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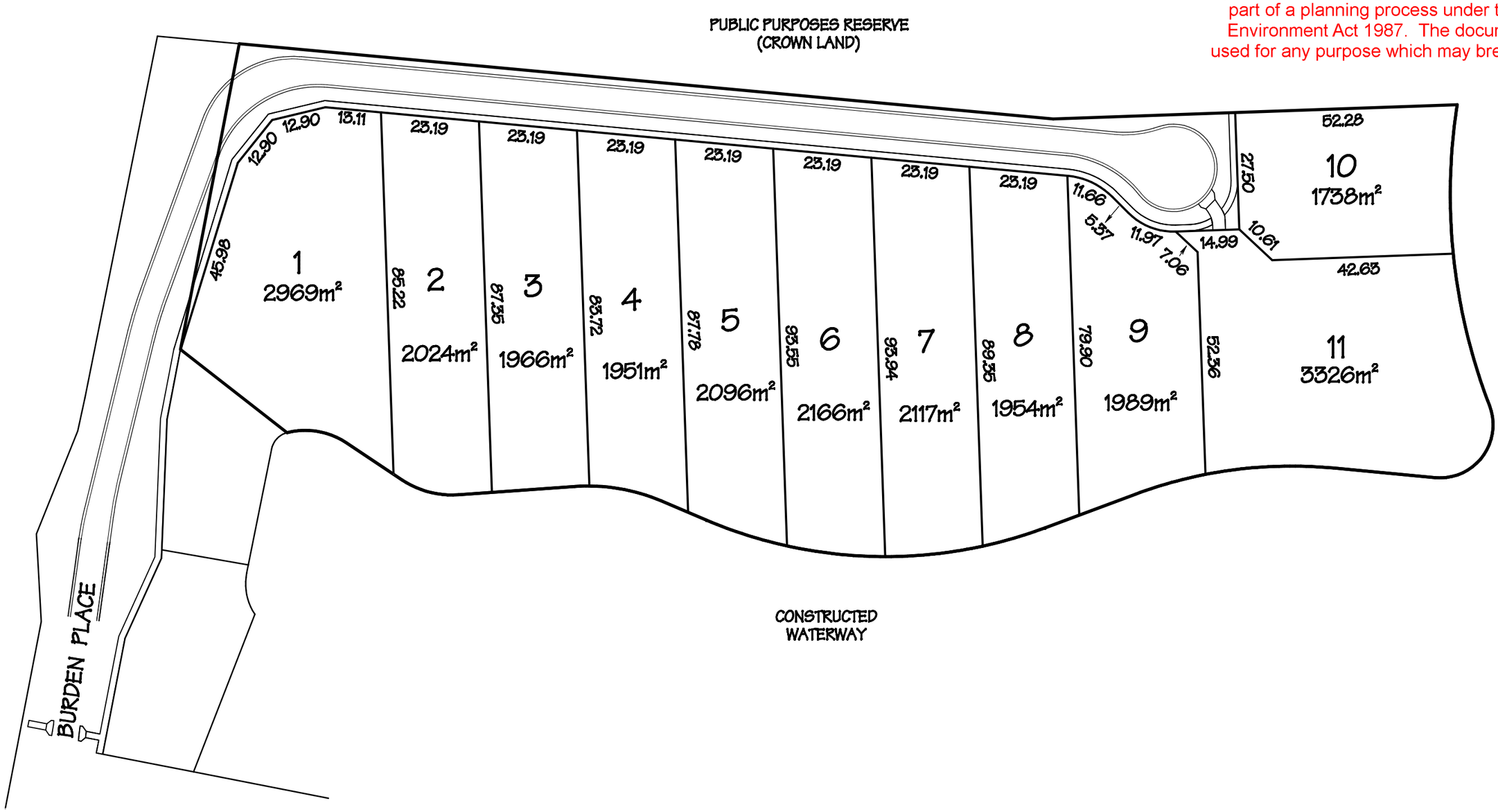



PAYNESVILLE POINT TRUST
35 BURDEN PLACE, PAYNESVILLE

Crowther&Sadler Pty.Ltd.
LICENSED SURVEYORS & TOWN PLANNERS
152 MACLEOD STREET, BAIRNSDALE, VIC., 3875
P. (03) 5152 5011 E. contact@crowthersadler.com.au

FILENAME: Y:\16000-16999\16000-16099\16006 Paynesville Point Trust - Burden\16006 Prop V6.pro

NOTATIONS

AREAS ARE APPROXIMATE ONLY
DIMENSIONS ARE SUBJECT TO SURVEY

| SCALE (SHEET SIZE A3) | SURVEYORS REF. |
|---|---|
| 1 : 1000 | 16006 |
| | VERSION 6 - DRAWN 31/08/2023 |

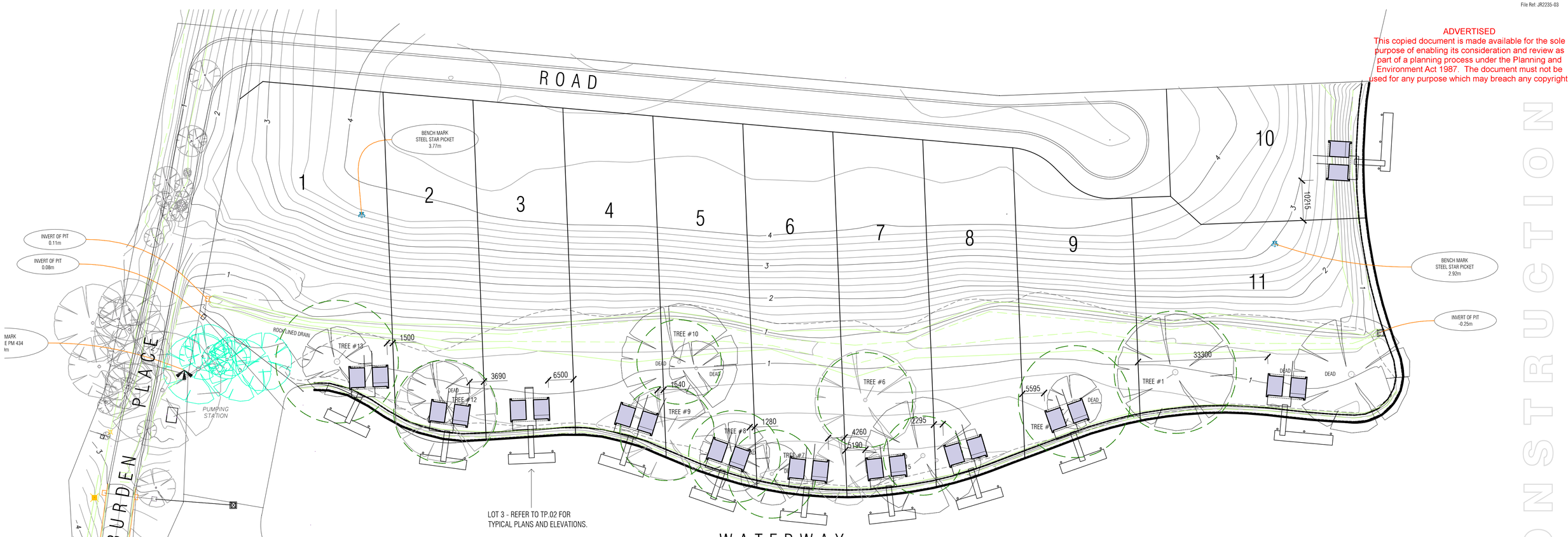
# PROPOSED SUBDIVISION

PARISH OF BAIRNSDALE
CROWN ALLOTMENTS 146 & 146G (PARTS)

LOT 2 ON PS748253X

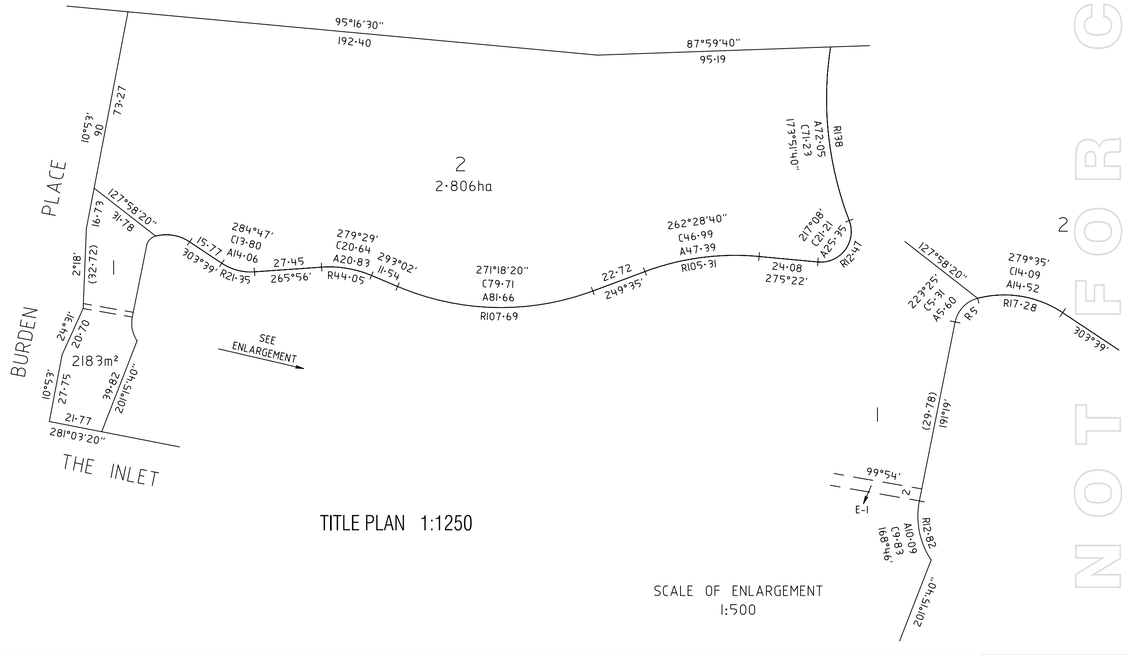
File Ref: JR2235-03






SITE PLAN 1:500


CONTEXT AERIAL NTS




TITLE PLAN 1:1250

SCALE OF ENLARGEMENT
1:500

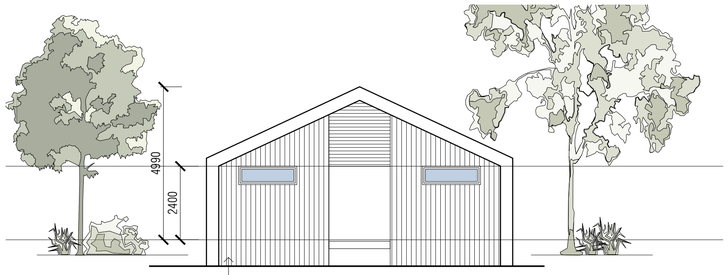


J.R Design Australia Pty. Ltd
P. 03 5910 4777 E. james@jrdapl.com.au

# PROPOSED BOAT SHEDS

LOT B ON PS625158D, BURDEN PLACE , PAYNESVILLE.

| | | |
|---|---|---|
| title: SITE PLAN | date: 30.06.23 | job no.: JR2235 |
| rev.: REV A - TOWN PLANNING ISSUE - 17.07.2023 | scale: 1:AS @A1 | sht. no.: TP.01A |

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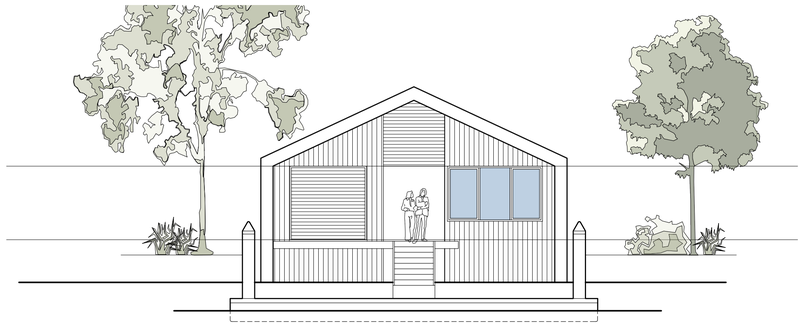
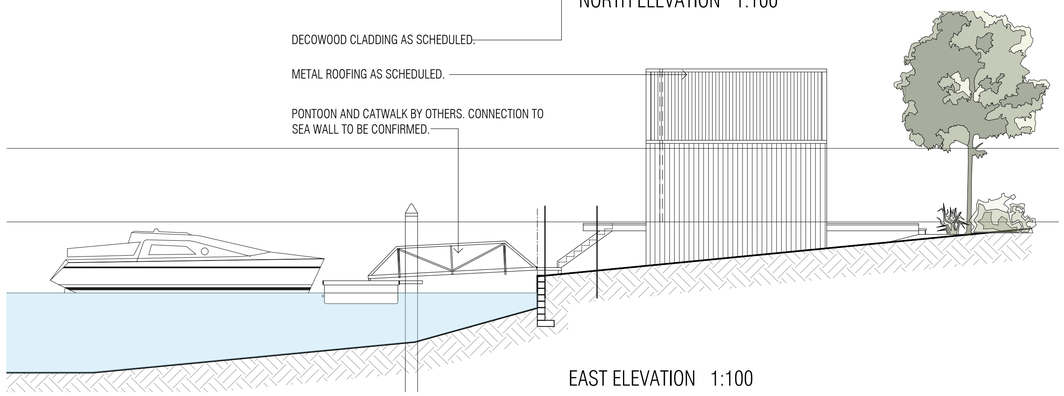


SOUTH ELEVATION 1:100

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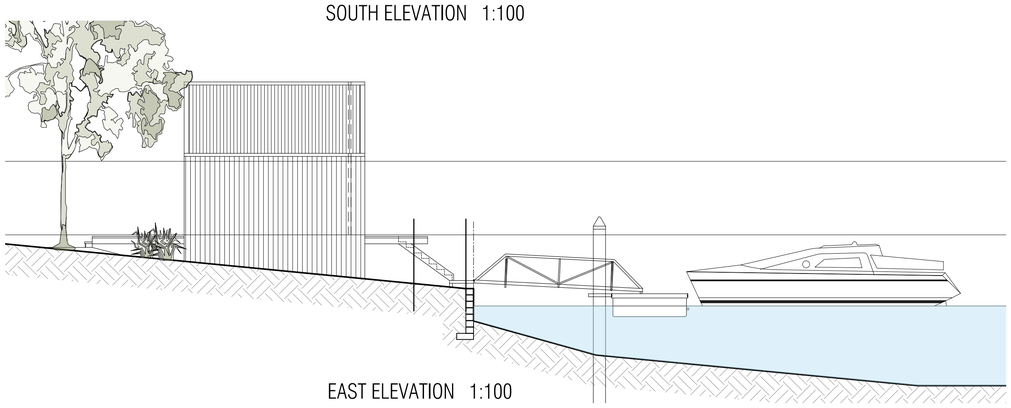

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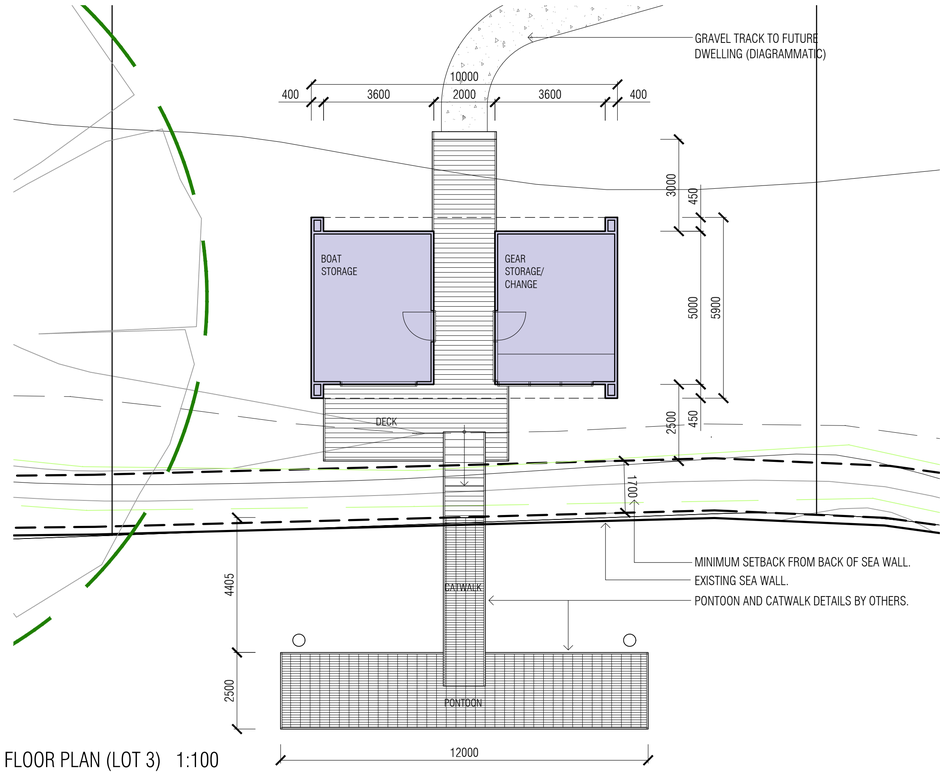


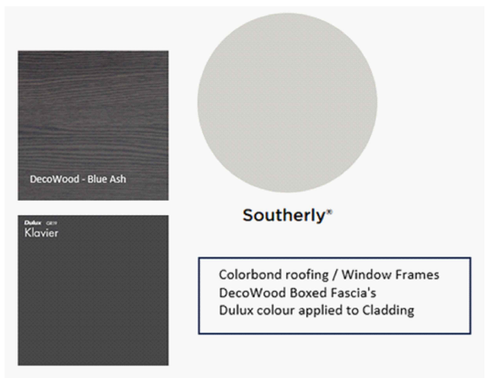

TYPICAL FLOOR PLAN (LOT 3) 1:100

AREAS:

BOAT SHED - 20.36m2
DECK - 28.90m2

SCHEDULE OF COLOURS & FINISHES.

OPTION 1

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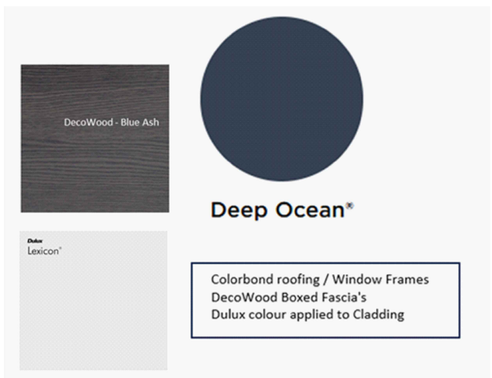


NOT FOR CONSTRUCTION

J.R Design Australia Pty. Ltd
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# PROPOSED BOAT SHEDS

LOT B ON PS625158D, BURDEN PLACE , PAYNESVILLE.

| | | | |
|---|---|---|---|
| title: PLAN & ELEVATIONS | date: 30.06.23 | job no.: JR2235 | |
| rev.: REV A - TOWN PLANNING ISSUE - 17.07.2023 | scale: 1:100 @A1 | sht. no.: TP.02A | |

DRAFT DATED 19/10/2022

| LOTS | PONTOON LENGTH | PONTOON WIDTH |
|---|---|---|
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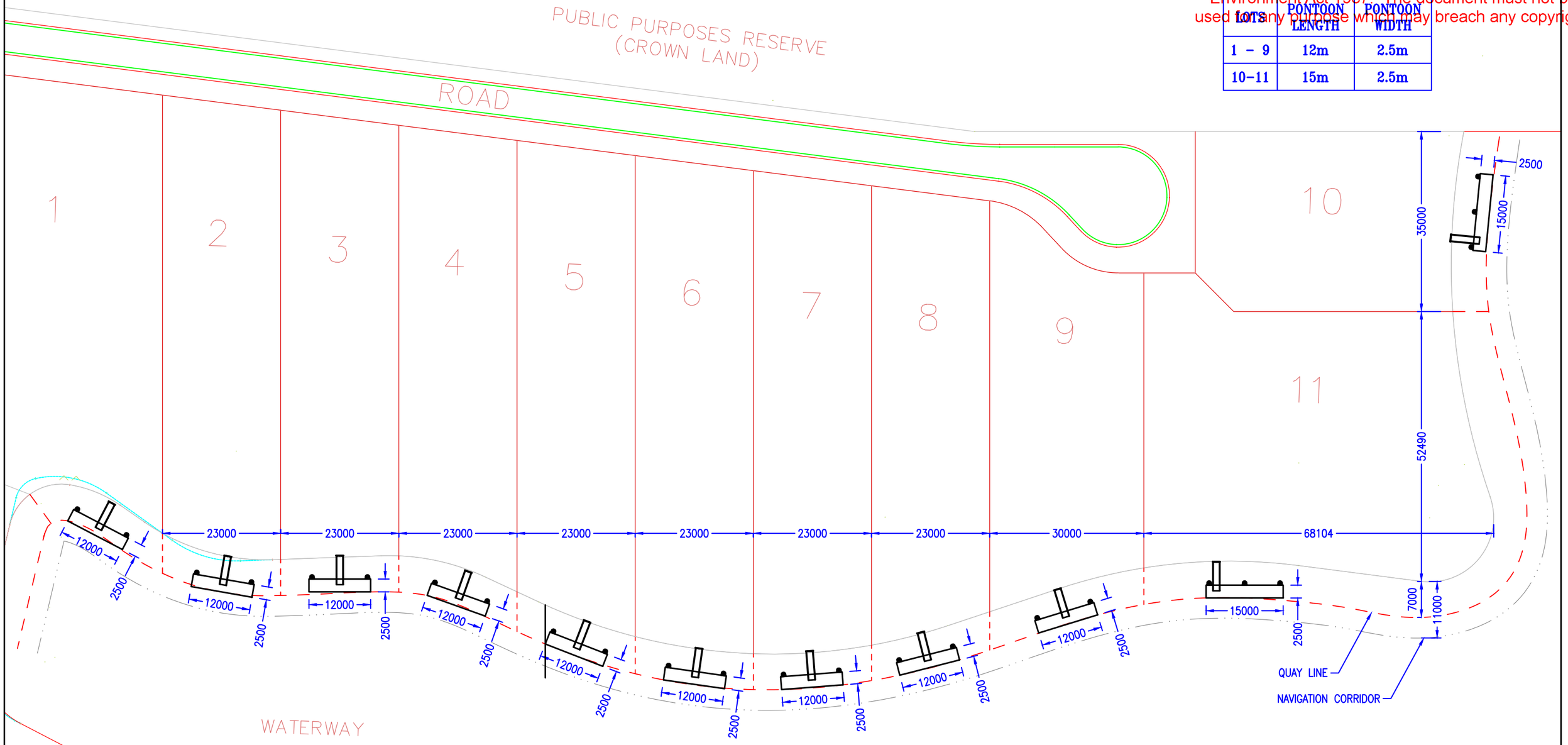
| 10–11 | 15m | 2.5m |




## SITE LAYOUT DRAFT

SCALE 1:750

FOR TENDER

| REV | DESCRIPTION | DRN BY | DATE | APPD |
|---|---|---|---|---|
| A | ORIGINAL ISSUE | | | |

EDGE CONSULTING ENGINEERS
EDGE Consulting Engineers
Level 1, 28 Balaclava Street
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Ph: +61 7 3392 3671
brisbane@edgece.com
CHKD R.P.E.Q. DATE:

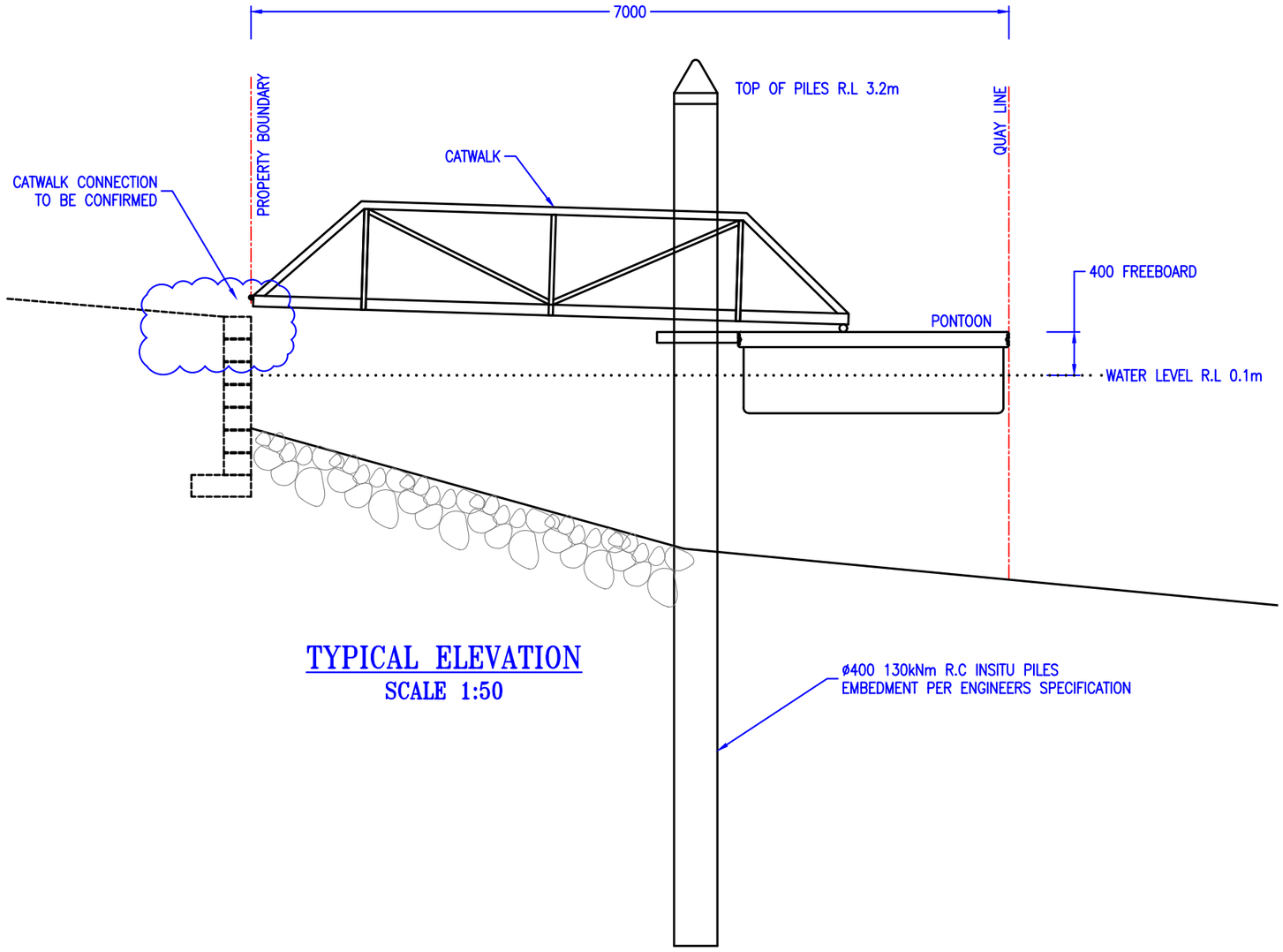
THE jetty SPECIALIST
18 RON PARKINSON CR BELLS CREEK QLD 4551
1300 260 878 www.tjsmarine.com.au home@tjsmarine.com.au

CLIENT: D PHILLIPS
PAYNESVILLE, VICTORIA
PROJECT: PROPOSED PONTOON & CATWALK

TITLE: SITE LAYOUT DRAFT
DRAWING No: TJS-PHILLIPS DRAFT-01

SHEET SIZE: A3
SHEET: 1 of 1
REV: A

DRAFT DATED 19/10/2022




## TYPICAL ELEVATION
SCALE 1:50

FOR TENDER

| REV | DESCRIPTION | DRN BY | DATE | APPD |
|---|---|---|---|---|
| A | ORIGINAL ISSUE | | | |

EDGE CONSULTING ENGINEERS
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THE jetty SPECIALIST
18 RON PARKINSON CR BELLS CREEK QLD 4551
1300 260 878 www.tjsmarine.com.au ✉ home@tjsmarine.com.au

CLIENT: D PHILLIPS
PAYNESVILLE, VICTORIA

PROJECT: PROPOSED PONTOON & CATWALK

TITLE: DRAFT ELEVATION

DRAWING No: TJS-PHILLIPS DRAFT-02

SHEET SIZE: A3
SHEET: 02
REV: A

**Proposed 11 Lot Residential Subdivision**
**35 Burden Place**

**Town Planning Report -**
# Stormwater Management Strategy

Prepared for:
**Paynesville Point Trust**

Prepared by:
**Crossco Consulting Pty Ltd**
**PO Box 858**
**Bairnsdale Vic 3875**

Document revision

| Version | Date | Prepared by | Comments |
|---|---|---|---|
| Rev 1 | 15/10/2023 | Crossco (#2057) | Distributed to Crowther & Sadler |
| Rev 2 | 18/12/2023 | Crossco (#2881) | Distributed to Crowther & Sadler |
| | | | |
| | | | |
| | | | |

***Notice:***

***This Stormwater Management Strategy:***

1. ***Has been prepared by Crossco Consulting Pty Ltd for Paynesville Point Trust.***
2. ***Is for the use of Paynesville Point Trust in seeking planning approval for a proposed 11 Lot residential subdivision at 35 Burden Place, Paynesville.***
3. ***Is subject to final revision to integrate findings and recommendations of other relevant documents and Agency feedback when available.***

**Abbreviations, Descriptions and Definitions**

The following table lists some common abbreviations and drainage system descriptions and their definitions which may be referred to in this report.

| Abbreviation / Descriptions | Definition |
|---|---|
| AHD - Australian Height Datum | Common base for all survey levels in Australia. Height in metres above mean sea level. |
| ARI - Average Recurrence Interval. | The average length of time in years between two floods of a given size or larger. A 100 Year ARI event has a 1 in 100 chances of occurring in any one year. |
| AEP – Annual Exceedance Probability | The chance of a storm (flow) of that magnitude (or larger) occurring in a given year. $\boldsymbol{AEP = 1 - e^{(\frac{-1}{ARI})}}$. i.e. 18.13% AEP = 5 Year ARI |
| BPEMG | Best Practice Environmental Management Guidelines. See CSIRO (1999) |
| EY – Exceedances per year | The amount of times a storm (flow) of that magnitude is expected to be exceeded per year. i.e. 4 EY = 3 Month ARI |
| $m^3/s$ -cubic metre/second | Unit of discharge usually referring to a design flood flow along a stormwater conveyance system |
| MUSIC | Hydrologic computer program used to calculate stormwater pollutant generation in a catchment and the amount of treatment which can be attributed to the WSUD elements placed in that catchment |
| MWC / MW | Melbourne Water Corporation |
| Retarding basin | A flood storage dam which is normally empty. May contain a lake or wetland in its base |
| NWL - Normal Water Level | Water level of a wetland or pond defined by the lowest invert level of the outlet structure |
| NSL – Natural Surface Level | The surface level of the natural (existing) surface before works. |
| RORB | Hydrologic computer program used to calculate the design flood flow (in $m^3/s$) along a stormwater conveyance system (e.g. waterway) |
| Sedimentation basin (Sediment pond) | A pond that is used to remove coarse sediments from inflowing water mainly by settlement processes. |
| TED | The top level of water stored for treatment within a wetland before bypass occurs |
| TSS | Total Suspended Solids – a term for a particular stormwater pollutant parameter |
| TP | Total Phosphorus – a term for a particular stormwater pollutant parameter |
| TN | Total Nitrogen – a term for a particular stormwater pollutant parameter |
| WSUD - Water Sensitive Urban Design | Term used to describe the design of drainage systems used to:<br>○ Convey stormwater safely<br>○ Retain stormwater pollutants<br>○ Enhance local ecology<br>○ Enhance the local landscape and social amenity of built areas |
| Wetland | WSUD element which is used to collect TSS, TP and TN. Usually incorporated at normal water level (NWL) below which the system is designed as shallow marsh, marsh, deep marsh and open water areas. |

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**Figures**



**Tables**

# 1. Background

*Crossco Consulting Pty Ltd* has been engaged by *Paynesville Point Trust* and instructed by *Crowther & Sadler, Town Planners & Licensed Surveyors* to prepare a Stormwater Management Strategy (SWMS) which will form part of the documentation required to lodge a planning permit application (by Others) to be submitted to East Gippsland Shire Council (EGSC) to subdivide land at 35 Burden Place, Paynesville (the site).

The site is subject to the East Gippsland Shire Planning Scheme and is zoned MUZ (Mixed Use), and various overlays apply to part or all of the site including:

- DDO2 (Design Development Overlay – Schedule 2)
- LSIO (Land Subject to Inundation Overlay)

The site is mapped as "an area of cultural heritage sensitivity".
Refer to Planning Property report at Appendix 1.

This report and attached Crossco Drawings (Appendix 3) are based on the following information provided to Crossco: Site Feature survey and proposed subdivisional layout by Crowther & Sadler at Appendix 2.

# 2. Purpose

This SWMS is prepared to meet the expected requirements of the EGSC and the East Gippsland Catchment Management Authority[1] (EGCMA) in regard to Water Sensitive Urban Design (WSUD) and drainage infrastructure.

As such this SWMS:

- Provides discussion in regard to flood retardation requirements of development of the subject site,
- The concept design of major pipe alignments, overland flow paths, swales, sediment ponds,
- Water Sensitive Urban Design elements to meet current Best Practice Environmental Guidelines,
- MUSIC modelling of Water Sensitive Urban Design initiatives,
- Development of a SWMS plan (concept design plans) to clearly show:
    - Encumbered space, noting treatment is achieved on proposed allotments,
    - How the drainage system concept designs can be realistically incorporated into the site proposals,
    - Preparation of initial site plan showing building/fill levels, setbacks, Expected 1% Annual Exceedance Probability (AEP) flood levels, and
    - development setbacks.
- Applies the IDM and other relevant design standards.

This SWMS has been prepared understanding that diligent site assessment is required at the SWMS/concept design stage to ensure any proposed assets can physically work. The SWMS/concept design stage of a project is the most important stage of a project, because, done well, it can stop inappropriate incorporation of assets in the future, while ensuring all EGSC requirements are met going forward.

[1] While EGSC is the drainage authority, the site is mapped LSIO and therefore EGCMA will be a referral authority.

# 3. Proposal

35 Burden Place, Paynesville (the Site) is proposed to be developed for residential purposes.
The proposed subdivision (refer to Appendix 3) creates:

- Lots 1 - 11 as residential allotments ranging in area from approximately 1,700 $m^2$ to 3500 $m^2$
- Road
- boatsheds (1 per proposed lot)
- boardwalks (refer to plan by Others)
- jetties (refer to jetty plan by Others)

In addition to roads & drains and stormwater management infrastructure, the proposed development proposes the provision of the following services which will all be constructed underground:

- Sewer – Gravity, Rising Main
- Watermain
- Electricity
- Communications

Refer to Access & Servicing drawings at Appendix 3.

# 4. Site Overview

## 4.1 Property Details

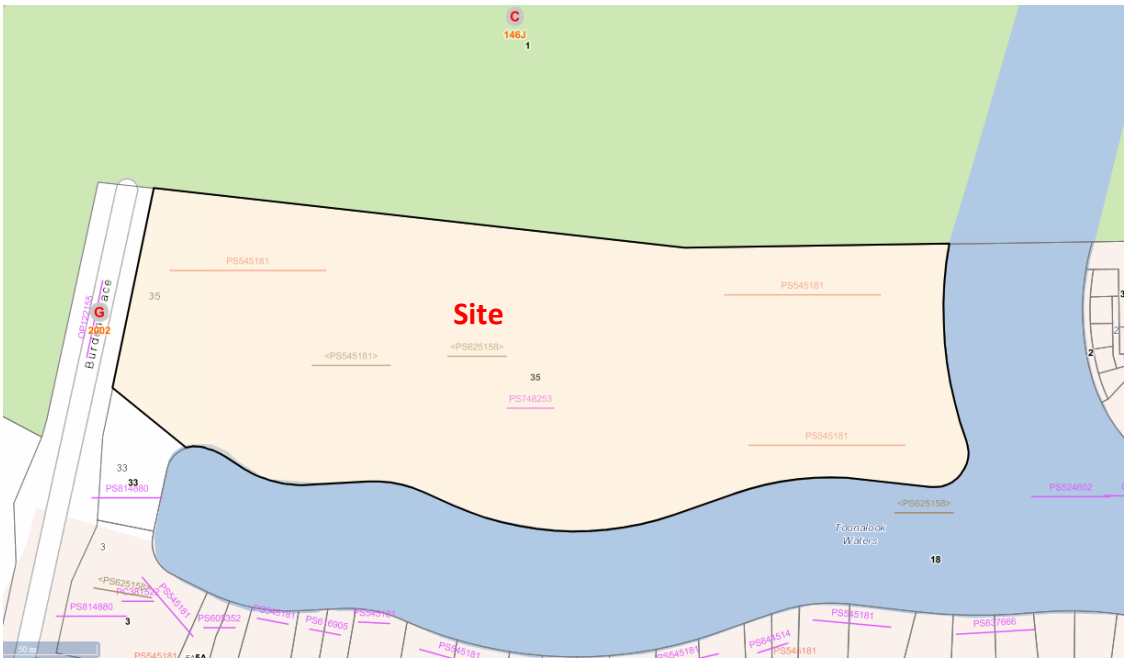



**Figure 1: Site**

The subject land comprises 1 parcel as shown on Figure 1 and outlined in Table 1 below.

**Table 1: Subject Land Details**

| | |
|---|---|
| Property Address | 35 Burden Place, Paynesville |
| Plan | Lot 2 on PS748253 |
| Boundaries | East: Constructed waterway<br>North: Crown Land (former Fill Site used during construction of constructed waterways)<br>West: Road Reserve<br>South: Constructed waterway |

## 4.2 Site Location

The site is located toward the northern extent of the Paynesville township as indicated at Figure 2.


**Figure 2: Locality Plan**

Figure 3 provides an overview of the location of the site in relation to existing development at Lake Tyers Beach. The waterways and waterbodies in proximity to the site are also shown.

Figure 3 and Figure 4 show the site in the context of the abutting land and road infrastructure.


**Figure 3: Aerial Overview**


**Figure 4: Site Aerial**

### 4.3 Site Description

The site comprises filled land to the north (material excavated during construction of the constructed waterways), and a vegetated strip to the south abutting the constructed waterway.

At the time the site was inspected:

- the area to the north of the vegetation was mown and maintained.
- grass cover was good with no apparent soil instability on the site. Figure 5 shows typical cover on the site.

**Figure 5: Grass Cover**

**Figure 6: Vegetation to South of Site**

The maximum elevation at the site is approximately 4.4m AHD (to the north boundary) and the minimum is <1m AHD (refer to Appendix 2 Feature Survey).

Slopes across the site vary as indicated in Figure 7.

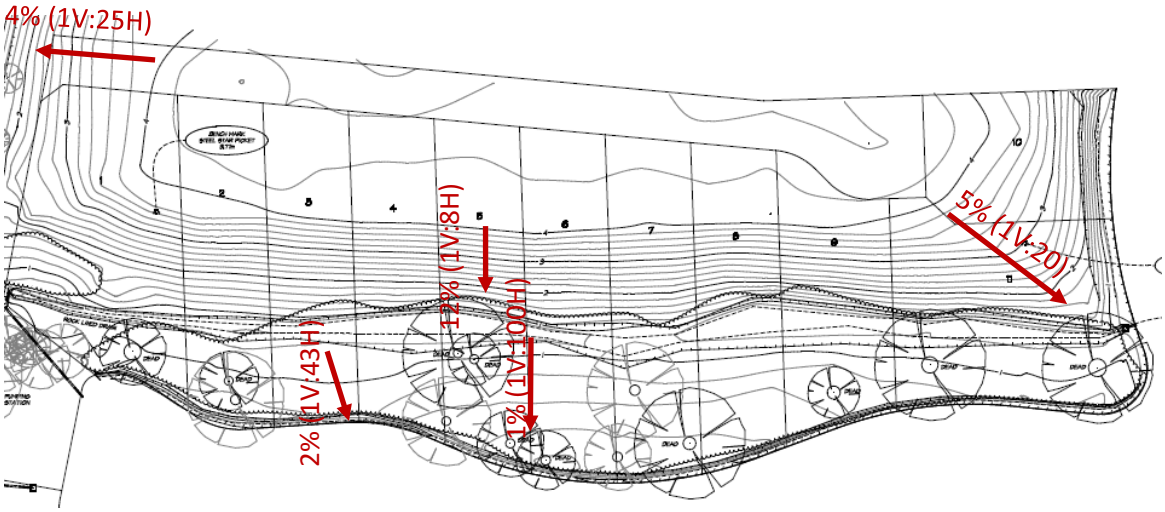



**Figure 6: Indicative Site Slope**

As can be observed in the aerial photographs at Figure 3 and Figure 4 the majority of the native vegetation on the property is located to the south adjacent to the constructed waterway boundary, on very flat land.

There are no defined waterways mapped on the site (refer to Figure 8), but there is an existing swale between the grassed (north) area of the site and the vegetation to the south, and constructed waterways to the east and south.


**Figure 7: Site and Defined Waterways**
***Source : https://mapshare.vic.gov.au/vicplan/***

### 4.4 Existing Drainage Infrastructure

The site has been the subject of previous stormwater management and drainage designs that have been progressively constructed since c2004.

This stormwater management strategy:

- is consistent with the stormwater management philosophy adopted when designing stormwater management works previously completed at the site.
- incorporates existing drainage infrastructure.
- outfalls to existing revetment wall penetrations.

The location of existing drainage infrastructure at the site is indicated in Figure 8 with labels corresponding to photographs and descriptions outlined in following sections.

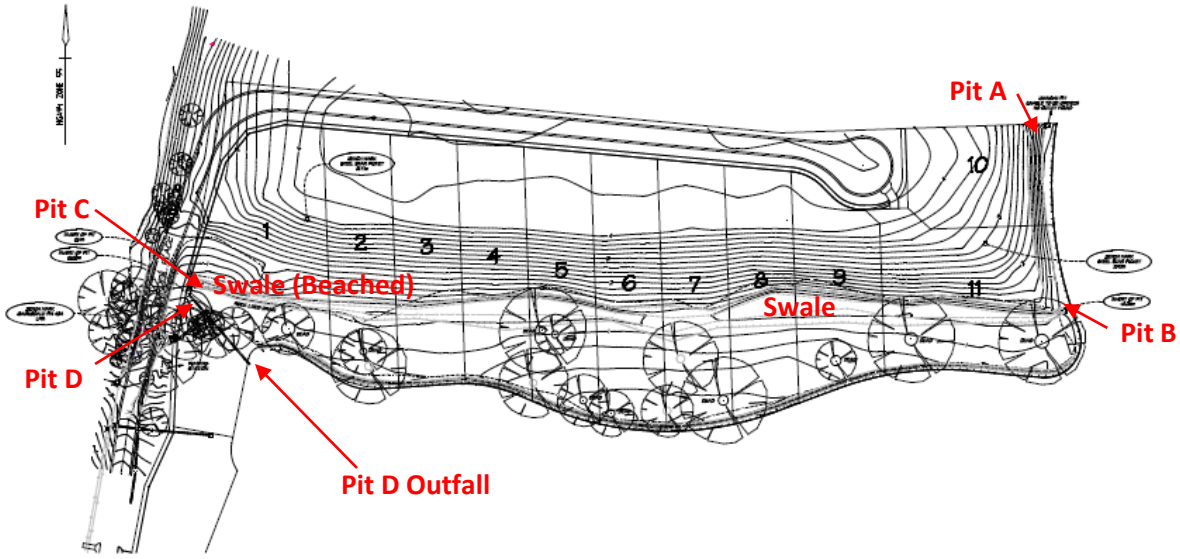



**Figure 8: Drainage Infrastructure Location**

### 4.4.1 Pit A

Pit A is located at the north-east boundary of the Site and was constructed c2004 when the revetment wall was constructed. There is no inflow into the pit. It is understood to have been constructed to facilitate future development by providing outfall for stormwater into the constructed waterway.

**Figure 9: Pit A**

### 4.4.2 Pit B

Pit B (Figure 10) is located toward the south-east boundary of the Site and was constructed c2004 when the revetment wall was constructed. The pit has an orifice (Figure 10) that takes stormwater from the vegetated swale and outfalls to the constructed waterway.

**Figure 10: Pit B**

### 4.4.3 Swale

The existing swale (Figure 11) was formed as part of the construction of the waterway c2004. The swale is generally vegetated, with some unvegetated areas forming crossing points through the swale from north-south. The swale outfalls to Pit B.

**Figure 11: Swale**

### 4.4.4 Swale (Beached)

The swale (beached) outfalls to Pit C and was constructed c2018 in accordance with planning permit No. 323/2017/P.

**Figure 12: Swale (Beached)**

### 4.4.5 Pit C

Pit C is an inlet pit that the swale (beached) discharges to. Stormwater then flows into Pit D and then to the constructed waterway via wall penetration (refer to Figure 13.

**Figure 13: Pit C**

### 4.4.6 Pit D

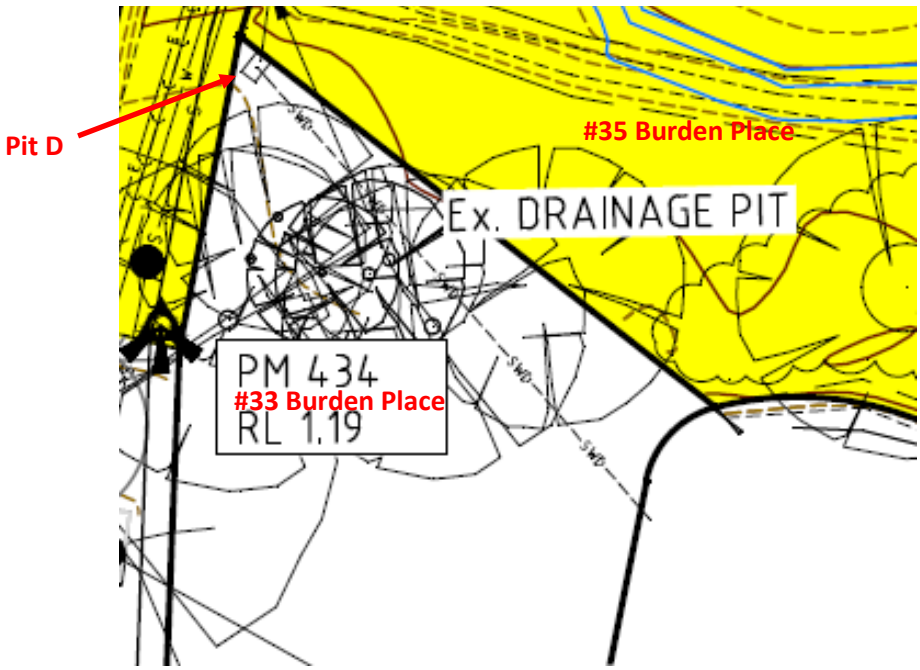



**Figure 14: Pit D & Pit D Outfall Location**

Pit D is a junction pit (JP) located in 33 Burden Place as shown on Figure 14 and Figure 15.

**Figure 15: Pit D**

### 4.4.7 Pit D Outfall

The location of the Pit D outfall to the constructed waterway as indicated on Figure 14.

The wall penetration could not be observed as a structure has been constructed over the penetration (refer to Figure 16). The construction of jetties in the constructed waterway requires EGSC approval.

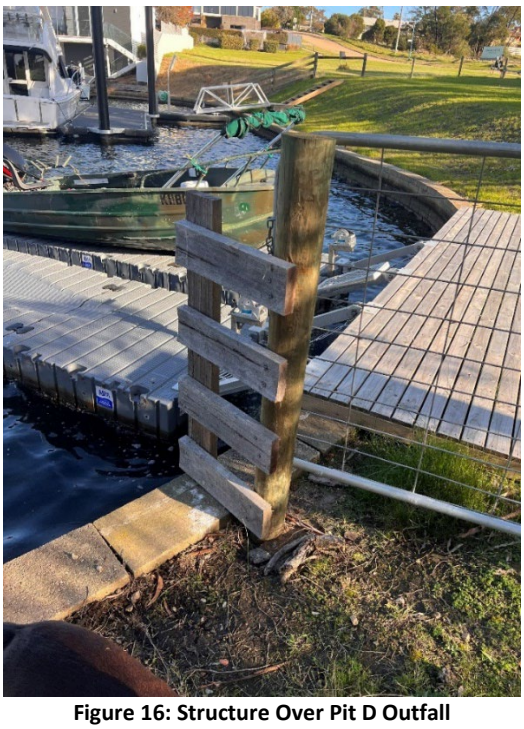


**Figure 16: Structure Over Pit D Outfall**

# 5. Reference Materials

## 5.1 Background Reports, Information and Designs

The formulation of the proposals herein has utilised information from the following sources relating to designs, studies and/or current works in the catchments/sites surrounding the Subject Site. Information obtained from each source below is described in more detail in subsequent parts of this report where required.

- Site survey information by Crowther & Sadler
- Proposed subdivisional layout by Crowther & Sadler (19609, V7 drawn 26/04/2022)
- Report 2: Inundation Hazard, Gippsland Lakes/90 Mile Beach Local Coastal Hazard Assessment Project, Water Technology, April 2014 (**2014 Gippsland Lakes Assessment**)
- The Effect of Climate Change on Extreme Sea Levels along Victoria's Coast, A Project Undertaken for the Department of Sustainability and Environment, Victoria as part of the 'Future Coasts' Program, Kathleen L. McInnes, Ian Macadam and Julian O'Grady, November 2009 (**2009 Climate Change Study**).
- Local Government Infrastructure Design Association Infrastructure Design Manual, Version 5.4, September 2022.
- Melbourne Water "MUSIC" (Model for Urban Stormwater Improvement Conceptualisation) Guideline, May 2022 (WMC MUSIC Guidelines).

# 6. Project Objectives

## 6.1 Overview

The proposed Stormwater Management solution meets the requirements of Cl 56.07-4 (Stormwater management objectives) and Standard C25 of the East Gippsland Planning Scheme.

- Stormwater is treated to the required standard.
- Post development flow is managed to not exceed pre-development flows.

The Crossco Drawings at Appendix 3 provide an illustration of the proposed stormwater solution. To prepare the proposed stormwater management solution Crossco has:

- had regard for best practice environmental guidelines for urban stormwater (BEPM).
- referenced stormwater management designs and construction at the subject land.
- considered the flood and coastal hazard issues.
- considered acid sulfate soil mapping.
- incorporated existing drainage infrastructure onsite.
- regard for proximity to the RAMSAR wetland / Gippsland Lakes.
- considered vegetation to the south of the Site.
- considered the design of the revetment wall.
- considered minimum access road level requirements.

## 6.2 Ramsar

To the north and west of the site are wetlands that fringe the Gippsland Lakes (Lake King) and forms part of the Gippsland Lakes RAMSAR site[2], a wetland of international significance. The north boundary (previously fillsite for constructed waterway construction) of the subject site abuts the RAMSAR boundary.


**Figure 17: Ramsar Boundary**

No stormwater discharge is proposed directly into the RAMSAR site.

## 6.3 Flood or Nuisance Surface Water from catchment

Some inundation of the proposed stormwater system can be expected when the water level of the constructed waterway exceeds the level of outfalls. This results in pipes / pits being flooded and will not impact dwellings or roadways as these are proposed to be constructed well above the 2100 SLR /SRM 1% AEP flood level.

[2] Source: https://rsis.ramsar.org/ris/269

### 6.4 Flood Storage Requirements

Commonly, to meet the requirements of the Local Government Infrastructure Design Association (LGIDA) Infrastructure Design Manual (IDM) flood retardation is required for new developments. Section 19.3.4 of the IDM states that:

> *Council's Engineering Department may waive the requirement for on-site detention, where it can be shown that there are no adverse impacts resulting from the increased rate and volume of stormwater from the development and that the level of service adopted by the Council will not be compromised*.

In this case, 100% of the development will drain to the constructed waterway to the south (via treatment through WSUD assets) or be retained for reuse via tanks on each allotment. The proposal has is no impact on flood storage within the Gippsland Lakes system. Subject to Council's Engineering Department agreement, detention has not incorporated into the SWMS.

### 6.5 WSUD Objectives

Clause 56.07-4 of the Victorian State Planning provisions states that urban stormwater management systems must be designed to meet current best practice management performance objectives for stormwater quality management as defined in the Best Practice Environmental Management Guidelines (**BPEMG**).

The BPEMG objectives for environmental management of stormwater are:

| | |
|---|---|
| Total Suspended Solids (**TSS**) | 80% retention of the typical urban annual load |
| Total Phosphorus (**TP**) | 45% retention of the typical urban annual load |
| Total Nitrogen (**TN**) | 45% retention of the typical urban annual load |
| Litter | 70% retention of typical urban annual load |
| Flows | Maintain discharges for the 1.5-year Average Recurrence Interval (**ARI**) event at pre-development levels |

### 6.6 Ecological Considerations

Consistent with the proposed subdivisional layout it is assumed that, as far as possible, all existing trees and vegetated areas will be retained.

Ecological assessments are by Others and will inform minimum required setbacks and limits of works as design solutions are further developed and refined.

No stormwater from the development is proposed to discharge to the Point Fullarton wetland to the west.

## 6.7 Coastal Acid Sulfate Soils

The site is mapped as having potential for Coastal Acid Sulfate Soils (CASS).

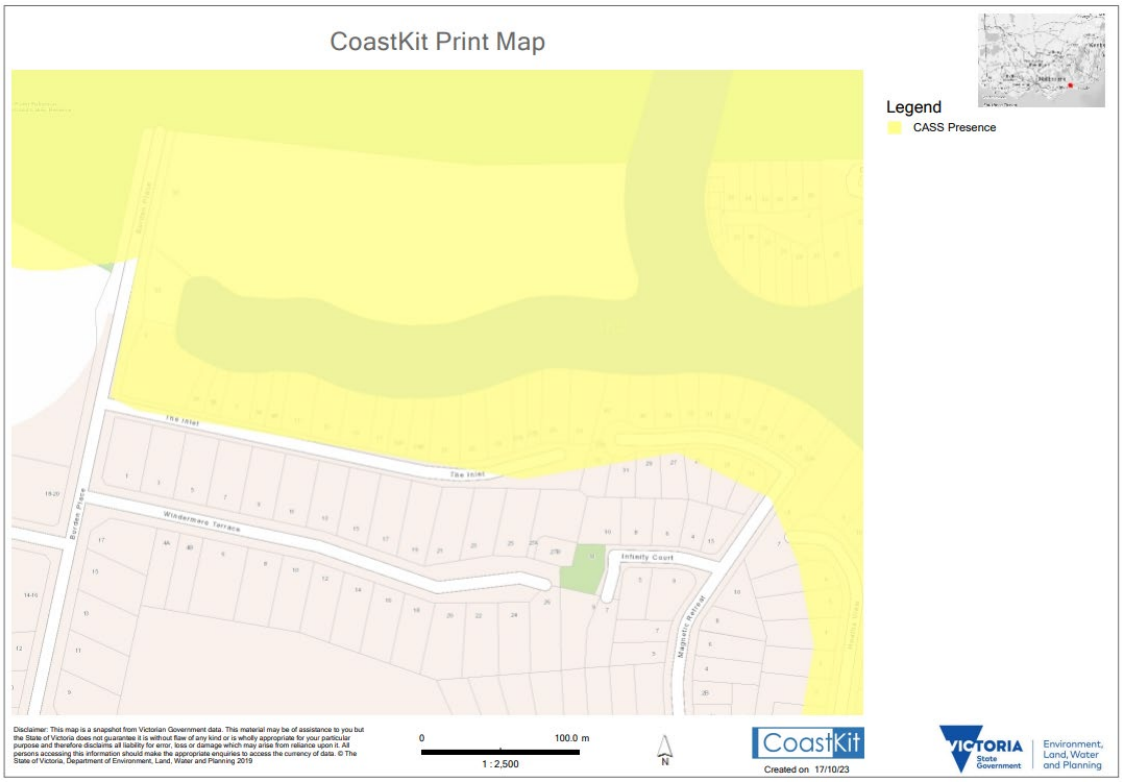



**Figure 18: CASS Mapping**

EPA Publication 1834 includes a statement regarding the management of acid sulfate soils, with a guidance sheet for management of "Hazardous Waste" including acid sulfate soils. Requirements for the management of acid sulfate soils (if present and/or disturbed by construction) will be addressed once the risk is identified and quantified through Detailed Design. The results of the Geotechnical Assessment confirm that infrastructure design avoids CASS disturbance (consistent with best practice).

If a CASS Management Plan is required, it will meet the requirements of DEECA and any other relevant Authority. CASS Management Plans are commonly implemented by Civil Contractors in East Gippsland and form an important part of OH&S and Environmental management of civil construction projects throughout coastal environments. While not relevant to stormwater assets which are gifted to the municipality, East Gippsland Water has a Standard Operating Procedure (SOP) for Management of Acid Sulfate Soils and will expect compliance with this SOP for construction of assets to be gifted to EGW (water and sewer assets) and it is anticipated that a single CASS Management Plan will be developed for all civil construction works.

The north of the site has been filled and all works are to be undertaken in the fill horizon, and to the south excavation to construct proposed infiltration raingardens will be shallow and designed above the CASS horizon consistent with best practice. Therefore, no CASS is expected to be encountered during the construction of civil infrastructure. Building foundation design will be undertaken by building designers which includes a requirement for soil investigation and classification - and will therefore consider CASS at that time.

### 6.8 Crown Land Infrastructure

No works are proposed on Crown Land.

### 6.9 Maintenance Requirements

All stormwater treatment is proposed on Private Land within Drainage Easements.

Maintenance of infrastructure on Private Land is proposed to be the responsibility of the landowner and included in a S173 Legal Agreement registered on each title.

## 7. SWMS Description

### 7.1 System Design Criteria

In accordance with the Infrastructure Design Manual (IDM), the proposed development is to be design based on:

- Design Storm Event
  - Minor Systems 20% AEP
  - Major Systems 1% AEP

- Provision of section 19.3.4 that on-site detention is not required as the development will have no adverse impacts resulting from the increase rate and volume of the 1% AEP flood flow from the development area.

- Runoff Coefficient
  - Residential Road Reserves - 0.75
  - Residential Area – Lot areas 2000m2 – 4000m2 - 0.45
  - Overall – 55%
- Provision of Stormwater Treatment
  - 80% Retention of the typical Urban annual load for Total Suspend Solids (TSS)
  - 45% Retention of the typical Urban annual load for Total Phosphorus (TP)
  - 45% Retention of the typical Urban annual load for Total Nitrogen (TN)
  - 70% Retention of the typical Urban annual load for Gross Pollutants

### 7.2 Assumptions

1. Further subdivision has not been allowed for as the lots are restricted with the proximity of the waterway.
2. Development should meet (Where possible) the requirements of the Urban Stormwater Best Practice Environmental Management Guidelines 1999 and the Water Sensitive Urban Design Engineering Procedures 2005.
3. There is adequate space available for Water Sensitive Urban Design (WSUD) assets which will be located within proposed lots and will be placed on title via a section 173 to maintain.
4. Dwellings and associated outbuildings will be constructed to the north of each proposed allotment, and boatsheds at in proximity to the revetment wall.
5. On-site detention is not required (refer to Section 7.4).

## 7.3 Catchment Management

### 7.3.1 Catchment Area

The catchment is defined by the site boundaries, essentially being:

- the extension of Burden Place to the west
- Crown land to the north – which is shaped to fall generally to the east, west and north
- Constructed waterway to the east and south

### 7.3.2 Sub-Catchments and Outfalls

The subject site has been divided into three (3) sub catchments with 3 proposed outfalls. These sub-catchments incorporate the following areas:

- Proposed municipal Road Reserve
- Proposed allotments ranging in area from approx. 1700m$^2$ to 3500 m$^2$ .

Crossco Drawing 2057/005 at Appendix 3 shows the 3 sub catchment boundaries and sub catchments are labelled (A, B, C).

As far as possible the 20% AEP pipe network has been formulated to direct flow to catchments A and B in a controlled manner. This “drainage configuration” is crucial to the strategy, both in mitigating off site impacts at via the contour swale and in maximising the treatment efficiency of the proposed grassed swale.

## 7.4 Stormwater Quality

WSUD infrastructure proposed for the site includes a combination of rainwater tanks for reuse only and a berm/contour grassed swale. The location of the proposed assets is detailed on Crossco Drawings 2057-005-D at Appendix 3.

- ✓ Roadway stormwater will be collected via conventional kerb and channel along with 20% AEP pipe network.
- ✓ Stormwater generated from dwelling and associated outbuilding roof areas on allotments is to be collected in rainwater tanks on each lot and used for domestic reuse in dwellings (eg. toilet, laundry and irrigation). Subject to RA preference, the requirement for rainwater tanks could be registered on title via Section 173 for each lot to ensure reuse and water quality benefits are carried forward on title.
- ✓ Stormwater generated from boatshed roof areas will outfall to an infiltration raingarden (individual infiltration raingarden for each boatshed).

### 7.4.1 Rainwater Tanks

Rainwater tanks provide benefit by reducing the quantity of stormwater entering waterways at the same point in time. This is achieved by collecting, storing and reusing stormwater runoff from roofed surfaces. Collected stormwater can be reused to flush toilets, wash clothes, water gardens and other outside activities which can significantly reduce demand for potable water.

This domestic usage of stormwater reduces strain on stormwater drainage network, drinking water network and reduces stormwater runoff and flood peaks.

Figure 23 shows an example of a general arrangement promoted by Melbourne Water for reuse of stormwater. No disinfection of stormwater at dwellings is proposed in the subject proposal.

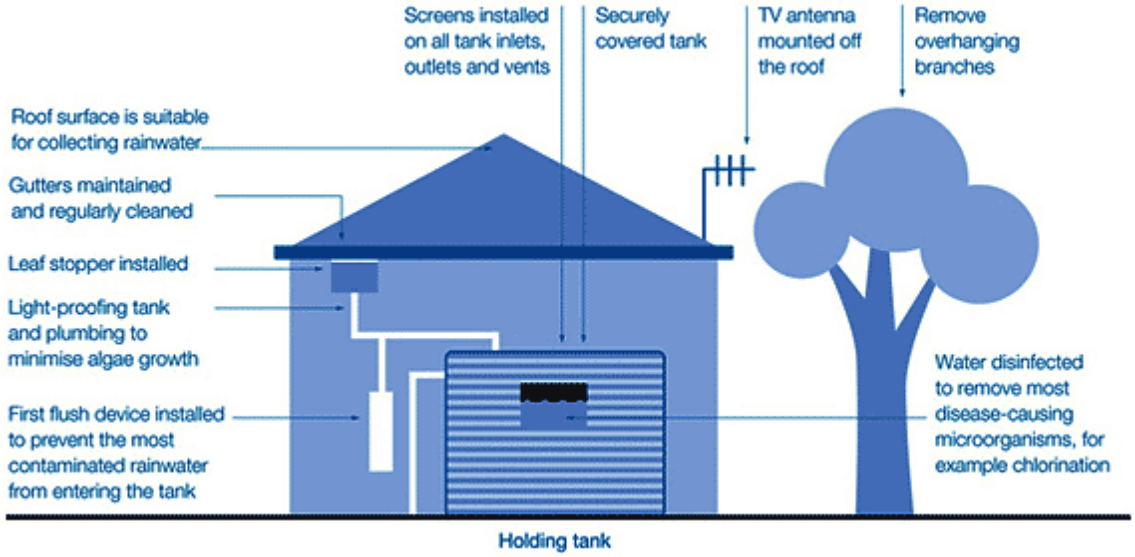



**Figure 19: Melbourne Water**

Rainwater tank demands are generally assumed as per the MWC MUSIC Guidelines as per the assumptions detailed in Appendix 4.

### 7.4.2 Swales (Grassed & Vegetated)

Swales are linear, open channels that collect and transfer stormwater. They can be lined with grass or more densely vegetated and landscaped (Melbourne Water, 2022). An example of a typical swale is shown at Figure 20 and Figure 21.

Swales can form a large component of a stormwater strategy by providing primary and secondary treatment. This is achieved by screening out sedimentation, infiltration of stormwater into soils and retained contaminants such as nutrient removal. Swales are considered a great stormwater management asset as they provide substantial benefit for little maintenance in comparison to for example propriety stormwater treatment systems.

The proposed swale system is defined as “Berm Swale” as per the Crossco Site Drainage Plan.

Concept design swale dimensions are as detailed in Appendix 3 and Appendix 4. Swales will be required to be designed to run along the contour within the proposed allotments before out falling into the canal via the existing pit/pipe infrastructure. A small berm will be constructed on the down-slope side to construct the swale on the existing slope.

The extent of swales and finalisation of geometric design (including design invert levels, batters etc (configured to accommodate upstream pipe inverts and outfall levels) will be further refined and documented during the detailed design phase.

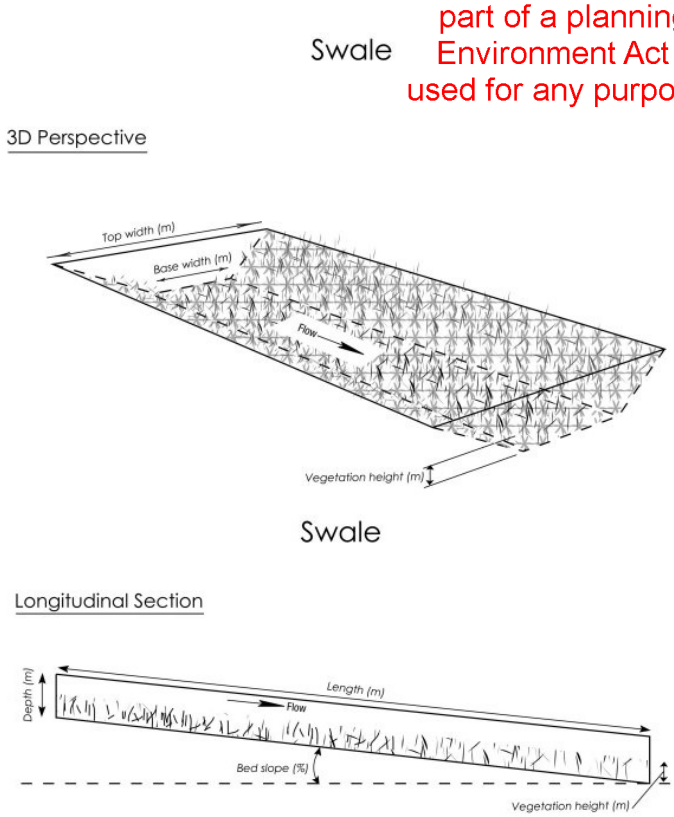



**Figure 20: Typical Swale Schematic**

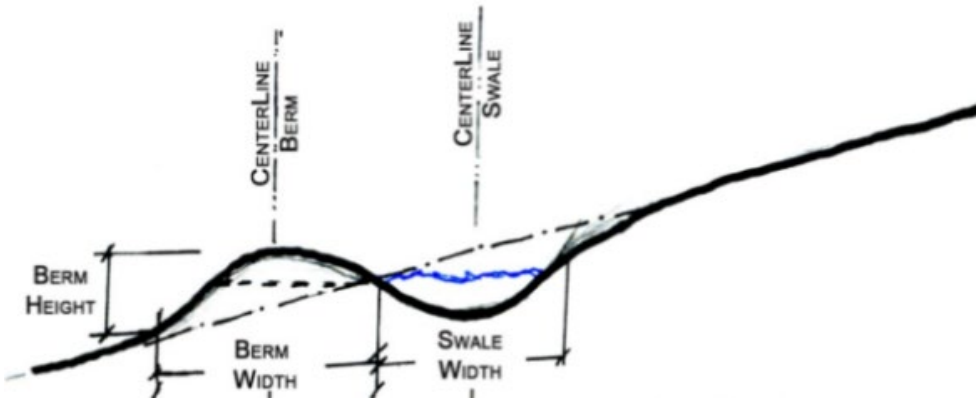



**Figure 21: Berm Swale section**

### 7.4.3 Infiltration Raingarden

Infiltration raingardens are designed to return treated stormwater to the soil profile, after treatment in a raingarden.

A typical section illustrating the construction of an infiltration raingarden is included at Figure 22, and a "Fact Sheet" providing further explanation is included at Appendix 5.

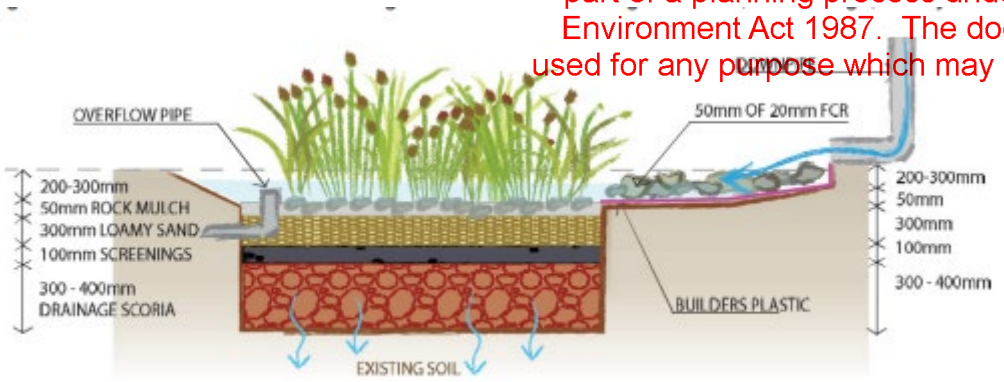



*Figure 5. Infiltration raingarden side view*

**Figure 22: Infiltration Raingarden[3]**

## 7.5 Proposed Treatment

### 7.5.1 Dwellings & Road

As detailed in Appendix 4 MUSIC Modelling has been undertaken to determine a practical WSUD Treatment train for the proposed development.
The MUSIC model does not consider treatment of stormwater generated at the proposed boatsheds – these have been considered separately.

In summary the treatment train comprises:

- Rainwater Tanks:
  Rainwater tanks to be connected to all future dwellings and plumbed to provide water for reuse to Toilets, Laundry and Irrigation purposes.
- Swale systems:
  The proposed swale system will follow a contour within the proposed lots along the south and eastern side of the development. These swales have an added benefit of providing a barrier and ecological benefit to the abutting Paynesville Canal.

All stormwater treatment is proposed on Private Land within Drainage Easements.

Maintenance of infrastructure on Private Land is proposed to be the responsibility of the landowner and included in a S173 Legal Agreement registered on each title.

The MUSIC Model assumptions, descriptions and results are detailed in Appendix 4.

### 7.5.2 Boatsheds

As described in Appendix 5, stormwater from each boatshed roof will be collected and treated in an infiltration raingarden to be constructed adjacent to each boatshed. Based on a boatshed area of 50 $m^2$, the raingarden area will be required to be $2m^2$. The final design of the infiltration raingardens is to be determined once geotechnical investigations have been completed, and confirmation of any proposed tank to be installed to provide reuse water for rinsing of equipment at each boatshed.

[3] Source: Infiltration Raingarden Fact Sheet, Clearwater, September 2012 (Appendix 5)

### 7.6 Sub catchment outfalls and treatment summary

Sub catchments (labelled on Crossco Drawing 2057/005 at Appendix 3) with stormwater generated in each sub catchment being treated and out falling at the location indicated on the above drawing and summarised at Table 2.

**Table 2: Treatment & Outfall Summary by Sub Catchment**

| Sub catchment | Treatment | Outfall |
|---|---|---|
| A | Rainwater Tank (Roofs Only)<br>Berm Swale | Outfall 1 |
| B | Rainwater Tank (Roofs Only)<br>Berm Swale | Outfall 1 |
| C | Rainwater Tank (Roofs Only)<br>Berm Swale | Outfall 1 |
| Boatsheds | Infiltration raingarden | N/A<br>Infiltration |

The proposed outfall (Outfall 1) for the development is to be restricted via a 0.3m high berm swale. This swale is to detain and treat stormwater from the development and outfall via either overland spreaders and/or the existing drainage outfall to the east (Pit B) and west (Pit D outfall) of the Site (Refer to 4.4.6 and 4.4.2) into the constructed waterway. Flows from the development are designed to avoid the risk of erosion.

### 7.7 Maintenance

A maintenance plan for respective lot owners will be provided during the detail design phase outlining the requirements for maintenance of the proposed swale on their allotment. The maintenance plan will include items such as mowing, clearing of litter, and visual inspection for erosion.

Maintenance of infrastructure in transferred to Council ownership will be undertaken in line with Council's maintenance plan.

### 7.8 Staging

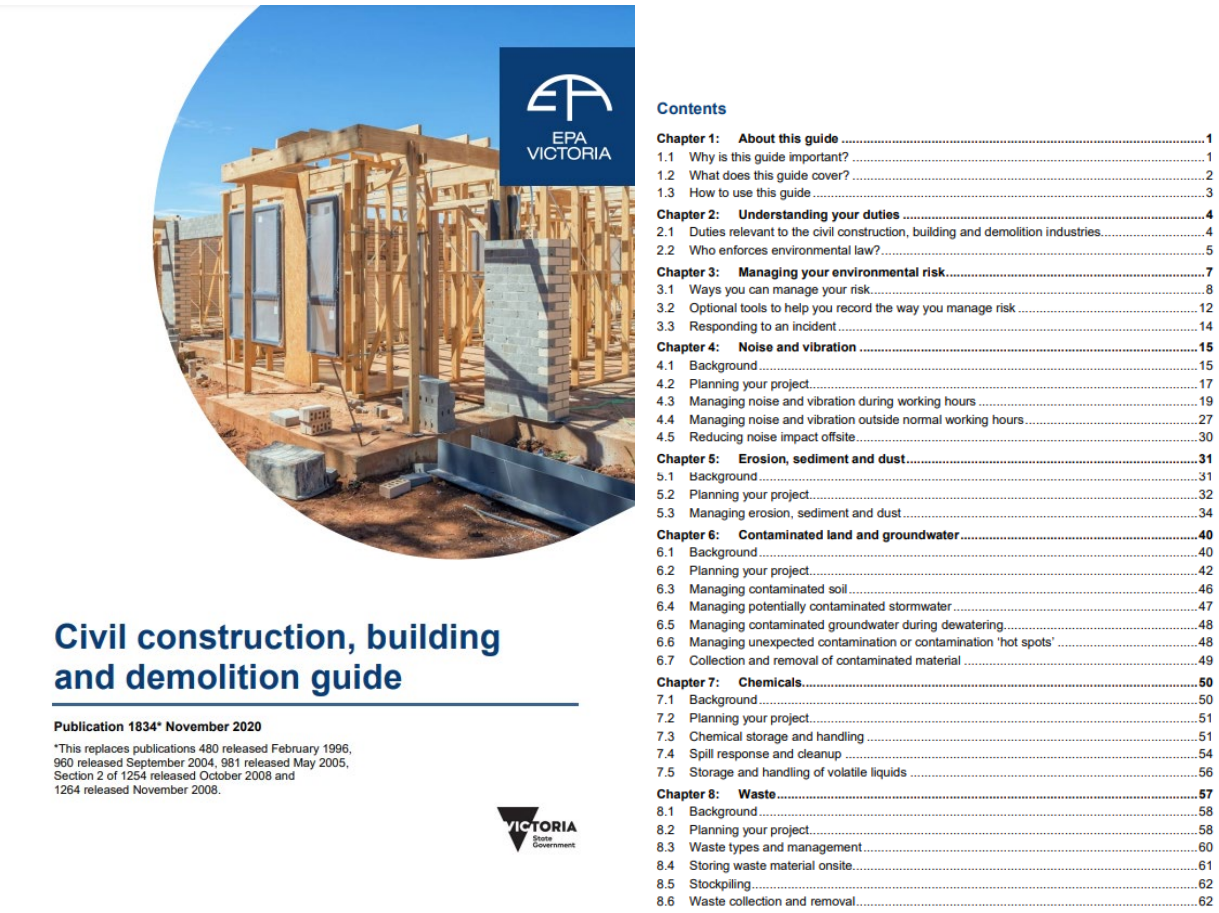
The proposed subdivision is proposed to be constructed in a single stage, therefore staging has not been considered in the SWMS.

## 8. Environmental Management

Construction of stormwater infrastructure outlined in this report will require management to ensure there is no off-site impact.

Poor sediment control and litter management practices during construction can result in public nuisance, drainage blockages and off-site pollution. In particular sediment entering the drainage system has a negative impact on the performance of stormwater treatment and conveyance by depositing sediment (in pits, pipes, swales, basins etc) which impairs the designed performance of the system. Sediment discharged off-site has negative ecological impacts including: smothering, reducing sunlight penetration and increasing nutrient loads and other pollutants.

Compliance with EPA publication 1834 through ***all*** phases of construction works is strongly recommended. The publication cover page and excerpt of table of contents is included at Figure 23.



EPA VICTORIA

**Civil construction, building and demolition guide**

**Publication 1834* November 2020**

*This replaces publications 480 released February 1996, 960 released September 2004, 981 released May 2005, Section 2 of 1254 released October 2008 and 1264 released November 2008.

VICTORIA State Government

**Contents**



**Figure 23: EPA Publication 1834 cover & ToC excerpt**

# 9. Conclusion and Recommendations

This report presents the concept design of infrastructure required to service the proposed development including WSUD elements that meet best practice treatment of stormwater generated before discharging to the constructed waterway. Roads, drainage and WSUD elements have been designed with preliminary grading (slope) and geometry considered. The level of detail supporting the design work represented in the drawings at Appendix 3 is not 2-dimensional.

Notwithstanding the above, all elements designed are **CONCEPT** designs only. Consistent with standard design practice, the concept design requires further development (into a functional and then detailed design) as the project becomes further advanced.

As design development advances the following is recommended:

- Service proving of the site.
- Geotechnical site assessment suitable for road pavement design and drainage infrastructure.
- Incorporation of stormwater treatment elements into landscape design.

Stormwater generated at the proposed development can be managed to meet best practice requirements.

Any approval should be condition upon and allow:

- progressive development of design
- staged delivery of infrastructure (if staged plan of subdivision proposed)
- all stages of infrastructure construction (including dwellings) to comply with EPA publication 1834.

M Supplitt
MIEAust CPEng NER

18/12/2023

## Appendix

## Appendix 1 – Property Reports

# PLANNING PROPERTY REPORT



From www.planning.vic.gov.au at 03 August 2023 11:42 AM

## PROPERTY DETAILS

| | |
|---|---|
| Address: | **35 BURDEN PLACE PAYNESVILLE 3880** |
| Lot and Plan Number: | **Lot 2 PS748253** |
| Standard Parcel Identifier (SPI): | **2\PS748253** |
| Local Government Area (Council): | **EAST GIPPSLAND** www.eastgippsland.vic.gov.au |
| Council Property Number: | **98663** |
| Planning Scheme: | **East Gippsland** Planning Scheme - East Gippsland |
| Directory Reference: | **Vicroads 685 R6** |

## UTILITIES

| | |
|---|---|
| Rural Water Corporation: | **Southern Rural Water** |
| Urban Water Corporation: | **East Gippsland Water** |
| Melbourne Water: | **Outside drainage boundary** |
| Power Distributor: | **AUSNET** |

## STATE ELECTORATES

| | |
|---|---|
| Legislative Council: | **EASTERN VICTORIA** |
| Legislative Assembly: | **GIPPSLAND EAST** |

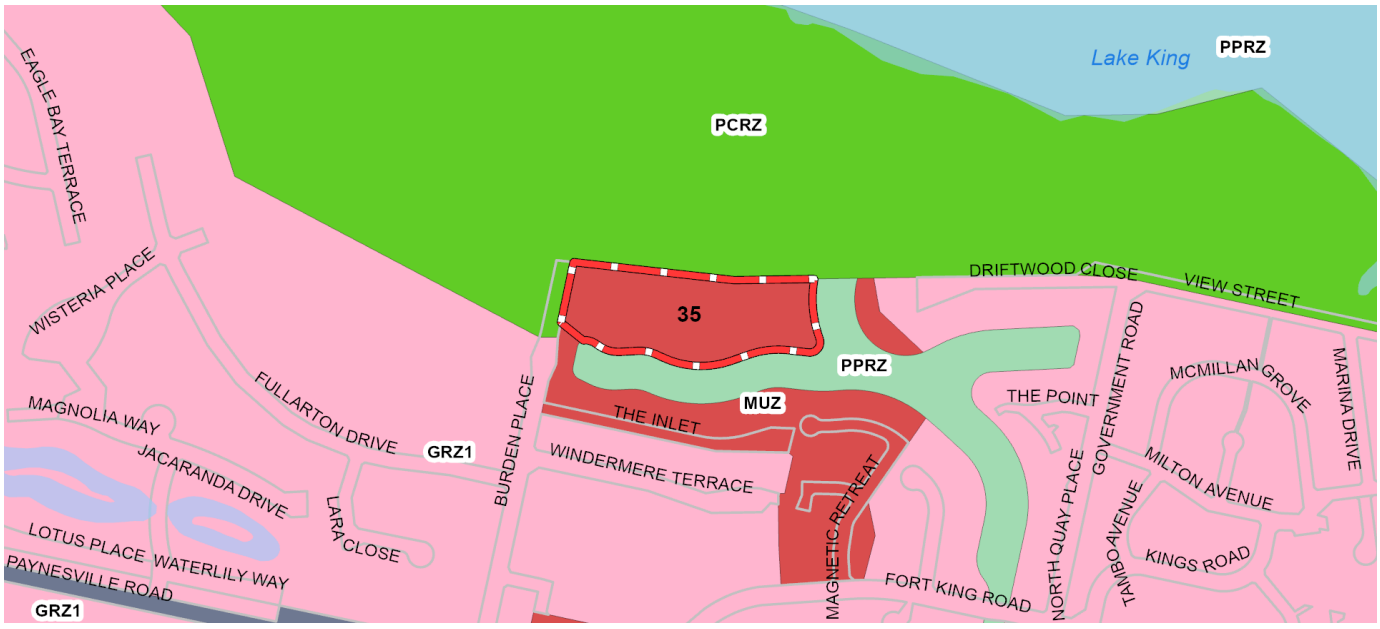
## OTHER

Registered Aboriginal Party: **Gunaikurnai Land and Waters Aboriginal Corporation**

View location in VicPlan

## Planning Zones

MIXED USE ZONE (MUZ)
SCHEDULE TO THE MIXED USE ZONE (MUZ)




FZ - Farming
GRZ - General Residential
MUZ - Mixed Use
PCRZ - Public Conservation and Resource
PPRZ - Public Park and Recreation
TRZ2 - Principal Road Network
Water area

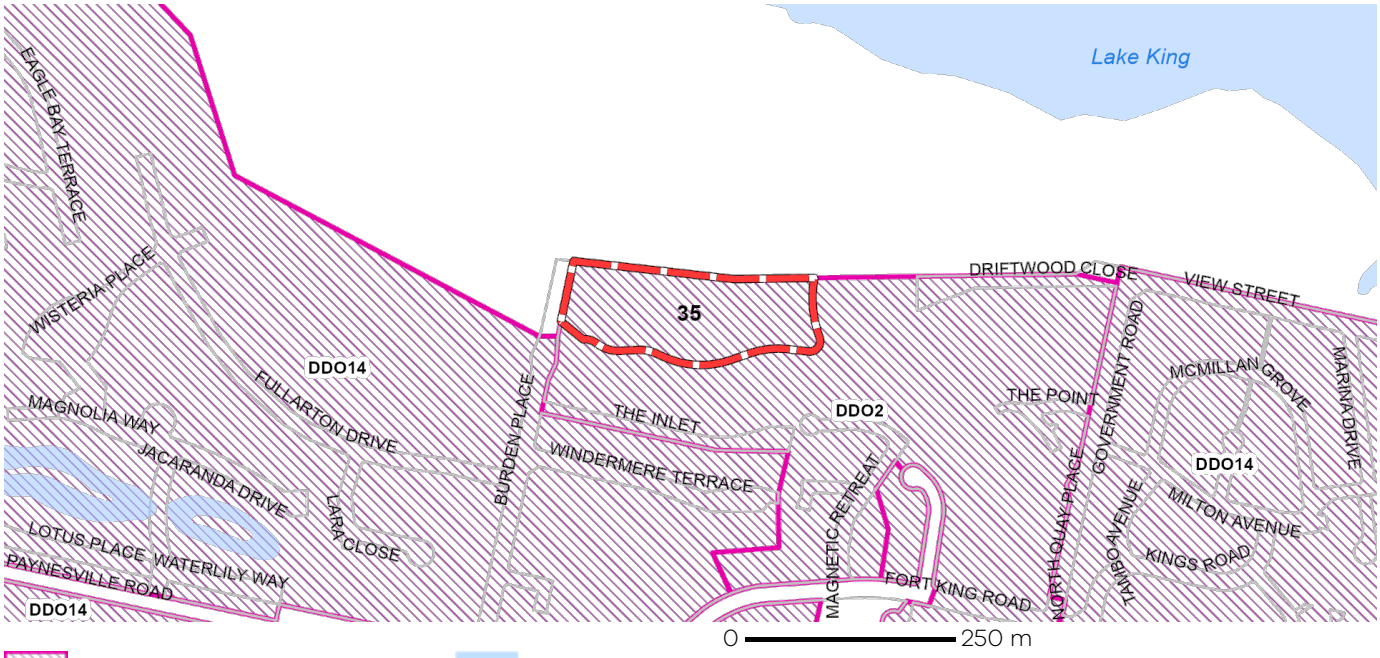
Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

# PLANNING PROPERTY REPORT



## Planning Overlays

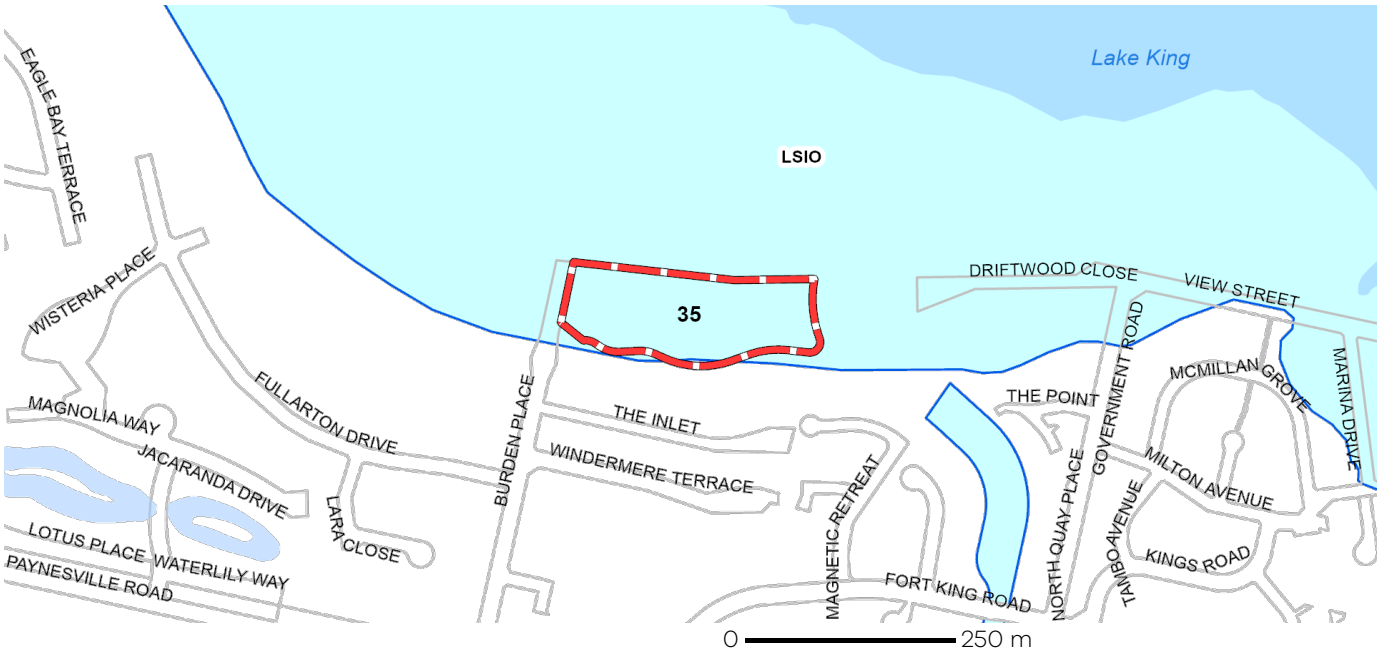
DESIGN AND DEVELOPMENT OVERLAY (DDO)
DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2 (DDO2)




**DDO - Design and Development Overlay** **Water area**

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

LAND SUBJECT TO INUNDATION OVERLAY (LSIO)
LAND SUBJECT TO INUNDATION OVERLAY SCHEDULE (LSIO)




**LSIO - Land Subject to Inundation Overlay** **Water area**

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

# PLANNING PROPERTY REPORT



## Planning Overlays

OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

EROSION MANAGEMENT OVERLAY (EMO)
SIGNIFICANT LANDSCAPE OVERLAY (SLO)
VEGETATION PROTECTION OVERLAY (VPO)


**EMO - Erosion Management Overlay** **SLO - Significant Landscape Overlay** **VPO - Vegetation Protection Overlay**

**Water area**

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

# PLANNING PROPERTY REPORT



## Areas of Aboriginal Cultural Heritage Sensitivity

All or part of this property is an 'area of cultural heritage sensitivity'.

'Areas of cultural heritage sensitivity' are defined under the Aboriginal Heritage Regulations 2018, and include registered Aboriginal cultural heritage places and land form types that are generally regarded as more likely to contain Aboriginal cultural heritage.

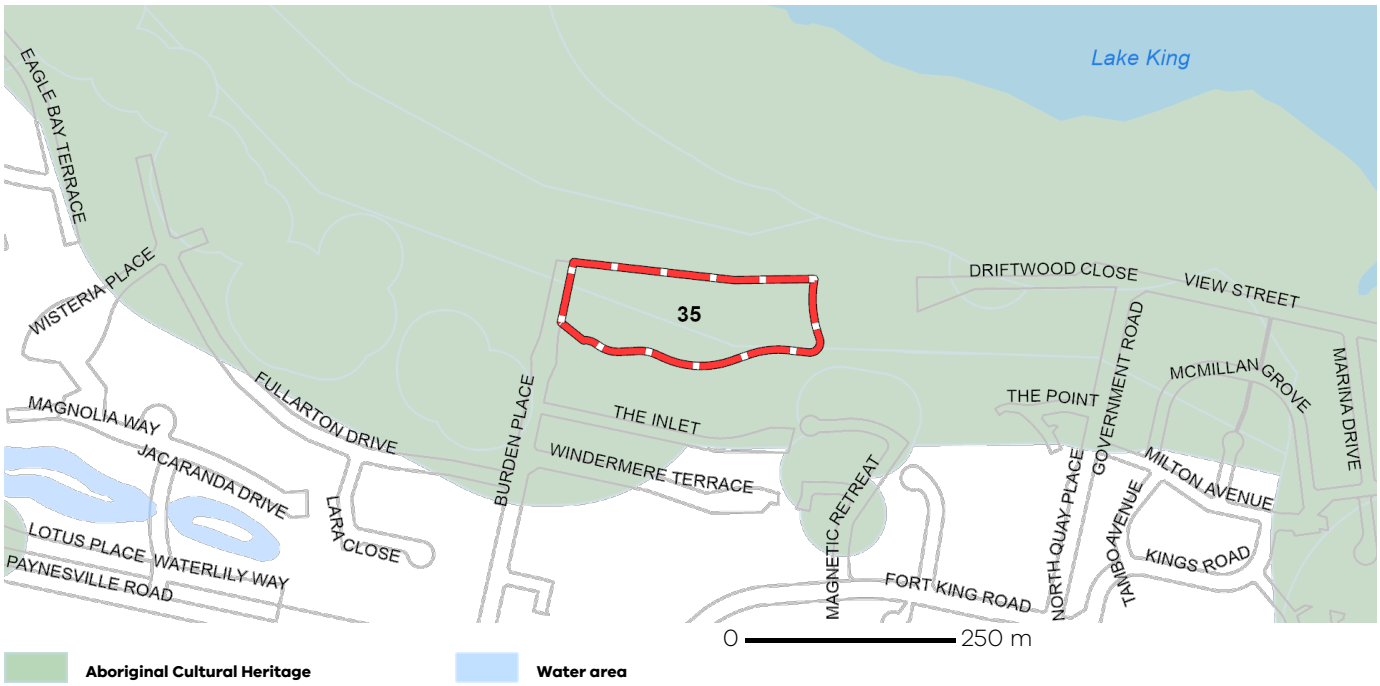
Under the Aboriginal Heritage Regulations 2018, 'areas of cultural heritage sensitivity' are one part of a two part trigger which require a 'cultural heritage management plan' be prepared where a listed 'high impact activity' is proposed.

If a significant land use change is proposed (for example, a subdivision into 3 or more lots), a cultural heritage management plan may be triggered. One or two dwellings, works ancillary to a dwelling, services to a dwelling, alteration of buildings and minor works are examples of works exempt from this requirement.

Under the Aboriginal Heritage Act 2006, where a cultural heritage management plan is required, planning permits, licences and work authorities cannot be issued unless the cultural heritage management plan has been approved for the activity.

For further information about whether a Cultural Heritage Management Plan is required go to http://www.aav.nrms.net.au/aavQuestion1.aspx

More information, including links to both the Aboriginal Heritage Act 2006 and the Aboriginal Heritage Regulations 2018, can also be found here - https://www.aboriginalvictoria.vic.gov.au/aboriginal-heritage-legislation



# PLANNING PROPERTY REPORT



## Further Planning Information

Planning scheme data last updated on 26 July 2023.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council or by visiting https://www.planning.vic.gov.au

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the ***Planning and Environment Act 1987.***
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates at Landata - https://www.landata.vic.gov.au

For details of surrounding properties, use this service to get the Reports for properties of interest.

To view planning zones, overlay and heritage information in an interactive format visit https://mapshare.maps.vic.gov.au/vicplan

For other information about planning in Victoria visit https://www.planning.vic.gov.au

# PLANNING PROPERTY REPORT

## Designated Bushfire Prone Areas

**This property is not in a designated bushfire prone area.**
**No special bushfire construction requirements apply. Planning provisions may apply.**

Where part of the property is mapped as BPA, if no part of the building envelope or footprint falls within the BPA area, the BPA construction requirements do not apply.

Note: the relevant building surveyor determines the need for compliance with the bushfire construction requirements.


Designated BPA are determined by the Minister for Planning following a detailed review process. The Building Regulations 2018, through adoption of the Building Code of Australia, apply bushfire protection standards for building works in designated BPA.

Designated BPA maps can be viewed on VicPlan at https://mapshare.vic.gov.au/vicplan/ or at the relevant local council.

Create a BPA definition plan in VicPlan to measure the BPA.

Information for lot owners building in the BPA is available at https://www.planning.vic.gov.au.

Further information about the building control system and building in bushfire prone areas can be found on the Victorian Building Authority website https://www.vba.vic.gov.au. Copies of the Building Act and Building Regulations are available from http://www.legislation.vic.gov.au. For Planning Scheme Provisions in bushfire areas visit https://www.planning.vic.gov.au.

## Native Vegetation

Native plants that are indigenous to the region and important for biodiversity might be present on this property. This could include trees, shrubs, herbs, grasses or aquatic plants. There are a range of regulations that may apply including need to obtain a planning permit under Clause 52.17 of the local planning scheme. For more information see Native Vegetation (Clause 52.17) with local variations in Native Vegetation (Clause 52.17) Schedule

To help identify native vegetation on this property and the application of Clause 52.17 please visit the Native Vegetation Information Management system https://nvim.delwp.vic.gov.au/ and Native vegetation (environment.vic.gov.au) or please contact your relevant council.

You can find out more about the natural values on your property through NatureKit NatureKit (environment.vic.gov.au)

## Appendix 2 – Feature Survey & Layout (V6)

MGA94 ZONE 55

BENCH MARK
STEEL STAR PICKET
3.71m

UNKNOWN PIT
(UNABLE TO BE OPENED)
NO OUTLET FOUND

INVERT OF PIT
0.11m

INVERT OF PIT
0.08m

BENCH MARK
BAIRNSDALE PM 434
1.19m

BURDEN PLACE

ROCK LINED DRAIN

PUMPING
STATION

BENCH MARK
STEEL STAR PICKET
2.42m

INVERT OF PIT
-0.25m

1 2 3 4 5 6 7 8 9 10 11

DEAD

## WARNING

BEWARE OF UNDERGROUND SERVICES

THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN

CAD FILENAME : Y:\16000-16999\16000-16099\16006 Paynesville Point Trust - Burden\16006 Features with V6 Layout (MGA2020).pro

## NOTATIONS

RE-ESTABLISHMENT DATUM VIDE PS814880C

HEIGHTS ARE TO AHD - DATUM VIDE GPSNET
CONTOUR INTERVAL : 0.2m

DATE OF SURVEY : 22/8/2022

Legend of Features

- © Electricity Pit
- Stop Valve
- T Telecom Pit
- Electricity Pole
- Light Pole
- S Sewerage Manhole
- Water Meter
- Fire Plug
- Tap

Crowther&Sadler Pty.Ltd.
LICENSED SURVEYORS & TOWN PLANNERS
152 MACLEOD STREET, BAIRNSDALE, VIC., 3875
TELEPHONE (03) 5152 5011

| SURVEYORS REF. | SCALE @ A1 |
|---|---|
| 16606 | 1 : 500 |

## PLAN OF RE-ESTABLISHMENT & FEATURES

PARISH OF BAIRNSDALE
CROWN ALLOTMENT 146 & 146G (PARTS)

LOT 2 - PS748253X

PAYNESVILLE POINT TRUST

BURDEN PLACE, PAYNESVILLE

## Appendix 3 – Crossco Drawings

- **2881/100 Overall Layout Plan – Sheet 1 of 4**
- **2881/101 Access & Servicing Strategy Detail Layout Plan – Sheet 2 of 4**
- **2881/102 Access & Servicing Strategy Detail Layout Plan – Sheet 3 of 4**
- **2881/103 Access & Servicing Strategy Detail Layout Plan – Sheet 4 of 4**
- **2057/105 Site Drainage Plan**
- **2057/106 Catchment Plan**

REFER TO DRAWING
No. 2881/101

CROWN LAND

CROWN LAND

BURDEN PLACE EXTENSION FINAL DESIGN ROAD LEVELS TO BE A MIN OF 2.0 AHD.
REFER TO CROWTHER AND SADLER FEATURE SURVEY DATED 22/08/2022 FOR EXISTING SURFACE LEVELS. FINAL ROAD LEVELS CONFIRMED IN DETAIL DESIGN AND SHALL VARY FROM 2.0 (MIN) AHD TO 4.2m AHD.

BURDEN PLACE

TBM 1
RL 3.77

TBM 2
RL 2.92

Ex. DRAINAGE PIT

PM 434
RL 1.19

PUMPING STATION

Ex. DRAINAGE OUTFALL

REFER TO DRAWING
No. 2881/102

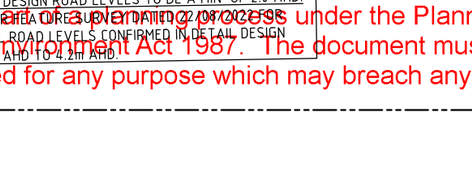
REFER TO DRAWING
No. 2881/103

BURDEN PLACE

THE INLET

WINDERMERE TERRACE

REFER TO RESI VENTURES PROPOSED
SUB DIVISION CROSSCO PROJECT No. 2635
FOR MORE INFORMATION




SECTION A - A
ACCESS PLACE

LEGEND:

- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED FULLY MOUNTABLE KERB
- PROPOSED CONCRETE FOOTPATH
- PROPOSED SEWER RETICULATION
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED COMMS
- PROPOSED HOUSE DRAIN
- EXISTING CONTOURS (1.0m INTERVAL)
- EXISTING KERB
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER
- EXISTING WATERMAIN
- EXISTING ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING TELSTRA
- EXISTING TREES
- EXISTING VEGETATION

CROSSCO ENGINEERING & ENVIRONMENTAL CONSULTANTS

Crossco Consulting Pty Ltd
ABN: 88 135 548 110
154 Macleod St
P.O. Box 858
Bairnsdale Vic 3875
Tel:(03) 51526298
Fax (03) 51527222
Email: consult@crossco.com.au

**PAYNESVILLE POINT PTY. LTD.**

LOT 1 PS748253

ACCESS AND SERVICING STRATEGY
OVERALL LAYOUT PLAN
SHEET 1 OF 4

DRAWING No.

**2881/100-A**

10 5 0 10 20 30 40 50 60
1: 1000 AT A3

DATE: 14 DECEMEBR 2023
CAD FILE NAME: R:\2881 Phillips 35 Burden Place Paynesville\ACAD\Prelim\2881 100.dwg

FOR CONTINUATION REFER TO DRAWING No. 2057/102

## LEGEND:

- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED FULLY MOUNTABLE KERB
- PROPOSED CONCRETE FOOTPATH
- PROPOSED SEWER RETICULATION
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED COMMS
- PROPOSED HOUSE DRAIN
- EXISTING CONTOURS (1.0m INTERVAL)
- EXISTING KERB
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER
- EXISTING WATERMAIN
- EXISTING ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING TELSTRA
- EXISTING TREES
- EXISTING VEGETATION

BURDEN PLACE EXTENSION FINAL DESIGN ROAD LEVELS TO BE A MIN OF 2.0 AHD. REFER TO CROWTHER AND SADLER FEATURE SURVEY DATED 22/08/2022 FOR EXISTING SURFACE LEVELS. FINAL ROAD LEVELS CONFIRMED IN DETAIL DESIGN AND SHALL VARY FROM 2.0 (MIN) AHD TO 4.2m AHD.

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LOT 1 PS748253

ACCESS AND SERVICING STRATEGY
DETAIL LAYOUT PLAN
SHEET 2 OF 4

DRAWING No.
**2881/101-A**

10 5 0 10 20
1 : 250 (A1)
1 : 500 (A3)

CROWN LAND
BURDEN PLACE
13.0m ROAD RESERVE
1.8m SEWERMAIN
2.8m COMMS
3.3m ELECTRICAL
11.0m
0.6m/5.4m/0.6m/4.1m/1.5m/0.05m
HD
1.2m SEWERMAIN
2.1m WATERMAIN
2.8m COMMS
3.3m ELECTRICAL
Ex. DRAINAGE PIT
20.0m ROAD RESERVE
PUMPING STATION
Ex. DRAINAGE OUTFALL
BURDEN PLACE
Ex. DRAINAGE OUTFALL
REFER TO RESI VENTURES PROPOSED SUB DIVISION CROSSCO PROJECT No. 2635 FOR MORE INFORMATION
1
3
4
56
57

DATE: 14 DECEMBER 2023
CAD FILE NAME: R:\2881 Phillips 35 Burden Place Paynesville\ACAD\Prelim\2881 101.dwg

CROWN LAND

BURDEN PLACE EXTENSION FINAL DESIGN ROAD LEVELS TO BE A MIN. OF 2.0 AHD
REFER TO CROWTHER AND SADLER FEATURE SURVEY DATED 22/08/2022 FOR
EXISTING SURFACE LEVELS. FINAL ROAD LEVELS TO BE CONFIRMED AT DETAILED DESIGN
AND SHALL VARY FROM 2.0 (MIN) AHD TO 4.2m AHD

BURDEN PLACE

0.6m/5.4m/0.6m1.7m

13.0m ROAD RESERVE

0.05m/1.5m/3.15m

1.8m WATERMAIN
2.8m COMMS
3.3m ELECTRICAL

REFER TO DRAWING No. 2881/101

FOR CONTINUATION REFER TO DRAWING No. 2881/103

1 2 3 4 5 6 7

HD

Ex. DRAINAGE PIT

Ex. DRAINAGE OUTFALL

PUMPING STATION

LEGEND:

- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED FULLY MOUNTABLE KERB
- PROPOSED CONCRETE FOOTPATH
- PROPOSED SEWER RETICULATION
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED COMMS
- PROPOSED HOUSE DRAIN
- 12 EXISTING CONTOURS (0.2m INTERVAL)

N

13.0m (MIN)
4.7m (MIN) 6.0m (MIN) 1.7m (MIN)
1.5m
1.8m
2.8m
3.3m

SECTION A - A
ACCESS PLACE

10 5 0 10 20

1 : 250 (A1)
1 : 500 (A3)

DATE: 14 DECEMEBR 2023
CAD FILE NAME: C:\Users\User\AppData\Local\Temp\AcPublish_4984\2881- 102.dwg

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LOT 1 PS748253

ACCESS AND SERVICING STRATEGY
DETAIL LAYOUT PLAN
SHEET 3 OF 4

DRAWING NO.
**2881/102-A**

FOR CONTINUATION REFER TO DRAWING No. 2881/102

CROWN LAND

BURDEN PLACE EXTENSION FINAL DESIGN ROAD LEVELS TO BE A MIN OF 2.0 AHD. REFER TO CROWTHER AND SADLER FEATURE SURVEY DATED 22/08/2022 FOR EXISTING SURFACE LEVELS. FINAL ROAD LEVELS CONFIRMED IN DETAIL DESIGN AND SHALL VARY FROM 2.0 (MIN) AHD TO 4.2m AHD.

BURDEN PLACE

13.0m ROAD RESERVE

0.6m/5.4m/0.6m/1.7m

0.05m/1.5m/3.15m

1.8m WATERMAIN
2.8m COMMS
3.3m ELECTRICAL

1.2m SEWERMAIN

0.9m DRAINAGE

1.2m SEWERMAIN

HD

Ex. DRAINAGE PIT

Ex. DRAINAGE OUTFALL

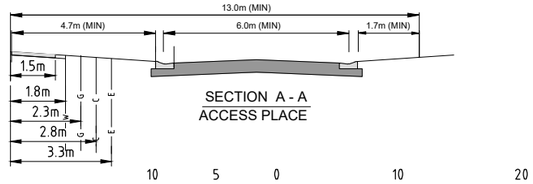
6 7 8 9 10 11

1 2 3 4

N

LEGEND:

- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED HOUSE DRAIN
- PROPOSED FULLY MOUNTABLE KERB
- PROPOSED CONCRETE FOOTPATH
- PROPOSED SEWER RETICULATION
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED COMMS
- 12 EXISTING CONTOURS (0.2m INTERVAL)




1 : 250 (A1)
1 : 500 (A3)

DATE: 14 DECEMBER 2023

CAD FILE NAME: R:\2881 Phillips 35 Burden Place Paynesville\ACAD\Prelim\2881-103.dwg

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LOT 1 PS748253

ACCESS AND SERVICING STRATEGY
DETAIL LAYOUT PLAN
SHEET 4 OF 4

DRAWING NO.
**2057/903-B**

CROWN LAND

CROWN LAND

BURDEN PLACE

TBM 1
RL 3.77

TBM 2
RL 2.92

PROPOSED OUTFALL TO BE ROCK BEACHED 3.0m X 3.0m, 600mm THICK ON NON WOVEN GEOTEXTILE (180G/SQM) D50=300mm ON OUTFALL. TO THE APPROVAL OF THE SUPERINTENDENT.

Ex. DRAINAGE PIT

PM 434
RL 1.19

PUMPING STATION

PROPOSED BERM SWALE DRAIN CONSTRUCTED ALONG 1.0m CONTOUR WHERE PRACTICAL

Ex. DRAINAGE PIT

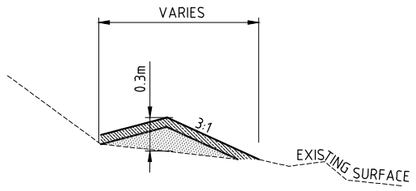
PROPOSED OUTFALL TO BE ROCK BEACHED 3.0m X 3.0m, 600mm THICK ON NON WOVEN GEOTEXTILE (180G/SQM) D50=300mm ON OUTFALL. TO THE APPROVAL OF THE SUPERINTENDENT.

Ex. DRAINAGE OUTFALL

BURDEN PLACE

THE INLET

WINDERMERE TERRACE



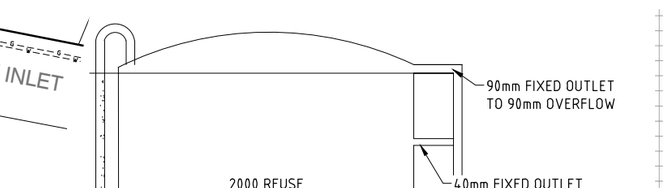

SECTION A - A
BERM SWALE DRAIN
NOT TO SCALE

## NOTES:

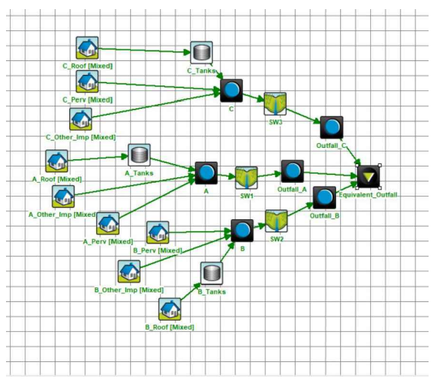
1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE ASSOCIATED STORMWATER MANAGEMENT STRATEGY REPORT - PROPOSED 11 LOT RESIDENTIAL SUBDIVISION - 35 BURDEN PLACE
2. LOCATION OF THE RAINWATER TANK/S WITH THE REQUIRED REUSE MAY BE LOCATED ANYWHERE ON ALLOTMENT EXCEPT WITHIN EASEMENTS. ROOF AREAS TO BE CONNECTED TO RAINWATER TANKS AND ARE THE PRIMARY SOURCE FOR FLUSHING OF TOILETS, LAUNDRY SERVICES AND GARDEN IRRIGATION

| | Sources | Residual Load | % Reduction | % Best Practice |
|---|---|---|---|---|
| Flow (ML/yr) | 10.50 | 8.06 | 23.5 | |
| Total Suspended Solids (kg/yr) | 1820.00 | 113.00 | 93.8 | ≥80 |
| Total Phosphorus (kg/yr) | 3.93 | 1.05 | 73.3 | ≥45 |
| Total Nitrogen (kg/yr) | 29.20 | 12.00 | 59.1 | ≥45 |
| Gross Pollutants (kg/yr) | 310.00 | 0.00 | 100 | ≥70 |

MUSIC OUTPUT RESULTS




RAINWATER TANK SYSTEM
STORMWATER TANK DETAIL (TYPICAL)
NOT TO SCALE




MUSIC SCHEMATIC
NOT TO SCALE

## LEGEND:

- PROPOSED BERM SWALE
- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED FULLY MOUNTABLE KERB
- PROPOSED CONCRETE FOOTPATH
- PROPOSED SEWER RETICULATION
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED COMMS
- PROPOSED HOUSE DRAIN
- EXISTING CONTOURS (0.2m INTERVAL)
- EXISTING KERB
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER
- EXISTING WATERMAIN
- EXISTING ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING TELSTRA
- EXISTING TREES
- EXISTING VEGETATION

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BURDEN PLACE

SITE DRAINAGE PLAN

DRAWING No.

**2057/105-A**

10 5 0 10 20 30 40 50 60
1: 1000 AT A3

DATE: 22 AUGUST 2023
CAD FILE NAME: R:\2057 Burden Pl - Booker\ACAD\Prelim\DESIGN 2022\2057- 105 - Site Drainage plan.dwg

CROWN LAND

CROWN LAND

BURDEN PLACE

CATCHMENT A = 14,735m²

CATCHMENT B = 10,064m²

CATCHMENT C = 5050m²

1 2 3 4 5 6 7 8 9 10 11

TBM 1
RL 3.77

TBM 2
RL 2.92

PROPOSED OUTFALL

Ex. DRAINAGE PIT

PM 434
RL 1.19

PUMPING STATION

Ex. DRAINAGE OUTFALL

Ex. DRAINAGE PIT

PROPOSED OUTFALL

BURDEN PLACE

156 57

THE INLET

WINDERMERE TERRACE

LEGEND:

- DIRECTION OF FALL
- PROPOSED SWALE
- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED FULLY MOUNTABLE KERB
- PROPOSED CONCRETE FOOTPATH
- PROPOSED SEWER RETICULATION
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED COMMS
- PROPOSED HOUSE DRAIN
- EXISTING CONTOURS (1.0m INTERVAL)
- EXISTING KERB
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER
- EXISTING WATERMAIN
- EXISTING ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING TELSTRA
- EXISTING TREES
- EXISTING VEGETATION

10 5 0 10 20 30 40 50 60 70 80 90 100
1:500 @ A1
1:1000 AT A3

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BURDEN PLACE

CATCHMENT PLAN

DRAWING No.

**2057/106-A**

DATE: 22 AUGUST 2023

CAD FILE NAME: R:\2057 Burden Pl - Booker\ACAD\Prelim\DESIGN 2022\2057- 106 - Catchment plan.dwg

# Appendix 4 MUSIC Modelling

MUSIC modelling was completed to assess the stormwater pollutant retention benefits of the drainage strategy.

**MODEL DEVLEOPMENT**

**Catchments**

The proposed WSUD Strategy comprises of 1 outfalls (A) which is separated by 3 catchments (A, B &C) – refer to Crossco Drawing 2057/005 at Appendix 3).

Catchments have been split (via surface types) as detailed in Table A.5.2. At this stage, it is assumed that every lot will have a 250m2 roof. As such, each sub catchment has then been further delineated to define (with consideration of the overall fraction imperviousness detailed in Table A.5.1) into:

- Impervious roof areas discharging to stormwater harvesting tanks.
- Impervious areas not discharging to tanks, and
- Pervious areas.

Given the lack of available data, the Melbourne water corporation MUSIC tool guidelines surface zonings and pervious soil storage parameters have been utilised.

Table A.5.1 Combined MUSIC Catchments

| Catchment | Area (ha)[1], | $F_{imp}$ (%) | No Lots |
|---|---|---|---|
| A | 1.47 | 60% | 5 |
| B | 1.01 | 60% | 4 |
| C | 0.51 | 45% | 2 |
| Total | **2.98** | 55% | 11 |

1 - Minor (pipe system) Catchment

Table A.5.2 Split MUSIC Catchments

| Catchment | Area (ha) | $F_{imp}$ |
|---|---|---|
| A_Roof | 0.125 | 100% |
| A_Other_Imp | 0.759 | 100% |
| A_Perv | 0.589 | 0% |
| B_Roof | 0.100 | 100% |
| B_Other_Imp | 0.504 | 100% |
| B_Perv | 0.403 | 0% |
| C_Roof | 0.050 | 100% |
| C_Other_Imp | 0.177 | 100% |
| C_Perv | 0.278 | 0% |

**Climate Data**

Six minute Melgo rainfall and evaporation data (1/1/1967 – 31/12/1976, Mean annual rainfall (MAR) = 773mm/yr, evaporation = 1027mm/yr) was used in the analysis. This is the Melbourne Water data set areas for south east Melbourne and West Gippsland for the rainfall band of 750mm-850mm. This rainfall set was used as it reasonably matches the Paynesville MAR of 645mm.

**Hydrologic Routing**

No routing has been utilised with the MUSIC modelling undertaken.

Treatment Elements

The WSUD Initiatives proposed are as detailed in this report and the Crossco Site Drainage Plan. Table A.5.3 below details the WSUD Assets modelled.

Table A.5.3 Major WSUD Element Parameter

| WSUD Element | Element Type | Design Parameters |
|---|---|---|
| Tanks for Toilet Flushing and Laundry | Tanks for Stormwater harvesting | 2000 litre tanks on each lot. |
| Rock Beaching | Rock Beaching | N/A |
| SW1 | Grassed Swale | Length = 10 m, Slope = 15%, 90 m base, 0.3 m deep, 100 m top width |
| SW2 | Grassed Swale | Length = 10 m, Slope = 15%, 90 m base, 0.3 m deep, 100 m top width |
| SW3 | Grassed Swale | Length = 10 m, Slope = 15%, 25 m base, 0.3 m deep, 30 m top width |

2kl rainwater tanks collecting stormwater from the roofs within the development are proposed within this SWMS as detailed in Table A.5.4. The Tanks are intended to be utilised for (at least) Toilet, laundry and garden use within all new dwellings. Utilized the 2021 census (to give an expected 2.2 people per dwelling), and the typical toilet and laundry demands quoted in the Melbourne Water Corporation draft MUSIC Guidelines.

- 20 litres/per person/per day for toilet demand and
- 80 litres/day per household for laundry demand.

Although the proposed rainwater tanks are to be connected for irrigation purposes, the new MUSIC guidelines states that '*Rainwater or stormwater harvesting may contribute to treatment train performance if the demands are reliable'* (for example, toilet flushing at 20 litres per person per day and laundry at 80 litres per household per day). Irrigation of residential blocks is encouraged, although it is not considered a reliable demand and hence has been excluded from the modelling.

Table A.5.4 Tank Modelling Assumptions

| Tanks | Roofs | Equivalent Tank Size (kL) | Toilet use (kL/yr) | Laundry Use (kL/yr) | Total Demand (kL/yr) |
|---|---|---|---|---|---|
| A_Tanks | 5 | 10 | 80.3 | 146 | 226.3 |
| B_Tanks | 4 | 8 | 64.2 | 116.8 | 181.0 |
| C_Tanks | 2 | 4 | 32.1 | 58.4 | 90.5 |

The MUSIC model is detailed in Figure A.5.1 Below

Figure A.5.1 MUSIC model

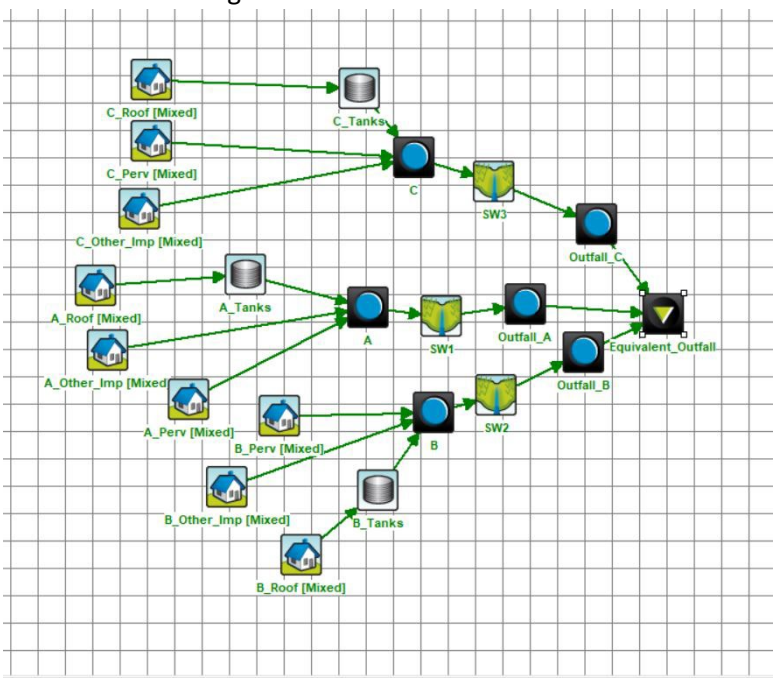


Table A.5.5 MUSIC Results

| Pollutant: | Total Loads generated | Total Loads Retained | % Retention | Best Practice |
|---|---|---|---|---|
| Flow (ML/yr) | 11.66 | 9.85 | 15.5% | |
| Total Suspended Solids (kg/yr) | 2119.0 | 1973.0 | 93.1% | ≥80% |
| Total Phosphorus (kg/yr) | 4.5 | 3.2 | 71.1% | ≥45% |
| Total Nitrogen (kg/yr) | 32.6 | 16.7 | 51.3% | ≥45% |
| Gross Pollutants (kg/yr) | 362.9 | 362.9 | 100.0% | ≥70% |

As detailed above, on a catchment scale, the proposed WSUD initiatives detailed and show on Crossco Drawing 2057/005 at Appendix 3 are meeting best practice requirements of 80% retention of TSS, 45% retention of TP and 45% retention of TN.

## Appendix 5 Infiltration Raingarden Factsheet

clearwater

fact sheet

# Infiltration raingarden

Constructing an infiltration raingarden at a lot scale

*Acknowledgement – the information in this fact sheet has been adapted from the practice notes prepared by Storm Consulting for the Little Stringy Bark Creek Project. For more information on this project please visit the project website - http://www.urbanstreams.unimelb.edu.au/*

## What is an infiltration raingarden?

Building a raingarden is a simple way to help the environment and the health of our local waterways while providing a self-watering garden for your backyard.
An infiltration raingarden is essentially a depression in a garden which allows water to soak into the ground.

The raingarden is filled with a sandy loam soil and can have an underlying gravel trench. This gravel trench is particularly useful for clay soils as it allows more stormwater to be stored, allowing it to slowly infiltrate into the ground and be used by the plants as they need it.

An infiltration raingarden helps protect our streams and rivers by replenishing groundwater and reducing stormwater. An infiltration raingarden can be shaped to suit the surrounding area and can be curved, oval, circular or simply rectangular.

A rectangle shape is often the simplest and cheapest to construct. It can be landscaped to suit the surrounding garden and include special features such as rocks and feature plants.

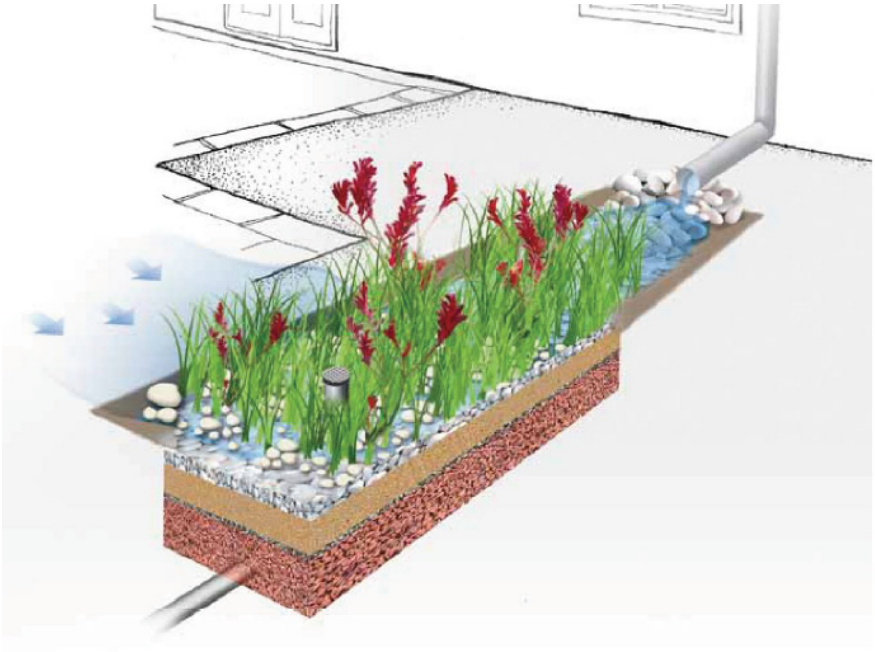

*Figure 1. An infiltration raingarden*

Infiltration raingardens are most effective in areas with sandy soils, however they should not be built too close to permanent structures (i.e. house, garage or shed) as the infiltration of water into the surrounding soils may affect building foundations.

*Please note: A certified plumber must be used for stormwater connections and modifications.*

# Building your raingarden

## Step 1- Getting Started

### *Location*

While it is best to build your raingarden as close as possible to a water source such as a downpipe, rainwater tank overflow, paving or driveway, an infiltration raingarden should be positioned at least five metres away from any permanent structure (i.e. house, garage or shed). If you plan to build your raingarden within five metres of a permanent structure, it is recommended that a PVC liner be used on the vertical side of the trench closest to the structure. You should also avoid building an infiltration raingarden on a steep site, unless it is designed appropriately.

### *Size*

Your raingarden can vary in size – but generally the larger the hard surface it is treating the larger the raingarden will need to be. If your raingarden is going to capture run-off from the roof via a downpipe, determine the area of your roof that drains to that downpipe. If your raingarden is only going to treat overflows from a rainwater tank then it can be significantly small. Table 1 will help you work out the correct size. The raingarden needs to be at least 1m wide.

### *Soil Type*

Areas with high groundwater tables should be carefully considered. While it is unlikely that you will encounter high groundwater, if water appears in the trench during excavation you should either consider reducing the depth of the raingarden or consult a landscape designer.

| | Area of raingarden required ($m^2$) | |
|---|---|---|
| Impervious Area ($m^2$) | 3000L tank connected to toilet, overflow to raingarden | Raingarden (with no tank) |
| 10 | 1 | 1 |
| 50 | 1 | 2 |
| 100 | 1 | 4 |
| 150 | 2 | 5 |
| 200 | 3 | 5 |
| 250 | 4 | 6 |
| 300 | - | 7 |
| 350 | - | 9 |
| 400 | - | 11 |
| 450 | - | 13 |

*Table 1. Raingarden size ($m^2$) for various impervious areas and configurations*

It takes longer for water to infiltrate in clay soils than sandy soils. If you have clay soils, ensure your raingarden is appropriately sized. If you're unsure or concerned about groundwater, you can dig a small hole to the same depth as your raingarden and leave it open for a few days to see if it fills with water. This is best done with an auger, however a small spade will also work.

If the hole fills with water then this is most likely groundwater. Groundwater levels can fluctuate, therefore, you may consider adjusting the depth of your raingarden so that the base is slightly above the groundwater level, or consider moving the raingarden to a higher location.

*Handy Hint – Water infiltration into soils near permanent structures can cause the ground to shrink/swell which can cause cracking, subsidence or foundation failure. This can be avoided by locating your infiltration raingarden at least five meters away from any permanent structure or by using builder's plastic.*

### *Underground Services*

Be aware of any underground services (gas, electricity, water) that run near your house or under your garden as this may determine where you can build your trench. To locate services on your property, visit Dial Before You Dig, at www.1100.com.au or call 1100. If your property is serviced by a septic system, you may need a licensed plumber to determine its location. Infiltration trenches should not be built over or in close proximity to a septic system.

### *Materials and tools*

Having all your equipment ready will make building the raingarden easier. The following tools are recommended for building a raingarden:

- Tape measure
- Shovels
- Rakes
- Spirit level
- Wood stakes
- String
- Small backhoe with caterpillar treads (optional)

Make sure you have your fill materials ready at hand before you begin construction. A materials list has been provided below in Table 2. Quantities shown are for a 2m infiltration raingarden. While item prices may vary depending on the materials you select, building a 2m raingarden is likely to cost between $350 and $450, plus the cost of a plumber.

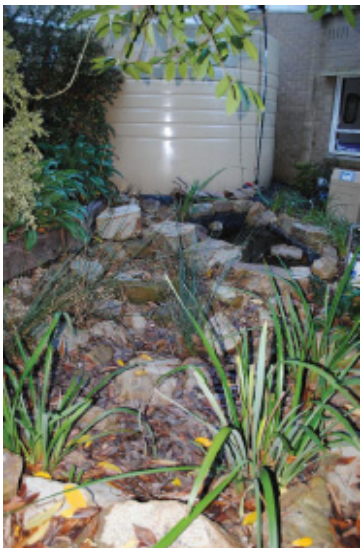

*Figure 1. Rainwater tank with overflow to raingarden*

| Material | Quantity |
|---|---|
| 7mm screenings | 0.2 $m^2$ |
| 20mm drainage scoria | 0.8$m^3$ |
| Loamy sand (white, washed) | 0.48$m^3$ |
| Topsoil | 0.12$m^3$ |
| Plants (150mm pots) | 12 |
| Gravel mulch | 0.1$m^3$ |
| 90mm diameter uPVC 90° bend<br>*or*<br>2 x 45° bends | 1 |
| 90mm diameter uPVC extension* | 1 |
| 90mm diameter uPVC grated end cap | 1 |
| 90mm diamter uPVC pipe** | 1 l/m |
| 20mm fine crushed rock*** | 0.05$m^3$ |
| Large flat rocks (100-200mm diameter)*** | 1$m^2$ |
| Builder's plastic (under rockwork near downpipe)*** | 1$m^2$ |

*Table 2. Material list for building an infiltration raingarden. Please note quantities shown are for a 2m² raingarden*

*Note:*
*l/m= linear metres*
*m²= square metres*
*m³= cubic metres*
*mm= millimetres*

**Length subject to change depending on distance from house*
***Length subject to change based on location of existing stormwater pipe*
****Quantity will vary depended on chute length and downpipe arrangement*

### *Stormwater reconnection*

Your infiltration raingarden should be constructed with an overflow pipe so that any excess water can drain from the raingarden back to the stormwater pipe. While the overflow can be positioned anywhere within the raingarden, it is best to locate it as close as possible to the existing underground stormwater pipes. This will minimise the additional pipework needed to reconnect the overflow back into the drainage system. The overflow pipe needs to sit 100-200mm above the top of the surface of the raingarden (i.e.gravel mulch or soil), and be almost the same level as the adjacent ground surface. The overflow will pipe excess water from the raingarden back into the existing stormwater system. A licensed plumber will need to undertake the stormwater connection work to ensure that pipes are reconnecting into the property's stormwater and not another service such as the sewer.

## Step 2 - Excavation and Pipe Infrastructure

- A licensed plumber should determine how and when to disconnect your downpipe to ensure that the area is not flooded during construction. A temporary diversion may be required.
- Make sure you have all your tools and equipment ready, including your fill materials.
- Once you have determined the location and size of your infiltration raingarden lay out the garden using stakes and string. This will help you dig your raingarden and ensure it looks good and is level.

*Handy Hint: If you are building a raingarden into an existing lawn, digging time can be reduced by killing the grass first. Place black plastic over the lawn until the grass dies.*

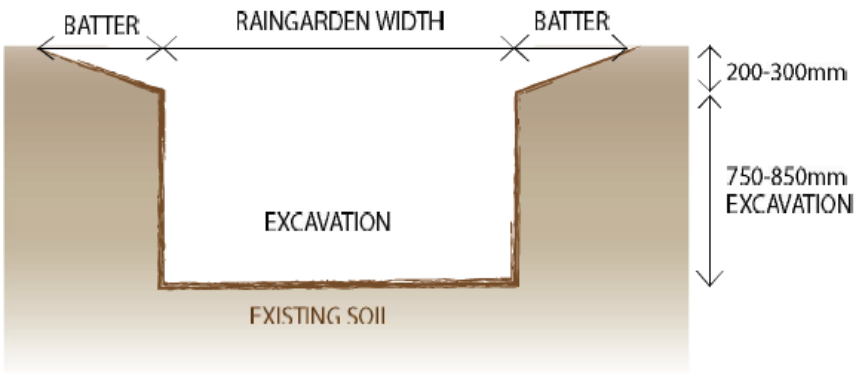


*Figure 2. Infiltration raingarden excavation front view*

- Excavate the trench and batters as depicted in figures 2 and 3 below. Generally your raingarden can be dug out using shovels and some manual labour. However, depending on the size of the raingarden and the soil type, an excavator may be required.
- Ensure that the base of the trench is level and free of loose material.
- To assist with directing the water from the downpipe into the trench, excavate a smaller depression (chute) between the pipe end and the trench. Alternatively, the downpipe can be extended to discharge water directly into the trench.
- If your trench is positioned less than five metres away from a permanent structure, you will need to line the vertical side of the trench closest to that structure with builder's plastic. To do this, place the builder's plastic on the vertical face. Ensure that each new piece of liner overlaps by 200mm. Seal the joins with duct tape.
- If the water from the downpipe is to flow over rocks, you may also place a PVC liner underneath the rockwork and at the interface between the rockwork and raingarden. This will minimise the risk of erosion.
- For the overflow, engage a plumber to install a vertical 90mm diameter overflow pipe outlet near the connection back into the existing stormwater pipes. The top of the overflow pipe outlet should be 100-200mm above the top or the surface of the raingarden (i.e gravel mulch or soil) and be almost the same level as the

ground surface.
- A temporary end cap on top of the overflow will prevent materials from dropping into the pipe while constructing your raingarden.
- Your plumber will then connect the raingarden overflow back into the existing stormwater system on the property.

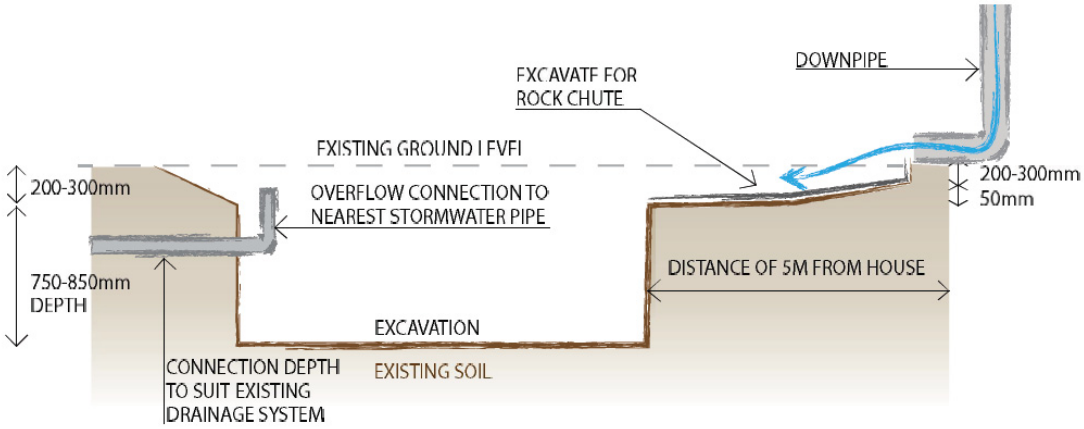


*Figure 3. Infiltration raingarden excavation side view*

*Did you know the legal Approved Point of Discharge (APD) is the point at which your property discharges to stormwater? This point is specified by council and should not be altered without council approval. It is also known as the Legal Point of Discharge (LPD).*

## Step 3 – Soil layers and rock work

Within the raingarden, there are different soil layers. The surface loamy sand layer provides a firm base for plants to grow in, and allows water to infiltrate into deeper layers at a controlled rate. The coarser particles of the deep layers have more space between the particles to allow more storage of water, and their surface allows biofilms to grow, which remove pollutants from the water.

Choosing the right type of soil for each layer is very important, to ensure that the raingarden will work properly;
- Drainage scoria – add 20mm diameter drainage scoria to a depth of 300mm to 400mm in the base of your trench.
- Place 7mm diameter screenings over the top of the scoria to ensure that the sand does not migrate into the scoria layers.
- Sand layer – place 300mm of sand or sandy loam over the screenings. Sandy loam consists of four parts sand (white washed) to one part loam topsoil. If needed, this mixture can be combined once added to the trench.
- Add 20mm finely crushed rock (FCR) to a depth of 50mm over the PVC lining in the chute.
- Place some large, flat, angular rocks in the chute area. Place smaller rocks in between the large rocks to fill any gaps. This will create a good interlock between the large and small rocks. It is very important to fill any gaps in the rockwork, as voids can lead to erosion problems. Alternatively, a flow spreading device can be fitted to the downpipe

Shown below are examples of typical soils used for infiltration raingardens. These include drainage scoria (left), 7mm screenings (middle) and sand or sand loam (right).

*Figure 4. Soils used for infiltration rangardens. From left to right: Scoria, screenings, loamy sand*

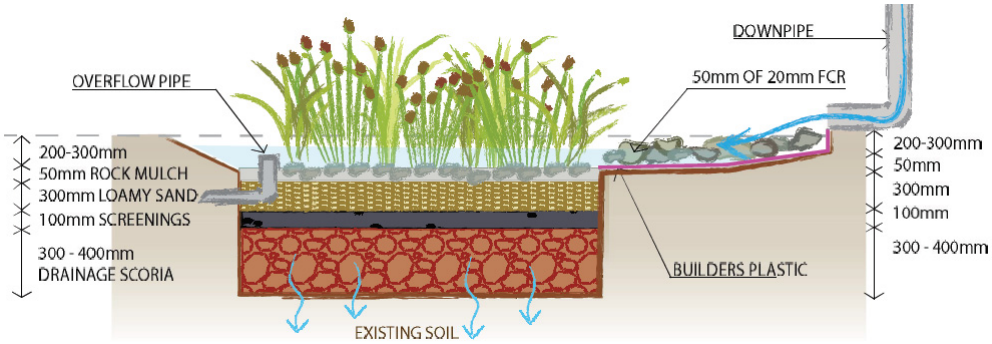


*Figure 5. Infiltration raingarden side view*

## Step 4- Pipe adjustments, plants and gravel mulch

### *Pipe adjustments*

Your plumber will redirect the downpipe into the trench using pipe bends where required. Two 45 degree pipes connected together will provide a much gentler and more even flow of water and reduce the risk of erosion. A 90 degree elbow pipe will do as an alternative.

### *Plants*

In general, plants that will grow well in a raingarden:

- can tolerate dry conditions and temporary wet periods
- are perennial rather than annual
- have an extensive fibrous root system.

A wide range of plants are suitable for raingardens and your local nursery will be able to guide you on what is right for your area.

There are also particular plants that are effective at removing pollutants from stormwater. These include:

- Carex appressa
- Lomandra longifolia
- Juncus flavidus
- Melaleuca ericifolia
- Goodenia ovata

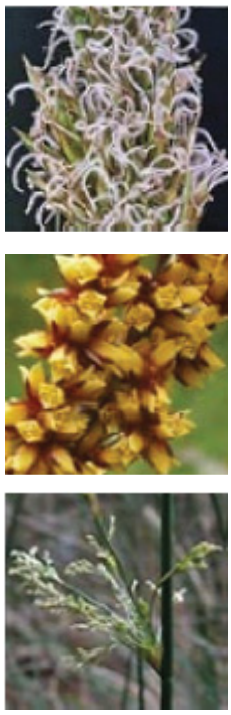

*Figure 6. Raingarden plants. Top to bottom: Carex appressa, Lomandra longifolia, Carex appressa*

50-100% of your raingarden should be planted with the above species, up to 50% can be made up of plants that like a dry environment with periodic wet periods. It is important that the plants you select are suitable for the amount of sun and shade your raingarden receives. See the Plant List for a range of suitable raingarden plants It is important to plant densely with ground cover species to fill the raingarden. It is recommended that you use 6 plants per m². So for a 2m² raingarden, you will need 12 plants.

*Tip – Did you know that you can plant trees in your raingarden? Melaleucas are an excellent native species choice and while the plants are establishing, if it doesn't rain, water your plants in compliance with your local water restrictions.*

*Figure 7. Established infiltration raingarden with Carex appressa*

### Gravel mulch (optional)

Gravel mulch is an optional additional layer you can add to your raingarden. Adding mulch provides a range of benefits, including weed control. However, it can prevent the spread of plants and as such; your raingarden may take longer to mature. Also, it is very important to ensure that you only use washed gravel mulch, as the fine dust on unwashed gravel mulch can clog pipes and the space between sand particles. Note – traditional wood chip mulch is not recommended to use within a raingarden. If you choose to add gravel mulch:

- Spread gravel mulch to a depth of 50mm around the base of the plants.
- Once mulching and planting is complete, the temporary end cap from the overflow pipe can be replaced with a grated end cap.
- Water the plants, in compliance with your local water restrictions to complete the installation process.

## Step 5 – register your raingarden

If you are within Melbourne Water's water management boundary you can register the raingardens constructed as part of the subdivision at www.melbournewater.com.au/raingardens and be part of the count towards building 10,000 raingardens to help our local waterways.

## Looking after your raingarden

Once established, raingardens are low maintenance, especially when planted with native plant species. They don't need to be watered, mowed or fertilised. However, a few simple tips can help your raingarden mature and function well.

1. Cover your raingarden with gravel mulch to retain moisture.
2. If you have an overflow, ensure that it is never blocked.
3. Remove any sediment or build up from the downpipe.
4. Weed regularly until plants have matured.
5. Evenly distribute water flow into your garden to limit erosion from heavy rainfall. Strategically placed rocks may help with this.
6. Inspect your garden regularly – replace plants and repair erosion when necessary
7. Protect your raingarden from pedestrian and vehicle access, as damage to plants and filter medium may significantly affect its ability to function.

**END OF DOCUMENT**