown in **Figure 6.1**. Melbourne Water quotes the 1% AEP flood level to vary between RL 118.56m AHD (north-west of site) to RL 114.14m AHD (south-west of site). Information relating to the PMF event is not included in the letter.

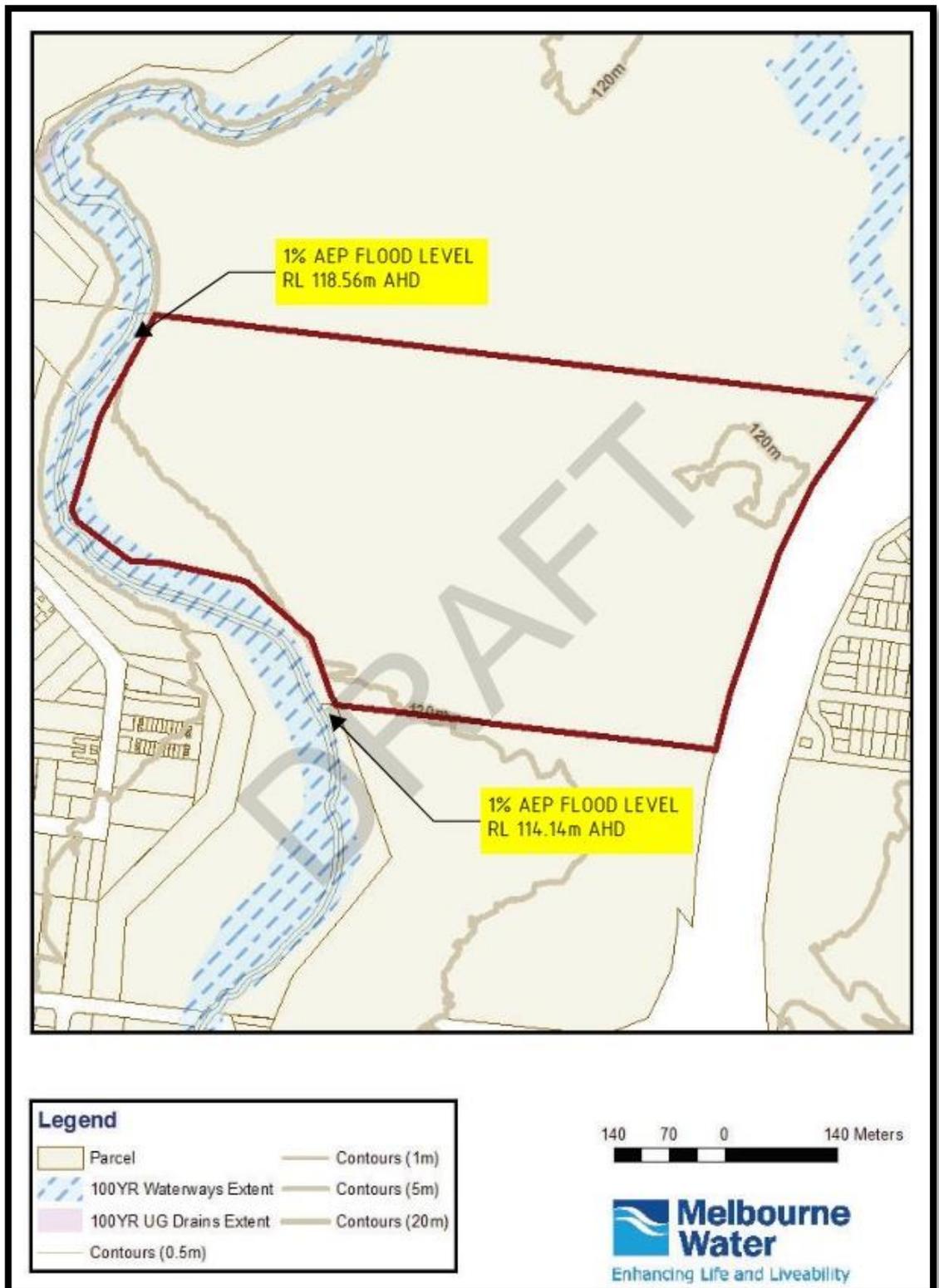


Figure 6.1. Excerpt of Melbourne Water Flood Diagram

## **6.2 Flood Planning and Council Requirements.**

Whittlesea City Council requires that the minimum floor level to be a minimum of 0.6m above 1% Annual Exceedance Probability flood level. The flood planning level (FPL) for the development is based on a minimum floor level of 1% AEP flood level plus 0.6m of freeboard.

For this site the proposed development requires a minimum FPL of RL 119.16m AHD at the north-western boundary grading to RL 114.74m AHD at the south-west. Noting that the anticipated site development levels will be between RL 129.5m AHD (at the north-west of the site), grading down to RL 122.0m AHD the site is noted to meet minimum flood planning levels. It is further noted that no works are proposed within any 1% AEP flood affected land, other than the drainage connection to Merri Creek.

Access to and from the site is able to be made in 1% AEP storm events.

We note the intention of the developers of 481 Cooper Street to formalise the Central Creek Drainage reserve which is to the north-east of the development site. This drainage system is noted to be clear of the development footprint and does not impact the current development site strategy or development area.

## **6.3 Flood Assessment Conclusion**

A review of flooding relating to the nearby Merri Creek has been completed.

The assessment of the 1% AEP event confirms that development does not impact or encroach on the existing 1% AEP flood extent. Further that the development site meets flood planning requirements for minimum floor levels and impact.

No further flood studies or assessments are required for the development.

## 7 CONSTRUCTION SOIL AND WATER MANAGEMENT

### 7.1 Soil and Water Management General

Without any mitigation measures and during typical construction activities, site runoff would be expected to convey a significant sediment load. A *Soil and Water Management Plan* (SWMP) and *Erosion and Sediment Control Plan* (ESCP), or equivalent, would be implemented for the construction of the Proposal. The SWMP and ESCPs would be developed in accordance with the principles and requirements of *IECA Best Practice Erosion and Sediment Control Document* (The White Book), *EPA publication 1834 - Civil construction, building and demolition guide Management During Construction (2020)*, *Melbourne Water Land Development Manual – Site Management Plans* and Whittlesea Council requirements with a staged approach.

In accordance with the principles included in the White Book, a number of controls have been incorporated into a preliminary Staged ESCP (refer to accompanying Drawings in **Appendix A**) and draft SWMP in **Appendix C**. The Staged ESCP considers initial site establishment, requirements during construction of roads and infrastructure and estate earthworks, completion of estate works and the period between this and development of individual lots.

**Section 1** provides a summary of the construction works for the Proposal. While all construction activities have the potential to impact on water quality, the key activities are:

- Erosion and sediment control installation.
- Grading of existing earthworks to suit building layout, drainage layout and pavements.
- Stormwater and drainage works.

The sections below outline the proposed controls for management of erosion and sedimentation during construction of the Proposal. The staged approach is noted to consider initial site establishment, construction of the estate and the period between completed of the estate infrastructure works and development of individual lots in the estate as included in the ESCP drawings **Appendix A**.

A geotechnical investigation is being completed in February 2023 which will provide an indication of what we can expect in terms of the existing soil conditions on site, according to which we could progress the designs and erosion & sediment control plans.

It should be noted that sodic and dispersive soils will be considered in the Construction Stormwater Management Plan to ensure the correct controls is implemented, as standard erosion controls, such as silt fences, and conventional sediment controls, such as sediment basins do not work with (unless coupled with chemical flocculants) sodic and dispersive soils.

### 7.2 Typical Management Measures

#### Sediment Basins

Sediment basins have been sized (based on 5 day 85<sup>th</sup> percentile rainfall) and located to ensure sediment concentrations in site runoff are within acceptable limits. Preliminary basin sizes have been calculated in accordance with the White Book and are based on 'Type D' soils.

Sediment basins for 'Type D' soils are typically wet basins which are pumped out following a rainfall event when suspended solids concentrations of less than 50 mg/L have been achieved.

The three sediment basins proposed (see CO14681.00-DA20) within the Erosion and Sediment Control Plan are temporary basins only as part of the delivery of the subdivision works to control sediment movement on the site during construction. These ponds will be removed during the construction process once sediment control is not required anymore. Sediment Basin number 1

will be positioned to be located within the same footprint of the future Stormwater Management Basin (Detention- and Bioretention) to reduce the area disturbed.

#### Sediment Fences

Sediment fences are located around the perimeter of the site to ensure no untreated runoff leaves the site. They have also been located around the existing drainage channels to minimise sediment migration into waterways and sediment basins.

#### Stabilised Site Access

For the proposal, stabilised site access is proposed at one location at the entry to the works area. This will limit the risk of sediment being transported onto public roads.

### **7.3 Other Management Measures**

Other management measures that will be employed are expected to include:

- Minimising the extent of disturbed areas across the site at any one time.
- Progressive stabilisation of disturbed areas or previously completed earthworks to suit the proposal once trimming works are complete.
- Regular monitoring and implementation of remedial works to maintain the efficiency of all controls.

It is noted that the controls included in the preliminary ESCP are expected to be reviewed and updated as the design, staging and construction methodology is further developed for the Proposal.

## 8 CONCLUSION

This Stormwater Management Report has been prepared to support the Planning Application for a Proposed Development at 485 Cooper Street, Epping, Victoria.

A stormwater management strategy for the site has been developed which provides a best practice solution within the constraints of the existing landform and proposed development layout. Within this strategy a stormwater quantity and quality management strategy has been developed to reduce both peak flows and pollutant loads in stormwater leaving this site. The stormwater management for the development has been designed in accordance with Whittlesea City Council and Melbourne Water WSUD requirements.

The hydrological assessment proves local post development flows from the site will be less than pre-development flows and demonstrates that the site discharge will not adversely affect any land, drainage system or watercourse as a result of the development.

During the construction phase, a Sediment and Erosion Control Plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

During the operational phase of the development, a treatment train incorporating the use of a proprietary GPT's, sediment forebays and bio-retention raingarden system is proposed to mitigate any increase in stormwater pollutant load generated by the development. MUSIC modelling results indicate that the proposed STM are effective in reducing pollutant loads in stormwater discharging from the site and meet the requirements of Council's pollution reduction targets. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

It is recommended the management strategies in this report be approved and incorporated into the future detailed design.

## 9 REFERENCES

- *EPA publication 1834 - Civil construction, building and demolition guide Management During Construction (2020).*
- *IECA Best Practice Erosion and Sediment Control Document (The White Book)*
- *Melbourne Water Land Development Manual – Site Management Plans*
- *Guidelines for Urban Development– 2015 (City Of Whittlesea)*
- *Construction Specification for Road and Drainage Works – 2011 (City Of Whittlesea); and*
- *Water Sensitive Urban Design Guidelines, South Eastern Councils – Melbourne Water*

# Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

# PROPOSED INDUSTRIAL ESTATE

## 485 COOPER STREET, EPPING, VIC, 3076

### DEVELOPMENT PLAN APPLICATION

#### DRAWING LIST

DRAWING NO.	DRAWING TITLE
C014681.00-DA10	DRAWING LIST & SITE LOCATION
C014681.00-DA20	EROSION AND SEDIMENT CONTROL PLAN
C014681.00-DA25	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 1
C014681.00-DA26	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 2
C014681.00-DA30	BULK EARTHWORKS PLAN
C014681.00-DA40	STORMWATER MANAGEMENT PLAN
C014681.00-DA41	STORMWATER MANAGEMENT PLAN - PROPOSED BIORETENTION
C014681.00-DA42	STORMWATER POST-DEVELOPMENT CATCHMENT PLAN
C014681.00-DA45	STORMWATER MANAGEMENT DETAILS - SHEET 1
C014681.00-DA46	STORMWATER MANAGEMENT DETAILS - SHEET 2
C014681.00-DA47	STORMWATER MANAGEMENT DETAILS - SHEET 3
C014681.00-DA48	TYPICAL SECTIONS

#### GENERAL NOTES:

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
3. ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE. ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS. ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT. REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
4. UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
5. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

#### ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.



#### NOTE:

DRAWING SET IS FOR INFORMATION PURPOSES ONLY. ALL INFRASTRUCTURE WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER STANDARDS AND GUIDELINES DURING THE DETAIL DESIGN STAGE.

**FOR DEVELOPMENT APPLICATION**

RENAMED TO DEVELOPMENT PLAN APPLICATION 20.07.23 D REVISED AS CLOUDED 23.02.23 C REVISED AS CLOUDED 22.12.16 B ISSUED FOR INFORMATION 22.09.21 A AMENDMENTS DATE ISSUE AMENDMENTS DATE ISSUE		ARCHITECT 	CLIENT 	PROJECT <b>PROPOSED INDUSTRIAL DEVELOPMENT</b> 485 COOPER STREET, EPPING, VIC 3076	CONSULT AUSTRALIA 	Costin Roe Consulting Pty Ltd. ABN 50 003 696 446 PO Box N419 Sydney NSW 1220 Level 4, 8 Windmill Street, Millers Point NSW 2000 p: +61 2 9251 7699 f: +61 2 9241 3751 e: mail@costinroe.com.au w: costinroe.com.au		DRAWING TITLE <b>DRAWING LIST &amp; SITE LOCATION</b> DRAWING No <b>C014681.00-DA10</b>	ISSUE <b>C</b>
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**SEDIMENTATION BASIN NOTE:**

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C014681.00-DA25.

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF IECA BEST PRACTICE EROSION AND SEDIMENT CONTROL DOCUMENT (THE WHITE BOOK)

CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 85th PERCENTILE INTENSITY (25.4mm).

APPROXIMATE AREA OF DISTURBED SITE = 28.50ha

SEDIMENT BASINS:	BASIN 1	BASIN 2	BASIN 3
CATCHMENT AREA	= 5.80ha	14.30ha	8.40ha
REQUIRED BASIN VOLUME	= 1105m <sup>3</sup>	8724m <sup>3</sup>	1000m <sup>3</sup>
BASE DIMENSIONS (L X W)	= 21.4m x 24.0m	45.0m x 35.0m	33.0m x 24.0m
TOP DIMENSIONS (L X W)	= 30.5m x 33.0m	54.0m x 44.0m	42.0m x 33.0m
MAX SIDE SLOPE	= 1V:3H	1V:3H	1V:3H
DEPTH	= 1.5m	1.5m	1.5m
PROVIDED BASIN VOLUME	= 1122m <sup>3</sup>	2943m <sup>3</sup>	1613m <sup>3</sup>

SEDIMENTATION BASINS TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS. COLLECTED RUN-OFF TO BE ASSESSED BY A QUALIFIED LABORATORY FOR DOUSING RATES OF ALUM OR

GYPSUM TO ENSURE COAGULATION OF SEDIMENTS PRIOR TO WATER BEING DISCHARGED TO COUNCIL STORMWATER SYSTEM.

EACH BASIN IS TO HAVE A MARKER PLACED AS PER THE DETAIL TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

ALLOWANCE TO BE MADE DURING BENCHING OF SITE TO ENSURE RUN-OFF IS DIRECTED TO SEDIMENTATION BASINS.

**NOTES:**

1. ASSUME TYPE D SOIL (CLAY/SILTY CLAY)
  2. ASSUME GROUP D SOIL (HIGH PLASTICITY AND SHRINK/SWELL PROPERTIES)
  3.  $C_v = 0.5$  & LENGTH TO WIDTH RATIO OF 2 (MIN)
- SOIL TYPE TO BE ASSESSED BY A GEOTECHNICAL ENGINEER.

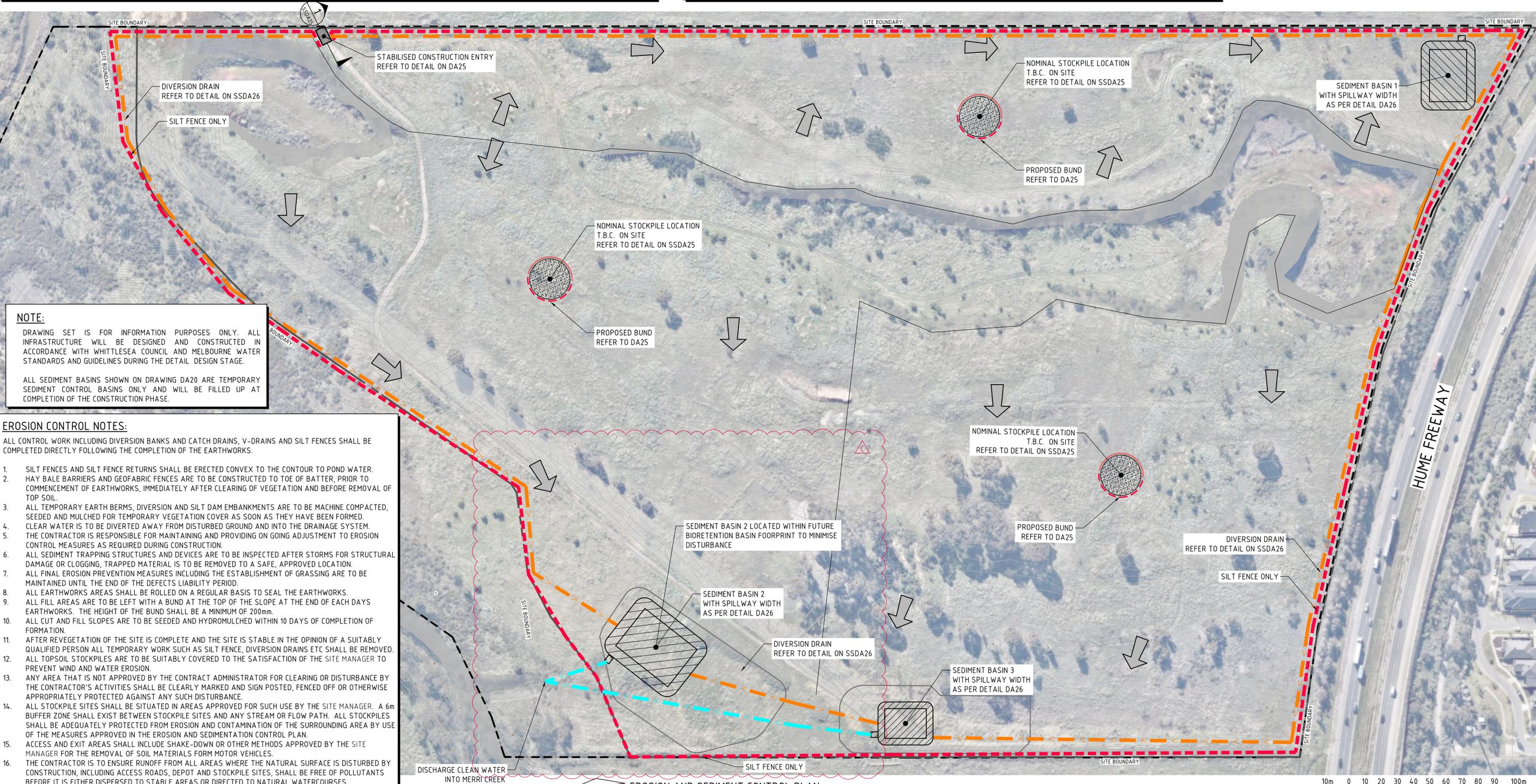
**SEDIMENT CONTROL BASIN NOTES:**

1. TYPE D BASIN IS REQUIRED.
2. VOLUME OF THE BASINS SHALL BE AS NOMINATED ON DRAWING. NOMINAL POND LOCATIONS AND NOMINAL DIMENSIONS.
3. SEDIMENT BUILD UP TO NOT EXCEED 33% TOTAL CAPACITY OF BASIN.
4. DEWATERING OF BASIN TO BE PERFORMED TO THE BOTTOM OF THE SEDIMENT SETTLING ZONE FOLLOWING ACHIEVEMENT OF WQO's. MANAGEMENT OF DOSAGE AND DISCHARGE TO BE ACHIEVED WITHIN 5 DAYS OF THE INITIAL RAINFALL EVENT.
5. FOLLOWING DEWATERING PER NOTE 4, WATER LEVEL TO BE MAINTAINED AT 20% CAPACITY AFTER A FOUR DAY SETTLING PERIOD FOLLOWING A STORM EVENT.
6. WATER TO BE DOSED WITH GYPSUM TO ACCELERATE ASETTLEMENT OF SUSPENDED SOLIDS AS REQUIRED.
7. GYPSUM DOSAGE RATE TO BE APPLIED AT APPROX. 32kg PER 100 CUBIC METRE OF COLLECTED RUNOFF.
8. THE USE OF ALUM (OR ANY OTHER ALTERNATIVE) AS A FLOCCULANT IS NOT RECOMMENDED. ALUM OR ANY OTHER FLOCCULANT IS TO BE USED ONLY FOLLOWING CONSULTATION WITH AND ACCEPTANCE FROM COUNCIL ESC OFFICERS.
9. DISCHARGE FROM POND IS PERMISSIBLE WHEN THE WATER PH IS 6.5-8.5 AND IS CLARIFIED TO AT OR BELOW A TSS OF 50mg/L. CLARIFICATION WOULD GENERALLY BE ACHIEVED IN 36-72 HOURS WITH THE USE OF GYPSUM. CORRELATION TESTS MUST BE UNDERTAKEN ON SITE TO ENSURE THIS IS ACHIEVED.
10. DEWATERING SHALL BE DONE IN SUCH A MANNER AS TO REMOVE THE CLEAN WATER BEING WATER WITHIN THE ADOPTED CRITERIA) WITHOUT REMOVING OR DISTURBING THE SEDIMENT THAT HAS SETTLED. THE PUMP INTAKE PIPE IS NOT TO REST ON THE SETTLED SEDIMENT LAYER.
11. IF WATER EXCEEDS TSS OF 50mg/L DURING DEWATERING, PUMPING IS TO CEASE. RECORDS ARE TO BE KEPT (ON-SITE AT ALL TIMES) OF ALL MEASUREMENT PRIOR TO, DURING AND AFTER DISCHARGE. RECORDS TO BE MADE AVAILABLE TO COUNCIL OFFICERS UPON REQUEST.
12. PROVIDE SECURITY FENCE TO BASIN FOR SAFETY.

**LEGEND:**

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS. TYPICAL (N.S.O.P.)

- DENOTES DIVERSION DRAIN (UNTREATED)
- DENOTES CLEAN WATER DIVERSION DRAIN
- DENOTES SILT FENCE WITH CATCH DRAIN
- DENOTES SILT FENCE ONLY
- DENOTES CONSTRUCTION ENTRY
- DENOTES OVERLAND FLOW PATH



**NOTE:**  
DRAWING SET IS FOR INFORMATION PURPOSES ONLY. ALL INFRASTRUCTURE WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER STANDARDS AND GUIDELINES DURING THE DETAIL DESIGN STAGE.  
ALL SEDIMENT BASINS SHOWN ON DRAWING DA20 ARE TEMPORARY SEDIMENT CONTROL BASINS ONLY AND WILL BE FILLED UP AT COMPLETION OF THE CONSTRUCTION PHASE.

**EROSION CONTROL NOTES:**

- ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.
1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
  2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
  3. ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
  4. CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
  5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
  6. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
  7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
  8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
  9. ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200mm.
  10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
  11. AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
  12. ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
  13. ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
  14. ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
  15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FROM MOTOR VEHICLES.
  16. THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
  17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

**FOR DEVELOPMENT APPLICATION**

AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE
REVISED SLIGHTLY TO SUIT UPDATED MASTERPLAN LAYOUT	20.07.23	C			
REVISED AS CLOUDED. ISSUED FOR INFORMATION.	23.02.23	B			
ISSUED FOR INFORMATION	21.09.22	A			

ARCHITECT: **SBA ARCHITECTS**

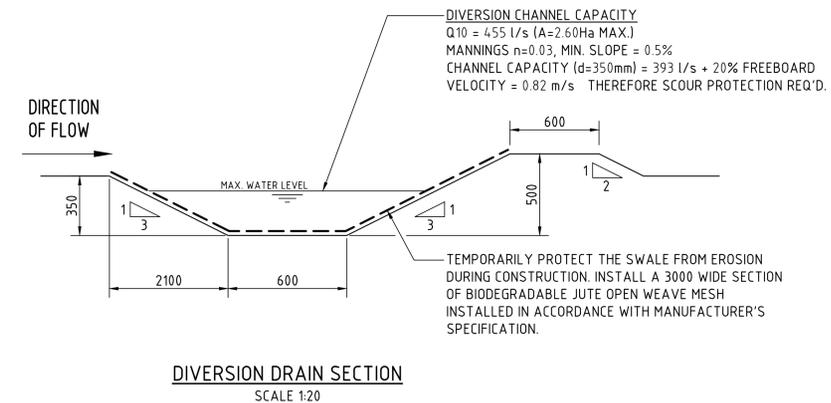
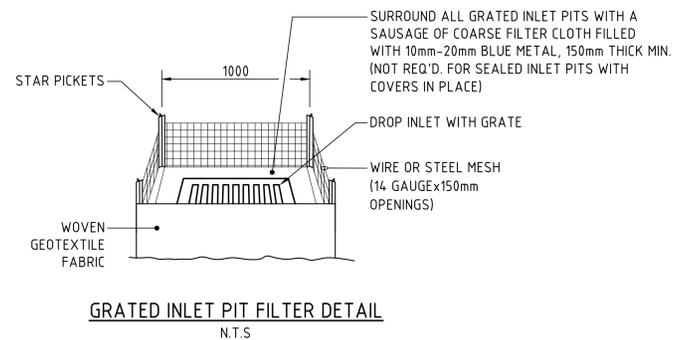
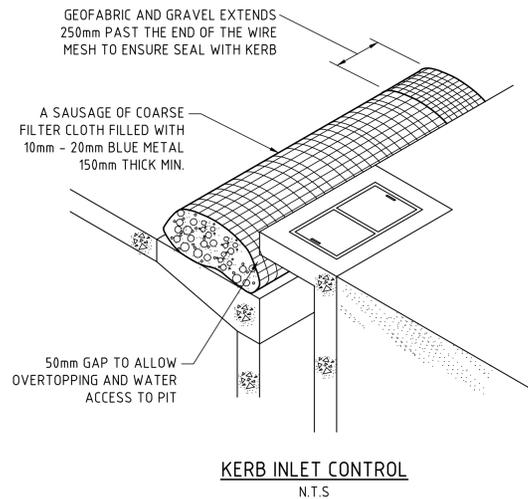
CLIENT: **GPT The GPT Group**

PROJECT: **PROPOSED INDUSTRIAL DEVELOPMENT**  
485 COOPER STREET, EPPING, VIC 3076

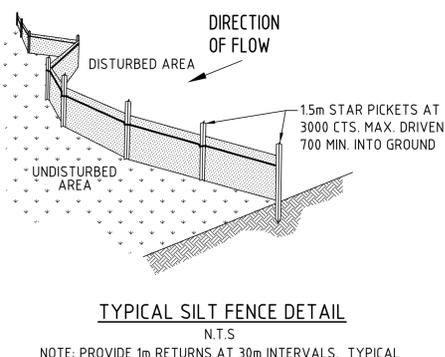
CONSULT AUSTRALIA  
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**CRC CIVIL & STRUCTURAL ENGINEERS**  
COSTIN ROE CONSULTING

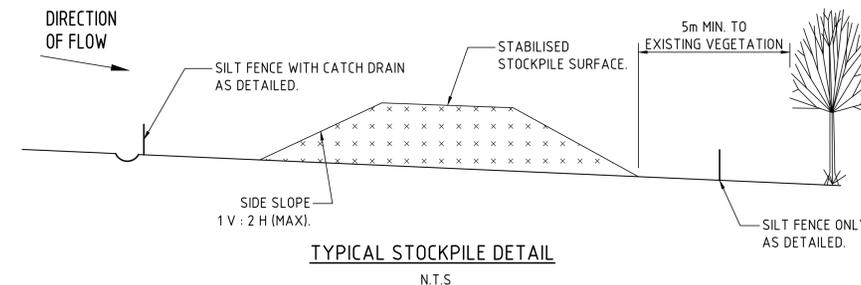
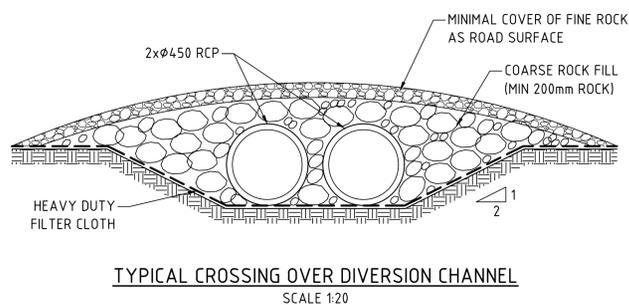
DRAWING TITLE: **EROSION AND SEDIMENT CONTROL PLAN**  
DRAWING No: **C014681.00-DA20**



**NOTE :**  
ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.

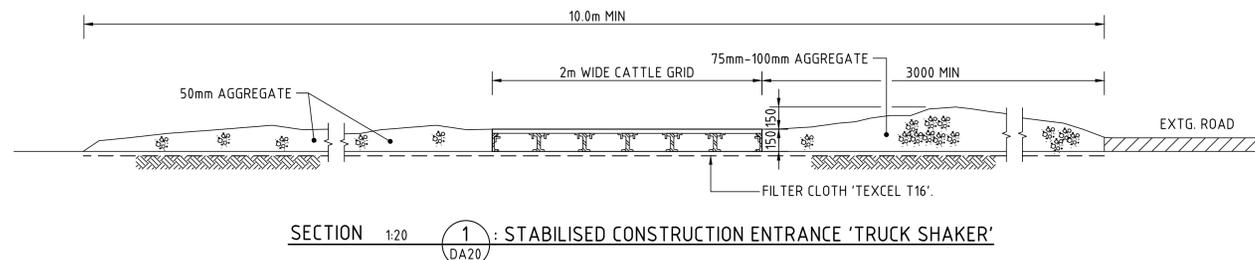


NOTE: PROVIDE 1m RETURNS AT 30m INTERVALS. TYPICAL



**STOCKPILE NOTES**

1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1 V : 2 H MAX.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH - 16 TONNE/Ha.
5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.

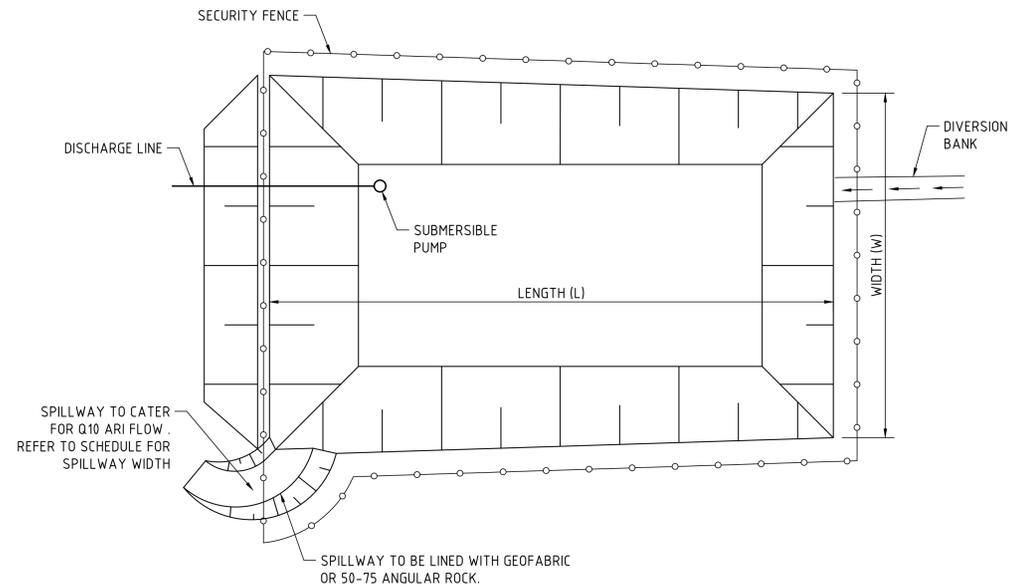


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200mm 0 500 1000 1500 2000mm  
SCALE 1:20 AT B1 SIZE SHEET

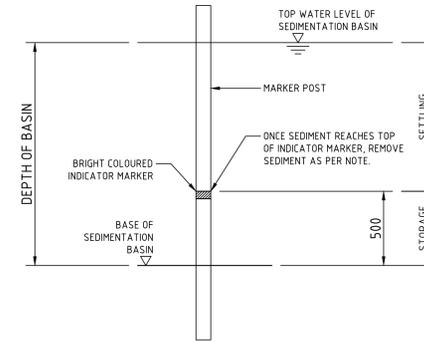
**FOR DEVELOPMENT APPLICATION**

ISSUED FOR DEVELOPMENT APPLICATION		20.07.23	C	ARCHITECT	CLIENT		PROJECT	COSTIN ROE CONSULTING PTY LTD.		<b>CRC</b> <b>CIVIL &amp; STRUCTURAL ENGINEERS</b>	DRAWING TITLE	
ISSUED FOR INFORMATION		23.02.23	B		CLIENT		PROPOSED INDUSTRIAL DEVELOPMENT	ABN 50 003 696 446			EROSION AND SEDIMENT CONTROL DETAILS	
ISSUED FOR INFORMATION		22.09.23	A		CLIENT		485 COOPER STREET, EPPING, VIC 3076	PO Box N419 Sydney NSW 1220 Level 4, 8 Windmill Street, Millers Point NSW 2000 p: +61 2 9251 7699 f: +61 2 9241 3731 e: mail@costinroe.com.au w: costinroe.com.au			SHEET 1	
AMENDMENTS		DATE	ISSUE	AMENDMENTS	DATE	ISSUE	DESIGNED	DRAWN	CHECKED		SCALE	CAD REF:
							LDV	LDV	MW	AS SHOWN	CO16681.00-DA25	C014681.00-DA25

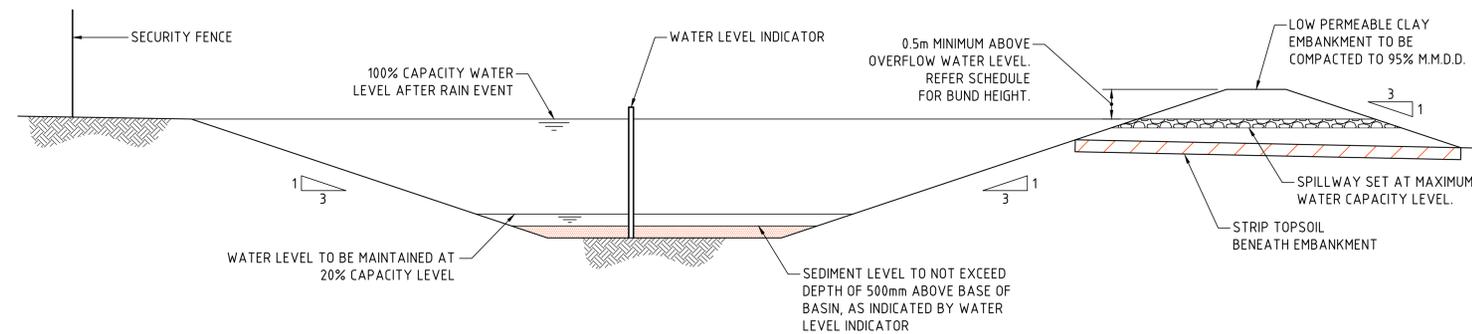


TYPICAL SEDIMENT CONTROL POND PLAN  
SCALE 1:250

SPILLWAY SCHEDULE					
CATCHMENT (Ha)	FLOW (m³/s)	WIDTH (m)	FLOW DEPTH (m)	ROCK SIZE (mm)	BUND HEIGHT ABOVE SPILLWAY (m)
1	0.3	2	0.20	200	0.70
2	0.6	4	0.20	200	0.70
5	1.4	5	0.30	200	0.80
10	2.8	8	0.35	200	0.85



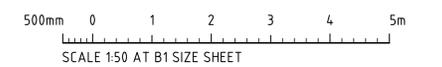
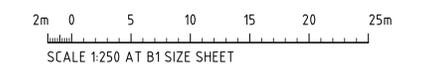
SEDIMENT STORAGE MARKER  
SCALE 1:20



TYPICAL SEDIMENT CONTROL BASIN SECTION  
SCALE 1:50

**NOTE:**

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**FOR DEVELOPMENT APPLICATION**

ISSUED FOR	DATE	ISSUE	AMENDMENTS
ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	C	
ISSUED FOR INFORMATION	23.02.23	B	
ISSUED FOR INFORMATION	23.09.22	A	
AMENDMENTS	DATE	ISSUE	AMENDMENTS

ARCHITECT  
**SBA**  
ARCHITECTS

CLIENT  
**GPT**  
The GPT Group

PROJECT  
**PROPOSED INDUSTRIAL DEVELOPMENT**  
485 COOPER STREET, EPPING, VIC 3076

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**CRC**  
COSTIN ROE CONSULTING  
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE  
**EROSION AND SEDIMENT CONTROL DETAILS SHEET 2**  
DRAWING No  
**C014681.00-DA26**

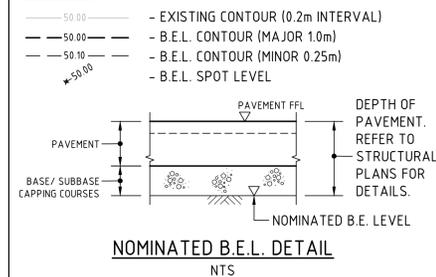
**SITE PREPARATION NOTES:**

- ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL REPORT (IN PROGRESS), TO BE CONFIRMED DURING DETAIL DESIGN STAGE).
- EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY HELLIER McFARLAND REFERENCE # 132315/1\_B DATED 13/01/2023.
- STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
- COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION. WHERE EXPOSED ROCK (WEATHERED SHALE OR SANDSTONE) IS ENCOUNTERED AT CUT SUBGRADE LEVEL, THE EARTHWORKS CONTRACTOR IS TO ALLOW TO RIP THE SURFACE TO A NOMINAL 0.3-0.4m DEPTH AND RECOMPACT (PER THE ENGINEERING SPEC) AS REQUIRED.
- AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL

- ENGINEER OR THE EARTHWORKS DESIGNER.
- SITE WON FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HLF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HLF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET. IMPORTED FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HLF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HLF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
- ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 mm SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HLF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 mm SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 mm SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION
- ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE

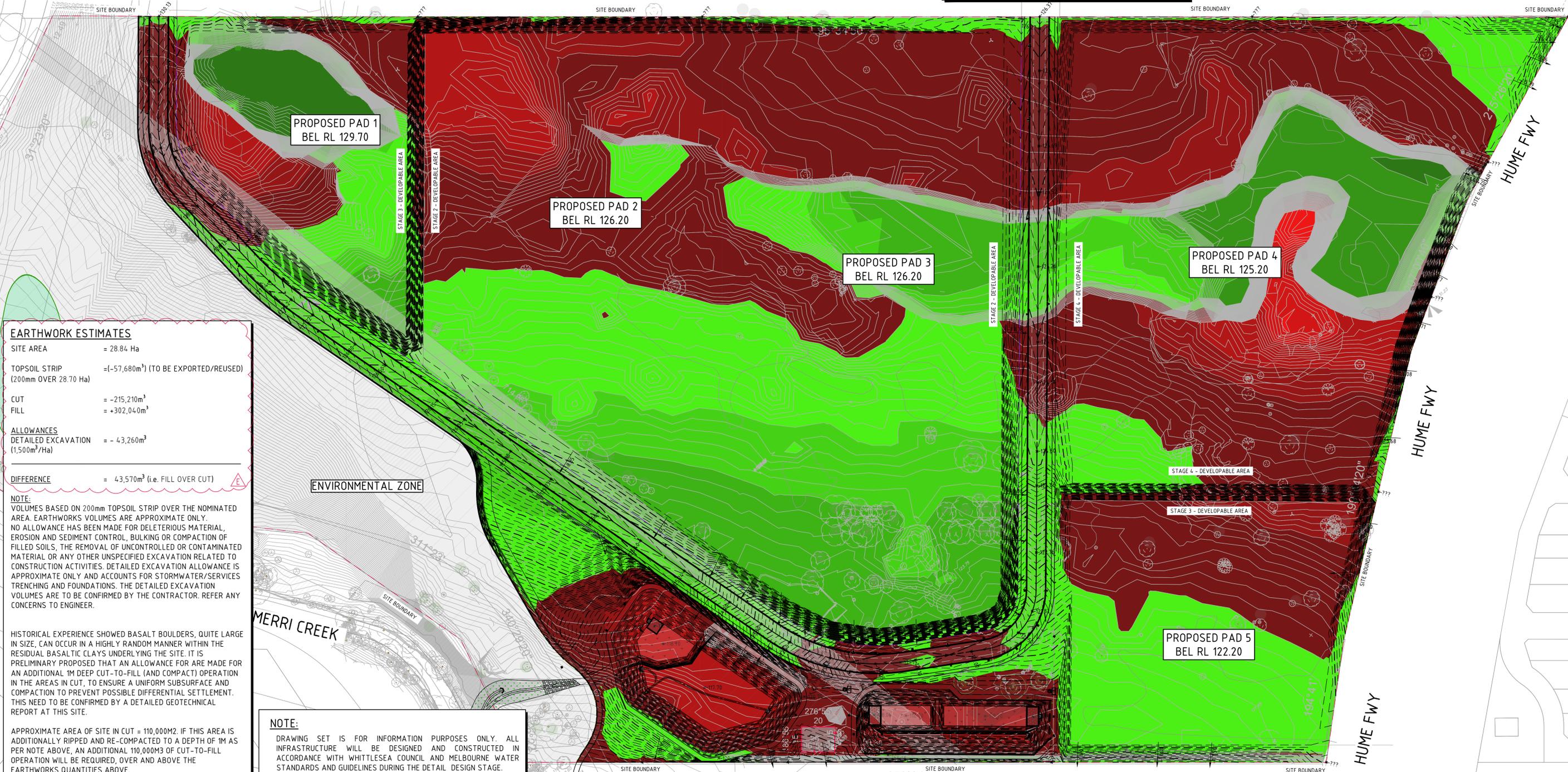
- CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED. EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
- MATCH EXISTING LEVELS AT BATTER INTERFACE.
- CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.
- DURING EARTHWORKS THE CONTRACTOR IS TO ENSURE ALL AREAS ARE FREE DRAINING & WILL NOT RETAIN WATER DURING RAINFALL. PROVIDE TEMPORARY MEASURES AS REQUIRED TO ENSURE FREE FLOWING RUNOFF THROUGH MANAGED DRAINAGE PATHS, DIVERSION DRAINS OR OTHER SUITABLE DISPOSAL METHOD AS AGREED DURING THE WORKS. REFER ANY CONCERNS TO THE ENGINEER. REFER TO EROSION AND SEDIMENT CONTROL DRAWINGS AND NOTES.

**LEGEND:**



NOTE: EARTHWORKS WITHIN THE PROPOSED SITE AREA ARE BASED ON THE PROPOSED FINISHED FLOOR LEVELS MINUS A PAVEMENT ALLOWANCE OF 300mm UNLESS NOTED OTHERWISE. FINAL DETAILED BULK EARTHWORKS LEVELS ARE TO BE CONFIRMED DURING FUTURE DETAILED DESIGN.

DEPTH RANGE			
No.	FROM DEPTH	TO DEPTH	COLOUR
1	-8.000	-6.000	Red
2	-6.000	-4.000	Dark Red
3	-4.000	-2.000	Red
4	-2.000	0.000	Dark Red
5	0.000	2.000	Green
6	2.000	4.000	Light Green
7	4.000	6.000	Light Green
8	6.000	8.000	Light Green
9	8.000	10.000	Light Green



**EARTHWORK ESTIMATES**

SITE AREA	= 28.84 Ha
TOPSOIL STRIP (200mm OVER 28.70 Ha)	= (-57,680m³) (TO BE EXPORTED/REUSED)
CUT	= -215,210m³
FILL	= +302,040m³
ALLOWANCES	
DETAILED EXCAVATION (1,500m³/Ha)	= - 43,260m³
DIFFERENCE	= 43,570m³ (i.e. FILL OVER CUT)

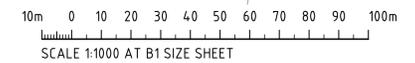
**NOTE:**  
 VOLUMES BASED ON 200mm TOPSOIL STRIP OVER THE NOMINATED AREA. EARTHWORKS VOLUMES ARE APPROXIMATE ONLY. NO ALLOWANCE HAS BEEN MADE FOR DELETERIOUS MATERIAL, EROSION AND SEDIMENT CONTROL, BULKING OR COMPACTION OF FILLED SOILS, THE REMOVAL OF UNCONTROLLED OR CONTAMINATED MATERIAL OR ANY OTHER UNSPECIFIED EXCAVATION RELATED TO CONSTRUCTION ACTIVITIES. DETAILED EXCAVATION ALLOWANCE IS APPROXIMATE ONLY AND ACCOUNTS FOR STORMWATER/SERVICES TRENCHING AND FOUNDATIONS. THE DETAILED EXCAVATION VOLUMES ARE TO BE CONFIRMED BY THE CONTRACTOR. REFER ANY CONCERNS TO ENGINEER.

HISTORICAL EXPERIENCE SHOWED BASALT BOULDERS, QUITE LARGE IN SIZE, CAN OCCUR IN A HIGHLY RANDOM MANNER WITHIN THE RESIDUAL BASALTIC CLAYS UNDERLYING THE SITE. IT IS PRELIMINARY PROPOSED THAT AN ALLOWANCE FOR ARE MADE FOR AN ADDITIONAL 1M DEEP CUT-TO-FILL (AND COMPACT) OPERATION IN THE AREAS IN CUT, TO ENSURE A UNIFORM SUBSURFACE AND COMPACTION TO PREVENT POSSIBLE DIFFERENTIAL SETTLEMENT. THIS NEED TO BE CONFIRMED BY A DETAILED GEOTECHNICAL REPORT AT THIS SITE.

APPROXIMATE AREA OF SITE IN CUT = 110,000M2. IF THIS AREA IS ADDITIONALLY RIPPED AND RE-COMPACTED TO A DEPTH OF 1M AS PER NOTE ABOVE, AN ADDITIONAL 110,000M3 OF CUT-TO-FILL OPERATION WILL BE REQUIRED, OVER AND ABOVE THE EARTHWORKS QUANTITIES ABOVE.

**NOTE:**  
 DRAWING SET IS FOR INFORMATION PURPOSES ONLY. ALL INFRASTRUCTURE WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER STANDARDS AND GUIDELINES DURING THE DETAIL DESIGN STAGE.

**BULK EARTHWORKS PLAN**  
 SCALE 1:1000  
**FOR DEVELOPMENT APPLICATION**



ISSUED FOR DEVELOPMENT APPLICATION	27.07.23	E	ARCHITECT	CLIENT
ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	D		
ISSUED FOR INFORMATION	23.02.23	C		
ISSUED FOR INFORMATION	27.09.22	B		
ISSUED FOR INFORMATION	21.09.22	A		
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE



PROJECT  
**PROPOSED INDUSTRIAL DEVELOPMENT**  
 485 COOPER STREET, EPPING, VIC 3076

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DRAWING TITLE	<b>BULK EARTHWORKS PLAN</b>
DRAWING No	C014681.00-DA30
ISSUE	E

**STORMWATER DRAINAGE NOTES:**

- ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
- THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
- PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
- EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
- ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
- ALL PIPES UP TO AND INCLUDING Ø300 TO BE UPVC GRADE SN8 UNO.
- PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
- ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F<sub>ck</sub>=25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
- IN ADDITION TO ITEM 9 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
- PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER

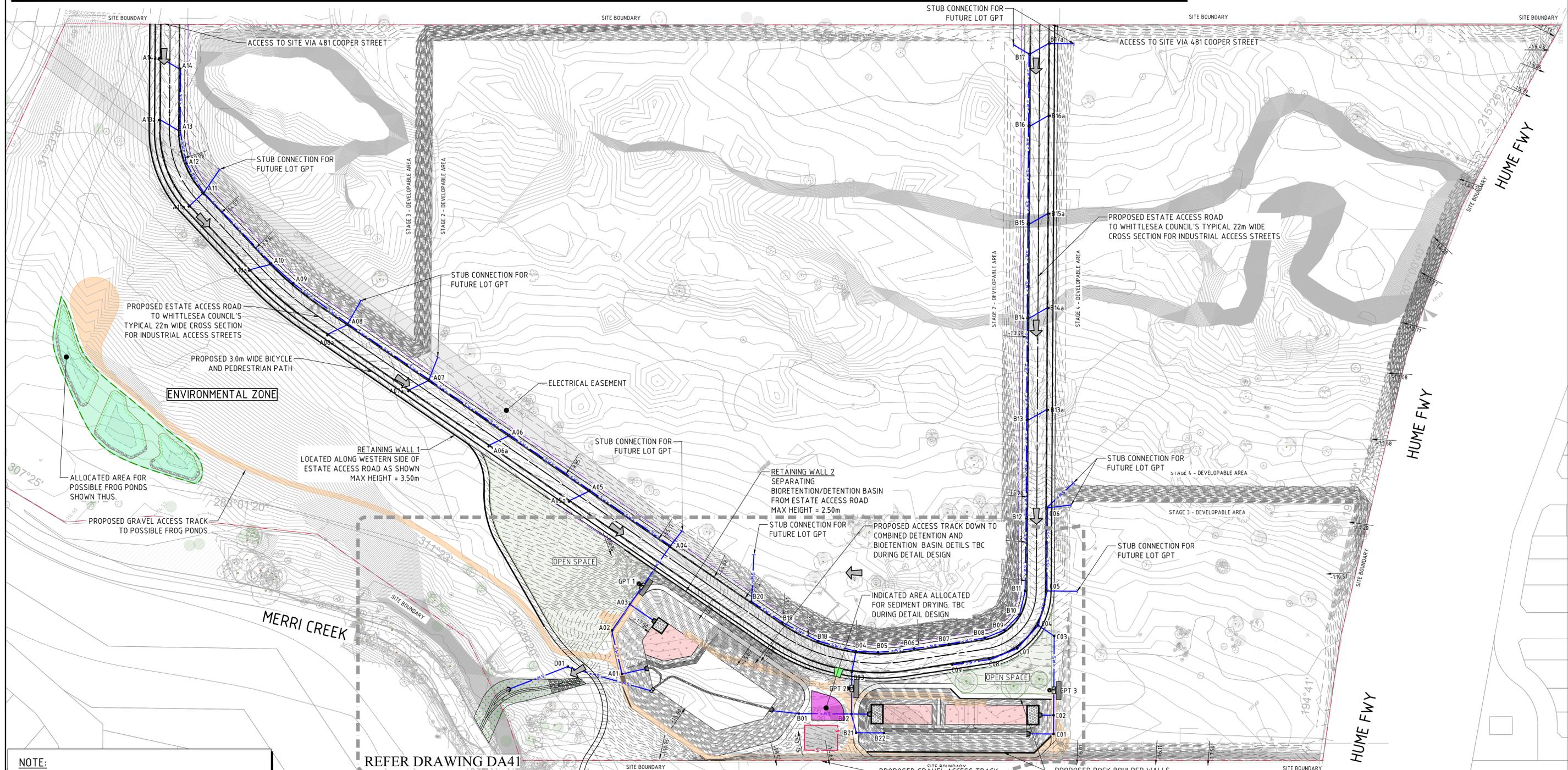
- BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
- CONCRETE PIPES UNDER, OR WITHIN THE ZONE OF INFLUENCE OF PAVED AREAS SHALL BE LAID USING HS2 TYPE SUPPORT, AS A MINIMUM, IN ACCORDANCE WITH AS 3725. AGGREGATE BACKFILL SHALL NOT BE USED FOR PIPE BEDDING AND OR HAUNCH/SIDE SUPPORT.
- WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 UPVC TO EACH SIDE OF PIPE.
- ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED UPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
- WHERE SUBSOIL DRAINAGE PASSES UNDER A PAVEMENT OR A SLAB, UNSLOTTED UPVC ARE TO BE PROVIDED UNLESS NOTED OTHERWISE.
- ALL PIPE GRADES 1 IN 200 MINIMUM UNO.
- PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
- MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
- PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS 'D' 'HEAVY DUTY', THOSE LOCATED IN

- NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
- DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
- PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS. WHERE CONNECTION TO EXISTING INGROUND DRAINAGE SYSTEMS, OPEN SWALES, CHANNELS OR ANY OTHER EXISTING SYSTEM, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION AND INVERT ON SITE AT THE BEGINNING OF THE CONSTRUCTION PERIOD. REFER ANY VARIANCE FROM DOCUMENTATION OR SURVEYS TO THE ENGINEER FOR CLARIFICATION.

**LEGEND:**

LEVELS DATUM IS AHD. EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY HELLIER MCFARLAND DATED 24/05/2021 REFERENCED 132315/1

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- BIO-RETENTION AREAS
- EXISTING DISCHARGE SWALE
- STACKED BOULDERS & SEDIMENT FOREBAY
- PROPOSED SWALE
- PROPOSED OUTLET HEADWALL STRUCTURE
- BATTERED SLOPES



**NOTE:**  
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REFER DRAWING DA41

STORMWATER MANAGEMENT PLAN  
SCALE 1:1000

**FOR DEVELOPMENT APPLICATION**

10m 0 10 20 30 40 50 60 70 80 90 100m  
SCALE 1:1000 AT B1 SIZE SHEET

ISSUED FOR INFORMATION	16.10.23	F	ARCHITECT	CLIENT	PROJECT
REVISED BICYCLE PATH ALONG OPEN SPACE	27.07.23	E			
ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	D			
ISSUED FOR INFORMATION	23.02.23	C			
ISSUED FOR INFORMATION	27.09.22	B			
ISSUED FOR INFORMATION	21.09.22	A			
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

**SBA ARCHITECTS**

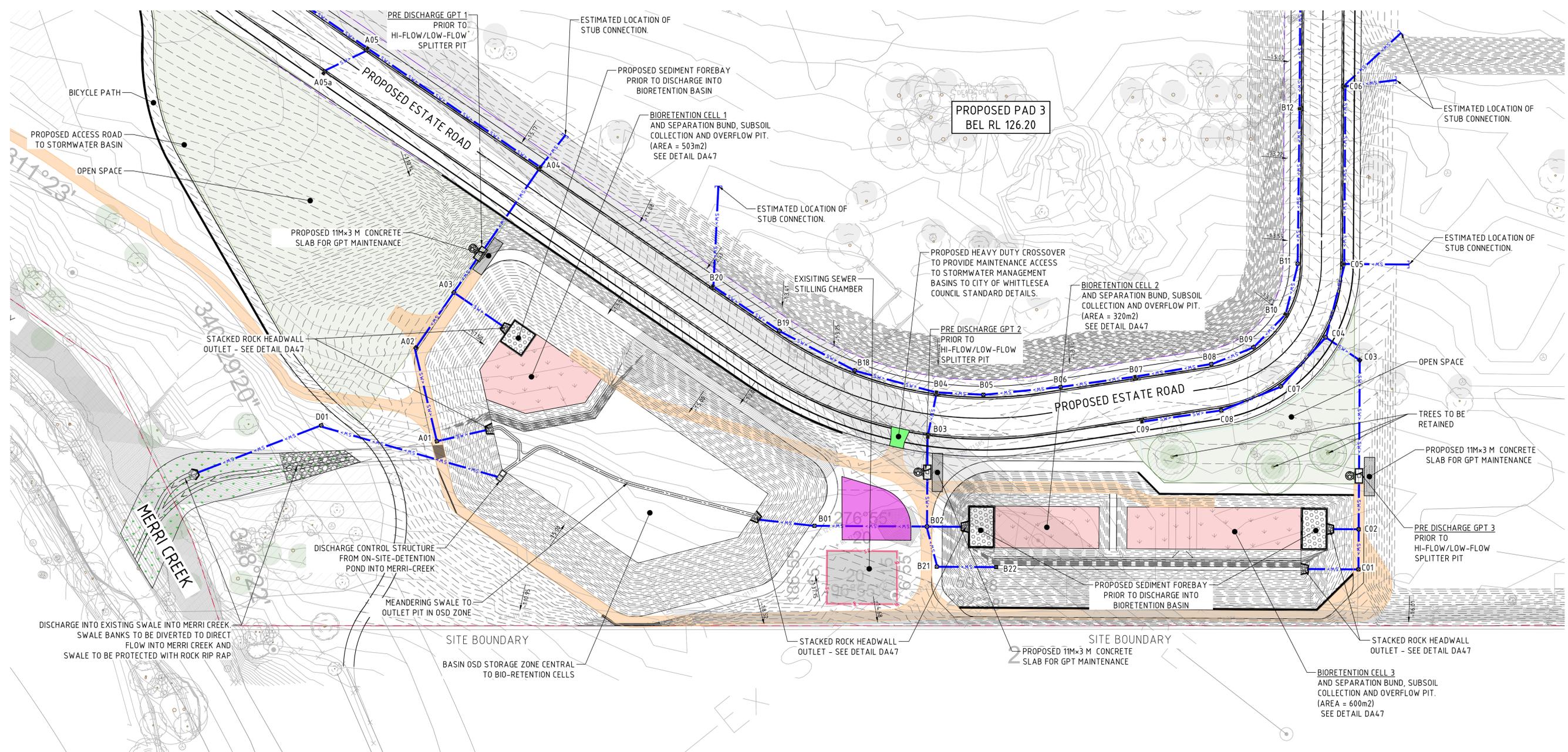
**GPT The GPT Group**

**PROPOSED INDUSTRIAL DEVELOPMENT**  
485 COOPER STREET, EPPING, VIC 3076

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**CRC CIVIL & STRUCTURAL ENGINEERS**

DRAWING TITLE: **STORMWATER MANAGEMENT PLAN**  
DRAWING No: **C014681.00-DA40**



**STORMWATER MANAGEMENT PLAN – COMBINED BIORETENTION & DETENTION BASINS**  
SCALE 1:250

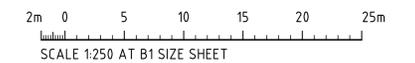
**DETAILS NOTE:**  
REFER TO DA47 FOR BIORETENTION NOTES AND TYPICAL DETAILS.  
REFER TO DA48 FOR A TYPICAL SECTION THROUGH BASIN.

**NOTE:**  
DRAWING SET IS FOR INFORMATION PURPOSES ONLY. ALL INFRASTRUCTURE WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER STANDARDS AND GUIDELINES DURING THE DETAIL DESIGN STAGE.

**LEGEND:**

LEVELS DATUM IS AHD. EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY HELLIER MCFARLAND DATED 24/05/2021 REFERENCED 13231S/1

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- BIO-RETENTION AREAS
- EXISTING DISCHARGE SWALE
- STACKED BOULDERS & SEDIMENT FOREBAY
- PROPOSED SWALE
- PROPOSED OUTLET HEADWALL STRUCTURE
- BATTERED SLOPES



**FOR DEVELOPMENT APPLICATION**

ISSUED FOR INFORMATION	16.10.23	F	ARCHITECT	CLIENT
REVISED BICYCLE PATH ALONG OPEN SPACE	27.07.23	E		
ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	D		
ISSUED FOR INFORMATION	23.02.23	C		
ISSUED FOR INFORMATION	27.09.21	B		
ISSUED FOR INFORMATION	22.09.21	A		
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE



**PROJECT**  
PROPOSED INDUSTRIAL DEVELOPMENT  
485 COOPER STREET, EPPING, VIC 3076

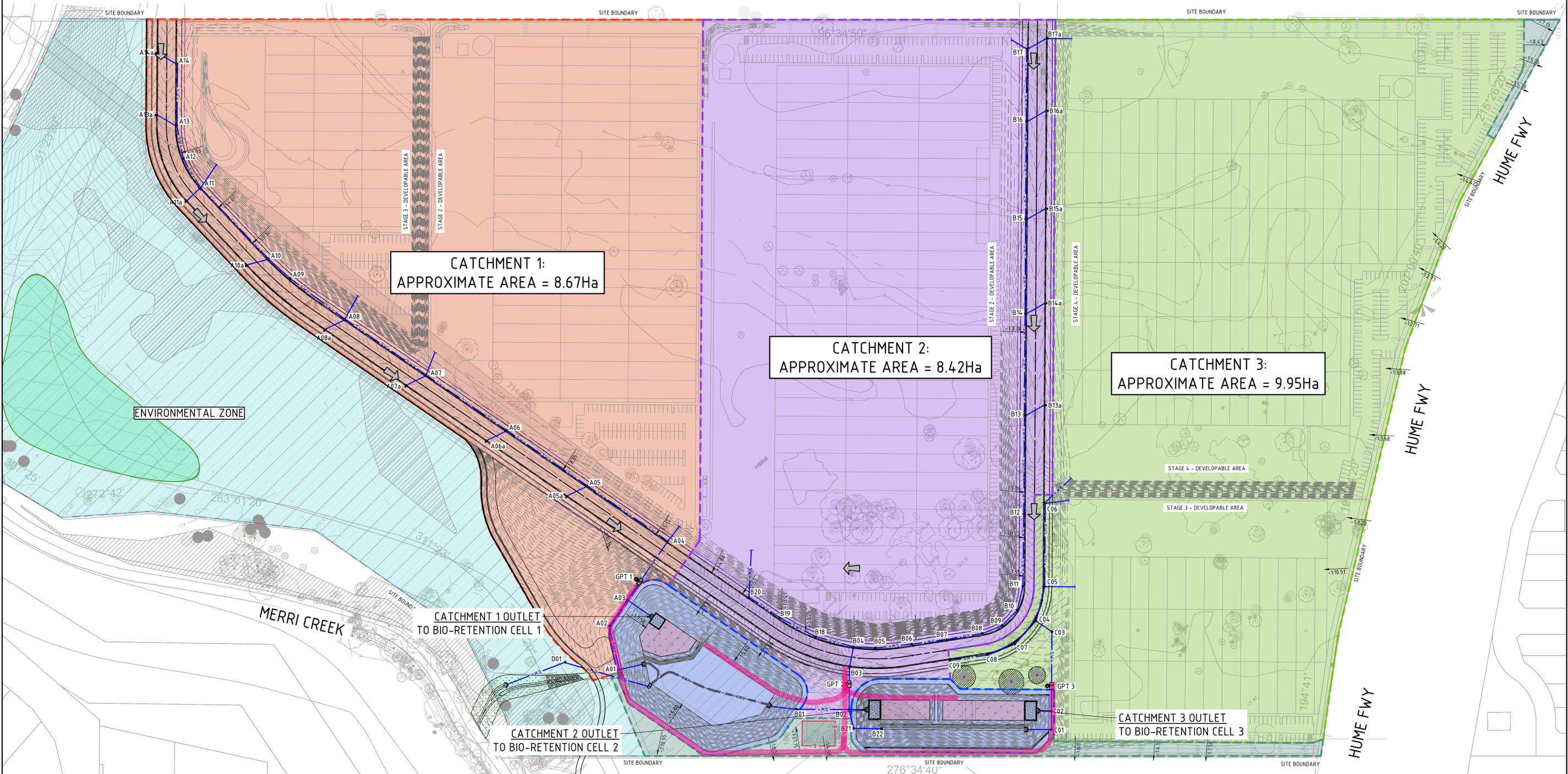
**Costin Roe Consulting Pty Ltd.**  
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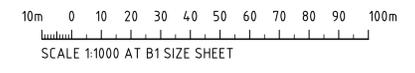
**DRAWING TITLE**  
STORMWATER MANAGEMENT PLAN  
COMBINED BIORETENTION & DETENTION  
BASINS  
DRAWING No: C014681.00-DA41

**LEGEND:**  
 LEVELS DATUM IS AHD. EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY HELIER MCFARLAND DATED 24/05/2021 REFERENCED 13231S/1

- CATCHMENT 1 EXTENT
- CATCHMENT 2 EXTENT
- CATCHMENT 3 EXTENT

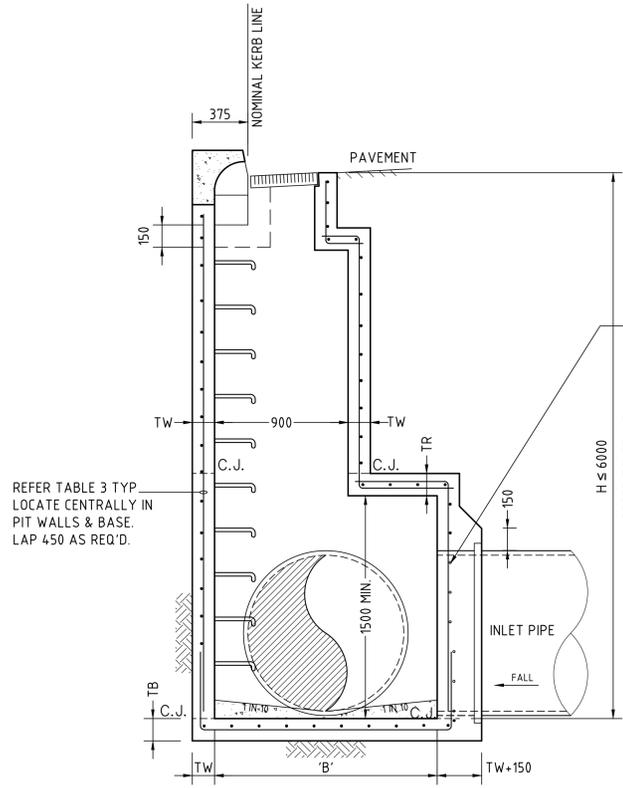


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**FOR DEVELOPMENT APPLICATION**

ISSUED FOR DEVELOPMENT APPLICATION ISSUED FOR DEVELOPMENT APPLICATION ISSUED FOR INFORMATION AMENDMENTS	27.07.23 C 20.07.23 B 23.02.23 A DATE ISSUE AMENDMENTS	ARCHITECT 	CLIENT 	PROJECT PROPOSED INDUSTRIAL DEVELOPMENT 485 COOPER STREET, EPPING, VIC 3076	CONSULT AUSTRALIA 	Costin Roe Consulting Pty Ltd. ABN 50 003 696 446 PO Box N419 Sydney NSW 1220 Level 4, 8 Windmill Street, Millers Point NSW 2000 p: +61 2 9251 7699 f: +61 2 9241 3731 e: mail@costinroe.com.au w: costinroe.com.au	DRAWING TITLE STORMWATER CATCHMENT PLAN - MUSIC DRAWING No C014681.00-DA42		ISSUE C
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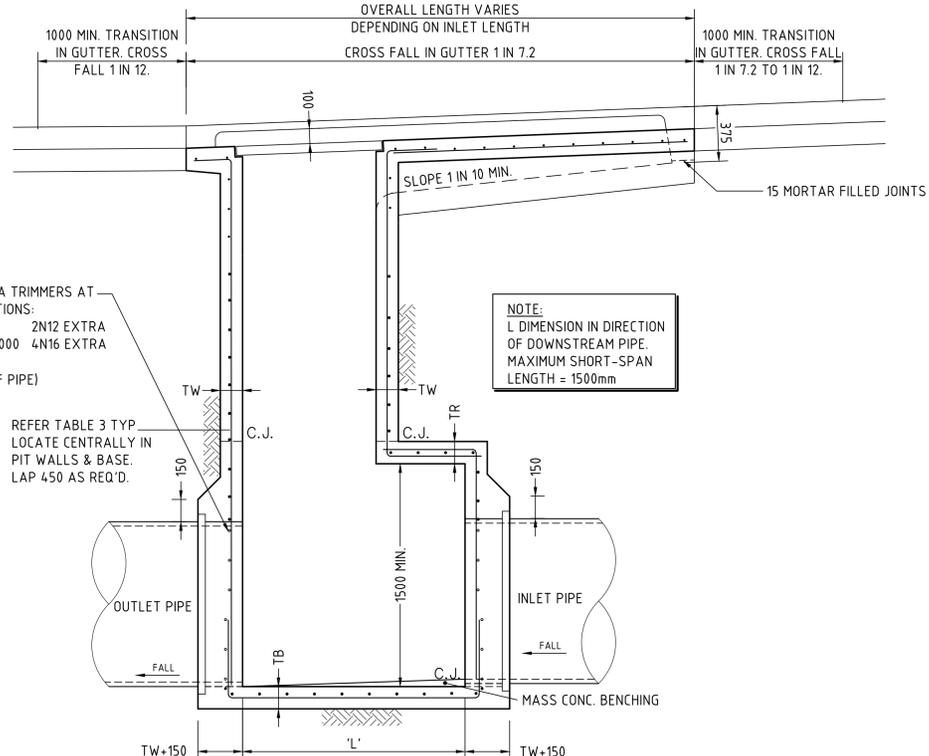
**CROSS SECTION.**  
SCALE 1:20

REFER TABLE 3 TYP. LOCATE CENTRALLY IN PIT WALLS & BASE. LAP 450 AS REQ'D.

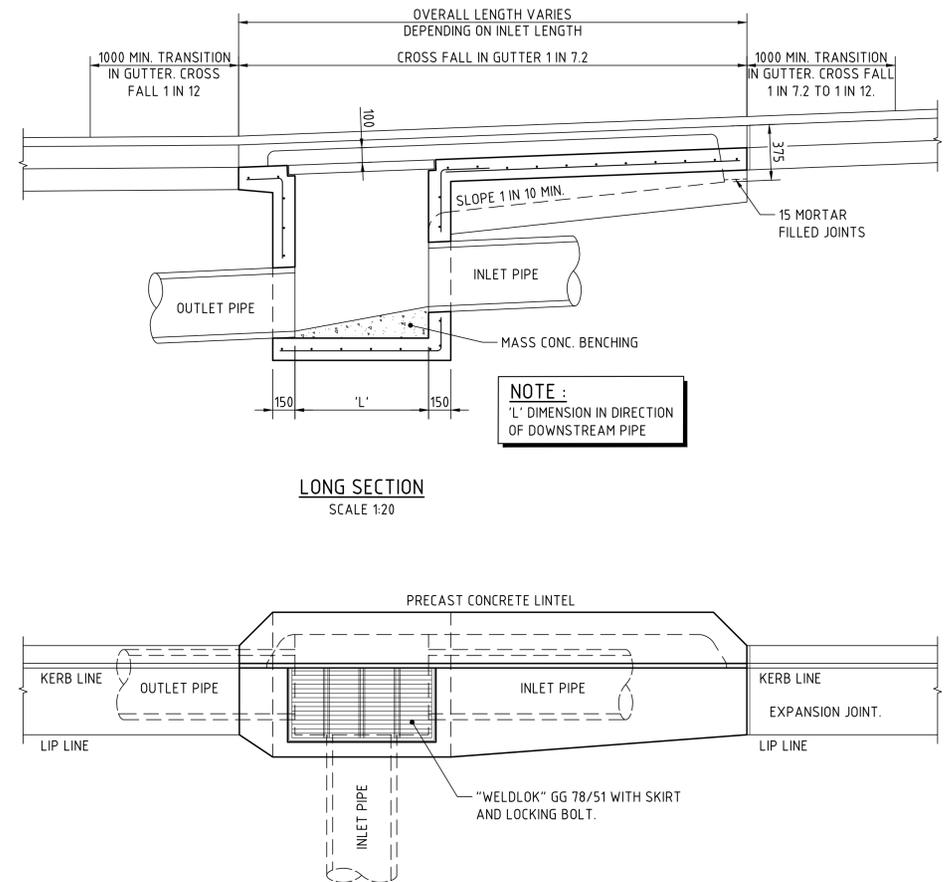
PROVIDE EXTRA TRIMMERS AT PIPE PENETRATIONS:  
FOR D= 0-3000 2N12 EXTRA  
FOR D= 3000-6000 4N16 EXTRA (TYP)  
(BOTH SIDES OF PIPE)

REFER TABLE 3 TYP. LOCATE CENTRALLY IN PIT WALLS & BASE. LAP 450 AS REQ'D.

NOTE:  
L DIMENSION IN DIRECTION OF DOWNSTREAM PIPE. MAXIMUM SHORT-SPAN LENGTH = 1500mm



**LONG SECTION.**  
SCALE 1:20



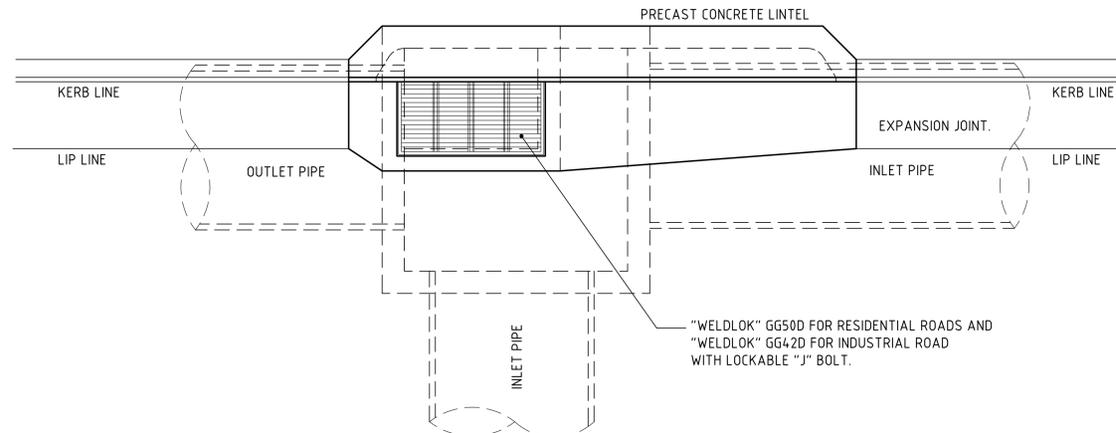
**LONG SECTION**  
SCALE 1:20

NOTE:  
'L' DIMENSION IN DIRECTION OF DOWNSTREAM PIPE

**PLAN**  
SCALE 1:20

**KERB INLET PIT - KIP**

- NOTE :**
- WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
  - SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
  - ALL REINFORCING TO HAVE 30 MIN. CLEAR CONCRETE COVER.
  - FOR PITS DEEPER THAN 1000mm CLIMB RAILS SHALL BE PROVIDED.



**PLAN**  
SCALE 1:20

"WELDLOK" GG50D FOR RESIDENTIAL ROADS AND  
"WELDLOK" GG42D FOR INDUSTRIAL ROAD  
WITH LOCKABLE "J" BOLT.

**TAPERED KERB INLET PIT - KIP**

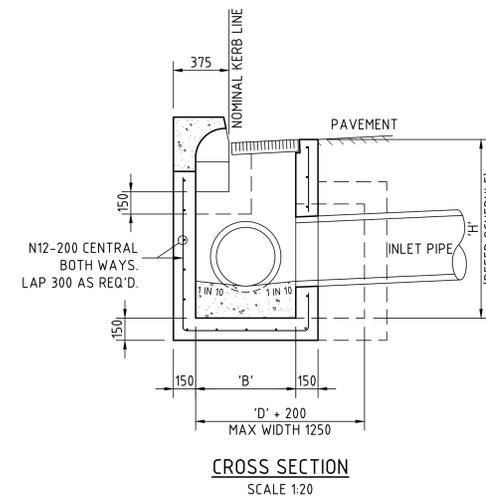
SUBSOIL NOT SHOWN FOR CLARITY.

CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
PIT	80	20	GP	NIL	25

**NOTES:**

- WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
- SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
- ALL REINFORCING TO HAVE 30 MIN. CLEAR CONCRETE COVER.
- FOR PITS DEEPER THAN 1200mm STEP IRONS SHALL BE PROVIDED.
- FOR ALL PITS IN TV PAVEMENT AREAS, PIT WALLS ARE TO BE INCREASED IN THICKNESS BY 50mm AND REINFORCEMENT TO BE N16 BARS IN LIEU OF N12

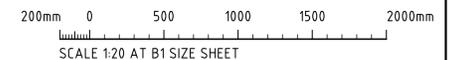
TABLE 3 - TAPERED CLASS D PIT REINFORCEMENT & WALL THICKNESS						
DEPTH 'H'	WALL THICKNESS 'TW'	WALL REINFORCEMENT	ROOF THICKNESS 'TR'	ROOF REINFORCEMENT	BASE THICKNESS 'TB'	BASE REINFORCEMENT
<1.5m	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY
1.5m-3.0m	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY
3.0m-4.5m	200mm	N16-200 EACH WAY	200mm	N16-200 EACH WAY	200mm	N12-200 EACH WAY
4.5-6.0	250mm	N16-200 EACH WAY	250mm	N16-200 EACH WAY	250mm	N16-200 EACH WAY



**CROSS SECTION**  
SCALE 1:20

CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
PIT	80	20	GP	NIL	32

**NOTE:**  
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**FOR DEVELOPMENT APPLICATION**

ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	C
ISSUED FOR INFORMATION	23.02.23	B
ISSUED FOR INFORMATION	23.09.22	A
AMENDMENTS	DATE	ISSUE

ARCHITECT  
**SBA**  
ARCHITECTS

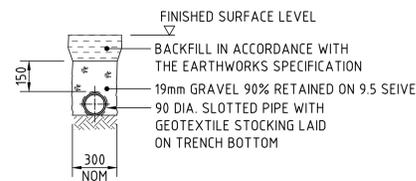
CLIENT  
**GPT**  
The GPT Group

PROJECT  
**PROPOSED INDUSTRIAL DEVELOPMENT**  
485 COOPER STREET, EPPING, VIC 3076

CONSULT AUSTRALIA  
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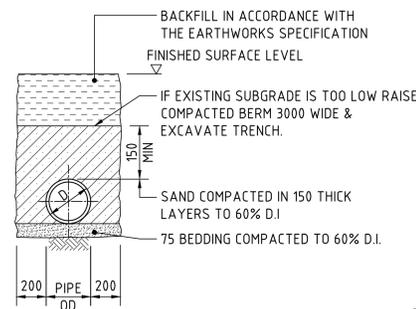
**CRC**  
COSTIN ROE CONSULTING  
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE  
**STORMWATER MANAGEMENT DETAILS**  
SHEET 1  
DRAWING No  
**C014681.00-DA45**

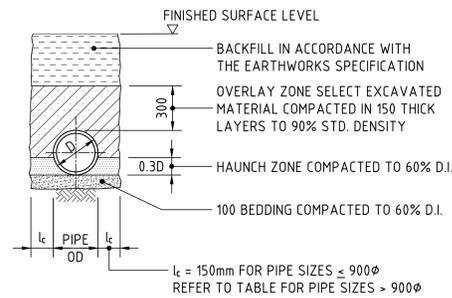


**SUPPORT TO AGRICULTURAL DRAIN**  
SCALE 1:20

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0

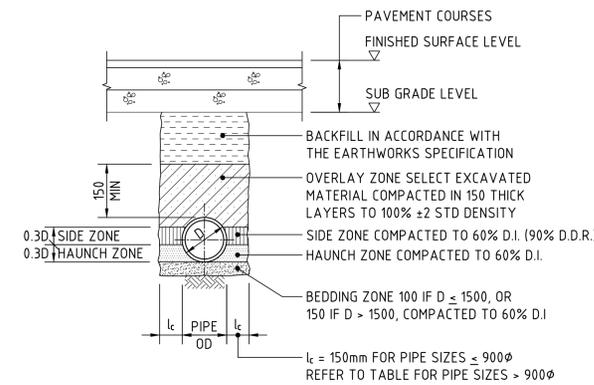


**SUPPORT TO uPVC PIPES**  
SCALE 1:20



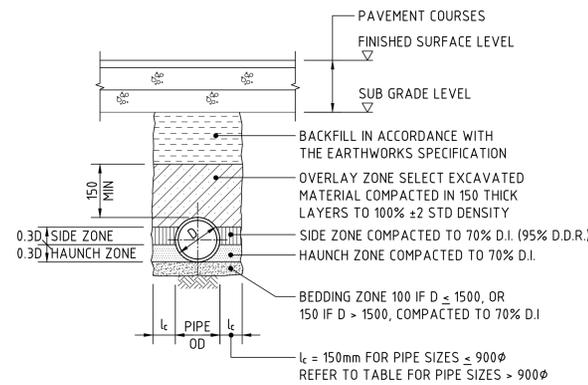
**TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS**  
SCALE 1:20

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	20 TO 0



**TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT**

SCALE 1:20  
D ≤ 1350, MAX FILL = 4.0m  
D > 1350, MAX FILL = 3.0m



**TYPE HS3 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT**

SCALE 1:20  
D ≤ 1050, MAX FILL = 6.0m  
D > 1050, MAX FILL = 4.8m

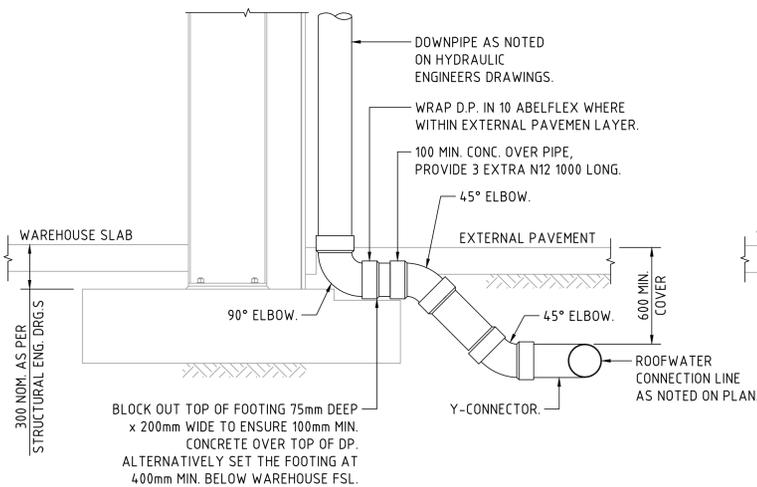
BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

SIDE ZONE WIDTH	
PIPE SIZE (mm)	l <sub>c</sub> (mm)
≤ 900φ	150
1050φ	175
1200φ	200
1350φ	225
1500φ	250
1650φ	275
1800φ	300

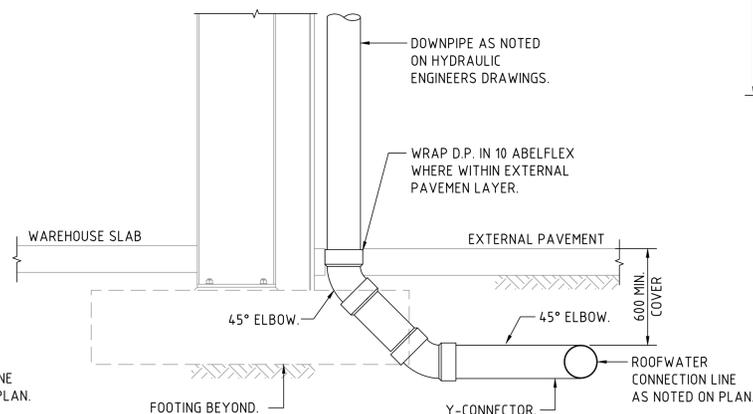
ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800φ

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0

SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725



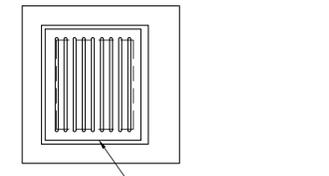
**DOWNPIPE TURN-UP DETAIL A**  
(AT FOOTING LOCATION)  
SCALE 1:20



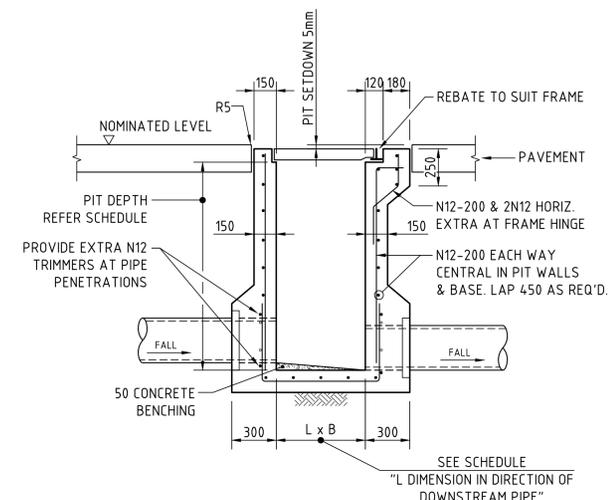
**DOWNPIPE TURN-UP DETAIL B**  
(CLEAR OF FOOTING)  
SCALE 1:20

**FOR DEVELOPMENT APPLICATION**

**NOTE:**  
DRAWING SET IS FOR INFORMATION PURPOSES ONLY. ALL INFRASTRUCTURE WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER STANDARDS AND GUIDELINES DURING THE DETAIL DESIGN STAGE.

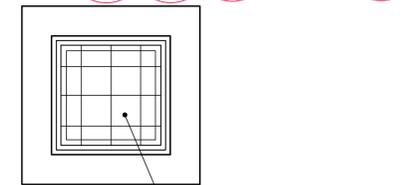


**PLAN**  
SCALE 1:20

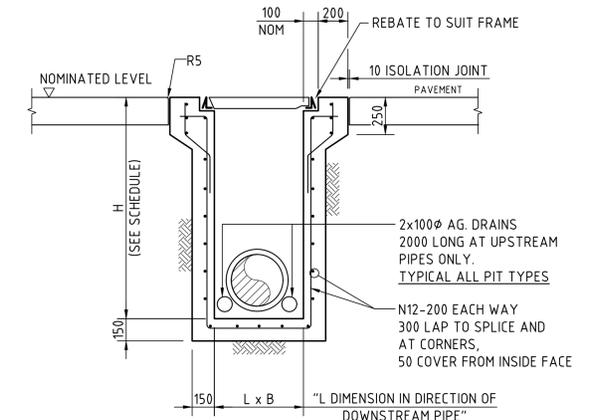


**SECTION**  
SCALE 1:20

**SINGLE GRATED GULLY PIT - SGGP**

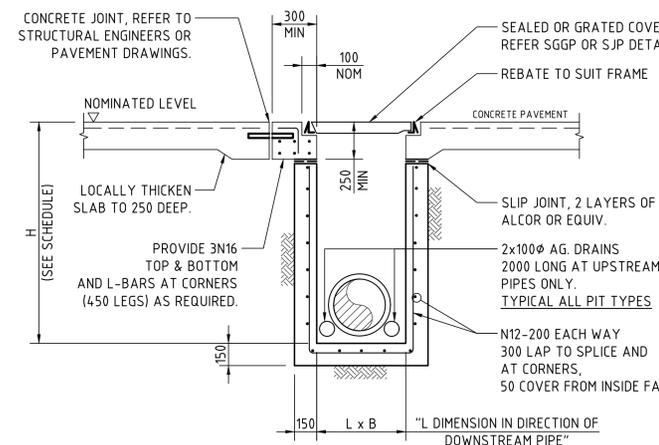


**PLAN**  
SCALE 1:20



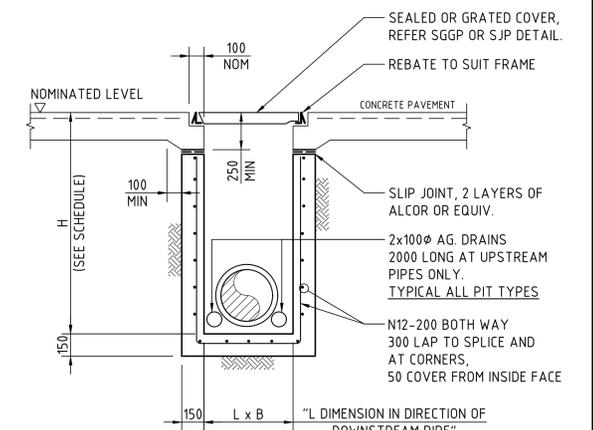
**SECTION**  
SCALE 1:20

**SEALED JUNCTION PIT - SJP**



**SECTION**  
SCALE 1:20

**SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL**  
**GRATE/COVER SUPPORT**  
**CAST-INTO PAVEMENT SLAB**  
(ADOPT IN CONCRETE PAVEMENT FOR SGGP's & SJP's, WHERE PITS ARE LOCATED IN THE CORNER OF SLAB PANELS OR ADJACENT TO SLAB PANEL JOINTS)



**SECTION**  
SCALE 1:20

**SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL**  
**GRATE/COVER SUPPORT**  
**CAST-INTO PAVEMENT SLAB**  
(ADOPT IN CONCRETE PAVEMENTS FOR SGGP's & SJP's, WHERE JOINTS ARE NOT LOCATED WITHIN PROXIMITY OF THE GRATE)

200mm 0 500 1000 1500 2000mm  
SCALE 1:20 AT B1 SIZE SHEET

ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	C
ISSUED FOR INFORMATION	23.02.23	B
ISSUED FOR INFORMATION	23.09.22	A
AMENDMENTS	DATE	ISSUE

ARCHITECT  
**SBA** ARCHITECTS

CLIENT  
**GPT**  
The GPT Group

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CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE  
STORMWATER MANAGEMENT DETAILS  
SHEET 2  
DRAWING No  
C014681.00-DA46

**BIO-RETENTION NOTES :**

FILTER MEDIA TO BE LOAMY SAND WITH A PERMEABILITY NOT LESS THAN 200mm/hr. FILTER MEDIA TO BE FREE OF RUBBISH, DELETERIOUS MATERIAL, TOXICANTS, DECLARED PLANTS AND LOCAL WEEDS, AND IS TO NOT BE HYDROPHOBIC.

FILTER MEDIA TO HAVE THE FOLLOWING COMPOSITION RANGE:  
 CLAY & SILT (<0.05mm) -3%  
 VERY FINE SAND (0.05-0.15mm) 5-30%  
 FINE SAND (0.15-0.25mm) 10-30%  
 MEDIUM TO COARSE SAND (0.25-1.00mm) 40-60%  
 COARSE SAND (1.0-2.0mm) 7-10%  
 FINE GRAVEL (2.0-3.4mm) -3%

FILTER MEDIA THAT DOES NOT MEET THE FOLLOWING CRITERIA SHALL BE REJECTED:

- a. ORGANIC MATTER CONTENT TO BE IDEALLY WITHIN 1% TO 3% (w/w) AND TO BE NO GREATER THAN 5%(w/w).
- b. PH TO BE BETWEEN 5.5 AND 7.5
- c. PHOSPHOROUS CONTENT TO BE NO GREATER THAN 35mg/kg

FILTER MEDIA TO BE ASSESSED BY QUALIFIED HORTICULTURALIST TO ENSURE CAPABILITY OF SUPPORTING PLANT LIFE.

DRAINAGE LAYER TO BE CLEAN GRAVEL 5-7mm.

PLANTS TO BE IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER REQUIREMENTS.

PROVIDE 100mm TOPSOIL AND TEMPORARY EROSION PROTECTION (JUTEMASTER OR EQUIV) TO SWALE BATTER SLOPES AND ADJACENT LANDSCAPED AREAS. NOTE THAT NO TOPSOIL IS TO BE PLACED OVER FILTRATION MEDIA. PROVIDE SILT FENCE TO TOP OF BANK UNTIL SUCH TIME AS THIS STABILISING AND VEGETATION HAS BEEN COMPLETED.

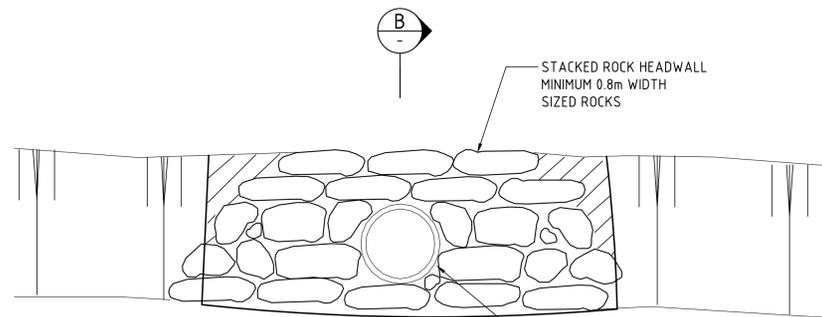
BIO-RETENTION TO BE PARTIALLY INSTALLED, FOLLOWING COMPLETION OF ROADWORKS, WITH THE TOP 75-100mm OF FILTER MEDIA REPLACED WITH A FINE TO COARSE SAND UNDERLAIN WITH A GEOTEXTILE LAYER (REFER TO DETAIL). FOLLOWING COMPLETION OF THE UPSTREAM DEVELOPMENT AND SITE STABILISATION, THE SAND IS TO BE REMOVED, REPLACED WITH FILTER MATERIAL AND PLANTED OUT. REFER TO TEMPORARY BIO-BASIN DETAIL

PRIOR TO PLANTING, THE TOP 100mm OF THE BIORETENTION FILTER MEDIA IS TO BE AMELIORATED WITH APPROPRIATE ORGANIC MATTER, FERTILISER AND TRACE ELEMENTS TO AID PLANT ESTABLISHMENT AS PER THE TABLE BELOW:

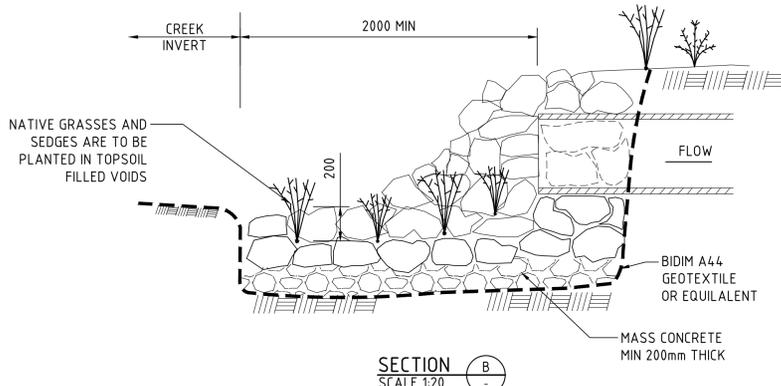
CONSTITUENT	QUANTITY (kg/m <sup>2</sup> OF FILTER AREA)
GRANULATED POULTRY MANURE FINES	50
SUPERPHOSPHATE	2
MAGNESIUM SULPHATE	3
POTASSIUM SULPHATE	2
TRACE ELEMENT MIX	1
FERTILISER NPK (16 & 14)	4
LIME	20

**APPLICABILITY:**

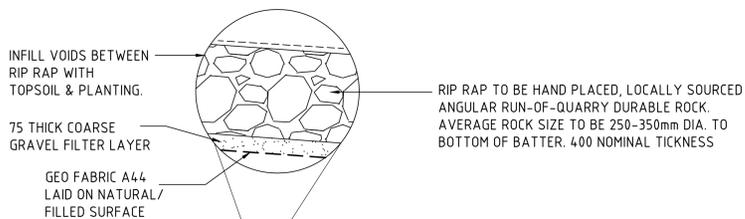
- 1) ALL PROPOSED OR FUTURE PIPED DRAINAGE CONNECTIONS TO THE PROPOSED CREEK WORKS SHOULD HAVE A SIMILAR OUTLET TREATMENT TO THOSE SHOWN HERE.
- 2) MIN. ROCK SIZE IN OUTLET DEPRESSED APRON SHOULD BE Ø500-600mm.



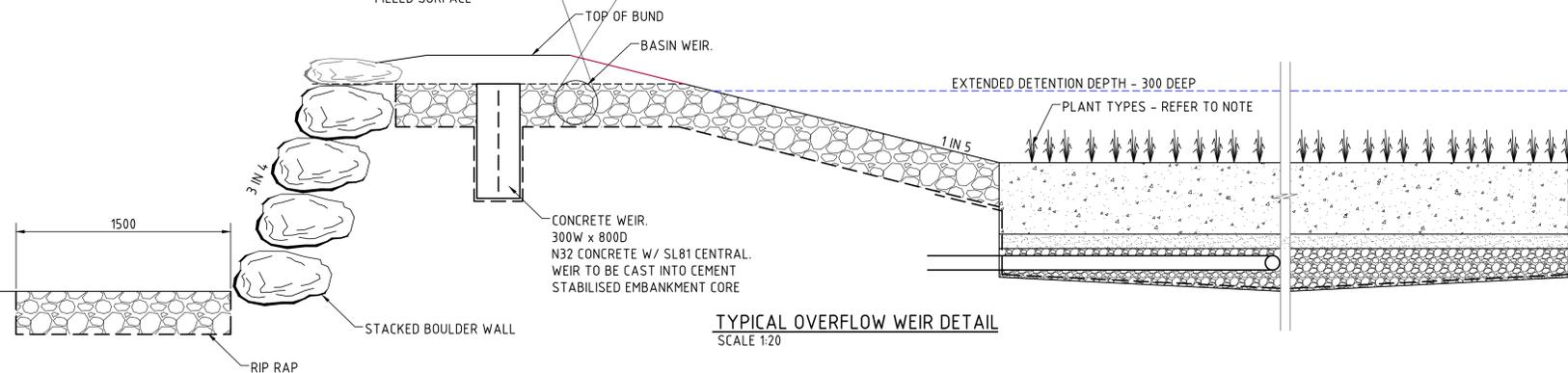
**TYPICAL STACKED ROCK HEADWALL TREATMENT**  
SCALE 1:20



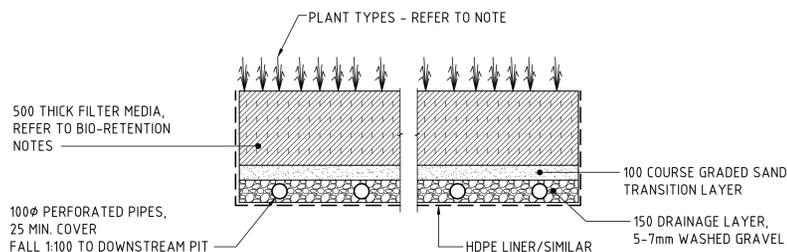
**SECTION B**  
SCALE 1:20



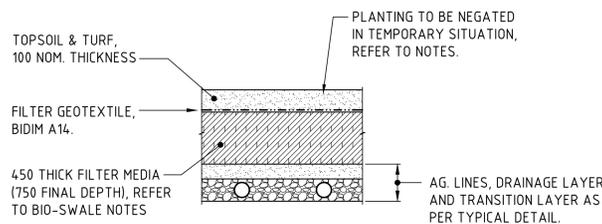
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F <sub>c</sub> (MPa)
O-F WEIR	80	20	GP	NIL	32



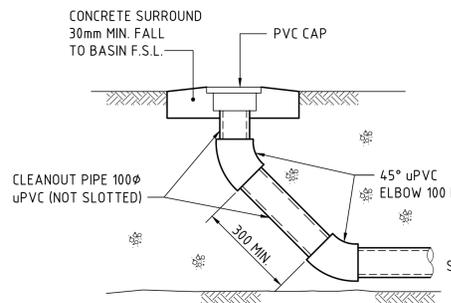
**TYPICAL OVERFLOW WEIR DETAIL**  
SCALE 1:20



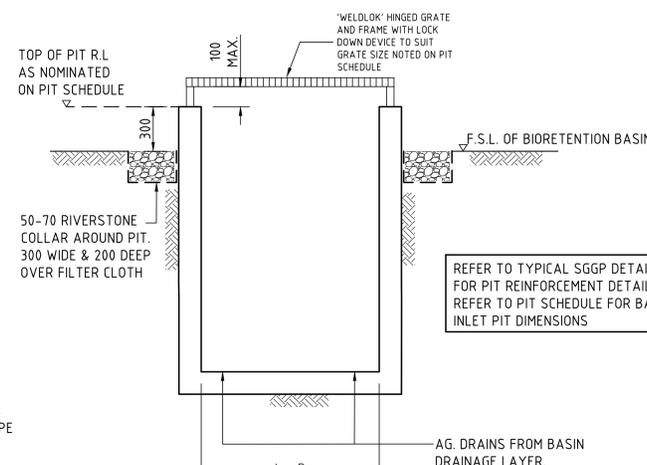
**TYPICAL BIO-RETENTION DETAIL**  
SCALE 1:20



**TEMPORARY BIO-RETENTION PROTECTION DETAIL**  
SCALE 1:20  
TEMPORARY CONSTRUCTION REQUIREMENT DETAIL - REFER TO NOTES FOR IMPLEMENTATION PERIODS.



**BIORETENTION CLEANOUT EYE ELEVATION**  
SCALE 1:20  
DENOTED C.E. ON PLAN



**BASIN INLET PIT - BIP**  
SCALE 1:20

**NOTE:**  
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**BIO-RETENTION BASIN DETAILS**

**FOR DEVELOPMENT APPLICATION**

200mm 0 500 1000 1500 2000mm  
SCALE 1:20 AT B1 SIZE SHEET

ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	C
ISSUED FOR INFORMATION	23.02.23	B
ISSUED FOR INFORMATION	23.09.22	A
AMENDMENTS	DATE	ISSUE



PROJECT  
PROPOSED INDUSTRIAL DEVELOPMENT  
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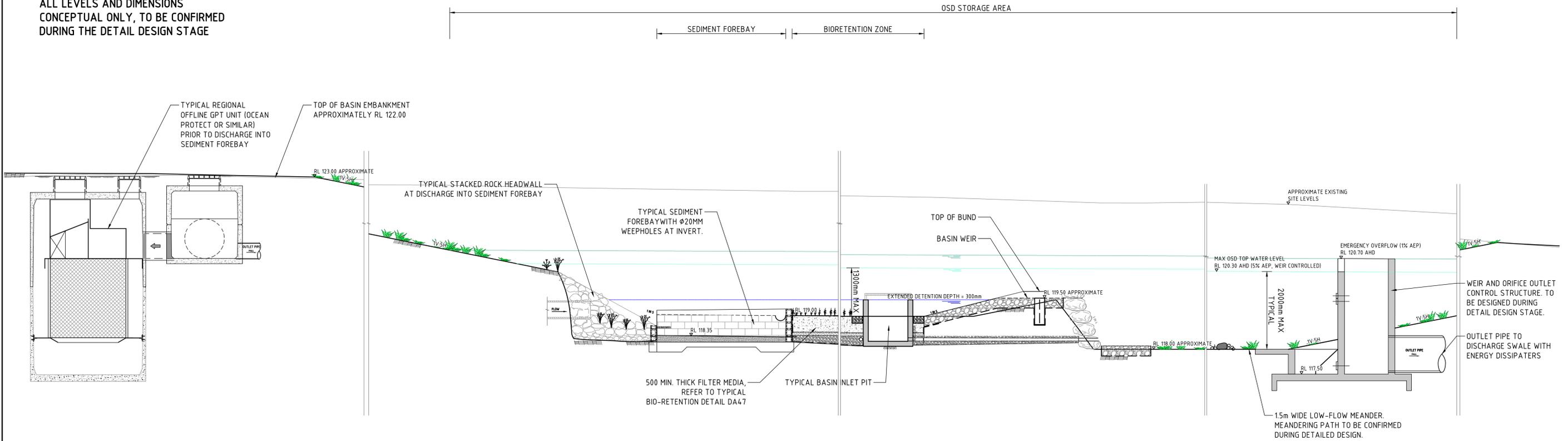


DRAWING TITLE  
STORMWATER MANAGEMENT DETAILS  
SHEET 3

DRAWING No  
C014681.00-DA47

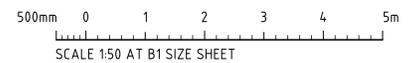
ISSUE  
C

NOTE:  
ALL LEVELS AND DIMENSIONS  
CONCEPTUAL ONLY, TO BE CONFIRMED  
DURING THE DETAIL DESIGN STAGE



TYPICAL SECTION THROUGH PROPOSED BIORETENTION- AND ON-SITE DETENTION BASIN  
WITH SEDIMENT FOREBAY AND CONCEPT OUTLET CONTROL STRUCTURE  
SCALE 1:50

NOTE:  
DRAWING SET IS FOR INFORMATION PURPOSES ONLY. ALL  
INFRASTRUCTURE WILL BE DESIGNED AND CONSTRUCTED IN  
ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER  
STANDARDS AND GUIDELINES DURING THE DETAIL DESIGN STAGE.



FOR DEVELOPMENT APPLICATION

ISSUED FOR	DATE	ISSUE	AMENDMENTS
ISSUED FOR DEVELOPMENT APPLICATION	20.07.23	C	
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ISSUED FOR INFORMATION	22.09.21	A	
AMENDMENTS	DATE	ISSUE	AMENDMENTS

ARCHITECT  
**SBA**  
ARCHITECTS

CLIENT  
**GPT**  
The GPT Group

PROJECT  
PROPOSED INDUSTRIAL DEVELOPMENT  
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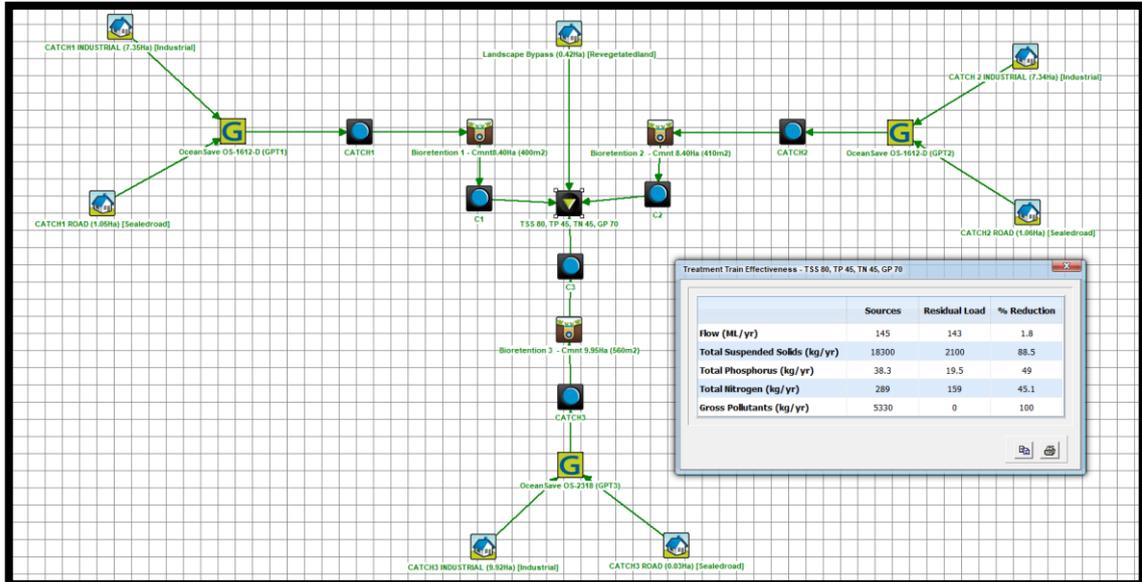
CONSULT AUSTRALIA  
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**CRC**  
COSTIN ROE CONSULTING  
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE  
TYPICAL SECTION  
BIORETENTION BASIN  
DRAWING No  
C014681.00-DA41  
ISSUE  
C

# Appendix B

## MUSIC MODEL CONFIGURATION & PARAMETERS



## B.1 Introduction

The MUSIC model was chosen to model water quality. This model, released by the Cooperative Research Centre for Catchment Hydrology (CRCCH), is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km<sup>2</sup> and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if the proposed systems and changes to land use are appropriate for their catchments and capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC, of relevance to this report, include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria nominated in **Section 3.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model “**14681.00\_Rev4\_Stage 1.sqz**” was set up to examine the effectiveness of the water quality treatment train and to predict if Council’s requirements have been achieved.

Modelling parameters used are based on those nominated in the Melbourne Water documents MUSIC Guidelines: Input parameters and modelling approaches for MUSIC users in Melbourne Water’s service area 2018 (MW MUSIC GUIDELINES) and Southern Eastern Councils WSUD Guidelines (Whittlesea Council Addendum).

## B.2 Rainfall Data

As per the recommendation of Section 3, Climate Data, of *MW MUSIC GUIDELINES (2018)*, the MUSIC rainfall templates for 10 year periods was downloaded from the Melbourne Water website with the model run at a 6 minute timestep.

### Input

Rainfall Station	086071 MELBOURNE
Rainfall Period	1952 – 1961 (10 years)
Mean Annual Rainfall (mm)	708
Evapo- transpiration	User Defined (995)
Model Time step	6 minutes

### Data Used

### B.3 Rainfall Runoff Parameters

Parameter	Value
Rainfall Threshold	1.00
Soil Storage Capacity (mm)	120
Initial Storage (% capacity)	25
Field Capacity (mm)	50
Infiltration Capacity Coefficient a	200
Infiltration Capacity exponent b	1.0
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	5
Daily Seepage Rate (%)	0

### B.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are based on parameters adopted by the Melbourne Water as per **Table B.1 below** (obtained from Table 3 in the MW MUSIC GUIDELINES (2018))

Pollutant	Surface Type	Storm Flow		Base Flow	
		Mean (log mg/L)	SD (log mg/L)	Mean (log mg/L)	SD (log mg/L)
SS	Roof	1.301	0.333	n/a*	n/a
	Road and paved areas	2.431	0.333	n/a	n/a
	Urban area not covered by roof, road or paved areas	1.900	0.333	0.96	0.401
TP	Roof	-0.886	0.242	n/a	n/a
	Road and paved areas	-0.301	0.242	n/a	n/a
	Urban area not covered by roof, road or paved areas	-0.700	0.242	-0.731	0.360
TN	Roof	0.301	0.205	n/a	n/a
	Road and paved areas	0.342	0.205	n/a	n/a
	Urban area not covered by roof, road or paved areas	0.243	0.182	0.455	0.363

Table 3 - Pollutant concentration data for source nodes. \* n/a indicates that base flow does not occur from these surfaces. (Source: Fletcher, 2007. Background Study for the revision of Melbourne Water's MUSIC Input Parameter Guidelines. Not published)

#### Table B.1. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table B.1** above.

The relevant stormwater catchment sizes are listed below in **Table B.2** and their configuration within the MUSIC model.

Catchment	Area (Ha)	Source Node	% Impervious
<b>CATCHMENT 1</b>			
<b>CATCH1 INDUSTRIAL (7.35Ha)</b>	7.35	INDUSTRIAL	90
<b>CATCH1 ROAD (1.05Ha) [ROAD]</b>	1.05	SEALEDROAD	100
<b>OP OS-1612 (GPT1)</b>	N/A	OP GPT	N/A
<b>CATCHMENT 2</b>			
<b>CATCH2 INDUSTRIAL (7.34Ha)</b>	7.34	INDUSTRIAL	90
<b>CATCH2 ROAD (1.06Ha) [ROAD]</b>	1.06	SEALEDROAD	100
<b>OP OS-1612 (GPT2)</b>	N/A	OP GPT	N/A
<b>CATCHMENT 3</b>			
<b>CATCH3 INDUSTRIAL (9.92Ha) [INDUSTRIAL]</b>	9.92	INDUSTRIAL	90
<b>CATCH3 ROAD (0.03Ha) [ROAD]</b>	0.03	SEALEDROAD	100
<b>OP OS-2318 (GPT3)</b>	N/A	OP GPT	N/A
<b>BIORETENTION PONDS</b>			
<b>BIORETENTION BASIN 1</b>	0.040	BIORETENTION	N/A
<b>BIORETENTION BASIN 2</b>	0.041	BIORETENTION	N/A
<b>BIORETENTION BASIN 3</b>	0.056	BIORETENTION	N/A
<b>LANDSCAPE BYPASS</b>			
<b>Landscape Bypass (0.42Ha)</b>	0.42	Revegetatedland	0
<b>Total</b>	27.31		

Table B.2. Music Model Source Nodes

### B.5 Treatment Nodes

Bio-Retention system and Ocean Protect OceanGuard (GPT) nodes have been used in the modelling of the development.

### B.6 Results

**Table B.3** shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

	Source	Residual Load	% Reduction	% Reduction Target
<b>Total Suspended Solids (kg/yr)</b>	17,600	1,810	89.70	80.00
<b>Total Phosphorus (kg/yr)</b>	36.90	19.00	48.50	45.00
<b>Total Nitrogen (kg/yr)</b>	289.00	150.00	48.00	45.00
<b>Gross Pollutants (kg/yr)</b>	5,370.00	0.00	100.00	70.00

**Table B.3. MUSIC analysis results**

The model results indicate that, through the use of the STM in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the requirements of Whittlesea Council on an overall catchment basis.

## **B.7 Modelling Discussion**

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements of Whittlesea Council have been met.

The MUSIC modelling has shown that the proposed treatment train of STM will provide stormwater treatment which will meet Whittlesea Council requirements in an effective and economical manner.

Hydrocarbon and oil & grease removal cannot be modelled with MUSIC software. As an industrial estate with users for individual development sites not known, the exact levels of hydrocarbons would not be known however given the expected use of the site as a warehouse distribution centre these pollutants would not be expected to be large. Potential sources of hydrocarbons and/or oil & grease which drain to the stormwater system would be limited to leaking engine sumps or for accidental fuel spills/leaks and leaching of bituminous pavements (car parking only). The potential for these pollutants is low and published data from the CSIRO indicates that average concentrations from industrial sites are in the order of 10mg/L and we would expect source loading from this site to be near to or below this concentration. Hydrocarbon pollution would also be limited to surface areas which will be treated via OceanProtect OceanGuard absorbent material which are predicted to reduce this pollutant.

Given the expected low source loadings of hydrocarbons and oil/grease and removal efficiencies of the treatment devices and bio-retention systems we consider that the requirements of the Whittlesea Council have been met.

# Appendix C

## DRAFT SOIL AND WATER MANAGEMENT PLAN

### C.1 Introduction

An erosion and sediment control plan (ESCP) is shown on drawing **Co14681.00-DA20** with details on **DA25**. These are conceptual plans only providing sufficient detail to clearly show that the works can proceed without undue pollution to receiving waters. A detailed plan will be prepared once consent is given and before works start.

The Staged ESCP considers initial site establishment, requirements during construction of roads and infrastructure and estate earthworks, completion of estate works and the period between this and development of individual lots.

### C.2 General Conditions

1. The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in IECA *Best Practice Erosion and Sediment Control Document* (The White Book), EPA publication 960, 2004 – “*Doing It Right on Subdivisions, Temporary Environmental Protection Measures for Subdivision Construction Sites*”, Melbourne Water Land Development Manual – Site Management Plans and Whittlesea Council.
3. All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

### C.3 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table C.1**.

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands	Entry prohibited except for essential management works	

**Table C.1 Limitations to access**

#### **C.4 Erosion Control Conditions**

1. Clearly visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
2. Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried, and topsoils remain on the surface at the completion of works.
3. Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
4. Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
5. Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
6. Where practical, foot and vehicular traffic will be kept away from all recently established areas
7. Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as low a gradient as practical but not steeper than:
  - 2H:1V where slope length is less than 7 metres

- 2.5H:1V where slope length is between 7 and 10 metres
  - 3H:1V where slope length is between 10 and 12 metres
  - 4H:1V where slope length is between 12 and 18 metres
  - 5H:1V where slope length is between 18 and 27 metres
  - 6H:1V where slope length is greater than 27 metres
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
  9. During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used, or the surface will be left in a cloddy state that resists removal by wind.

### **C.5 Pollution Control Conditions**

1. Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways. Silt/ sediment fences and appropriate stabilisation of stockpiles are to be provided as detailed on the drawings.
2. Sediment fences will:
  - a) Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.
  - b) Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and
  - c) Provide a return of 1 metre upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20-year  $t_c$  discharge.
3. Sediment removed from any trapping device will be disposed in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
4. Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.
5. Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

## C.6 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance service will be provided at least weekly.

## C.7 Site Inspection and Maintenance

1. A self-auditing program will be established based on a Check Sheet. A site inspection using the Check Sheet will be made by the site manager:
  - At least weekly.
  - Immediately before site closure.
  - Immediately following rainfall events in excess of 5mm in any 24-hour period.

The self-audit will include:

- Recording the condition of every sediment control device
  - Recording maintenance requirements (if any) for each sediment control device
  - Recording the volumes of sediment removed from sediment retention systems, where applicable
  - Recording the site where sediment is disposed
  - Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information
2. In addition, a suitably qualified person will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report. The responsible person will ensure that:
    - The plan is being implemented correctly
    - Repairs are undertaken as required
    - Essential modifications are made to the plan if and when necessary

The report shall carry a certificate that works have been carried out in accordance with the plan.

3. Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.
4. Proper drainage will be maintained. To this end drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that,
  - No low points exist that can overtop in a large storm event
  - Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams or installing additional diversion upslope.
  - Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).
5. Sand/soil/spoil materials placed closer than 2 meters from hazard areas will be removed. Such hazard areas include and areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.

6. Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.
7. Excessive vegetation growth will be controlled through mowing or slashing.
8. All sediment detention systems will be kept in good, working condition. In particular, attention will be given to:
  - a) Recent works to ensure they have not resulted in diversion of sediment laden water away from them
  - b) Degradable products to ensure they are replaced as required, and
  - c) Sediment removal, to ensure the design capacity or less remains in the settling zone.
9. Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.
10. Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.
11. Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site stabilised
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

**EROSION AND SEDIMENT CONTROL  
WEEKLY SITE INSPECTION SHEET**

**LOCATION** .....  
**INSPECTION OFFICER** ..... **DATE** .....  
**SIGNATURE** .....

Legend:             OK                       Not OK                      N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	.....
2	Entry/exit pads clear of excessive sediment deposition.	.....
3	Entry/exit pads have adequate void spacing to trap sediment.	.....
4	The construction site is clear of litter and unconfined rubbish.	.....
5	Adequate stockpiles of emergency ESC materials exist on site.	.....
6	Site dust is being adequately controlled.	.....
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	.....
8	Up-slope "clean" water is being appropriately diverted around/through the site.	.....
9	Drainage lines are free of soil scour and sediment deposition.	.....
10	No areas of exposed soil are in need of erosion control.	.....
11	Earth batters are free of "rill" erosion.	.....
12	Erosion control mulch is not being displaced by wind or water.	.....
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	.....
14	Sediment fences are free from damage.	.....
15	Sediment-laden stormwater is not simply flowing "around" the sediment fences or other sediment traps.	.....
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	.....
17	All sediment traps are free of excessive sediment deposition.	.....
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	.....
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	.....
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	.....
21	Stabilised surfaces have a minimum 70% soil coverage.	.....
22	The site is adequately prepared for imminent storms.	.....
23	All ESC measures are in proper working order.	.....

# Appendix D

## STORMWATER SYSTEM MAINTENANCE SCHEDULE

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
<b>SWALES/ LANDSCAPED AREAS</b>			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
<b>INLET &amp; JUNCTION PITS</b>			
Inside of pits	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Outside of pits	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
<b>PROPRIETARY TREATMENT DEVICES (OceanSave GPT)</b>			
Refer to Manufacturers Operation and Maintenance Manuel	Annually	Maintenance Contractor	Refer to Manufacturers Operation and Maintenance Manuel
<b>BIORETENTION BASIN</b>			
Check all items nominated for SWALES/ LANDSCAPED AREAS above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above
Check for sediment accumulation at inflow points	Six monthly/ After Major Storm	Maintenance Contractor	Remove sediment and dispose in accordance with local authorities' requirements.
Check for erosion at inlet or other key structures.	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed profile is maintained
Check for evidence of dumping (litter, building waste or other).	Six monthly	Maintenance Contractor	Remove waste and litter and dispose in accordance with local authorities' requirements.
Check condition of vegetation is satisfactory (density, weeds, watering, replating, mowing/ slashing etc)	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Check for evidence of prolonged ponding, surface	Six monthly/ After Major Storm	Maintenance Contractor	Remove sediment and dispose in accordance

<b>MAINTENANCE ACTION</b>	<b>FREQUENCY</b>	<b>RESPONSIBILITY</b>	<b>PROCEDURE</b>
clogging or clogging of drainage structures	5-10 years		with local authorities' requirements.  Replace filter media & planting – refer to appropriately qualified engineer or stormwater specialist
Check stormwater pipes and pits	Six monthly/ After Major Storm	Maintenance Contractor	Refer to INLET/JUNCTION PIT section.
<b>FUTURE RAINWATER TANK</b>			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet -leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant
<b>STORMWATER SYSTEM</b>			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.
<b>OSD SYSTEM</b>			

<b>MAINTENANCE ACTION</b>	<b>FREQUENCY</b>	<b>RESPONSIBILITY</b>	<b>PROCEDURE</b>
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen and clean	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen if required to clean it.
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve are clear.
Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates.	Six Monthly	Maintenance Contractor/ Owner	Remove debris and floatable materials.
Check attachment of orifice plate and screen to wall of pit	Annually	Maintenance Contractor	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required.
Check orifice diameter is correct and retains sharp edge.	Five yearly	Maintenance Contractor	Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged.
Check screen for corrosion	Annually	Maintenance Contractor	Remove grate and screen and examine for rust or corrosion, especially at corners or welds.
Inspect overflow weir and remove any blockage	Six monthly	Maintenance Contractor/ Owner	Ensure weir is free of blockage.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Inspect walls for cracks or spalling	Annually	Maintenance Contractor	Remove grate to inspect internal walls, repair as necessary.
Check step irons	Annually	Maintenance Contractor	Ensure fixings are secure and irons are free from corrosion.

# Appendix E

## MELBOURNE WATER FLOOD ADVISE LETTER

06 September 2022

Lourens C/- LANDATA  
Two Melbourne Quarter, Level 13, 697 Collins Street Docklands

Dear Lourens C/- LANDATA,

Proposal: Flood level certificates  
Site Location : Lot No 1, 485 COOPER STREET, EPPING 3076  
Melbourne Water reference: MWA-1265056  
E flood reference number: 65841726  
Date referred: 29/08/2022

#### Applicable Flood Level:

The estimated flood level for the property grades from 118.56 metres to Australian Height Datum (AHD) at the Norther west corner down to 114.14 metres to AHD at the south west corner. These flood levels are based on storm event that has an Annual Exceedance Probability AEP, that is, a 1% probability of being equalled or exceeded in any one year.

A licensed surveyor should be engaged to determine the exact effect of the applicable flood level on the property.

Please note that whilst the above levels are based on storm event that has an AEP, that is, a 1% probability of being equalled or exceeded in any one year. The property may be affected by more frequent flooding. To determine whether the property is affected by flooding from the local drainage system, please consult your local Council.

#### Important to note:

Melbourne Water provides flood advice under Section 202(2) of the Water Act 1989.

This letter does not constitute approval for any proposed development for planning or building.

To obtain flow rate velocity information or Melbourne Water's requirements for any proposed development, please contact our Customer Service Centre on 131 722 or make an application [here](#).

The flood level advice provided is based on the most accurate information currently available. This estimated flood information may change and is valid for 3 months from the date of this letter. If you are proposing to develop this land after such time, it is recommended that new advice be obtained from Melbourne Water.

## Disclaimer

This letter does not constitute approval for any proposed development for planning or building. Melbourne Water provides flood advice under Section 202(2) of the Water Act 1989.

This certificate provides information as a general reference source only and has taken all reasonable measures to ensure that the material in this letter is as accurate as possible at the time of publication. However, Melbourne Water makes no representation and gives no warranty about the accuracy, reliability, completeness or suitability for any particular purpose of the information. To the full extent that it is able to do so in law, Melbourne Water disclaims all liability, (including liability in negligence), for losses and damages, (including indirect and consequential loss and damage), caused by or arising from anyone using or relying on the information for any purpose whatsoever.

The flood information provided represents the best estimates based on currently available information. This information is subject to change as new information becomes available and as further studies are carried out.

This estimated flood information may change and is valid for 3 months from the date of this letter. If you are proposing to develop this land after such time, it is recommended that new advice be obtained from Melbourne Water.

## Advice

For more information in relation to flooding or additional services that Melbourne Water can provide please visit our [website](#).

For general development enquiries contact our Customer Service Centre on 131722.

Regards,

Christina Camilleri  
CSR

# Appendix F

## PRELIMINARY CORRESPONDENCE WITH WHITTLESEA COUNCIL

Enquiries: Rick Cesare Phone: 9217 2194

CRM No. 1871623

5 October 2022

Soula Kaldas  
C/- Landata  
GPO Box 527  
MELBOURNE VIC 3001  
Email: [landata.online@servictoria.com.au](mailto:landata.online@servictoria.com.au)

Dear Soula,

**Council Stormwater Drainage – Point of Discharge Information**  
**Property: 485 Cooper Street, Epping – Proposed Development/Subdivision**

Further to your application for Council information for the above property, the following advice is provided by Council:

**Stormwater Drainage – Point of Discharge**

There is no appropriate drainage infrastructure available in the vicinity of the property. As such, the Point of Discharge for this property is to Merri Creek (Upper) at the western boundary of the property as shown on the attached plan and will require Melbourne Water approval.

In lieu of the above, a drainage strategy is required to be provided as part of any development or subdivision of this property. Prior to any development commencing the applicant must prepare a drainage strategy to demonstrate that the site may be drained to the satisfaction of the Responsible Authority (City of Whittlesea) and Melbourne Water.

On site detention and water sensitive urban design (WSUD) elements may also be required subject to Melbourne Water's requirements for stormwater discharge into the Merri Creek (Upper). Further, Melbourne Water approval will be required to connect to the Melbourne Water asset.

The information provided is based on the available Council asset records which may not accurately reflect the existing conditions. Council accepts no responsibility or liability for any inaccuracies contained within this information. Therefore, the applicant must verify the information on site.

It is noted that this letter includes only stormwater information. For all other property information enquiries please refer to Building & Planning Department on 9217 2259.

**Council Offices**  
25 Ferres Boulevard  
South Morang VIC 3752  
  
Locked Bag 1  
Bundoora MDC VIC 3083  
  
ABN 72 431 091 058

**Tel** 03 9217 2170  
**Fax** 03 9217 2111  
**TTY** 133 677 (ask for 9217 2170)  
**Email** [info@whittlesea.vic.gov.au](mailto:info@whittlesea.vic.gov.au)  
[www.whittlesea.vic.gov.au](http://www.whittlesea.vic.gov.au)

 Free Telephone Interpreter Service

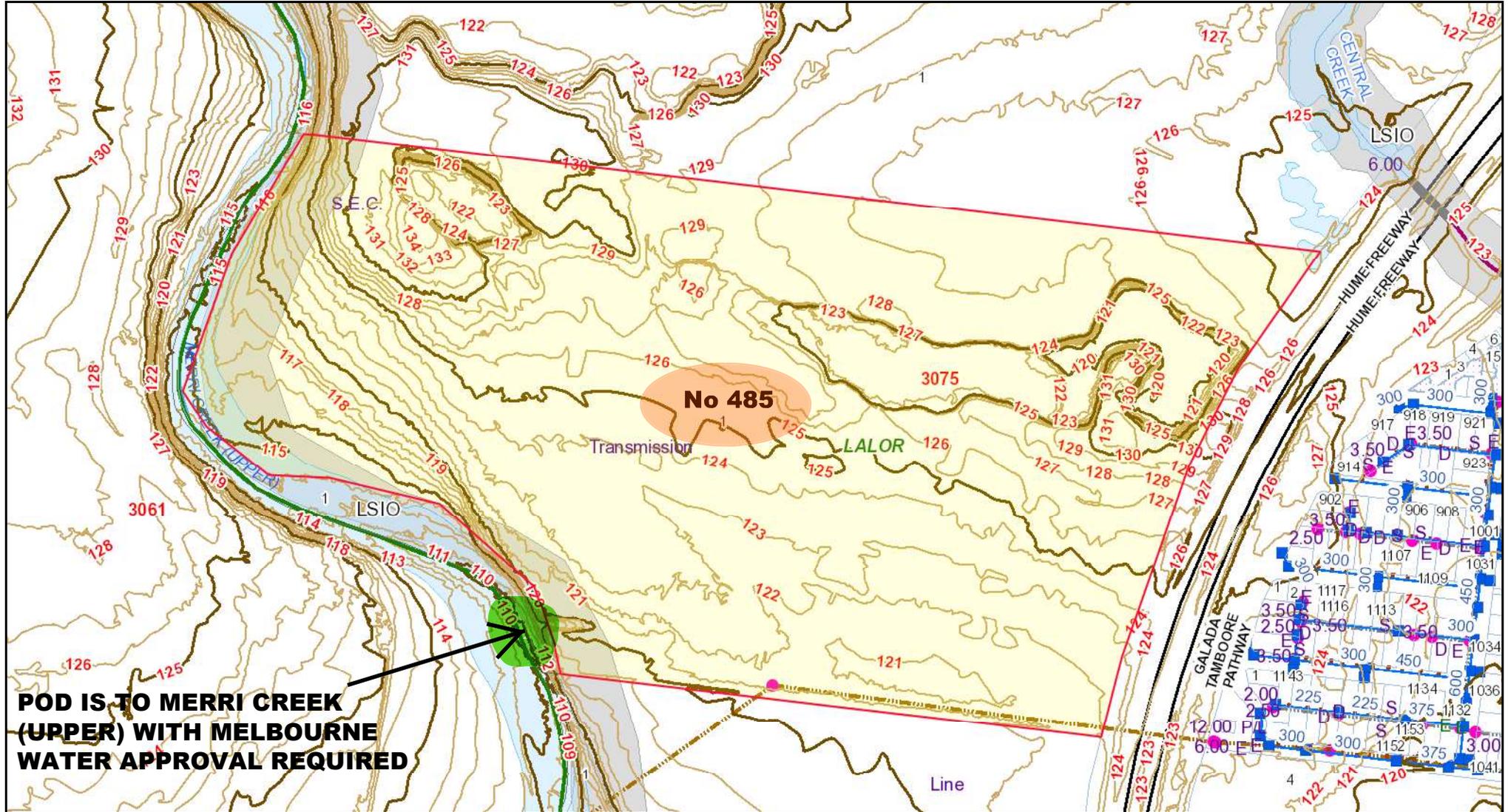
عربي	9679 9871	Hrvatski	9679 9872
廣東話	9679 9857	Ελληνικά	9679 9873
Italiano	9679 9874	Türkçe	9679 9877
Македонски	9679 9875	Việt-ngữ	9679 9878
普通话	9679 9876	Other	9679 9879

Should you have any queries, please contact Rick Cesare of Engineering Approvals on 9217 2194.

Yours sincerely

A handwritten signature in blue ink that reads "Rick Cesare". The signature is written in a cursive style with a prominent initial "R".

**Rick Cesare**  
**Development & Drainage Engineering Officer**



Point of Discharge for Proposed Development and/or Subdivision



COPYRIGHT 2019  
The State of Victoria and the City of Whittlesea does not warrant the accuracy and completeness of information on this map. The State of Victoria and the City of Whittlesea shall not bear any responsibility or liability for errors or omissions in the information. Reproduction of the plan is possible only with permission from the City of Whittlesea.

**CITY OF WHITTLESEA**  
 CARE HAS BEEN TAKEN TO ENSURE THAT THE  
 INFORMATION ON THIS PLAN IS CORRECT,  
 HOWEVER COMPLETE ACCURACY CANNOT BE  
 GUARANTEED.

 Map Scale: 1 : 5000  
 Date: 06/10/2022  
 Produced By: rtc

## **Appendix G**

**RESPONSE TO PRELIMINARY COMMENTS RECEIVED FROM WHITTLESEA COUNCIL AND MELBOURNE  
WATER**



Costin Roe Consulting Pty Ltd

ABN 50 003 696 446

PO Box N419 Sydney NSW 1220  
Level 4, 8 Windmill Street, Millers Point NSW 2000

e: mail@costinroe.com.au  
p: +61 2 9251 7699  
f: +61 2 9241 3731  
w: costinroe.com.au



16 February 2023

The GPT Group  
**Attention: Mr Matt Apostola**  
Level 51 MLC Centre  
19 Martin Place  
SYDNEY NSW 2000

email: [Matt.Apostola@gpt.com.au](mailto:Matt.Apostola@gpt.com.au)

Dear Sir

**Re: Response to Submissions (RTS)  
Whittlesea Council Development Plan Application (485 Cooper Street DP) &  
Melbourne Water Planning Permit for Development (MWA-1274358)  
485 Cooper Street, Epping, Victoria**

In reaction to the letter from City of Whittlesea Council referenced DPO33/485 Cooper Street DP dated 20 December 2022, please see our Response to Submission below:

Whittlesea Council Comment <i>Letter dated 20 Dec 2022</i> <i>Council Ref: DPO33 (485 Cooper Street DP)</i>	CRC Response
15. The Stormwater Management Plan and Drainage Strategy does not adequately integrate stormwater treatment into the landscape or protect water quality, in accordance with DPO33.	<p>CRC15. Clarification regarding this point is required.</p> <p>The progression of the proposed Stormwater Management plan and strategy will include the comments received from Council and Melbourne Water.</p> <p>In summary, the following SWMS is envisioned: Stormwater from the development site (roofs, hardstands, parkings, landscape etc.) will be drained via an in-ground drainage system to the Estate in-ground drainage system within the Estate Access Road without any primary treatment taking place on each individual lot.</p> <p>A portion of each warehouse roof will also be diverted to proposed rainwater tanks (Smart Tanks specifications will be reviewed) with the aim to reduce the water demand for the development to between 50-70% of non-potable demand. The</p>

	<p>rainwater tank overflows will also discharge into the estate drainage located in the road reserve.</p> <p>The three proposed catchments will eventually drain via the estate drainage system into three GPTs immediately prior to the bioretention system.</p> <p>These GPTs will then discharge into the proposed sediment forebays immediately prior to the bioretention basins.</p> <p>The forebays will overflow into the bioretention ponds where the water will be treated to reduce the total suspended solids, Total Phosphorus, Total Nitrogen and Gross Pollutants to the required reduction targets set in the development guides.</p> <p>The treated water will then discharge into the detention basin. The detention basin will be designed and sized to ensure the cumulative effect of development does not have a detrimental effect on the existing watercourse (Merri Creek) located downstream from the site. The intent is for development to not increase or exacerbate any hydraulic conditions in upstream, downstream or adjoining drainage systems. The water will then be discharged from the detention pond into Merri Creek, ensuring both the quality and quantity of the stormwater discharged satisfies the required standards.</p> <p>The combined bioretention- and detention basin will be constructed adjacent to the estate road reserve, outside the 1% AEP flood line, and integrated into the landscape to maintain a natural appearance and blend in with the environment.</p>
<p>16. There is concern about the proposed co-location of stormwater retarding basins with frog ponds. Justification for this approach is required following the outcomes of the targeted surveys and the preparation of a habitat linkage plan. Until the presence or otherwise of GGF is established, the currently proposed location of the retarding basin is not supported.</p>	<p>CRC16. The inclusion of frog ponds (GGF habitat) within the stormwater detention basins have been removed and will be removed from the Stormwater Management Plan and Drainage Strategy drawing package.</p> <p>An alternative location was identified along the western boundary of the site to provide a cluster of habitats for the Growling Grass Frog. Refer to new drawing <b>CO14681.00-DA49</b> for the alternate frog pond habitat proposal.</p>

<p>17. The Stormwater Management Strategy (SWMS) refers to three catchments on page 20 (Table B.1. Pollutant Concentrations). We request that these catchments are presented on a map.</p>	<p>CRC17. This additional catchment plan has been added to the SWMS and is shown on drawing <b>CO14681.00-DA42-A</b>, attached to this letter under <b>Appendix A</b>.</p>
<p>18. There is a portion of the site that has a natural depression to the north east which contributes to the Central Creek catchment rather than the Merri Creek catchment. <b>(A)</b></p> <p>It is noted that the SWMS will ‘ultimately runoff from the property drains to Merri Creek’, however in practice this doesn’t seem achievable noting that the north western corner of the development area does not have much fall available to convey stormwater to the south western corner for ultimate treatment/discharge into Merri Creek. <b>(B)</b></p>	<p>CRC18.</p> <p><b>(A)</b> We note the north-eastern portion of the existing site that naturally drains in a north-eastern direction towards Central Creek is approximately 1Ha in size of the 35.2Ha (2.8%) site (of which 27.3Ha is planned to be developed). We would propose that this small portion of the site’s catchment be included in the 485 Cooper Street development SWMS (treated, retained and discharged into Merri Creek).</p> <p>Bulk earthworks will be undertaken to provide large flat building pads, hardstand areas, car parking areas and an estate access road through the site.</p> <p>The drainage of this natural depression in the north-eastern corner will be achieved by drainage stormwater from the created flat pads with inground drainage systems, gravitating to the southern boundary of the development site to discharge into the proposed combined bioretention- and detention pond shown on drawings <b>CO14681.00-DA40-B &amp; CO14681.00-DA41-B</b>.</p> <p><b>(B)</b> As noted in (A) above, Bulk earthworks will be required to facilitate the development of the site for the planned industrial use. The earthworks will be undertaken to provide large flat building pads, hardstand areas, car parking areas and an access road through the site.</p> <p>The primary drivers for the proposed earthworks levels are achieving the required flood planning levels, allowing satisfactory overland flow drainage, and allowing sufficient cover above the underground services while minimising retaining wall quantities as well as balancing the cut and fill volumes as far as practically possible.</p>

	<p>The concept bulk earthworks pad levels can be seen on drawing <b>CO14681.00-DA30-B</b>. Stormwater generated on any of the future lots will gravitate via in-ground stormwater drainage systems to the estate’s main drainage pipeline located within the estate access road, which will be sloped from the northern boundary of the site to the southern boundary of the site.</p> <p>The proposed bulk earthworks pad level in the north-western corner of the development site is estimated to be around RL 129.50m AHD (+- 500mm) and in the north-eastern corner the level is estimated to be around RL 125.00m AHD (+- 500mm). It should be noted that this is the initial planning levels, and these can be adjusted slightly to suit the drainage requirements. Currently, the invert level of the bioretention pond is envisioned to be at approximately RL 119.00m AHD and the top water level at approximately RL120.50m AHD. Stormwater can sufficiently be conveyed via the proposed in-ground drainage system from across the site to the proposed bioretention system on the southern boundary of the site, maintaining the minimum council requirements for minor drainage systems.</p>
<p>19. The minor drainage system can be designed to 1 in 10 year (Q10) storm event in accordance with Table 14 of Council’s Guidelines for Urban Development (GUD) and *Table 14 of the Victoria Planning Authority’s Engineering Design and Construction Manual for Subdivision in Growth Areas (VPA EDCM). Whilst there are multiple instances where the subsurface drainage is being designed to a 1 in 20 year storm event (Q20), this is in accordance with the GPT Group Brief. It is not a City of Whittlesea requirement.</p>	<p>CRC19. This is noted.</p>
<p>20. Modelling and computations should consider fraction impervious values for proposed land uses in accordance with Table 16 of Council’s GUD and *Table 16 of the VPA EDCM. Table B.2 assumes areas for surface types which may not represent the developed characteristics, this should be treated as runoff by the zoning of the catchment</p>	<p>CRC20. This is noted and the MUSIC model will be updated accordingly. The entire site is categorised as an Industrial 1 Zone, and each of the three catchments will therefore be modelled as such, with a fraction impervious of 0.9 used.</p>

<p>(i.e. industrial zone, road zone, public park and recreation zone, etc.) in accordance with the aforementioned documents.</p>	<p>Planning Scheme Zone: IN1Z (Industrial 1 Zone)</p>
<p>21. Computations should be provided that demonstrate that the post-development flow rate from the catchment areas will be retarded back to the pre-development flow rate at the proposed stormwater treatment/retention systems to not cause inundation of the downstream waterways.</p>	<p>CRC21. This is noted. A pre- and post-development DRAINS model will be compiled to prove that the correct volume detention will be provided to ensure the discharge into the downstream waterways remain similar to the pre-development scenario.</p>
<p>22. Gross Pollutant Traps (GPT) should be provided in accordance with Section 13.12.5 of Council's GUD. It is not considered appropriate that a GPT is proposed for each allotment unless it is approved under the relevant permit application for the proposed development and use of the lot, which will be subject to the relevant Planning Scheme Provisions.</p>	<p>CRC22. This is noted. The separate lot GPTs will be removed from the proposed drainage network and a new larger GPT, for each of the three separate catchments, shall be provided "immediately upstream of the receiving waterbody and designed with an outlet that provides a dry waste chamber suitable for cleansing by suction hose from a tanker" as required by the Council GUD and shall be designed accordingly.</p>
<p>23. Council does not approve technical drawings as part of the Development Plan process. If the technical drawings at Appendix A of the SWMP are to be included, a note should state they are for information purposes only and that all drainage infrastructure will be designed and constructed in accordance with Council and Melbourne Water standards and guidelines. For example, the proposed kerb inlet pit on page 36 would not receive Council approval due to non-compliance with Council standard drawings.</p>	<p>CRC23. We note this comment and will revise all drawings to state that the drawings are for information purposes only and that all drainage infrastructure will be designed and constructed in accordance with Council and Melbourne Water standards and guidelines. We will revise all details to be in line with the Council Standard Drawings available online.</p>
<p>24. The DP should include a statement that requires sodic and dispersive soils to be considered in the Construction Stormwater Management Plan. Understanding these soil types is essential for planning effective erosion and sediment controls as standard erosion controls, such as silt fences, do not work, and conventional sediment controls, such as sediment basins also do not work (unless coupled with chemical flocculants).</p>	<p>CRC24. This is noted and will be added as requested. A geotechnical investigation is being completed in January 2023 which will also give us a good indication of the existing soil conditions on site, according to which we could progress the designs and erosion &amp; sediment control plans.</p> <p>We will investigate the conditions and considered sodic and dispersive soils in the Construction Stormwater Management Plan.</p>
<p>25. The Erosion and Sediment Control Plan at Appendix A of the Stormwater Management Strategy shows a Sediment Basin located well within Environmental Zone and closer to Merri</p>	<p><b>(A)</b> CRC25. With reference to drawing <b>CO14681.00-DA20</b>, Sediment Basin 1 is located relatively close to the proposed detention basin location. This basin will be relocated slightly north-east of its</p>

<p>Creek than the stormwater detention basin that is part of the stormwater system for the constructed development. It is unclear what level of disturbance and placement of fill may be required for construction of this basin, if indeed it is separate to the detention basin. This requires closer assessment in view of the ESO and marram baba Parklands. <b>(A)</b></p> <p>Reference to the EPA publication 960 - Doing It Right on Subdivisions, Temporary Environmental Protection Measures for Subdivision Construction Sites (2004) should be deleted and replaced with the EPA publication 1834 - Civil construction, building and demolition guide Management During Construction (2020). <b>(B)</b></p>	<p>current location to be located fully within the proposed stormwater detention basin location.</p> <p>The ESC plan is indicative only and will be updated to suit the topography during the detail design stage. As confirmed in 24. above, sodic and dispersive soils will also be considered during the design of the ESC plan.</p> <p><b>(B)</b> This is noted. All references to EPA publication 960 will be updated to refer to EPA publication 1834.</p>
<p>26. It should be clearly nominated within the SWMS that the three sediment basins provided within the Erosion and Sediment Control Plan are temporary measures as part of the delivery of the subdivision works to avoid confusion as to what stormwater treatment assets will be delivered to service the ultimate development.</p>	<p>CRC26. This is noted and will be clearly updated on the drawing package and reports to state that the three sediment basins provided within the Erosion and Sediment Control Plan are temporary measures only as part of the delivery of the subdivision works.</p>
<p>27. The proposed Bioretention system should be protected by sedimentation ponds (in addition to the network of GPTs)</p>	<p>CRC27. Additional to the GPT units on each lot as well as the new GPT proposed immediately prior to the bioretention basin, we have also allowed for a sediment forebays into which the GPT will discharge before entering the bioretention basins.</p> <p>With Rainwater tanks, GPT units prior to discharge from each lot and immediately prior to the bioretention basins, together with the proposed sediment forebays, we would not be recommending sediment basins prior to the bioretention systems.</p>
<p>28. Bioretention systems should be aligned adjacent to road reserves with the development to create more amenity.</p>	<p>CRC28. This is noted. The proposed bioretention basins are all aligned adjacent to the proposed road reserves. Refer to drawing <b>CO14861-DA40</b>.</p>
<p>29. Large bioretention systems are preferred, with the development having no more than 3 bioretention systems.</p>	<p>CRC29. This is noted. Only three bioretention systems are currently proposed as shown on drawing <b>CO14861-DA40</b>.</p>

<p>30. Rainwater harvesting for all development as proposed at Section 5.4 of the SWMS is supported. It is Council’s recommendation that Smart Tanks be connected to all roof surfaces greater than 100m<sup>2</sup>. Smart Tank system specifications are available on request.</p>	<p>CRC30. This is noted. Smart tank system specifications will be requested during the detail design stage.</p>
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<p><b>Melbourne Water Comment</b>  <i>Letter dated 21 Dec 2022</i>  <i>Melbourne Water Ref: MWA-1274358</i>  <i>Council Ref: DPO33</i></p>	<p><b>CRC Response</b></p>
<p>1. The treatment train as currently designed does not include appropriate measures for sediment capture prior to discharge into the catchment Bioretention System. Bioretention systems are heavily reliant on effective sediment treatment to ensure its effective operation. Melbourne Water requires further information on the sediment forebay proposed in the SWMS to demonstrate the effectiveness and performance, inclusive of design and proposed locations. Additionally, Melbourne Water strongly recommends that the storm water treatment system includes a robust sediment capture asset, preferably a sediment pond, prior to the bio retention system.</p>	<p>CRC1. An additional GPT shall be provided “immediately upstream of the receiving waterbody and designed with an outlet that provides a dry waste chamber suitable for cleansing by suction hose from a tanker” as required by the Council GUD, and shall be designed accordingly. Over and above the GPT units on each lot as well as the new GPT proposed immediately prior to the bioretention basin, we have also allowed for a sediment forebays into which the GPT will discharge before entering the bioretention basins. The detail design and proposed locations of the sediment forebays will be included for review.</p> <p>With GPT units prior to discharge from each lot and immediately prior to the bioretention basins, together with the proposed sediment forebays, we would not be recommending sediment basins prior to the bioretention systems.</p>
<p>2. Submitted Storm water Management Plan does not demonstrate existing and developed flows at the downstream boundary of the property. (Eg Table 4.1 in report) Mechanisms must be demonstrated to retard flows back to pre-developed condition - such as using a downstream retarding basin prior to discharge into the Merri Creek.</p>	<p>CRC2. This is noted. A pre- and post-development DRAINS model will be compiled to prove that the correct volume detention will be provided to ensure the discharge into the downstream waterways remain similar to the pre-development scenario.</p>



Yours faithfully,  
**COSTIN ROE CONSULTING PTY LTD**

A handwritten signature in black ink, appearing to read 'LDV', with a large, sweeping flourish extending to the right.

**LOURENS DE VILLIERS**  
Design Engineer

21 December 2022

Taras Rego  
Whittlesea City Council  
25 Ferres Boulevard  
South Morang VIC 3752

Dear Taras,

**Proposal:** Proposed Development Plan

**Site location:** Lot No 1, 485 COOPER STREET EPPING 3076

**Melbourne Water reference:** MWA-1274358

**Council reference:** DPO33

**Date referred:** 02/11/2022

### **Our Decision**

Melbourne Water, pursuant to Section 56(1) of the Planning and Environment Act 1987, objects to the proposed Development Plan as the associated Storm water Management Plan (SWMS) for the development shown in the plan has not been prepared to Melbourne Water's satisfaction. (SWMS requires Melbourne Water's approval under Clause 4.0 of the Schedule 33 to Clause 43.04 of the Whittlesea Planning Scheme)

Melbourne Water objects to the submitted SWMS on the following grounds:

### **Grounds of objection**

1. The treatment train as currently designed does not include appropriate measures for sediment capture prior to discharge into the catchment Bioretention System. Bioretention systems are heavily reliant on effective sediment treatment to ensure its effective operation. Melbourne Water requires further information on the sediment forebay proposed in the SWMS to demonstrate the effectiveness and performance, inclusive of design and proposed locations. Additionally, Melbourne Water strongly recommends that the storm water treatment system includes a robust sediment capture asset, preferably a sediment pond, prior to the bio retention system.
2. Submitted Storm water Management Plan does not demonstrate existing and developed flows at the downstream boundary of the property. (Eg Table 4.1 in report) Mechanisms must be demonstrated to retard flows back to pre-developed condition - such as using a downstream retarding basin prior to discharge into the Merri Creek.

In addition to above concerns, Melbourne Water requires following to be shown for the Development Plan to be considered further:

a) River Red Gums marked for removal in Figure 5 of the Development Plan are not provided with an ID number that matches the Arborist Assessment nor are they included in the Native Vegetation Removal Plan (Figure 10 of Development Plan). Prior to the endorsement of the Development Plan, the following must be submitted to Melbourne Water:

b) A separate Arboricultural Impact Assessment is required for the River Red Gums proposed for removal that includes an avoid and minimise statement (as outlined in 7.2.1 of Flora and Fauna Assessment) and necessary mitigation and protection measures if removal can be avoided.

c) An updated Flora and Fauna Assessment to include these trees for removal.

d) An updated Development Plan must also be updated to include the ID number of these River Red Gum so they can be cross referenced with the Arborist Assessment.

e) Prior to the endorsement of the Development Plan, a Conservation Management Plan must be submitted to Melbourne Water for approval. The plan must detail measures to minimise environmental impacts and the procedures to be taken in the event of encountering Growling Grass Frogs or other species of significance, to the satisfaction of Melbourne Water.

## Advice

To access more information regarding other services or online applications that Melbourne Water offers please visit our [website](#).

For general development enquiries contact our Customer Service Centre on 131722.

Regards,



Indi Prathapasinghe  
Development Planning Services

Enquiries: Taras Rego, Ph 9217 2383

20 December 2022

Tom Hamilton  
Associate  
Suite 3, Level 2, 99 Coventry Street  
SOUTHBANK VIC 3006

Dear Tom,

### **Request for Further Information: 485 Cooper Street Development Plan**

I refer to the proposed Development Plan, which was submitted to Council in October 2022. I wish to advise that Council officers have undertaken a detailed assessment of the submitted application. Further to the Preliminary Request for Further Information Letter dated 17 November 2022, we provide a comprehensive Request for Further Information Letter.

Please note that this letter does not include referral advice from external agencies, including Melbourne Water and the Department of Environment, Land, Water and Planning. In accordance with Development Plan Overlay - Schedule 33, which applies to the site, a Stormwater Management Plan and Drainage Strategy must be prepared to the satisfaction of Melbourne Water, and a Landscape Concept Plan must be prepared in consultation with the Department of Environment, Land, Water and Planning (Port Phillip Region).

Council officers are committed to facilitating an outcome to assist with the development and delivery of 485 Cooper Street. However, there are a number of matters that are required to be addressed before the Development Plan can proceed to non-statutory exhibition.

### **Site Context Plan**

1. A site context plan is required in accordance with Development Plan Overlay – Schedule 33 (DPO33). The Site Context Plan should address the location of the site in the context of the wider Cooper Street Employment Area, incorporating existing natural features, threatened species habitat, drainage lines, water courses, wetlands, ridgelines and hill tops, and approved road and path connections.

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## Aboriginal Cultural Heritage

2. In accordance with DPO33, a detailed archaeological survey and heritage assessment must be submitted which includes recommendations for the protection, restoration and interpretation of significant individual sites, and where appropriate, design measures to sensitively integrate sites into the open space network. Findings from the archaeological survey and heritage assessment should inform the Development Plan and Landscape Plan.

## Biodiversity

### *Arboricultural Assessment*

3. A requirement of DPO33 is the incorporation of existing natural features (including remnant vegetation) into the street layout and design response.

The DP should consider the retention of trees 1, 2, 3, 7, 8 and 9 which are all medium sized River Red Gums (RRG) with a high arboricultural value. Tree 114 is also worthy of retention.

4. The preference is for the aforementioned trees to be located within a Council tree reserve accessible from the local street network. There is also an opportunity to co-locate these trees with drainage assets as well as passive open space areas to provide respite for local workers. Requirements regarding appropriate interfaces to the tree reserves will need to be incorporated into the DP, under the proposed design guidelines section.
5. Further assessment is required to confirm whether some trees within the site are protected by Clause 52.17. The arboricultural report states that 91 trees are rated as being of no protection value and that further assessment from an Ecologist may be required to confirm if the trees or groups of trees are protected by Clause 52.17 (page 5).

### *Flora and Fauna Assessment*

6. The avoid and minimise statement is inadequate and responds to the design without consideration of avoidance. In particular, patches A, L and P should be considered for retention.
7. A recent site visit by Council officers indicated that there are some unmapped areas of native vegetation and the site requires further analysis. The below map indicates areas where further assessment should be undertaken.

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8. There are issues with the timing of the surveys and species identified in the Flora and Fauna Assessment. For example, Wallaby Grasses were not identified to species level and no spear grasses were noted, nor geraniums of any kind.

The time of year the surveys were conducted has implications for the findings of the assessment in that under those conditions the extent, quality and diversity of the native vegetation may be less than what would be observed at a more optimum time of year.

It is recommended that during the period of targeted surveys, additional native vegetation assessment also be undertaken. Other EPBC-listed flora species that are recommended to be included in the assessment include:

- River-swamp Wallaby grass (*Amphibromus fluitans*)
- Swamp Everlasting (*Xerochrysum palustre*)
- Adamson's Blown Grass (*Lachnograstis adamsonii*)
- Large-headed Fireweed (*Senecio macrocarpa*)
- Clover Glycine (*Glycine clandestina*)
- Curly Sedge (*Carex tasmanica*)

Wallaby Grass species and common native grasses (Spear Grasses, Chloris, Microlaena, Wheat Grass) should also be identified.

9. It is recommended that consideration be given to realignment of the western boundary of the 'environmental zone' to allow for the avoidance of the partial removal of patches T and U.
10. Targeted surveys have not been completed and will be required for three species listed under the EPBC Act (Matted Flax-lily, Golden Sun Moth and Growling Grass)

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Frog). Referral to Commonwealth may also be required for these matters depending on the findings of the surveys.

There are at least four waterbodies on site which have the potential to provide habitat for the Growling Grass Frog (GGF). These waterbodies must be retained until further monitoring and assessment of the GGF is undertaken. If retention is not feasible, an equivalent area of dedicated GGF habitat should be provided that meets the requirements of the *Growling Grass Frog Habitat Design Standards* (DELWP 2017).

11. A referral under the EPBC Act would be required for the proposed impacts to Grassy Eucalypt Woodland and Natural Temperate Grassland which is classified as a significant impact.

A future application to remove native vegetation would fall into the Detailed assessment pathway and require referral to DELWP in accordance with the Guidelines, in addition to the previously mentioned referral to Commonwealth under the EPBC Act.

#### *Habitat Linkage Plan*

12. A Habitat Linkage Plan is required as per DPO33. The plan should identify existing and future habitat links and communities of species identified in the Flora and Fauna Assessment Report, and prescriptions/principles previously outlined in the Conservation Management Plan for 445 and 475 Cooper Street, Epping (Ecology Australia, 2010). This should be prepared following the completion of all targeted surveys for listed threatened species that were recommended out of the Flora and Fauna Assessment.

#### *Other Fauna habitat considerations*

13. The rocky escarpments may provide habitat for a range of other fauna. The Development Plan should include details of the species that may be present in these locations as well as appropriate survey, salvage and translocation provisions by a suitably qualified professional as a requirement of any future permit.
14. We request that a statement be included within the DP stating that a Kangaroo Management Plan must be prepared and provided to Council together with a 'design and management response' statement at the planning permit stage outlining how the application is consistent with and gives effect to any requirements of the Kangaroo Management Plan.

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## Stormwater Management Plan and Drainage Strategy

15. The Stormwater Management Plan and Drainage Strategy does not adequately integrate stormwater treatment into the landscape or protect water quality, in accordance with DPO33.
16. There is concern about the proposed co-location of stormwater retarding basins with frog ponds. Justification for this approach is required following the outcomes of the targeted surveys and the preparation of a habitat linkage plan. Until the presence or otherwise of GGF is established, the currently proposed location of the retarding basin is not supported.
17. The Stormwater Management Strategy (SWMS) refers to three catchments on page 20 (Table B.1. Pollutant Concentrations). We request that these catchments are presented on a map.
18. There is a portion of the site that has a natural depression to the north east which contributes to the Central Creek catchment rather than the Merri Creek catchment. It is noted that the SWMS will 'ultimately runoff from the property drains to Merri Creek', however in practice this doesn't seem achievable noting that the north western corner of the development area does not have much fall available to convey stormwater to the south western corner for ultimate treatment/discharge into Merri Creek.
19. The minor drainage system can be designed to 1 in 10 year (Q10) storm event in accordance with Table 14 of Council's Guidelines for Urban Development (GUD) and \*Table 14 of the Victoria Planning Authority's Engineering Design and Construction Manual for Subdivision in Growth Areas (VPA EDCM). Whilst there are multiple instances where the subsurface drainage is being designed to a 1 in 20 year storm event (Q20), this is in accordance with the GPT Group Brief. It is not a City of Whittlesea requirement.
20. Modelling and computations should consider fraction impervious values for proposed land uses in accordance with Table 16 of Council's GUD and \*Table 16 of the VPA EDCM. Table B.2 assumes areas for surface types which may not represent the developed characteristics, this should be treated as runoff by the zoning of the catchment (i.e. industrial zone, road zone, public park and recreation zone, etc.) in accordance with the aforementioned documents.
21. Computations should be provided that demonstrate that the post-development flow rate from the catchment areas will be retarded back to the pre-development flow rate at the proposed stormwater treatment/retention systems to not cause inundation of the downstream waterways.

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22. Gross Pollutant Traps (GPT) should be provided in accordance with Section 13.12.5 of Council's GUD. It is not considered appropriate that a GPT is proposed for each allotment unless it is approved under the relevant permit application for the proposed development and use of the lot, which will be subject to the relevant Planning Scheme Provisions.
23. Council does not approve technical drawings as part of the Development Plan process. If the technical drawings at Appendix A of the SWMP are to be included, a note should state they are for information purposes only and that all drainage infrastructure will be designed and constructed in accordance with Council and Melbourne Water standards and guidelines. For example, the proposed kerb inlet pit on page 36 would not receive Council approval due to non-compliance with Council standard drawings.
24. The DP should include a statement that requires sodic and dispersive soils to be considered in the Construction Stormwater Management Plan. Understanding these soil types is essential for planning effective erosion and sediment controls as standard erosion controls, such as silt fences, do not work, and conventional sediment controls, such as sediment basins also do not work (unless coupled with chemical flocculants).
25. The Erosion and Sediment Control Plan at Appendix A of the Stormwater Management Strategy shows a Sediment Basin located well within Environmental Zone and closer to Merri Creek than the stormwater detention basin that is part of the stormwater system for the constructed development. It is unclear what level of disturbance and placement of fill may be required for construction of this basin, if indeed it is separate to the detention basin. This requires closer assessment in view of the ESO and marram baba Parklands.  
  
Reference to the EPA publication 960 - Doing It Right on Subdivisions, Temporary Environmental Protection Measures for Subdivision Construction Sites (2004) should be deleted and replaced with the EPA publication 1834 - Civil construction, building and demolition guide Management During Construction (2020).
26. It should be clearly nominated within the SWMS that the three sediment basins provided within the Erosion and Sediment Control Plan are temporary measures as part of the delivery of the subdivision works to avoid confusion as to what stormwater treatment assets will be delivered to service the ultimate development.
27. The proposed Bioretention system should be protected by sedimentation ponds (in addition to the network of GPTs)
28. Bioretention systems should be aligned adjacent to road reserves with the development to create more amenity.
29. Large bioretention systems are preferred, with the development having no more than 3 bioretention systems.

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30. Rainwater harvesting for all development as proposed at Section 5.4 of the SWMS is supported. It is Council's recommendation that Smart Tanks be connected to all roof surfaces greater than 100m<sup>2</sup>. Smart Tank system specifications are available on request.

### Potentially Contaminated Land

31. The Environment Report (Edge Group September 2022) Preliminary Site Investigation (PSI) must make an unequivocal statement that either:
- The site is not likely to be contaminated to a level which would pose a significant risk to the environment or human health under the proposed use/development scenario. No further assessment is required, or,
  - The site is contaminated, or there is likelihood of contamination, that would pose a risk to the proposed use/development scenario. There is sufficient information to derive a risk-based remediation or management strategy, or,
  - The site is contaminated, or there is likelihood of contamination, that would pose a risk to the proposed use/development scenario. The site requires further information.

### Interface and Design Guidelines

32. The Development Plan should be revised to address the key objective to provide activated frontages along the Merri Creek and the Barry Road Grasslands. The design treatment of these interfaces should be addressed within the Development Plan.

Our position is that a loop road along the southern and western interface would be the most appropriate interface treatment to achieve an active street frontage that will encourage walkability, cycling opportunities, bushfire management and passive surveillance.

Section 4.2 *Merri Creek Marran Baba Parklands Strategic Management Plan* states that 'the interface to the parklands should be designed to enhance the recreation experience, vistas and personal and property safety'. It is our position that the loop road would achieve this objective.

33. Design Guidelines must be included within the Development Plan report addressing the key objectives and various requirements of DPO33. The design guidelines should have regard to the Biodiversity Business Park Planning and Design Guidelines and the Cooper Street Employment Area Design Guidelines.

### Landscape Concept Plan

34. The landscape concept plan does not demonstrate key objectives of DPO33 to maintain the habitat corridor along the Merri Creek, avoid the removal of native vegetation, and maintain an open space zone adjacent to the creek to allow for the construction of a 3 metre wide shared trail above the 1 in 10 year ARI flood level.

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35. Plan 3.1 Suburban Parklands appears to indicate that the Marram Baba Merri Creek Regional Parklands are within the subject site abutting the southern interface. This is inconsistent with the plans on the subsequent pages.



36. It is unclear what the below link on Plan 4.1 Proposed Merri Creek Park Plan is proposed to be and further clarification is required.



37. Plan 4.2 Typical Plan – Proposed landscape treatment to property frontages should be updated include plantings within the vegetation buffer between the shared path and the car park.
38. Greater detail should be provided within the Landscape Plan and the Development Plan regarding the proposed shared path, including specific measurements and how it connects in with the existing/proposed paths within the local area.

DPO33 requires a Pedestrian and Cyclist Connectivity Plan which must address the provision of a continuous accessible path of travel in accordance with Disability Discrimination Act 1992 requirements and have regard to the shared trail requirements contained within *Merri Creek Marram Baba Parklands Strategic Management Plan* (Parks Victoria, 2013).

It is also unclear why the shared path does not continue through the internal road network (see below image) and further clarification is required.

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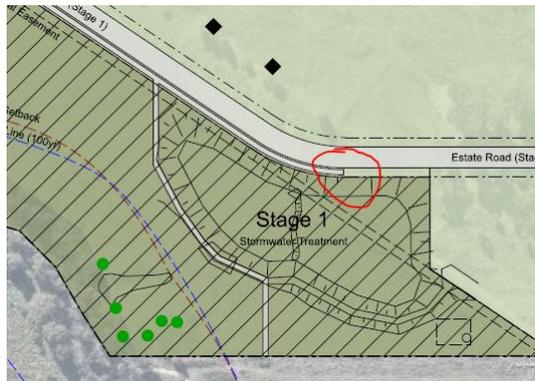
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39. The figures referenced in Section 7.0 of the DP do not appear to be correct. Section 7.0 refers to Figure 7 which does not appear to be relevant and Section 7.1 refers to Figure 3 which is of the planning zones.
40. Item 1 in the 'Key' on Page 8 of the Landscape Planning Report refers to 'Proposed stormwater treatment. Under development by others'. Clarification is requested as it is understood that this stormwater asset will be developed as part of future works within the DP.
41. The proposed use of "Eucalyptus melanoxylon (Black morrell)" in the Environmental Zone should be deleted as this is W.A. species. It is possible there has been some confusion with *Acacia melanoxylon* (Blackwood). This acacia species is a local species and would be suitable, providing locally indigenous stock is used.
42. The proposed planting of trees in various parts of the Environmental Zone should be labelled as indicative only. Cultural heritage and further flora studies, as well as an ecological restoration plan for the area are needed before planting locations can be specified.
43. All indigenous species used in the Environmental Zone and in interface areas should be sourced from locally indigenous stock. It is noted that the Spotted Gum *Corymbia maculate* is proposed to be used in the roadsides. It is proposed that a local indigenous Eucalypt species be used to be in keeping with the intended landscape character of the Marram Baba Merri Creek Regional Parklands.
44. The area on the DP identified as 'Environmental Zone' should include enough space to provide visitor infrastructure, such as resting places, benches and tables without compromising areas dedicated to conservation.
45. The shared path should be located set back within the 'Environmental Zone' further away from McKellar Way, provided this does not compromise existing patches of native vegetation and avoids steep topography.

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46. The stormwater system, which consists of bioretention treatment systems (to achieve water quality objectives) that sit within a larger detention basin (to manage water quantity), may be sub-optimal for a parkland environmental zone. The amenity impacts of the detention basin structure, particularly the wall/batter structure that is needed to contain the basin, have not been addressed and the detail needed to make this assessment has not been provided.

We are not convinced that the proposed system meets these landscape character objectives. It appears to require significant earthworks and changes to the form of the land. A design that is responsive to the amenity value of the area is needed, taking into account the alignment of the Shared Path which is shown as being in very close proximity to the stormwater system.

#### Traffic Impact Assessment (TIA)

47. Indicative cross-section(s) should be prepared to confirm the infrastructure spacing to be provided within the road reserve.
48. The TIA will be referred to the Department of Transport (DoT) for review as the access is through DoT signalised intersections from Cooper Street at Biodiversity Boulevard and Greystone Court intersections.
49. The TIA does not propose an estimated traffic generation from the proposed industrial subdivision. The RTA Guide to Traffic Generating Developments (Technical Direction 2013) identifies that business parks/industrial estates generate the following rates:

<b>Business parks and industrial estates</b>				
In 2012 eleven of these two types of sites were surveyed, four within the Sydney urban area, four within the Lower Hunter, one in the Illawarra and one in Dubbo. Summary vehicle trip generation rates were as follows:				
Weekday Rates	Sydney Average	Sydney Range	Regional Average	Regional Range
AM peak (1 hour) vehicle trips per 100 m <sup>2</sup> of GFA.	0.52	0.15-1.31	0.70	0.32-1.20
PM peak (1 hour) vehicle trips per 100 m <sup>2</sup> of GFA.	0.56	0.16-1.50	0.78	0.39-1.30
Daily total vehicle trips	4.60	1.89-10.47	7.83	3.78-11.99

These rates should be considered in the TIA, or otherwise an empirical assessment of similar existing business parks/industrial estates should be considered when estimating the traffic generation from the site when developed.

#### Servicing Report

50. A Servicing Report should be prepared to confirm connection locations to existing infrastructure to service the development area and staging of service infrastructure to service the development. This is requested in accordance with Clause 4.0 (Staging) of DPO33

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We look forward to continuing to work with you to finalise the Development Plan in accordance with relevant requirements and policy.

Should you have any queries about the application, please contact Taras Rego in the Strategic Futures Department on 9217 2229 or [Taras.Rego@whittlesea.vic.gov.au](mailto:Taras.Rego@whittlesea.vic.gov.au).

Yours sincerely



**Linda Martin-Chew**  
**Coordinator Strategic Land Use Planning**

\* The EDCM is co-referenced with GUD because standards are consistent across both documents.

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**Council Offices**

25 Ferres Boulevard, South Morang VIC 3752

**Mail to:** Locked Bag 1, Bundoora MDC VIC 3083

**Phone:** 9217 2170

**National Relay Service:** 133 677 (ask for 9217 2170)

**Email:** [info@whittlesea.vic.gov.au](mailto:info@whittlesea.vic.gov.au)

Free telephone interpreter service

 **131 450**



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16 October 2023

The GPT Group

**Attention: Mr Matt Apostola**

Level 51 MLC Centre

19 Martin Place

SYDNEY NSW 2000

email: [Matt.Apostola@gpt.com.au](mailto:Matt.Apostola@gpt.com.au)

Dear Sir

**Re: Response to Submissions (RtS)  
Whittlesea Council Development Plan Application (485 Cooper Street DP) &  
Melbourne Water Planning Permit for Development (MWA-1274358)  
485 Cooper Street, Epping, Victoria**

City of Whittlesea Council have reviewed the initial responses from the proponent sent on 16 February 2023 and have responded with another round of comments as summarised in the table below.

In reaction to these additional comments received from Council based on the letter from City of Whittlesea Council referenced DPO33/485 Cooper Street DP dated 20 December 2022, please see our Response to Submission below.

<b>Whittlesea Council Comment</b> <i>Letter dated 20 Dec 2022</i> <i>Council Ref: DPO33 (485 Cooper Street DP)</i>	<b>CRC Initial Response on 16 Feb 2023</b>	<b>Additional Whittlesea Council Comments</b>	<b>CRC Response on 13 October 2023</b>
<p>20. Modelling and computations should consider fraction impervious values for proposed land uses in accordance with Table 16 of Council's GUD and *Table 16 of the VPA EDCM. Table B.2 assumes areas for surface types which may not represent the developed characteristics, this should be treated as runoff by the zoning of the catchment (i.e. industrial zone, road zone, public park and recreation zone, etc.) in accordance with the aforementioned documents.</p>	<p>CRC20. This is noted and the MUSIC model have been updated accordingly. The entire site is categorised as an Industrial 1 Zone, and each of the three catchments was modelled as such, with a fraction impervious of 0.9 used.</p> <p>Planning Scheme Zone: IN1Z (Industrial 1 Zone)</p>	<p>The MUSIC model is to be submitted to Council at the FLP stage. This can be noted on the plan.</p>	<p>The updated MUSIC model is to be submitted to council with this RTS responses. MUSIC model is referenced <b>14681.00_Rev4_Stage1.sqz</b></p>
<p>22. Gross Pollutant Traps (GPT) should be provided in accordance with Section 13.12.5 of Council's GUD. It is not considered appropriate that a GPT is proposed for each allotment unless it is approved under the relevant permit application for the proposed development and use of the lot,</p>	<p>CRC22. This is noted. The separate lot GPTs will be removed from the proposed drainage network and a new larger GPT, for each of the three separate catchments, shall be provided "immediately upstream of the receiving waterbody and designed with an outlet that provides a dry waste chamber suitable for cleansing by suction</p>	<p>Hardstand area (11m x 3m) and truck turning area is to be provided.</p>	<p>This is noted. The required 11m x 3m hardstand- and truck turning area will be allowed for at each of the GPT units for maintenance access.</p> <p><b>Refer to drawings DA40 &amp; DA41.</b></p>

<p>which will be subject to the relevant Planning Scheme Provisions.</p>	<p>hose from a tanker” as required by the Council GUD and shall be designed accordingly.</p>		
<p>27. The proposed Bioretention system should be protected by sedimentation ponds (in addition to the network of GPTs)</p>	<p>CRC27. Additional to the GPT units on each lot as well as the new GPT proposed immediately prior to the bioretention basin, we have also allowed for a sediment forebays into which the GPT will discharge before entering the bioretention basins.</p> <p>With Rainwater tanks, GPT units prior to discharge from each lot and immediately prior to the bioretention basins, together with the proposed sediment forebays, we would not be recommending sediment basins prior to the bioretention systems.</p>	<p>With respect to the sedimentation ponds please provide maintenance access tracks connected to the public road network and sediment dryout areas. Heavy duty vehicle crossings connecting the maintenance access tracks with the public road network.</p>	<p>A maintenance access track will be provided from the estate’s public access road (via a heavy-duty vehicle crossing connecting the access track to the estate road) to each of the proposed sediment forebays. An additional area will be allocated around the proposed bioretention basins for sediment dryout.</p> <p><b>Refer to drawings DA40 &amp; DA41.</b></p>
<p>Greater detail should be provided within the Landscape Plan and the Development Plan regarding the proposed shared path, including specific measurements and how it connects in with the existing/proposed paths within the local area.</p>	<p>Previous response from proponent (not CRC): Landscape Plan has been updated to provide clearer detail on the shared path.</p>	<p>Details around DDA compliance, accessibility and connectivity must be addressed. Paths within the DP area is required to meet DDA requirements. Noting the retaining wall within the cross section - how is accessibility intended to be achieved here?</p>	<p>Architect and Landscape Architect to note that footpaths/walkways and pedestrian ramps noted by Whittlesea Council to be designed during the detail design stage to meet AS1428.1 requirements.</p>

<p>DPO33 requires a Pedestrian and Cyclist Connectivity Plan which must address the provision of a continuous accessible path of travel in accordance with Disability Discrimination Act 1992 requirements and have regard to the shared trail requirements contained within Merri Creek Marran Baba Parklands Strategic Management Plan (Parks Victoria, 2013).</p> <p>It is also unclear why the shared path does not continue through the internal road network (see below image) and further clarification is required.</p>			<p>The shared path proposed in the development plan follows the Principle Bicycle Network (PBN) shown on VicPlan.</p> 
<p>The area on the DP identified as 'Environmental Zone' should include enough space to provide visitor infrastructure, such as resting places, benches and tables without compromising areas dedicated to conservation.</p>	<p>Previous response from proponent (not CRC): The Development Plan has been updated to include a dedicated space for visitor infrastructure.</p>	<p>The DP report and Landscape Plan are to include the following statement: 'open space to be embellished appropriately with visitor infrastructure by the developer in alignment with City of Whittlesea's Open Space Strategy 2016 and handed over to Council after a maintenance period'.</p>	<p>This item is for the architect and landscape architect to comment and report on.</p>

		<p>There is linework shown in the middle of the proposed open space area marked as '5' on the Landscape Plan. We need to better understand what this landscape feature is. If it is a retaining wall or battering type feature, we need to understand how this impacts the open space. We want to maximise usable open space and the proposal needs to consider whether there is ample space for the functionality and appropriate embellishment of a regional open space as identified in the CoW Open Space Strategy 2016.</p>	
<p>A Servicing Report should be prepared to confirm connection locations to existing infrastructure to service the development area and staging of service infrastructure to service the development. This is requested in accordance with Clause 4.0 (Staging) of DPO33</p>	<p>Previous response from proponent (not CRC): A Servicing Report has been provided with the updated pack.</p>	<p>Sediment dryout area, maintenance access tracks, truck turning area shall be provided via continuation of existing servicers from developed areas. Details of the purpose and extent of the 6-meter shared path shown in the Landscape between the stormwater treatment assets needs to be provided. The requirement for turning and drying areas should to be incorporated and reflected in the DP and Landscape Plans.</p>	<p>This is noted. A maintenance access track will be provided from the estate's public access road (via a heavy-duty vehicle crossing connecting the access track to the estate road) to each of the proposed sediment forebays. An additional area will be allocated around the proposed bioretention basins for sediment dryout.</p> <p>The 6m shared path between the stormwater treatment assets will be removed from the DP. The maintenance access route will be revised and provided</p>

			from a single location between the two stormwater management basins.
Stormwater Management Strategy	New comment, no previous response.	Remove the statement under Section 5.2 of the Stormwater Management Strategy 'Proposed Stormwater Treatment System': 'No additional treatment or detention will therefore be required on future sub-divided lots' Individual lots should deal with and treat stormwater to some extent, due to the large scale hard surfacing through car parking and roofed areas. This is reflected in section 5.4 Stormwater Harvesting and the proposed changes to the design guidelines.	This is noted. Section 5.2 of the Stormwater Management Report have been updated to note that additionally to the proposed estate level stormwater quality measures, a portion of the future sub-divided lots' roofs will be partially treated via rainwater reuse and settlement within the rainwater tank. No other treatment measures are proposed on the future sub-divided lots.

Yours faithfully,  
**COSTIN ROE CONSULTING PTY LTD**



**LOURENS DE VILLIERS**  
 Design Engineer

## Appendix H

**ADDITIONAL COMMENTS RECEIVED FROM MELBOURNE WATER DATED 23 MAY 2023**

**Your Melbourne Water reference number:** MWA-1274358

**Application purpose:** Planning permit for development

**Application submission date:** 02/11/2022

**Location:** Lot No 1, 485 COOPER STREET EPPING 3076

## Lourens de Villiers

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**From:** Matt Apostola <Matt.Apostola@gpt.com.au>  
**Sent:** Tuesday, 23 May 2023 11:45 AM  
**To:** Lourens de Villiers  
**Subject:** Fwd: Response to information forwarded on 20 April 2023- for Planning permit for development - MWA-1274358 - Lot No 1 485 COOPER STREET EPPING 3076

FYI

Sent from my iPhone

Begin forwarded message:

**From:** Melbourne Water <No\_reply@melbournewater.com.au>  
**Date:** 23 May 2023 at 10:56:25 am AEST  
**To:** Matt Apostola <Matt.Apostola@gpt.com.au>  
**Cc:** Taras.Rego@whittlesea.vic.gov.au  
**Subject:** **Response to information forwarded on 20 April 2023- for Planning permit for development - MWA-1274358 - Lot No 1 485 COOPER STREET EPPING 3076**

Hi Matt,

Thank you for forwarding further information in regards to the following application:

**Your Melbourne Water reference number:** MWA-1274358  
**Application purpose:** Planning permit for development  
**Application submission date:** 02/11/2022  
**Location:** Lot No 1, 485 COOPER STREET EPPING 3076

Melbourne Water's advice and comments on the information forwarded on 20/04/2023 to address our concerns regarding the proposed development plan (Objection response dated 21/12/2022) are as following:

### Flood protection requirements

Melbourne Water has considered that the 'Stormwater Management Strategy and Drainage for development site - Proposed Industrial Estate 485 Cooper Street Epping'; Prepared by Costin Roe Consulting (submitted date 4/5/2023)' as acceptable subject to the following conditions:

1. The majority of localised catchment from north through to the property and therefore the proposed development including internal drainage system, buildings and roads requirement, and detention basin must be to Council's satisfaction – Council's requirements and conditions.
2. No cut or fill is permitted within the 1% AEP flood extent.
3. Finished floor levels of the proposed buildings must be set no lower than 600mm above 1% AEP flood levels.
4. Access ways/ roads must comply with DELWP's guidelines for access safety. ('Developments within Flood Affected Land' of 2019)

Internal notes: The applicant is proposed approx. 50m setback between the Merri Creek and detention basin. Hence Regional Service Team should be contacted to confirm whether it's acceptable. Noting that it's intended that ownership and maintenance of the estate detention and water quality basin is transferred to Whittlesea Council following completion of works and development of the land. Listed in the SWMS report (p.21).

#### Waterway protection requirements

Melbourne Water is supportive of the submitted Conservation Management Plan and Flora and Fauna Assessment as our following concerns raised before have been addressed:

2a has been addressed on Figure 3 of Flora and Fauna Assessment

2b has addressed the avoid and minimise statement and mitigation and protection measure under 7.2.1 and 7.7 the Flora and Fauna Assessment

2c has been addressed on Figure 2 and 3 of the Flora and Fauna Assessment

However, considering waterway health and environment the following additional information is required for our full assessment of the Development Plan:

1. The Development Plan has not been updated to include the tree ID's of the River Red gums to be removed (as per 2d of MWA-1274358 Objection)

2. Flora and Fauna Assessment, it is noted that there is 9 river red gums, however 10 are marked for removal on Figure 3. This may be an error as Tree 130 is an Acacia implexa on the Arborist Assessment.

3. As per 2e of previous objection: "the Conservation Management Plan (or within the Flora and Fauna Assessment) must detail measures to minimise environmental impacts and the procedures to be taken in the event of encountering Growling Grass Frogs or other species of significance, to the satisfaction of Melbourne Water." The Conservation Management Plan does outline some construction environmental management measures, however, it does not outline any procedures in the event of encountering Growling Grass Frogs, e.g. through a translocation plan. As per the Flora and Fauna Assessment there are areas of suitable habitat that has been identified on site and surveys were undertaken outside of their calling period. Even if it is unlikely to encounter a Growling Grass Frogs, a translocation procedure must be prepared.

4. Figure 1 does not include the two sites surveyed for GGF, this must be provided.

5. The Conservation Management Plan must also outline where access gates will be installed along the permanent fence and provide the access gate design. There must be a minimum of two access gates to the site.

#### Stormwater Management Plan -

6. Condition 1 MWA-1274358 has not been addressed adequately to include a robust sediment capture asset. The following information is required:

The sediment forebays appear to be undersized in relation to the catchments they are to treat, sediment forebays are generally designed for catchment areas >2ha – 5ha (refer to CS1 of MW "Biofiltration systems in DSS guideline 2020") and all of these proposed catchment areas are above 5ha. A sediment pond is the preferred asset to treat coarse particles sufficiently without prematurely undermining the performance of the bioretention system. It must be clearly explained as to why a sediment pond has not been incorporated into the design, if the proposed sediment forebays are to remain, it must be demonstrated

that the sizing of the sediment forebays are sufficient for the catchment areas, including estimated dimensions and relevant modelling and calculation (e.g. MUSIC) results. Unless otherwise specified by City of Whittlesea.

7. Please provide the updated geotechnical investigation report (as noted in Appendix G –pt 24 noted this was being completed in January 2023). Any findings of sodic or dispersive soils from the updated geotechnical investigation may impact how the stormwater is managed on the site.

Potentially Contaminated Land -

8. Noting that the Geotechnical Report observed potential asbestos containing materials and waste dumped and the previous Environmental Report (Edge Group September 2022) found household rubbish, asbestos fibre cement in ground. As per City of Whittlesea condition 31 (20/12/2022) it needs to be determined whether the site is contaminated or likely to be contaminated. Based on these findings, an appropriate contamination management strategy that outlines the environmental and human health risks that will be mitigated and managed during construction. This must be prepared for review and approval by Melbourne Water prior to construction.

### **Advice**

1. The Construction Stormwater Management Plan is to be provided to Melbourne Water for review and approval prior to commencement of works.

2. Melbourne Water recommends that bollards are placed around the bioretention/detention ponds to prevent vehicles from driving into the basin.

3. Melbourne Water strongly advises that the sediment forebay design (if a sediment pond is not achievable) demonstrates the following:

- sufficiently treat 95% of coarse sediment load  $\geq 125\mu\text{m}$  diameter from the peak 3 month ARI flow;
- be  $\leq 300\text{mm}$  deep;
- provide adequate sediment storage volume to store 1 year of sediment;
- provide energy dissipation of incoming flows;
- be free draining;
- is designed to be easily accessible for maintenance, these access requirements should be provided by Council;
- sizing and shape has been calculated based on CSIRO WSUD Engineering Procedures equations in 4.3.2.

To respond to us regarding this application, please use **DevConnect@melbournewater.com.au** quoting MWA-1274358 in the subject line.

This email is sent from a notification-only email address that does not accept incoming email.

For general development enquiries contact our Customer Service Centre on 131 722.

Regards,

Indi Prathapasinghe | Senior Planner , Statutory Referral Permit Services | Melbourne Water  
T: 131 722 | 990 La Trobe Street, Docklands, VIC 3008 | PO Box 4342 Melbourne VIC 3001  
| melbournewater.com.au

Enhancing Life and Liveability

If you have received this email in error, please notify the sender by return email, delete it from your system and destroy any copies.

**Matt Apostola**

**Development Manager**

**The GPT Group**

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