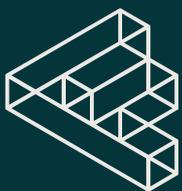


# WSUD Report

14 Hopetoun Ave,  
Reservoir VIC

04/07/2024



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Sustainability  
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# Water Sensitive Urban Design (WSUD) Report

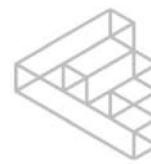
## Proposed Residential Development

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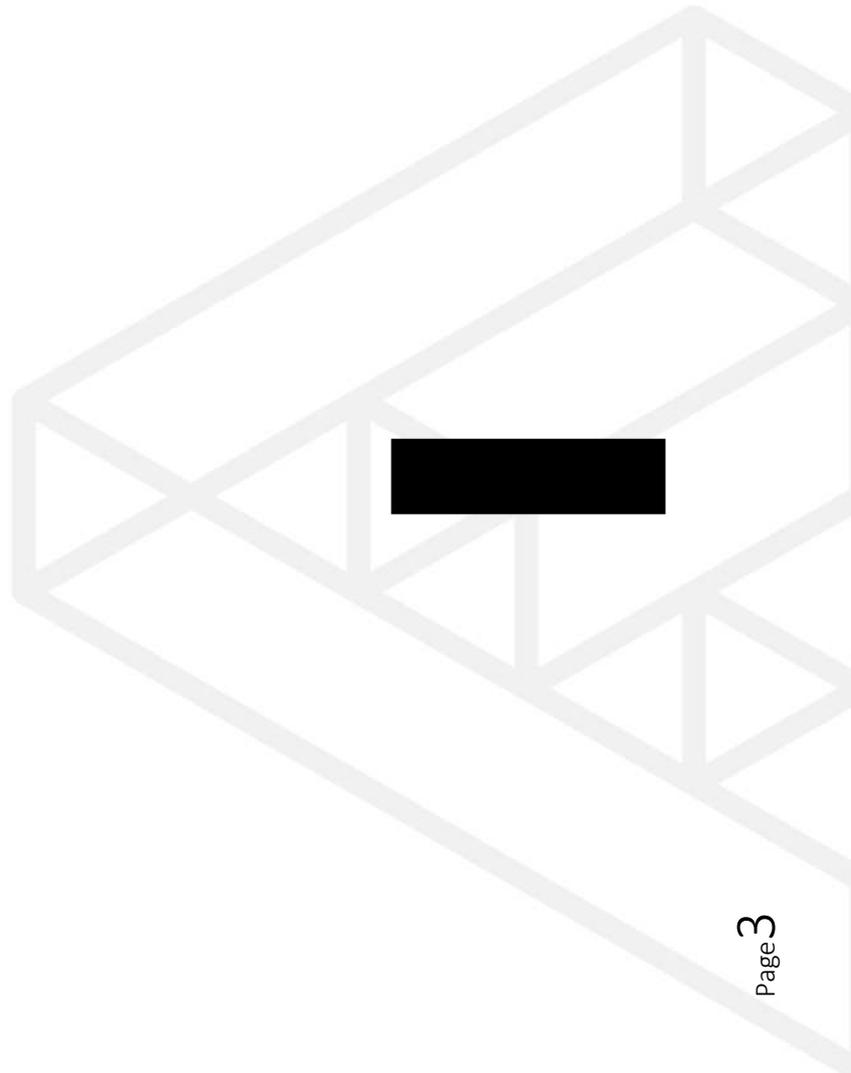
### DOCUMENT VERSION

Version	Date	Changelog	Author	Review
0	03/07/24	Issued for Client Review		Out of Scope
1	04/07/24	Updated as per client's comments		



## INITIATIVES TO BE MARKED ON DRAWINGS

- Mark-up showing the roof catchment area to be diverted to the Rainwater tank for dwelling 2 – If required, the use of a charged pipe system will be explicitly acknowledged on the drawings and charged pipes will not be running underneath the building footprint
- Location and size of the Rainwater tank proposed
- Note showing connection to the toilets and laundry
- Extent of a minimum of 75m<sup>2</sup> permeable driveway

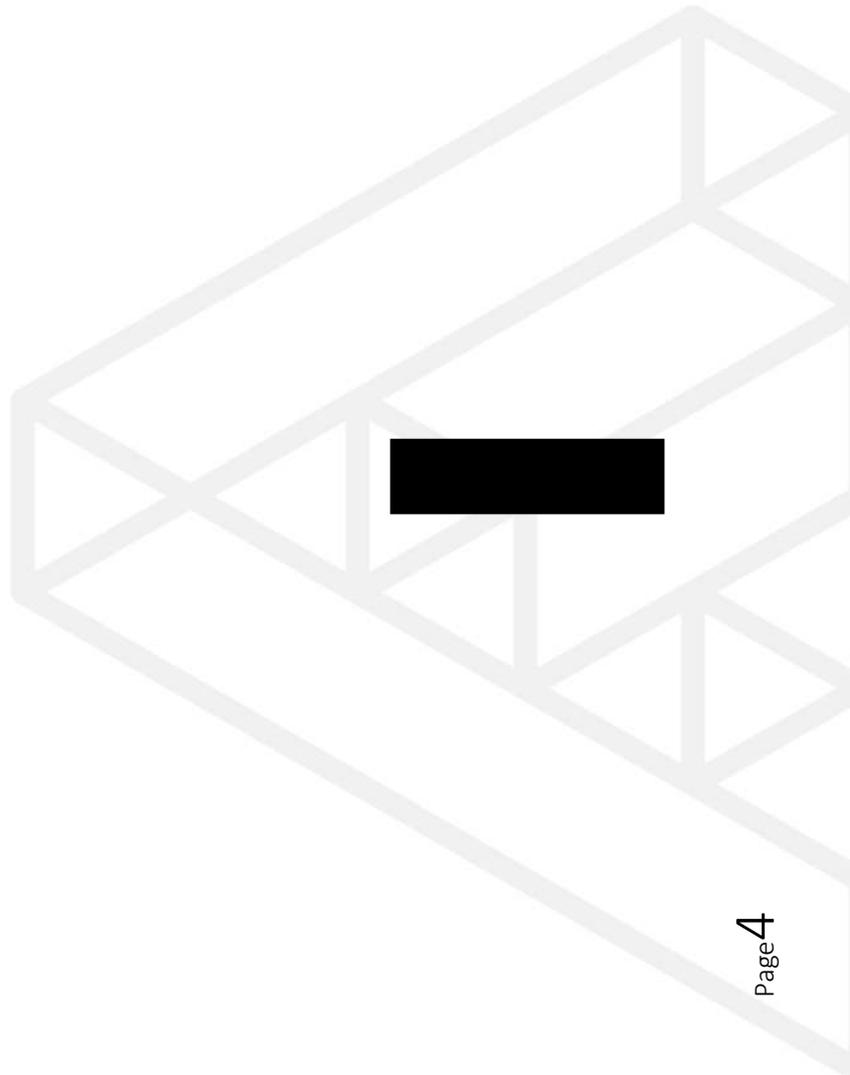


## INTRODUCTION

Framer Consulting Services has been engaged to undertake a Water Sensitive Urban Design Report (WSUD) for the proposed residential development located at 14 Hopetoun Avenue, Reservoir. This has been prepared to address the requirements of Darebin City Council especially Clause 53.18 of the Local Planning Policy *Stormwater Management in Urban Development (Water Sensitive Urban Design)*.

This report includes an assessment of the proposed development, to determine the potential impacts as a result of stormwater runoff from the site during rainfall events. The report identifies several initiatives that will be implemented into the development to minimise these stormwater impacts. These initiatives are appropriate and practical for the site to ensure the proposed development meets the target water quality objectives required by the City of Darebin.

The site has been assessed using the STORM Calculator. Melbourne Water has developed the STORM (Stormwater Treatment Objective – Relative Measure) Calculator to analyse the impacts of stormwater quality based on various treatment methods applied to a development. The STORM Calculator is able to display the amount of effective treatment that typical WSUD measures will provide in relation to best practice targets.



## SITE DESCRIPTION

The proposed site is located at 14 Hopetoun Avenue, Reservoir. The 512m<sup>2</sup> site is currently occupied by a single-storey house which is proposed to be retained. The development is located approximately 12 km north of the Melbourne CBD.

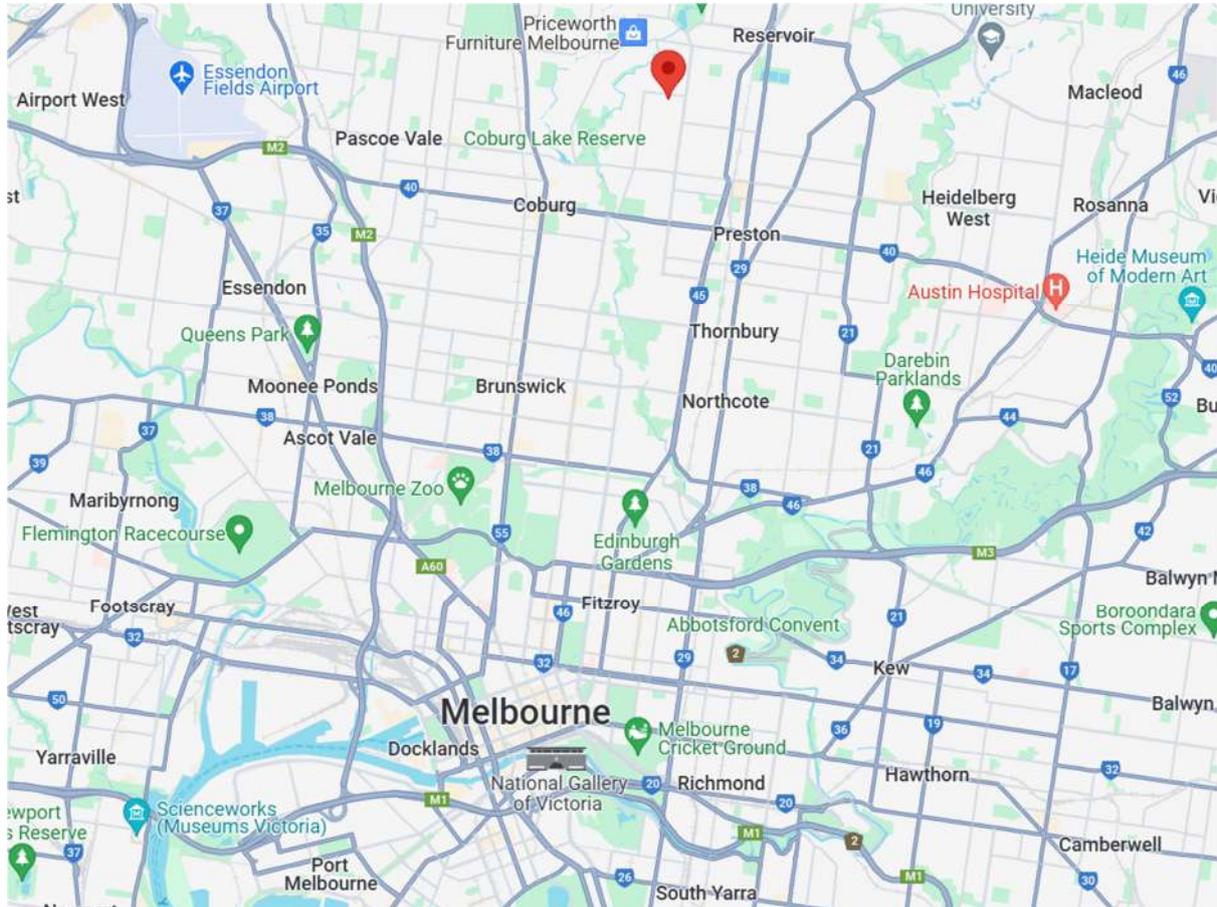
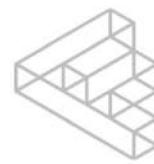


Figure 1: Location of the proposed development in Reservoir in relation to Melbourne CBD

(Source: Google Maps)

## PROPOSED DEVELOPMENT

The proposal consists of developing an additional double-storey townhouse (1 x 2-bedroom) at the rear of the lot. The site area is 512m<sup>2</sup>. The new townhouse will have an undercover garage, and another garage will be provided for the existing townhouse. Both dwellings will have a shared driveway opening on Hopetoun Avenue.



## STORMWATER MANAGEMENT OBJECTIVES

The City of Darebin has recognised the importance of stormwater management and its effects on the surrounding environment. As a result, a local planning policy, Clause 53.18 “*Stormwater Management (Water Sensitive Urban Design)*”, has been introduced into the City of Darebin Planning Scheme. New developments, or extensions to existing buildings that are 50m<sup>2</sup> in floor area or greater, must adhere to the local policy.

The objectives that form part of the Stormwater Management Policy include:

- To achieve the best practice water quality performance objectives as set out in the Urban Stormwater Best Practice Environmental Management Guidelines, Victoria Stormwater Committee 1999 (as amended). Currently, these water quality performance objectives are:
  - Suspended Solids - 80% retention of typical urban annual load
  - Total Nitrogen - 45% retention of typical urban annual load
  - Total Phosphorus - 45% retention of typical urban annual load
  - Litter - 70% reduction of typical urban annual load
- To promote the use of water sensitive urban design, including stormwater reuse.
- To mitigate the detrimental effect of development on downstream waterways, by the application of best practice stormwater management through water sensitive urban design for new development.
- To minimise peak stormwater flows and stormwater pollutants to improve the health of water bodies, including creeks, rivers and bays.
- To reintegrate urban water into the landscape to facilitate a range of benefits, including microclimate cooling, local habitat and provision of attractive spaces for community use and well-being.

To assess these initiatives, the STORM tool – which is an industry-accepted tool – is used to comply with these initiatives. The results are presented in this report.



## DEVELOPMENT CHARACTERISTICS

For the stormwater assessment, only the area of the site where new construction will occur will be considered. Unit 1 and its roof will be preserved, and its impact on stormwater in the surrounding environment will remain the same. The unchanged area of Unit 1 is 129.6m<sup>2</sup>. Therefore, the area to be considered for the stormwater assessment is 512m<sup>2</sup> - 129.6m<sup>2</sup> = 382.4m<sup>2</sup>.

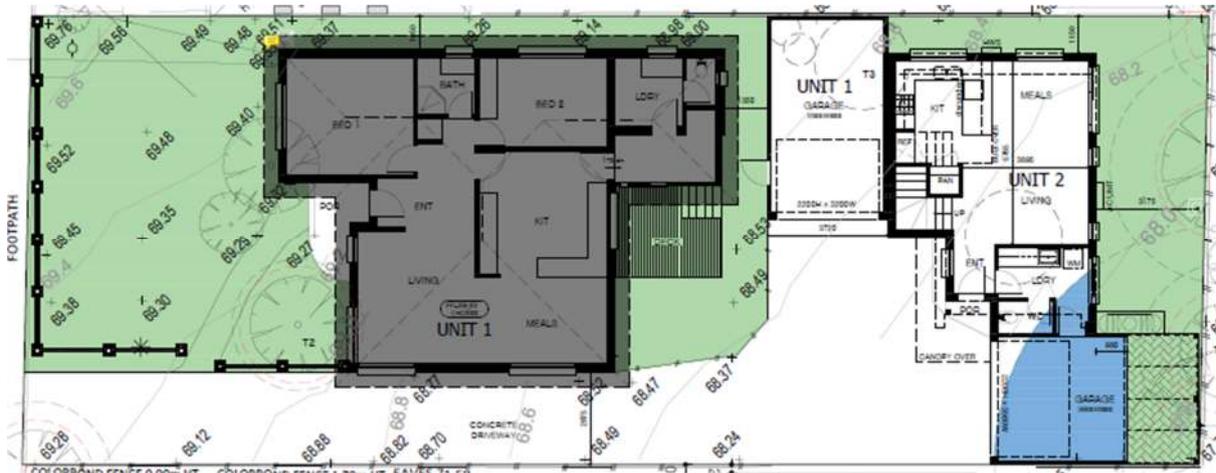


Figure 2: Area excluded (Dark Grey) from the assessment as the impact will be unchanged.

### Site Delineation

For the purpose of the assessment, the development has been delineated into the following surface types:

- Assessed Area of 382.4m<sup>2</sup>;
- The roof area runoff of dwelling 2 of 91m<sup>2</sup> which will be diverted into rainwater tank(s);

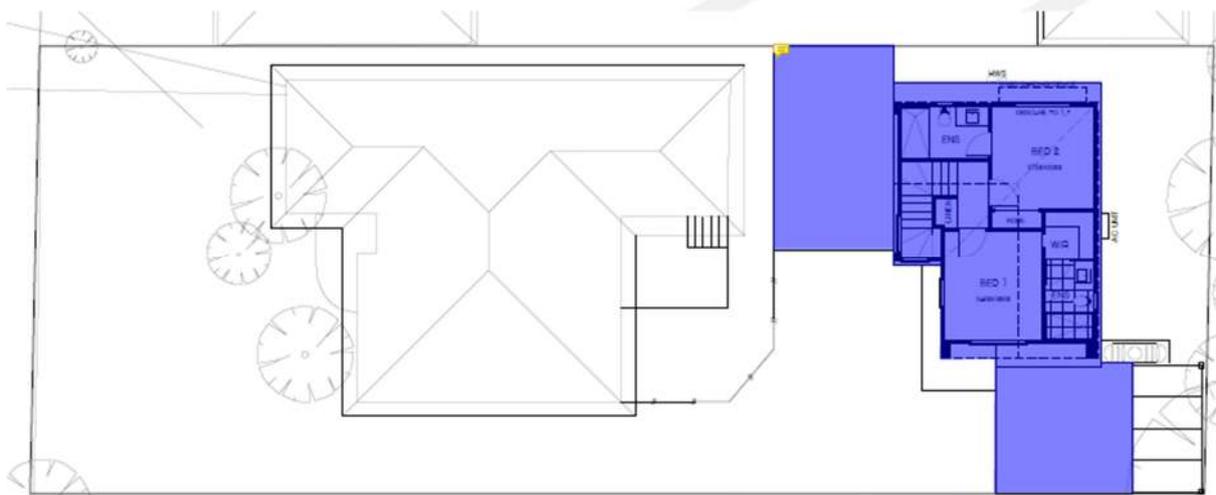
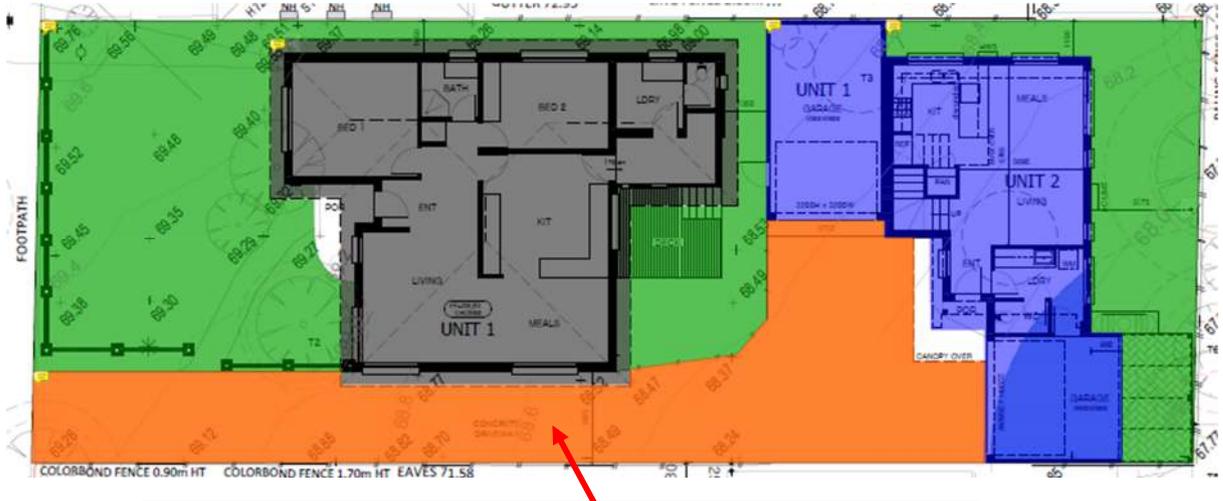


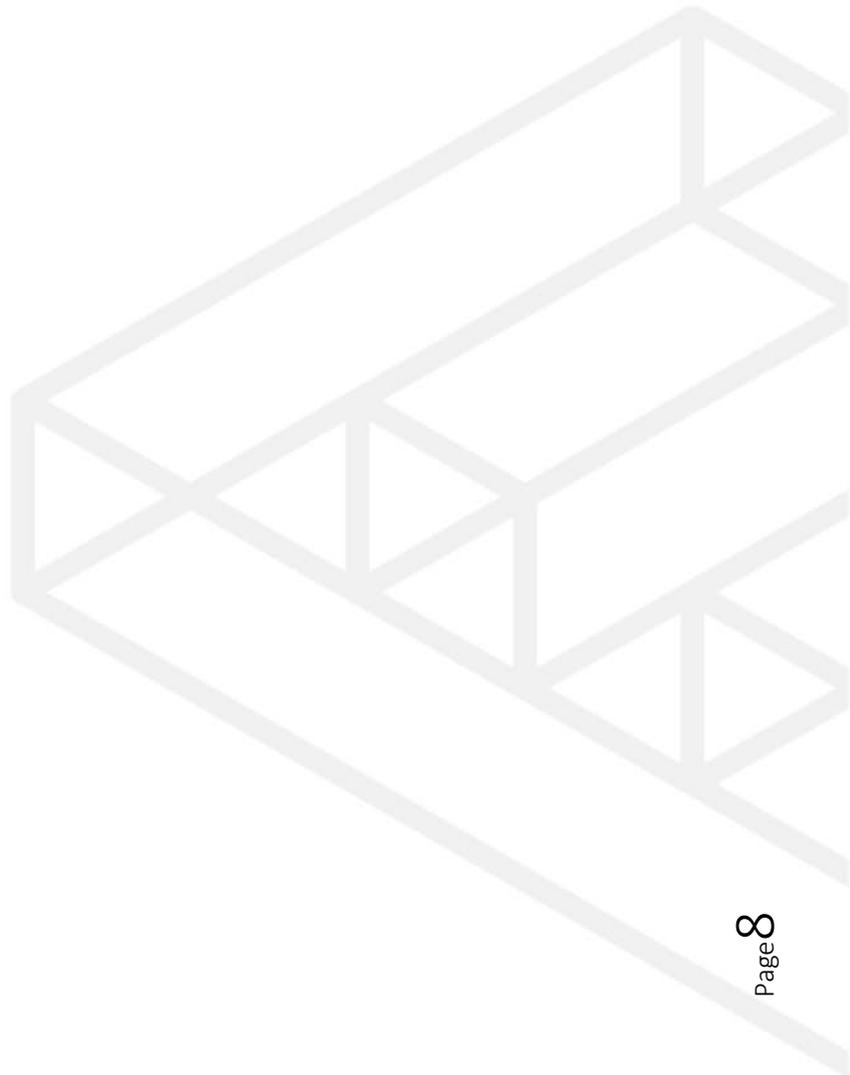
Figure 3: Roof catchment area for dwelling 2 to RWT (blue)

- Permeable area of 177.4m<sup>2</sup> comprised of landscaped area and other pervious surfaces in the backyards;
- Part of the shared driveway of a minimum of 75m<sup>2</sup> to be designed to be permeable; and
- The remainder of 39m<sup>2</sup> consists of impervious areas around the site.



A minimum of 75m<sup>2</sup> of the orange area to be permeable

Figure 4: Driveway (orange) to permeable and permeable areas (green).



## STORMWATER MANAGEMENT INITIATIVES

The following section presents the stormwater management initiatives that have been identified for the proposed development.

### ***Rainwater Tank***

#### ***(Rainwater tank for toilet flushing and laundry for dwelling 2)***

The roof catchment area of dwelling 2 (as described above) will be diverted into a 3,000L rainwater tank. The rainwater collected will be used for toilet flushing and laundry in this townhouse.

If required, a charged pipe system or multiple tanks will be installed to collect water from part of the roof of dwelling 2.

**In the case of a charged pipe system, the charged pipes will not be running underneath the slab and the stakeholders (builder/developer/architect) will be required to explicitly acknowledge this solution and have the capacity to install it.**

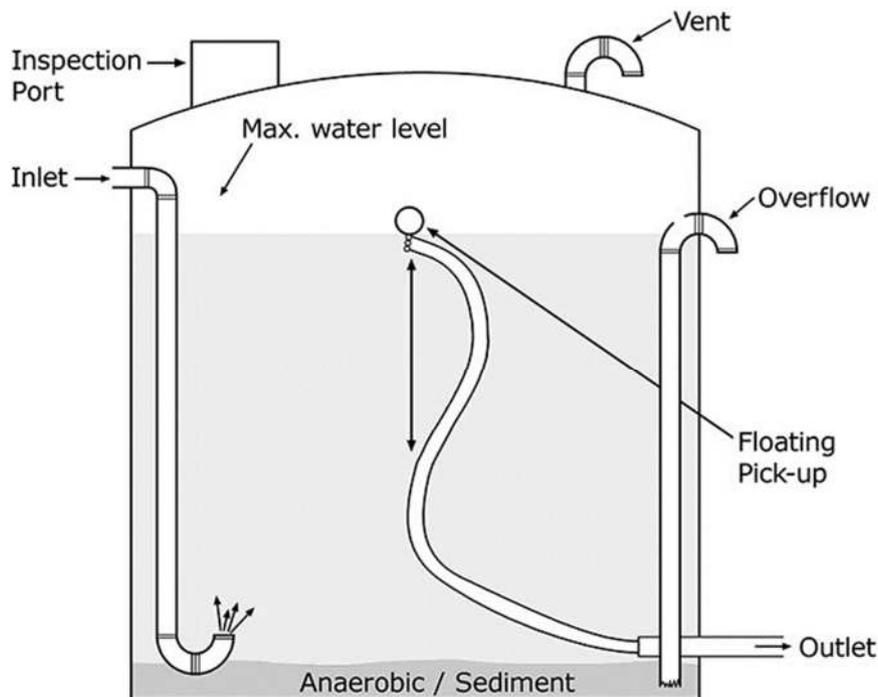


Figure 5: Typical Cross-Section of RWT.

***Permeable Paving***

Part of the shared driveway (as described above) will be designed to be permeable, reducing the overall stormwater runoff from the site. Given Darebin’s clay soil, the permeable paving will include a continuous, impervious liner and a subsurface aggie drain.

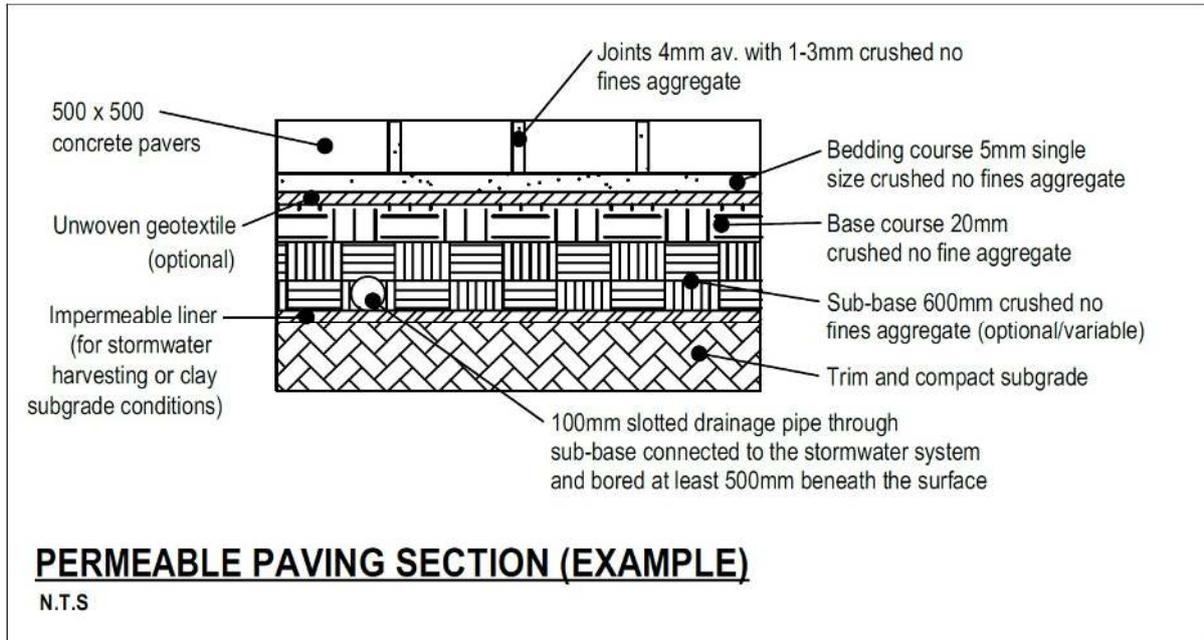
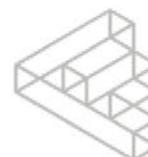


Figure 6: Typical cross-section of permeable paving

The remaining impervious areas will be released directly at the legal point of discharge on site. Permeable areas are excluded from the STORM assessment.

**It should be noted that permeable areas have been maximised within the development, which will reduce the overall stormwater outflows from the site. Vegetated areas are provided in the proposed development, reducing the heat island effect and improving the local habitat.**





# STORMWATER ASSESSMENT RESULTS

The initiatives and areas described above have been applied to the STORM calculator for the development and have achieved a score of 100% or more.



## STORM Rating Report

TransactionID: 0  
 Municipality: DAREBIN  
 Rainfall Station: DAREBIN  
 Address: 14 Hopetoun Avenue

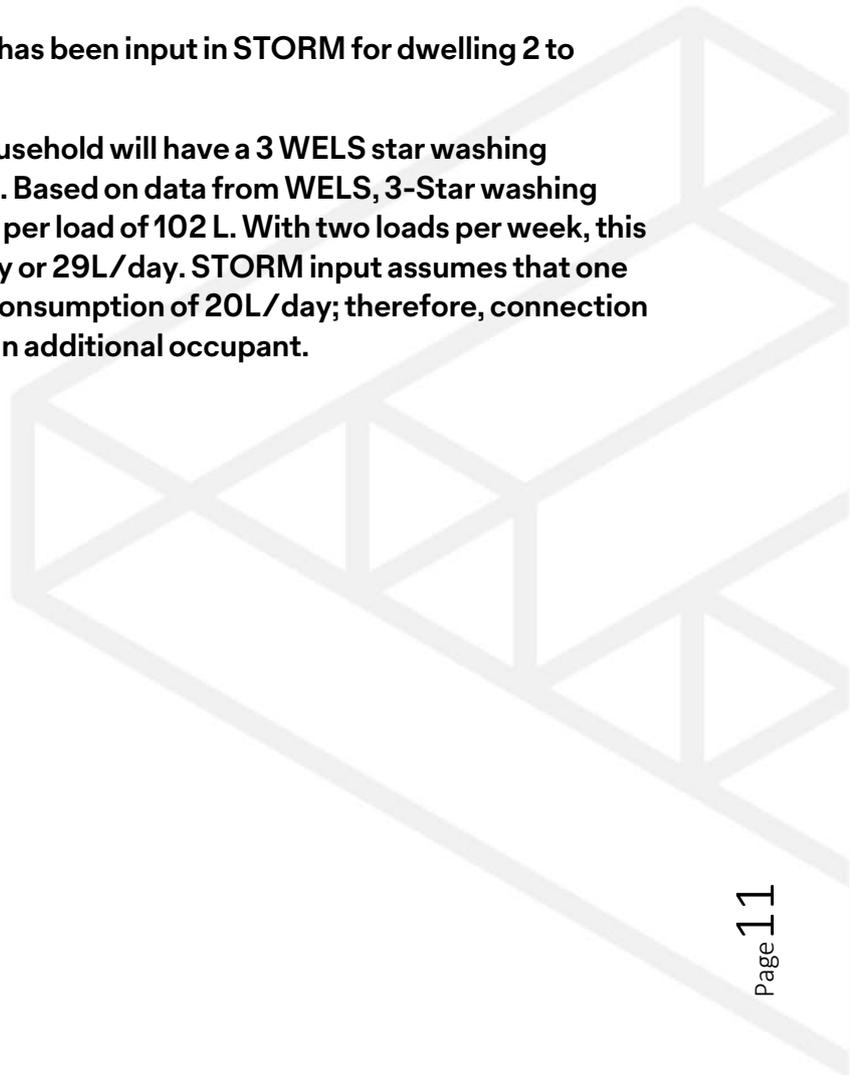
Reservoir  
 VIC 3073

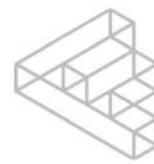
Assessor: Frater Consulting Services  
 Development Type: Residential - Extension  
 Allotment Site (m2): 382.40  
 STORM Rating %: 100

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
Roof 2 to RWT	91.00	Rainwater Tank	3,000.00	3	143.00	90.70
Other Impervious areas	39.00	None	0.00	0	0.00	0.00

Please note that an additional occupant has been input in STORM for dwelling 2 to account for the laundry connection.

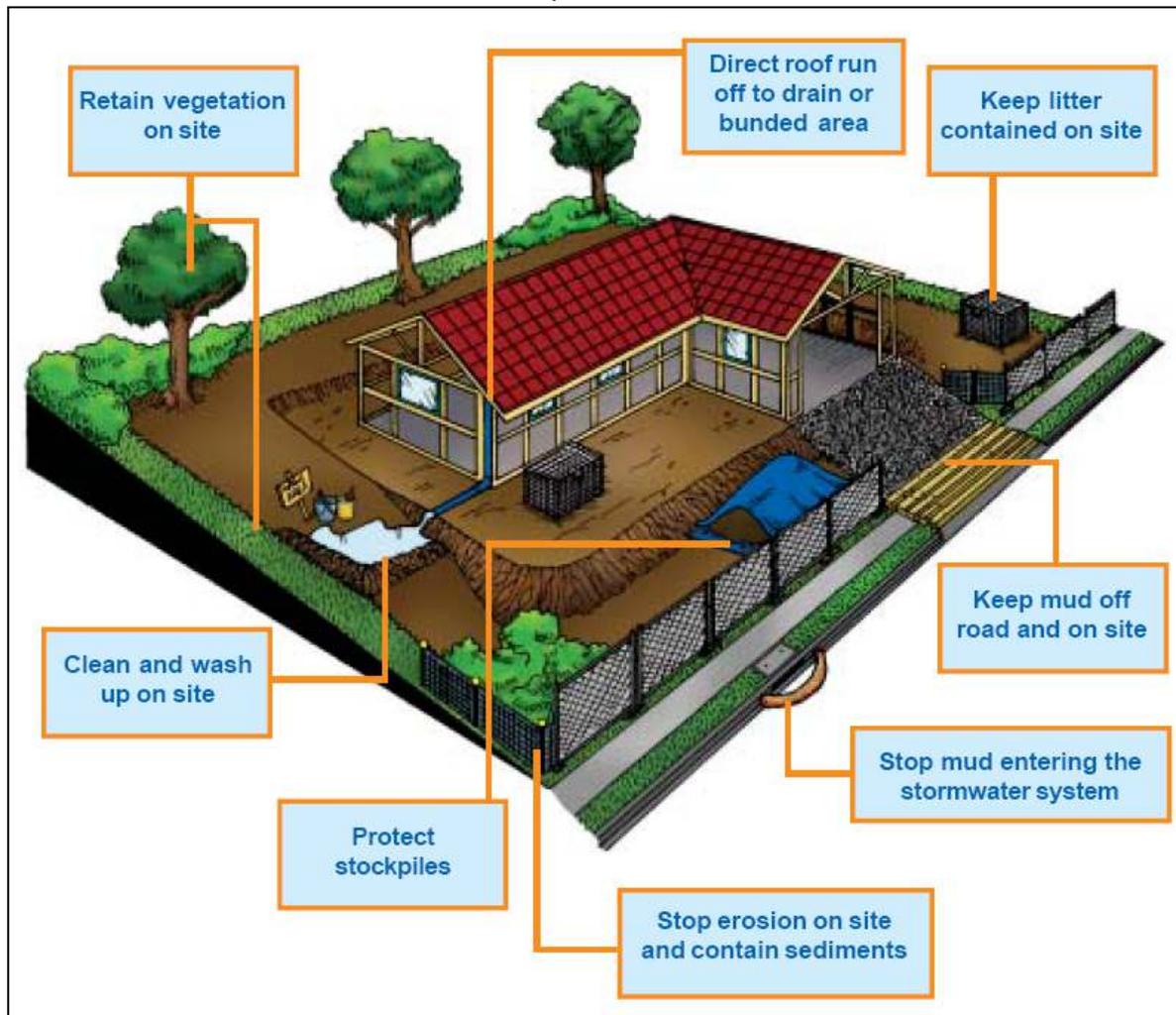
We have assumed that, on average, a household will have a 3 WELS star washing machine and will run two loads per week. Based on data from WELS, 3-Star washing machines have an average consumption per load of 102 L. With two loads per week, this would represent 204 L/week for laundry or 29L/day. STORM input assumes that one bedroom/occupant represents a daily consumption of 20L/day; therefore, connection to laundry (29L/day) has been input as an additional occupant.





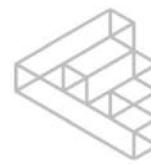
## STORMWATER MANAGEMENT AT CONSTRUCTION SITE

To manage stormwater management in the construction stage, measures will be put in place to minimise the likelihood of contaminating stormwater. This will mean ensuring buffer strips are in place, sediment traps are installed, and the site will be kept clean from any loose rubbish. The builder will follow the process outlined in “Keeping Our Stormwater Clean – A Builder’s Guide” by Melbourne Water.



Copies of “Keeping Our Stormwater Clean – A Builder’s Guide” booklet can be downloaded from the following website:

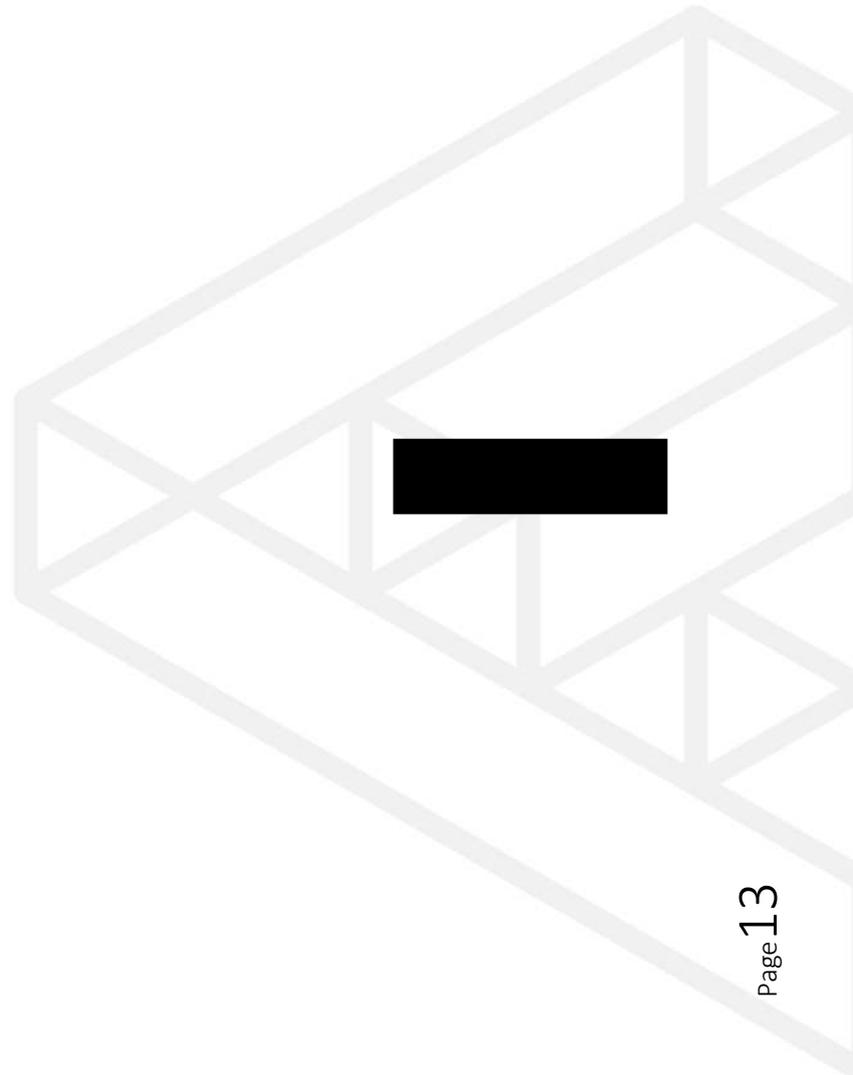
<https://www.clearwatervic.com.au/resource-library/guidelines-and-strategy/keeping-our-stormwater-clean-a-builders-guide.php>

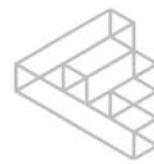


## CONCLUSION

With the proposed stormwater treatment measures incorporated into the development at 14 Hopetoun Avenue, Reservoir, the design will achieve a score of 100%, which meets the minimum performance standards of the City of Darebin's planning scheme. The proposed development will incorporate a rainwater tank for dwelling 2 with an effective capacity of 3,000L connected to the toilets and laundry and a permeable shared driveway area of 75m<sup>2</sup> to treat the stormwater runoff.

The development has managed the outflows and quality of stormwater runoff from the site by achieving more than a 45% reduction in the typical annual load of total nitrogen, thus achieving best practice objectives. The builder must also adhere to Melbourne Water's stormwater management guidelines during the construction stage.





## APPENDIX A – WSUD MAINTENANCE & INSTALLATION

### Installation

#### Rainwater Tank(s)

The rainwater tank(s) will be installed above ground. Its manufacturer or material has not been nominated. It will be installed with a mesh insect cover over the inlet pipe to ensure the tank does not become a breeding ground for pests. Mesh needs to be installed over overflow pipes and if a manhole is present it needs to be properly sealed.

Please refer to the architectural drawings for the location of the rainwater tank.

#### Pumps

The pumps required either to divert the stormwater runoff to the rainwater tank or to distribute the collected water to the end use (toilets and laundry) will be required to be installed as per the chosen manufacturer specifications.

#### Permeable Paving

Permeable paving used for the driveway shall be installed in strict accordance with the site plans and the permeable paving manufacturer's specific drawings and requirements.

### Inspection Requirements

#### Rainwater Tanks

Inspections of roof areas and gutters leading to the tank should take place every 6 months. Rainwater in the tanks should be checked every 6 months for mosquito infestation.

The rainwater tank should be examined every 2 years for sludge buildup.

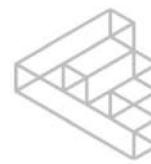
Ensure the monitoring system (be it digital or a simple float system) is functioning properly by checking the water level in the rainwater tanks.

#### Pumps

The pumps required will be required to be routinely inspected by listening to the day operation of the pumps. Unusual noise or no noise should be investigated. Inspection should occur as per the chosen manufacturer's specifications.

#### Permeable Paving

Permeable paving should be inspected for damage after large storm events (48.2mm in one hour is considered a large storm event in Melbourne – 1 in a 100-year storm) and should be inspected every 3 months.



During the inspection, the following should be looked for:

- Water ponding on porous joints or permeable pavers;
- Soggy and boggy soils;
- Uneven surface;
- Rubbish, leaf litter and sediment; and
- Blocked underdrainage.

## **Clean Out / Maintenance Procedure**

### **Rainwater Tank, Roof and Gutters**

Rainwater tanks will require the roof and gutters onsite to be maintained; gutters should be checked, maintained and cleaned every six months to avoid blockages from occurring. If a leaf-blocking system is installed this can be completed annually.

Any trees onsite should be maintained every 6 months with branches overhanging the roof removed.

Water ponding in gutters should be avoided as this provides a breeding ground for mosquitos; tanks should also not become breeding grounds for mosquitoes. If mosquitoes are detected in the tank remedial steps need to occur to prevent breeding. If mosquitoes or other insects are found in rainwater tanks, the point of entry should be located and repaired. As well as preventing further access, this will prevent the escape of emerging adults. Gutters should be inspected to ensure they do not contain ponded water and be cleaned if necessary.

Please refer to <https://www.health.vic.gov.au/sites/default/files/2022-11/Keeping-your-rainwater-tank-safe-from-mosquitos.pdf> for more information on mosquito control.

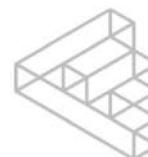
Rainwater tanks should be checked by a regular maintenance person every 3-6 months to ensure that connection to the building is maintained and there are no blockages.

A simple way to ensure the tank is operating as intended would be through the installation of a smart monitoring device (e.g. OneBox®). These systems allow users to operate tanks remotely from the internet or smartphone, monitor and control the tanks in real time, allow the automatic release of stored water prior to storm events, alert users [REDACTED] blockage and view tank history and usage patterns.

Alternatively, onsite tank gauges can help those familiar with the tank know if the tank is not working correctly.

### **Pumps**

Maintenance should occur as per the chosen manufacturer's specifications. All strainers and filters should be cleaned every 6 months. Good quality pumps should provide trouble-free service for up to 10 years.



## Permeable Paving

Permeable paving will require ongoing maintenance based on the inspection. The following maintenance task could be required:

Item	What to check for	Inspected	Maintenance undertaken	Further action required or comment
<b>Civil components – Permeable pavement</b>				
<b>Permeability</b>	Pavement area is free draining (i.e. no clogging of the pavement surface).  Clogging is generally evident by water ponding on the surface of the permeable paving more than 2 hours after rainfall.			
<b>Pavement surface</b>	No uneven paver surface (i.e. pavement surface lifting and rutting).  No physical damage to the pavement surface – look for cracks and holes.			
<b>Infill material</b>	Infill material is present between pavers.  No scour occurring.			
<b>Landscape components – Permeable pavement</b>				
<b>Weeds</b>	Less than 10% of infill surface area (where present) covered by weeds.			

## Commissioning

### Rainwater Tank

All rainwater tanks should be washed or flushed out prior to use. All inlets and outlets should be correctly sealed to prevent insects from entering. Connection to all toilets and laundry in the development should be tested (dye test or equivalent).

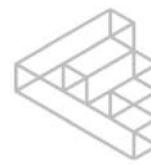
Please note if new roof coating or paint is to be installed then the first few run-offs after installation need to be discarded.

### Pumps

Commissioning should occur as per the chosen manufacturer's specifications.

### Permeable Paving

Commissioning should occur as per the chosen manufacturer's specifications.



## Summary

The following needs to occur onsite to ensure compliance with WSUD requirements and maintain the operation of the rainwater tank and connections onsite.

Task	When?	Requirement
Inspect Rainwater tanks	Every 6 months	<ul style="list-style-type: none"><li>• Check for any damage/compression</li><li>• Mosquitoes infestation</li></ul>
	Every 2 years	<ul style="list-style-type: none"><li>• Sludge Build up – if sludge build-up occurs a vacuum tank needs to be called out to the site.</li></ul>
Inspect roofs & gutters	Every 6 months	<ul style="list-style-type: none"><li>• Clean out of leaves/debris.</li><li>• Remove any overhanging branches onsite.</li></ul>
Inspection of Permeable Paving	3-Monthly	<ul style="list-style-type: none"><li>• Check joints</li><li>• Check soil</li><li>• Check for blockages</li><li>• Check for ponding</li><li>• Check for uneven surfaces</li></ul>
	Following a large storm event	

