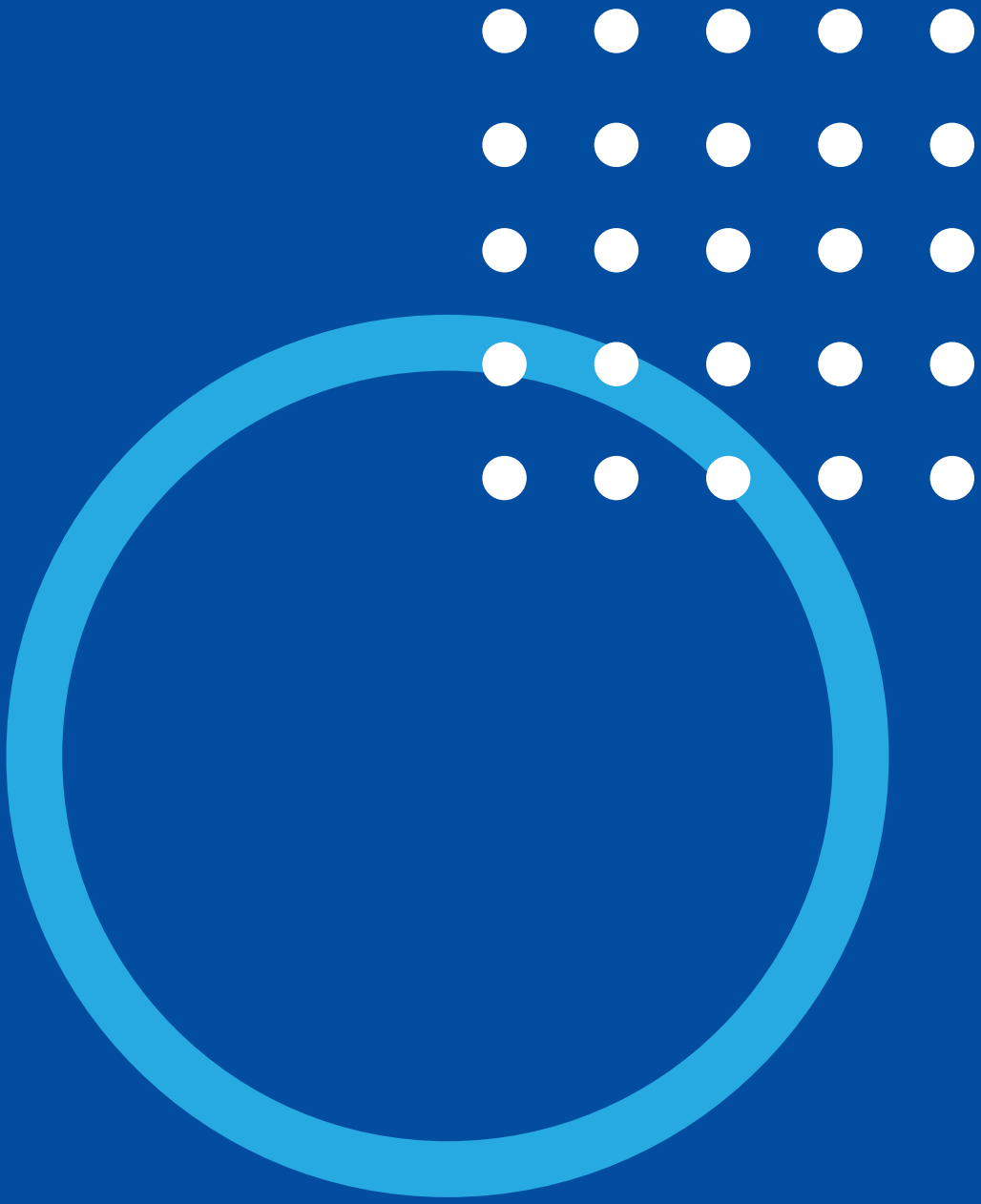
Compliance Guidelines for Clause 22.12 Stormwater Management

(Water Sensitive Urban Design)



Acknowledgements

This document was supported by Melbourne Water's Living Rivers Program.

The project consultants were Design Flow

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Introduction

This guideline provides advice on the implementation of Planning Policy Clause 22.12 Stormwater Management (Water Sensitive Urban Design). It provides a detailed explanation of how the objectives of the policy are to be applied to a range of development types.

All development planning applications that trigger Clause 22.12 must include a Stormwater Management Assessment detailing how the objectives of the policy will be met.

This guideline outlines the information that must be provided to Council in a SMA and includes a step by step explanation of how to develop a stormwater management strategy for a development site and a SMA.

The application of Clause 22.12 to new developments will assist the City of Port Phillip transition to a Water Sensitive City by reducing potable water use, creating greener urban environments, and minimising the impact of urban development on the environment by managing stormwater runoff.

Overview of Clause 22.12 requirements

Local Planning Policy Clause 22.12 applies to applications for:

- New buildings
- Extensions to existing buildings which are 50 square metres in floor area or greater
- A subdivision in a commercial zone.

The policy requires development applications to:

- Achieve the best practice water quality performance objectives set out in the Urban Stormwater Best Practice Environmental Management Guidelines (CSIRO, 1999):
  - 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% retention of typical urban annual load
- Use stormwater treatment measures that improve the quality and reduce the flow of water discharged to waterways. This can include but is not limited to:
  - collection and reuse of rainwater and stormwater on site
  - vegetated swales and buffer strips
  - raingardens
  - installation of water recycling systems
  - multiple uses of water within a single manufacturing site
  - direction of flow from impervious ground surfaces to landscaped areas
- Encourage measures to prevent litter being carried off-site in stormwater flows including:
  - Appropriately designed waste enclosures and storage bins, and
  - The use of litter traps for developments with the potential to generate significant amounts of litter
- Encourage the use of green roofs, walls and façades on buildings where practicable (to be irrigated with rainwater/stormwater) to enhance the role of vegetation on buildings in managing the quality and quantity of stormwater.

The full Clause 22.12 Stormwater Management (Water Sensitive Urban Design) provisions are provided in Appendix D.

Benefits of reducing stormwater pollutant loads

Pollutants associated with stormwater run-off from urban catchments are detrimental to the health of downstream waterways. Stormwater run-off from the City of Port Phillip is discharged to Port Phillip Bay via the stormwater drainage system. Stormwater pollutants, particularly nitrogen, have been identified as a major stressor to the Port Phillip Bay's long term health.

WSUD initiatives in new developments, such as rainwater tanks, raingardens and other infiltration devices, will help to improve stormwater run-off quality and therefore protect Port Phillip Bay.

Benefits of harvesting stormwater run-off in urban areas

The capture and use of stormwater run-off in urban areas has many social, economic and environmental benefits including:

- Minimising the impact of urban development on the environment, including waterways such as Port Phillip Bay
- Reducing potable water use where rainwater is used for fit for purpose uses, such as in toilets, hot water, laundry washing and garden irrigation
- Recharging local groundwater through the infiltration of stormwater run-off
- Creating greener urban environments with high visual amenity
- Passive cooling through increased vegetation cover.
- Reducing flood risk

Extensions:

To determine if your extension meets the policy trigger conduct the following calculation:

Proposed overall dwelling floor area (GFA) - Existing dwelling floor area (GFA)

If outcome is >50m^2 then the policy applies

If outcome is <50m^2 then the policy is not triggered however council encourages you to consider Water Sensitive Urban Design (WSUD) measures within your development application.

Example:

350m^2 (GFA Proposed) - 190m^2 = 160m^2 extension exceeds 50m^2 and triggers Clause 22.12

GFA - Gross Floor Area

How Clause 22.12 relates to other Council requirements

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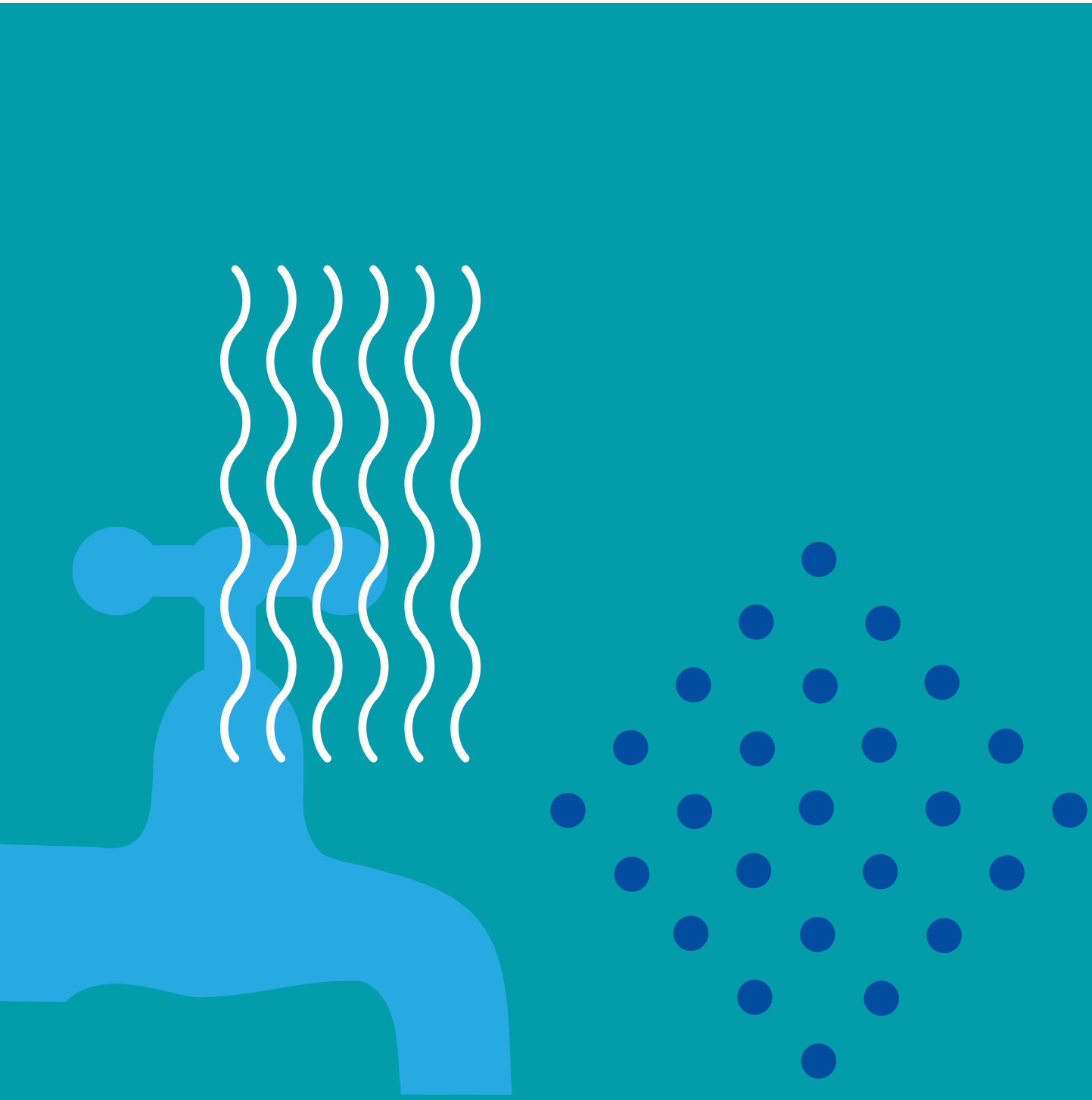

The objectives and intent of Clause 22.12 are consistent with the following Council planning policies and guidelines:

City of Port Phillip Planning Scheme Clause 22.13 Environmentally Sustainable Development

Planning Policy Clause 22.13 aims to implement the land development sustainability objectives and strategies outlined in Council's Municipal Strategic Statement. The policy objectives include:

- To improve water efficiency
- To reduce total operating potable water use
- To encourage the collection and reuse of stormwater
- To encourage the appropriate use of alternative water source (e.g. greywater)
- To reduce the impact of stormwater run-off
- To improve the water quality of stormwater run-off
- To achieve best practice stormwater quality outcomes
- To incorporate the use of water sensitive urban design, including stormwater reuse.

Sustainable Design Assessment in the Planning Process (SDAPP)

The SDAPP framework includes key environmental performance indicators in the planning approval process for assessing sustainable design of building related statutory planning applications. The SDAPP framework includes ten sustainable design categories including water efficiency and stormwater management. The framework applies to residential and non-residential development for new buildings or extensions to existing buildings which are greater than or equal to 50 square meters.

The SDAPP stormwater management objective is commensurate with Clause 22.12 and aims to reduce the impact of stormwater run-off by encouraging the incorporation of water sensitive urban design into urban development design.

Achieving Best Practice Stormwater Management

The majority of existing urban allotments do not meet best practice objectives for stormwater management. In essence this means they are contributing to pollution in Port Phillip Bay.

The Port Phillip Planning Scheme supports a transition towards best practice stormwater management in order to address legacy issues and deliver stormwater management to a new standard. In tandem with the requirements on private land, significant effort is also being put into improving Council owned public land across the city.

All new buildings and extensions to existing buildings of 50m^2 or greater are required to meet the policy objectives and these apply to the entire development site. The policy applies regardless of whether or not the development is increasing pre-development impervious areas as the intent is for all new development to meet a new standard of best practice stormwater management.

Determining the 'Water Sensitive Urban Design' that best suits your site

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A WSUD strategy addressing the objectives of this policy is the first and central part of the Cl.22.12 Stormwater Management Assessment. It must clearly demonstrate how stormwater run-off from a development site will be treated to meet best practice water quality standards.

The following section provides step-by-step guidance to developing a stormwater quality strategy for a development site. Case studies covering a range of common development types are provided in Appendix C.

Determine catchment area and discharge point(s)

The area of all external impervious surfaces within the development site need to be determined to enable the stormwater quality strategy to be developed. This includes surfaces such as roofs, balconies, verandahs, pergolas, concreted and paved areas. Depending upon the type of roof construction, sections of the roofed areas may drain to different points of the development, and therefore may need to be separated into sub-roof areas. Sub-roof areas may be combined where the roof run-off will be diverted to a common WSUD treatment, i.e. rainwater tank.

Swimming pools that drain to sewer can be excluded from the site stormwater catchment areas. An impervious splash zone (up to 1 metre wide) around the pool perimeter can also be excluded from the stormwater catchment areas.

The legal point of discharge for the property should be identified. Discharges from WSUD treatments will need to be conveyed to this point.

Note: Run-off from balconies is generally dirtier than other roof run-off so should not be diverted to rainwater tanks. Balcony run-off should be treated prior to discharge from the site.

Choosing treatment systems

A range of WSUD systems can be used to treat stormwater run-off from urban developments. The WSUD treatment system(s) adopted must respond to the scale and layout of the proposed development.

Diverting roof run-off to a rainwater tank and using rainwater for toilet flushing and other internal uses represents one of the most effective options for achieving water quality treatment objectives for roof run-off. Extracting water from rainwater tanks (e.g. for toilet flushing) diverts the rainwater and associated pollutants away from the downstream waterway.

Inground and planter box raingardens are commonly used to treat roof run-off and run-off from impervious surfaces such as concreted and paved areas. Impervious surfaces such as concreted and paved areas may also be directed to pervious surfaces such as turfed areas and garden beds.

In situations where run-off from impervious surfaces cannot be diverted to a WSUD treatment system, it may still be possible to meet the overall site stormwater quality requirements by providing additional treatment (i.e. increased rainwater tank volume) for some areas to compensate for the untreated run-off.

For some developments, it may possible to comply with the requirements of Clause 22.12 utilising only one WSUD treatment system; however some developments may require a combination of WSUD treatment systems.

A description of common WSUD treatment systems is provided below.

Rainwater tanks

Run-off from roof areas can be diverted to rainwater tanks and used for toilet flushing, hot water service and laundry connections. Rainwater can also be used for irrigating gardens and lawns, and car washing. For further information, please refer guidance on the use of rainwater tanks produced by the Environmental Health Committee of the Australian Health Protection Committee in 2010.

Rainwater tanks can be located above or below ground. Above ground tanks are generally cheaper than below ground tanks.

Run-off from roof areas can be discharged directly from down pipes into above ground rainwater tanks or conveyed via charged underground pipes. Charged pipes are generally needed where the majority of the roof drains to a single tank.

Rainwater tanks will require a pump and mains water switch system, which switches to mains water supply when the water level in the rainwater tank is low.

Rainwater tanks can assist to reduce peak flow rates from a site, however complying with Clause 22.12 will not guarantee that the development will meet on-site detention requirements specified by Council's engineering department when applying for legal point of discharge. This must be considered separately and is typically applied for once a planning permit has been issued. Refer to Council's website for further details on Stormwater Discharge (www.portphillip.vic.gov.au/stormwater_discharge.htm).

Best practice design requires that all rainwater tank overflows are ultimately discharged to the legal point of discharge. Tank overflows can also be discharged to other WSUD treatments, such as raingardens before the overflow connection reaches the legal point of discharge.

The minimum acceptable rainwater tank size for water quality treatment is 1,000 L. It may be beneficial to adopt a larger rainwater tank than the minimum size needed to meet stormwater quality standards to ensure maximum water harvesting. This can be achieved using Tankulator (http://tankulator.ata.org.au), an online rain harvesting calculator that enables the size of rainwater tanks to be matched to the roof catchment area and water demands.

Inground raingardens

Inground raingardens are specialised garden beds that treat stormwater run-off by infiltrating the water through a filter media. Stormwater that enters a raingarden is temporarily stored on the surface of the infiltration bed before passing through the filter media.

Inground raingardens comprise of several media layers, including an upper filter media layer (loamy sand), a middle transition layer (coarse sand) and a lower drainage layer (gravel). The infiltrated stormwater is collected at the base of the raingarden by a perforated pipe (underdrain) and the water is conveyed to the site's legal point of discharge. An overflow pipe protruding above the surface of the filter media conveys flows to the stormwater drainage system when the storage capacity above the raingarden is full.

Inground raingardens are extremely effective at removing suspended solids and nutrients from stormwater run-off, and provide onsite retention of stormwater run-off. They can be readily integrated with garden beds and planted with a wide range of plant species.

Note: The minimum acceptable size for an inground raingarden is 1 m^2 with a minimum width of 350 mm.

Planter box raingardens

Planter box raingardens are 'mini' raingardens constructed in elevated garden beds. Planter box raingardens are structured in the same way as an inground raingarden, with several filter layers and an underdrain connected to the stormwater drainage system.

Planter box raingardens are generally used where there is no garden space available to construct an inground raingarden (i.e. paved areas or balconies), on flat sites to allow the filtered flows to gravity feed to the legal point of discharge or for a desired landscaping outcome.

Note: The minimum acceptable size for a planter box raingarden is 1 m^2 with a minimum width of 350 mm.

Buffer strips and vegetated swales (onsite filtration)

Buffer strips and swales comprise of vegetated pervious areas such as garden beds and turfed areas along the edge of an impervious surface. Buffer strips are used to infiltrate stormwater run-off from impervious surfaces such a concrete and paved areas, where it is difficult to divert the run-off to a raingarden system. Swales are shallow depressions that help to direct the movement of stormwater around a site to support its greater infiltration and landscape benefit, before typically discharging into the piped stormwater system.

Diverting stormwater run-off to buffer strips provides passive irrigation and helps to increase the volume of water infiltrated to the local groundwater table.

Pollutants are removed from the stormwater run-off as it passes through the vegetation and is infiltrated into the ground. Careful site grading toward buffer strips is necessary for these systems to function.

Note: The maximum width of impervious area that can be treated by a buffer strip is 3 m. Buffer strips must be configured so that any run-off from the buffer strip is discharged to the legal point of discharge.

Porous and permeable pavements

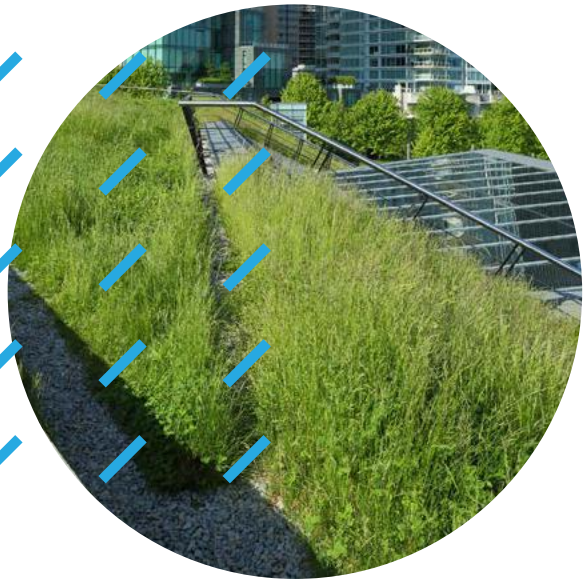
Porous and permeable pavements allow stormwater run-off to infiltrate to the underlying soils rather than running off impervious surfaces into the stormwater drainage system.

Porous pavements comprise of traditional masonry tiles that have a porous jointing material between the tiles. The jointing material generally comprises of sand or gravel, and allows the stormwater to pass through to the ground below.

Permeable pavements comprise of either tiles or solid pavements that have been designed to allow stormwater to pass through the tile or pavement surface to the ground below.

Porous and permeable pavements are often used in lieu of concreted surfaces for paths and courtyard areas. The infiltration of stormwater into the underlying soils provides passive irrigation and helps to increase the volume of water infiltrated to the local groundwater table.

Note: Areas to be covered with permeable paving are assumed to be pervious and can be excluded from STORM calculations. Areas to be covered with permeable paving must be clearly indicated on town



Green roofs, walls and façades

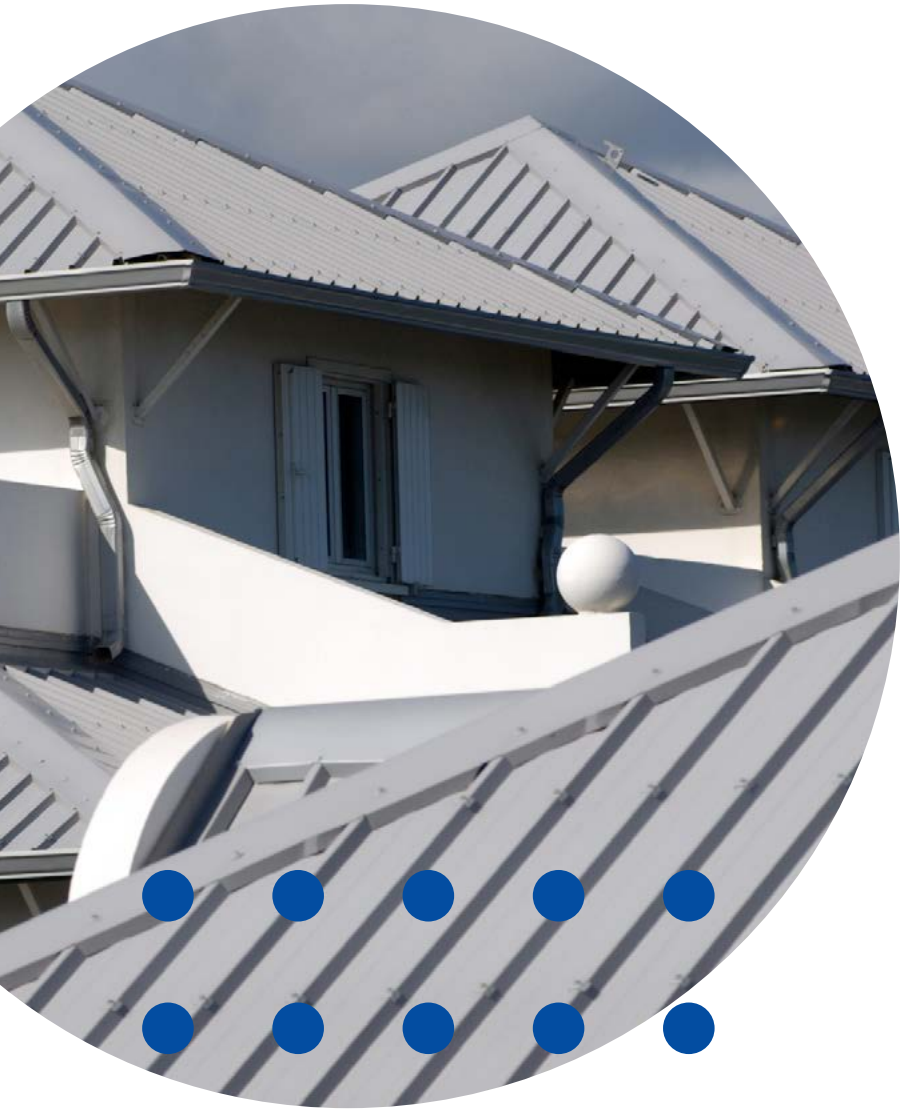
Green roofs, walls and façades can be added to new or existing buildings and can be used to treat and retain stormwater. They also compensate for the loss of urban greenery, and provide localized cooling and aesthetic improvements.

Green roofs are vegetated landscapes growing in a shallow growing substrate. The depth of the substrate is tailored to the type of vegetation to be planted and the weight capacity of the building's roof. Rainfall on the roof surface is removed by evapotranspiration. Water that filters through the growing substrate can be collected in a rainwater tank and use to irrigate the green roof or supply other water demands. Green roofs with an appropriate growing media ≥ 100 mm deep can be treated as pervious surfaces for the purpose of assessing a stormwater treatment strategy.

Green walls support vertical growing systems, and comprise of series of interconnected planting containers attached to an internal or external wall. Green walls can provide an attractive design feature whilst creating a cooler microclimate and improving local air quality. Green walls need to be regularly irrigated and may be connected to a rainwater tank to maximize rainwater use.

A green façade is created by growing climbing plants up and/or across the façade of a building. Climbing plants can attach directly onto the surface of the building or can be supported on a structure (e.g. frame) independent of the building. Green façades can also be irrigated using rainwater.

Please refer to the Growing Green Guide (www.growinggreenguide.org/) for additional information on green roofs, walls and façade's.



Step C

Size rainwater tank and/or treatment system

The size of the rainwater tank and/or WSUD treatment system required to meet best practice standards may be determined using two commonly used industry tools.

Option 1 – STORM Calculator

The STORM Calculator developed by Melbourne Water, is a user friendly, free online calculator that can be used to assess whether best practice water quality objectives have been achieved for a site.

The STORM Calculator requires that the total development area and all impervious areas within the site are listed, including impervious areas where no treatment will be provided for stormwater run-off. The calculator enables users to select from a range of WSUD treatment types.

Where a rainwater tank is used, the number of bedrooms is used estimate the demand for rainwater from the tank. The tool assumes 1 person per bedroom and a toilet flushing demand of 20 litres of water per person per day.

Where rainwater will be used to supply the laundry cold water tap, in addition to flushing the toilets, an extra bedroom can be added in the STORM assessment. This enables the calculator to account for the additional use of water in the laundry.

The overall STORM score is a weighted average of the scores for each impervious surface. An overall STORM score of 100% is required to demonstrate that best practice water quality objectives have been achieved for the site. The STORM Calculator enables users to iteratively change the size of WSUD treatment systems to obtain a STORM score of 100%.

The results of the STORM assessment must be submitted to Council as part of the WSUD Response to demonstrate compliance with the Clause 22.12 objectives.

STORM is appropriate to use for development sites that are 1 000m^2 or less. For sites over 1 000m^2 or where the sites impervious fraction is less than 40% or if multiple treatment trains are intended to be used or the site and development are too complex then refer to Option 2 - MUSIC.

The STORM Calculator can be accessed online at www.storm.melbournewater.com.au

Note: For a rainwater tank to contribute to meeting Part 3.12 of the National Construction Code (NCC) for a new residential building, it must be at least 2,000L, receive run-off from at least 50m^2 of roof and supply all toilets in the building. In some instances a rainwater tank less than 2,000L will be sufficient to achieve a STORM rating of 100% however the applicant may choose to adopt a 2,000L tank to get credit towards Part 3.12 or keep the tank size below 2,000L and adopt a solar hot water system to comply with Part 3.12

Option 2 - MUSIC

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is a modelling tool that uses historic rainfall data to estimate catchment run-off and predict the performance of urban stormwater management systems. It enables a significantly higher degree of modelling complexity and flexibility compared to the STORM calculator.

MUSIC is developed by eWater, an Australian Government owned not-for-profit organisation. MUSIC users must have a software licence and a minimum level of training and competency to develop a MUSIC model.

MUSIC models for development sites must be developed in accordance with the Melbourne Water MUSIC Guidelines (MUSIC Guidelines: Recommended input parameters and modelling approaches for MUSIC users. Melbourne Water, 2016). MUSIC can be purchased online at www.ewater.org.au

Council advises that MUSIC is used for all sites above 1 000m^2 or where the sites impervious fraction is less than 40% or if multiple treatment trains are intended to be used.

Melbourne Water MUSIC Guidelines can be accessed at: https://www.melbournewater.com.au/Planning-and-building/Applications/Documents/Music-tool-guidelines.pdf

Note: The basis for the rainwater or stormwater harvesting demands used in the MUSIC model must be provided. For residential developments, no justification for demand is required if the daily water demand in Table 1 are adopted. Outdoor water demands should not be included in the MUSIC model unless evidence is provided that these demands will persist for the life of the

Note: The City of Port Phillip do not accept nitrogen reductions from Gross Pollutant Traps (GPT's) or other proprietary stormwater systems within MUSIC calculations and as a proxy for raingardens in the STORM tool.

Table 1: Council approved rainwater tank demands

Use	Water demand
Toilet flushing[1]	20 litres per person per day (assume an average of one person per bedroom for residential sites)
Laundry[1]	21 litres per person per day
Hot water[2]	45 litres per person per day

[1] Toilet and laundry based on Gan & Redhead (2013) Melbourne Residential Water Use Studies.

[2] Hot water demand based on data provided by Sustainability Victoria (sustainability.vic.gov.au).

The MUSIC model and a summary of the modelled stormwater treatment performance must be submitted to Council as part of the WSUD Response as a digital .sqz file. Note: Any variations to the MUSIC default settings must be clearly indicated.

How to prepare a Clause 22.12 Stormwater Management Assessment

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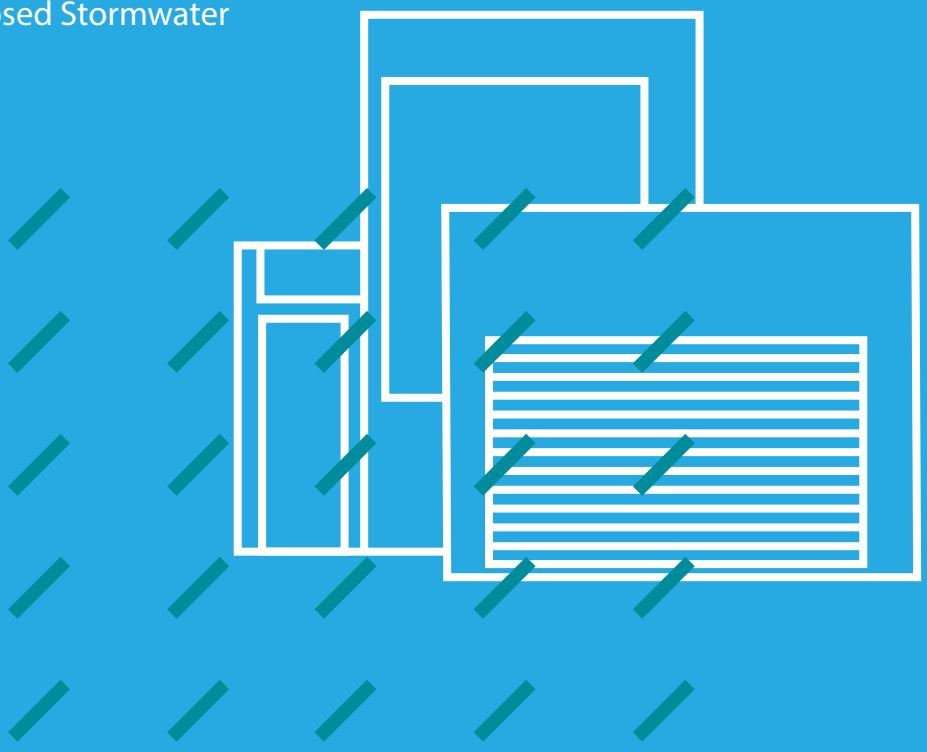
A planning application for a new development must be accompanied by a Stormwater Management Assessment which outlines how the treatment of stormwater run-off from the proposed development site complies with the objectives of Clause 22.12.

The SMA response submitted to Council must be a succinct report that includes the following information:

1. Stormwater Summary Report describing the proposed stormwater treatment system
2. A site layout plan
3. Design details of the proposed Stormwater treatment systems
4. Site Management Plan



The checklist below summarises the information that is required to be submitted in each of these components.

Item 1:
Stormwater Summary Report

The Stormwater Summary Report describes the stormwater treatment system as set out in the Site Layout Plan, including how it performs against the requirements of Clause 22.12.

The Stormwater Summary Report should outline:

1. Proposed changes to the site including;

- ☐ Existing site conditions
- ☐ Extent to which existing buildings are to be demolished (if applicable)
- ☐ What the proposed development will look like

2. Catchment areas (impervious and pervious) including;

- ☐ Overall site area
- ☐ Table and/or figure/ site or roof plan summarising impervious and pervious surface areas that are equal to 100% of the site area

3. Proposed stormwater treatment system/s including;

- ☐ Type of treatment system
- ☐ Treatment system locations
- ☐ Impervious catchment areas being treated by each system
- ☐ Rainwater demands
- ☐ Connections between treatment systems
- ☐ Connections to the legal point of discharge

4. A summary of the stormwater treatment modelling undertaken for the development site, including:

- ☐ Either a STORM rating report, or MUSIC model and treatment performance
- ☐ A statement of compliance confirming that the proposed Stormwater Quality Strategy complies with the objectives of Clause 22.12.

Examples for a range of common development types are provided in the Appendix.

Item 2:
Site layout plan

The site layout plan which forms part of the town planning drawings submitted as part of the planning application should identify the following information, ensuring consistency with the description and modelling outlined in the Stormwater Summary Report:

- ☐ Proposed site layout including the site boundary (including title dimensions and co-ordinates), existing and proposed buildings, external infrastructure (e.g. concrete and paved areas, pools, patios, decks) and landscape features (e.g. garden beds, turf areas).
- ☐ Legal point of discharge for stormwater run-off. If unknown, contact Engineering Services at Council to determine the legal point of discharge.
- ☐ All impervious and pervious surfaces including the area (m^2). Arrows should be used to indicate the direction of flow for impervious surfaces. For example, run-off from a roof area may be directed to different areas of the site. The roof sub-areas should be clearly identified and direction to which the run-off is directed identified. Impervious areas for which there will be no run-off treatment should be clearly marked.
- ☐ Proposed location and size of the proposed WSUD treatment system/s. This should include an indication of the pipe network connected between each impervious surface and the corresponding WSUD treatment system to demonstrate feasibility.

Item 3:
Design details

The design details of all proposed WSUD treatment systems should be provided. A detailed checklist of requirements to include for each specific WSUD treatment type are provided in the Appendix.

In general, plan views and cross sections should be provided (as relevant), showing

- ☐ Dimensions of any treatment/tanks (area, height, width, length)
- ☐ All drainage pipe infrastructure
- ☐ Details of the downpipe connections
- ☐ Details of overflow connection to the legal point of discharge
- ☐ Details and location of any pump system and mains water switch system
- ☐ Details of the pipe connections between any rainwater tank and end uses (e.g. toilet/s, laundry cold water taps and garden, if applicable).
- ☐ Details of backflow control devices
- ☐ Levels for each WSUD treatment including surface level, batter slopes, extended detention depth, filter layers, underdrain system
- ☐ Plant species and planting densities to be used in any vegetated treatment systems.

Typical section details are located as an appendix and on our website in .dwg format. These will be suitable for submission at the planning phase of your application.

Item 4:
Site management plan

The site management plan should explain how the site will be managed during the construction phase, to avoid stormwater pollution during on-site works. The plan should include:

- ☐ a statement outlining the construction measures required to prevent litter, sediments and pollution entering stormwater systems during construction.
- ☐ be communicated to the site contractors with the construction measures outlined in the plan incorporated into the site construction management plan.

For small developments of less than 10 dwellings, a short form site management plan response referring to the EPA Construction Techniques for Sediment and Pollution Control is considered acceptable.

Environmental Protection Authority (EPA) Victoria Construction techniques for sediment pollution control www.epa.vic.gov.au/our-work/publications/publication/1991/may/275

Reducing stormwater pollution from construction sites www.epa.vic.gov.au/~/media/Publications/981.pdf

A more detailed site management plan is required for large scale developments (10 dwellings or more (residential) or 1000m2 (non-residential). An example of a site management plan for a large scale development is provided in Appendix B.

Item 5:
Maintenance program

The critical element of this step is to advise how the proposed WSUD stormwater treatment will be maintained in the future.

The maintenance program should include:

- ☐ A clearly labelled diagram identifying the key elements that need to be regularly inspected and maintained
- ☐ A maintenance checklist summarising the key treatment system elements, inspection and maintenance tasks and frequency

Example maintenance manuals for common WSUD treatment systems are available from Council's website (www.portphillip.vic.gov.au/sustainable-design.htm):

- Rainwater tanks www.portphillip.vic.gov.au/Maintenance_Manual_Rainwater_Tank.pdf
- Raingardens
- www.portphillip.vic.gov.au/Maintenance_Manual_Raingarden.pdf
- Porous pavements
- www.portphillip.vic.gov.au/Maintenance_Manual_Porous_Pavement.pdf

The maintenance manuals provide lists of the key tasks required to maintain these WSUD treatment systems and the recommended frequency of each maintenance task. Where applicable, these manuals may be included as part of the SMA response in lieu of developing site specific maintenance programs for these WSUD treatment systems. At the planning phase applicants are encouraged to fill out the details that are known at the time and to leave sections such as construction date, building inspections dates and maintenance logs empty. Evidence of this document indicates that a maintenance plan is in place and will be filled out accordingly by the asset owner. Alternatively submissions may contain a customised maintenance program that is specific to your project.

Appendix A:
Example Stormwater Management Assessment

A1: Introduction

This SMA Response has been developed for the proposed development at 67 Beauchamp Street, St Kilda. The proposed development site is 235 m^2.

The site has two legal points of discharge; run-off from the western end of the site is directed to a stormwater pit located in Beauchamp Street, whereas run-off from eastern end of the site is directed to a grated stormwater drainage pit located in the courtyard area, and the stormwater conveyed to the stormwater drain in Georges Lane to the east of the allotment.

A2: Proposed SMA Response

A new residential building is proposed for the development site. The building will be double storey and have three bedrooms. The rear courtyard will be paved with porous pavers, and there will be garden beds and turfed areas to the front and rear of the property.

Stormwater run-off from the site will be treated using a rainwater tank, a raingarden and porous paving (Figure 1):

a) Rainwater tank

Run-off from the roof area (129.3 m^2) will be diverted to a 1,200L rainwater tank located underneath the paved area at the rear of the property. Rainwater will be used for toilet flushing. Overflows from the rainwater tank will be discharged to the existing grated stormwater pit located at the rear of the property and conveyed to the legal point of discharge in Georges Lane.

b) Raingarden

Run-off from the front balcony and verandah areas (36.5 m^2) will be diverted to a 1m^2 raingarden located in the front garden. The raingarden will comprise of a small basin and have 100 mm extended detention depth (ponding depth) plus 100 mm freeboard to the surrounding surface levels.

Stormwater will infiltrate through the vegetated filter media where physical and biological processes will remove pollutants including fine suspended solids, phosphorus and nitrogen. The stormwater will pass through the filter bed into an underdrain pipe and conveyed to the existing side entry pit in Beauchamp Street.

The raingarden basin will have an impermeable liner comprising of HDPE plastic. The underdrain system will be configured to create a saturated zone within the base of the basin, thus providing a permanent store of water. The depth of the saturated zone (within the drainage layer) will be set by the level of the underdrain outlet pipe. The saturated zone will provide a water source for the plants during extended dry periods.

The extended detention depth above the filter media surface (100 mm) will allow temporary ponding of the stormwater during rainfall events. When the extended detention volume is full, additional inflows to the raingarden will be discharged into the overflow pipe and conveyed to the legal point of discharge in Beauchamp Street.

It is envisaged that the raingarden will be planted with a suite of native plant species sympathetic to the surrounding garden bed planting layout.

c) Porous paving

Stormwater run-off from the rear courtyard will be infiltrated to the underlying soils using porous paving. During large rainfall events, stormwater that cannot be infiltrated via the pavers will be discharged to the stormwater drainage system via the stormwater drainage pit located in the courtyard area.

d) Other catchment areas

No treatment will be provided for run-off from the front entry path (1.85m^2). Rainfall on garden beds and turfed areas to the front and rear of the property will be directly infiltrated to the in situ soils.

STORM Report

Overall site STORM Rating = 101%

Catchment	Impervious area (m^2)	Treatment type	Treatment area/ volume (m^2 or L)	Occupants/Number of bedrooms	Treatment %	Tank water supply reliability (%)
Balcony and verandah	36.5	Raingarden	1	0	131	0
Roof	129.3	Rainwater tank	1,200	3	94.6	79.2
Entry path	1.85	None	0	0	0	0
Garden beds and turfed areas	21.5	Not included in STORM as pervious surface				

Statement of compliance:

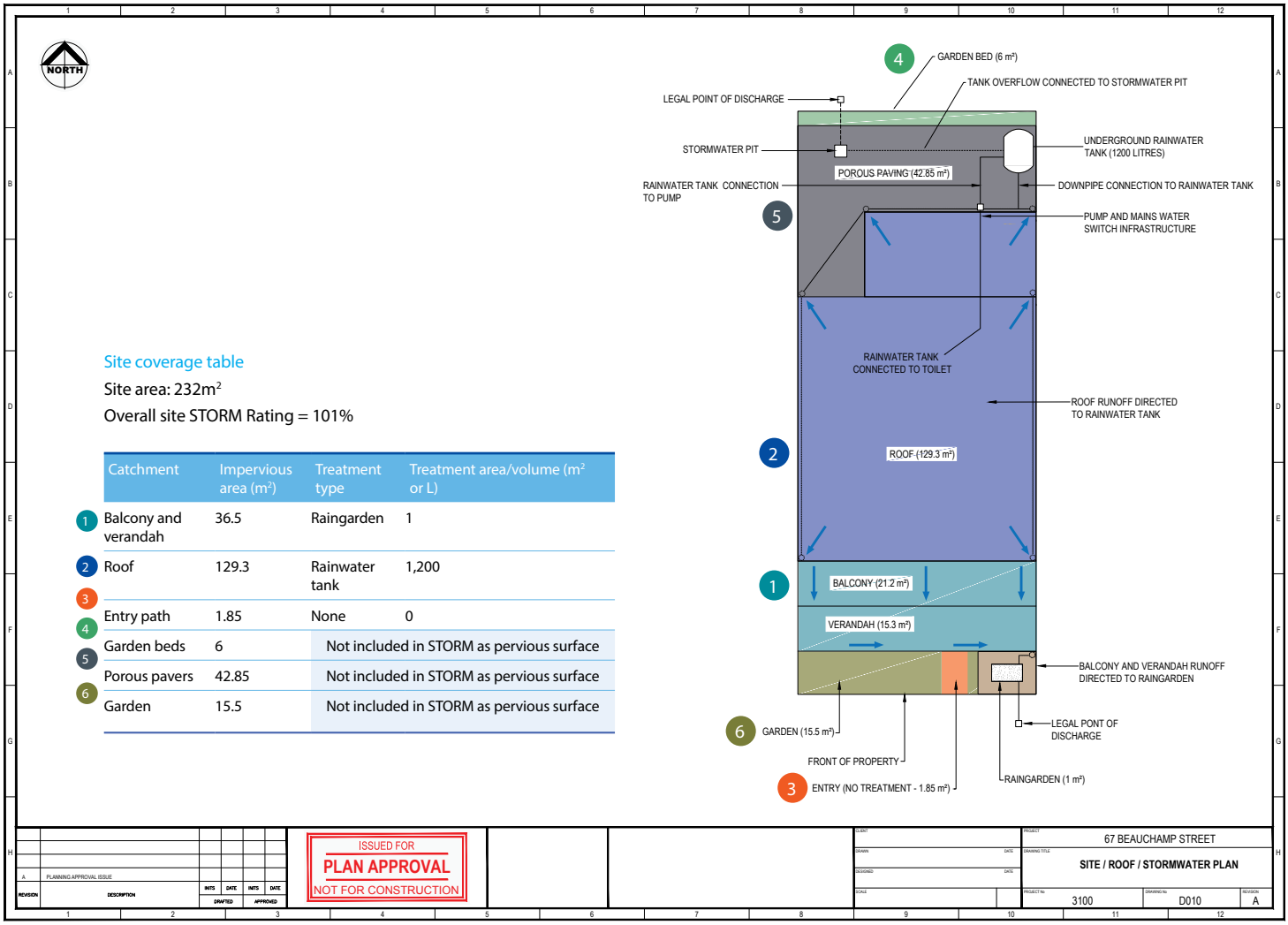
The STORM results indicate that the proposed Stormwater Quality Strategy complies with the objectives of Clause 22.12.

A3: Site Layout Plan

The site layout showing the stormwater management components of the proposed development are shown in Figure 1.

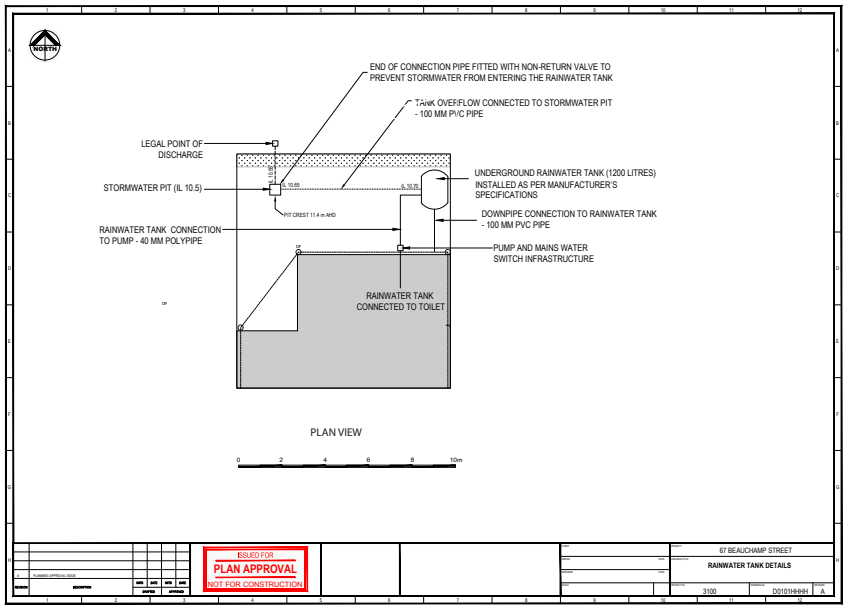
This page is available as a seperate document and .dwg file on our website www.portphillip.vic.gov.au/sustainable-design.htm

Figure 1: Site Layout Plan for 67 Beauchamp St, St Kilda.



A4: Design Details

The preliminary design details of the stormwater treatment systems are provided below. These details are available as a seperate documents and .dwg file on our website www.portphillip.vic.gov.au/sustainable-design.htm



A5: Site Management Plan

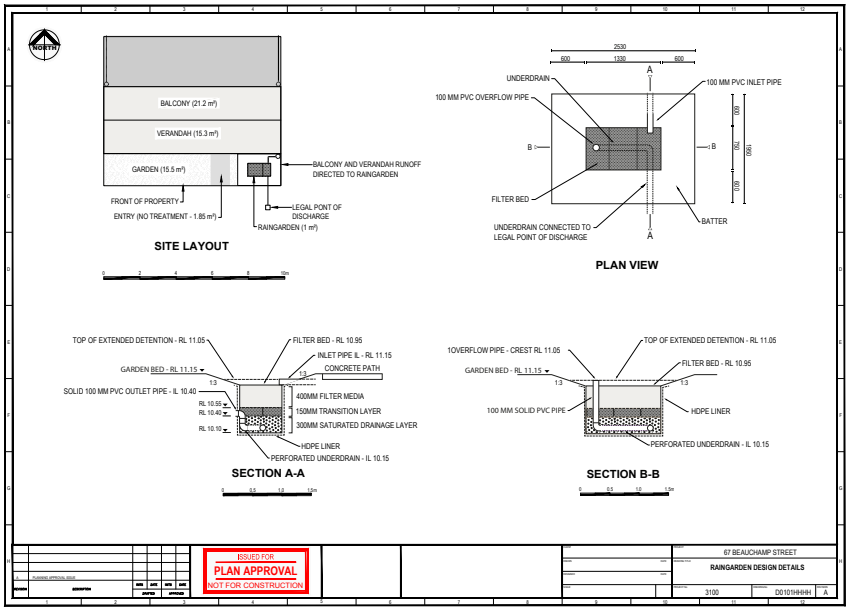
The project proponent recognises the need to identify and mitigate the potential environmental impacts associated with stormwater runoff, including erosion and sediment control during the construction process.

The construction site will be managed in accordance with the EPA (1991) 'Construction Techniques for Sediment and Pollution Control' to prevent sediments and pollutants from entering the local stormwater drainage system or adjoining properties.

Risks to be managed during the site construction include:

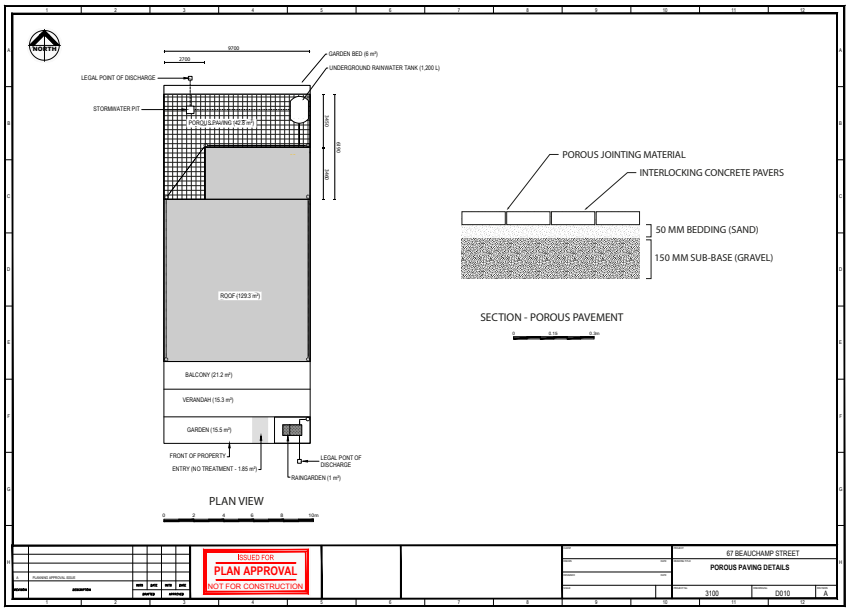
- Erosion and pollutants from vehicle access and works areas
- Erosion and deposition from stockpiles
- General erosion and site runoff
- Litter management

Specific actions to mitigate the above risks will be the responsibility of the site contractor and will be confirmed with Council prior to the commencement of construction.



A6: Maintenance program

The rainwater tank and, raingarden and porous pavement will be maintained in accordance with the maintenance programs provided by Council (www.portphillip.vic.gov.au/sustainable-design.htm).



Appendix B:
Example Stormwater Management Assessment

This section provides examples of how the Clause 22.12 objectives may be achieved for a range of common urban development types.

Example One:
New residential building

A new residential building is proposed for on a 235 m^2 development site (Figure 2). The building will be double storey and have three bedrooms.

Run-off from the roof area (129.3 m^2) will be diverted to an underground rainwater tank located under the turfed area at the rear of the property.

Rainwater will be used for toilet flushing.

Run-off from the front balcony and verandah (36.5 m^2) will be diverted to a 1m^2 inground raingarden (100 mm ponding depth) located in the front garden.

The rear courtyard will be paved with porous pavers, and there will be garden beds and turfed areas to the front and rear of the property.

No treatment will be provided for run-off from the front entry path (1.85 m^2).

STORM Report

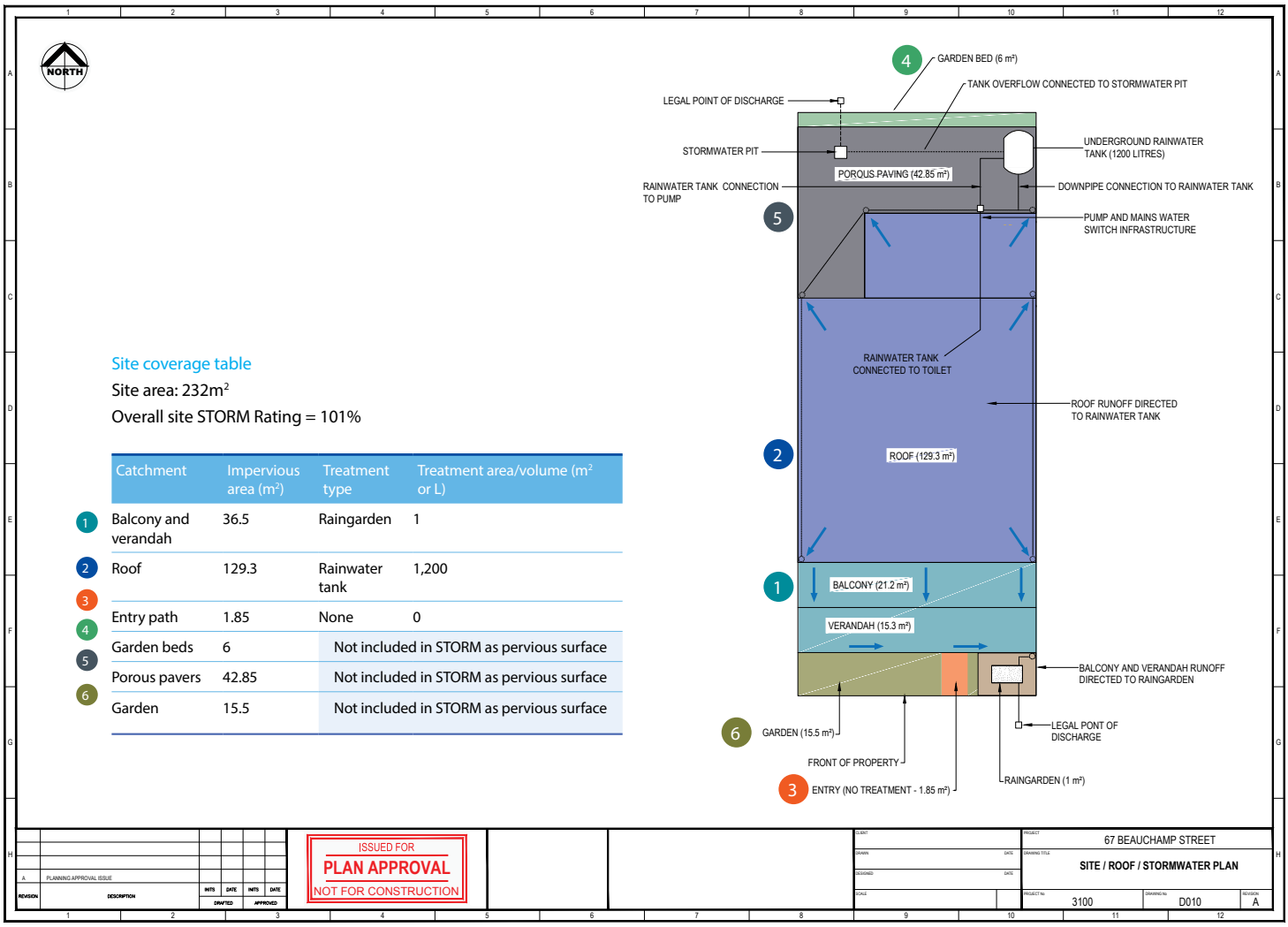
Overall site STORM Rating = 101%

Table 2: Example One STORM summary.

Catchment	Area (m^2)	Treatment type	Treatment area/ volume (m^2 or L)	Occupants/Number of bedrooms	Treatment %	Tank water supply reliability (%)
Balcony and verandah	36.5	Raingarden	1	0	131	0
Roof	129.3	Rainwater tank	1,200	3	94.6	79.2
Entry path	1.85	None	0	0	0	0
Garden beds and turfed areas	21.5	Not included in STORM as pervious surface				
Porous pavers	42.85	Not included in STORM as pervious surface				

(From www.storm.melbournewater.com.au)

Figure 2: Example One – Residential site layout plan.



Site coverage table

Site area: 232m^2

Overall site STORM Rating = 101%

	Catchment	Impervious area (m^2)	Treatment type	Treatment area/volume (m^2 or L)
1	Balcony and verandah	36.5	Raingarden	1
2	Roof	129.3	Rainwater tank	1,200
3	Entry path	1.85	None	0
4	Garden beds	6	Not included in STORM as pervious surface	
5	Porous pavers	42.85	Not included in STORM as pervious surface	
6	Garden	15.5	Not included in STORM as pervious surface	

Example Two:
Residential extension

An extension to an existing residential building is proposed on a 328m^2 development site.

The extended building will comprise of 188.7m^2 of roof, installation of permeable paving along the northern boundary (28.1m^2), a small shed (4.1m^2), a swimming pool with surrounding paved areas (30.5m^2), timber decking and garden beds adjacent to the pool area (Figure 3).

Run-off from south-east roof area of the existing residential building (49.1m^2) will be diverted to a 1m^2 inground raingarden (100mm ponding depth) located in the front garden of the property.

Run-off from the remaining roof areas (139.6m^2) including both the extension and existing roof areas, and the shed (4.1m^2) will be diverted to a 1,200L rainwater tank and used for toilet flushing and laundry taps (three bedrooms plus laundry).

The diversion of run-off from the existing roof area to the rainwater tank will require re-pitching of the gutter along the northern side of the building to ensure that it drains towards the rear of the property.

Run-off from the paved areas adjacent to the swimming pool will be diverted to the pool and will not be treated. The large deck area between the pool and building extension will be constructed over bare ground and is assumed to act as a pervious surface.

STORM Report

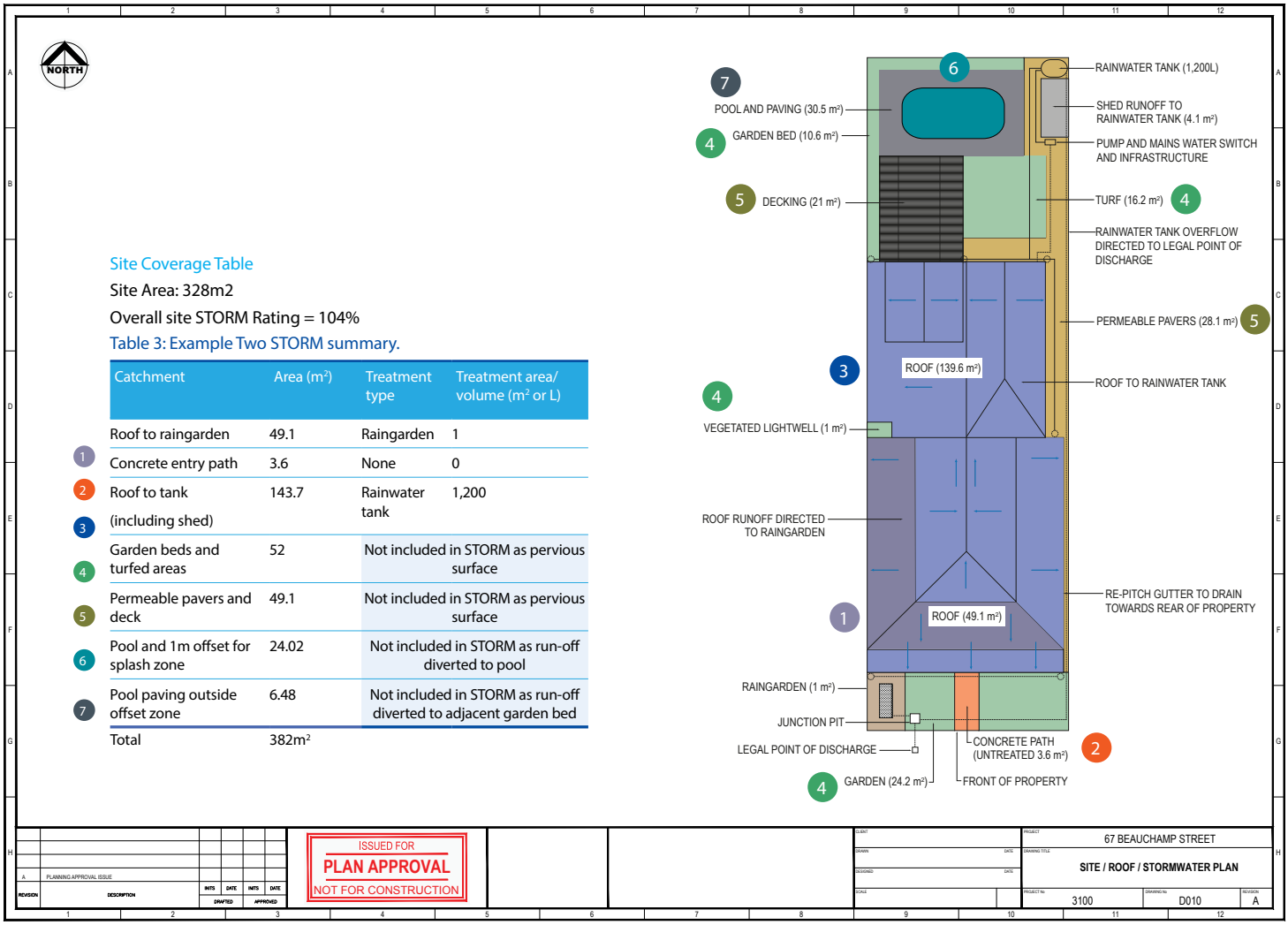
Overall site STORM Rating = 104%

Table 3: Example Two STORM summary.

Catchment	Area (m^2)	Treatment type	Treatment area/ volume (m^2 or L)	Occupants/Number of bedrooms	Treatment %	Tank water supply reliability (%)
Roof to raingarden	49.1	Raingarden	1	0	128.2	0
Concrete entry path	3.6	None	0	0	0	0
Roof to tank (including shed)	143.7	Rainwater tank	1,200	3	98.2	68.7
Garden beds and turfed areas	52	Not included in STORM as pervious surface				
Permeable pavers and deck	49.1	Not included in STORM as pervious surface				
Pool and 1 m offset for splash zone	24.02	Not included in STORM as run-off diverted to pool				
Pool paving outside offset zone	6.48	Not included in STORM as run-off diverted to adjacent garden bed				

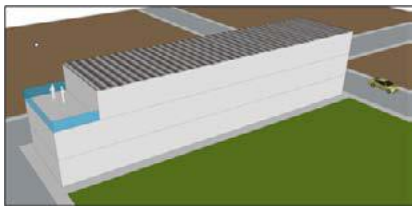
(From www.storm.melbournewater.com.au)

Figure 3: Example Two – Residential extension site layout plan.



Example Three:
Commercial

A commercial office building is proposed on a 150 m^2 development site. The building will occupy the entire site and comprise of three stories with five offices and three toilets. The typical building occupancy is estimated to be at least 10 people (i.e. equivalent to a residential development with ten bedrooms) (Figure 4). Run-off from the roof area (134 m^2) will be diverted to a rainwater tank located in the basement of the building. The rainwater will be used for toilet flushing. Run-off from the terrace (16 m^2) will not be treated and will be discharged to the stormwater drainage system at the legal point of discharge for the site.



STORM Report

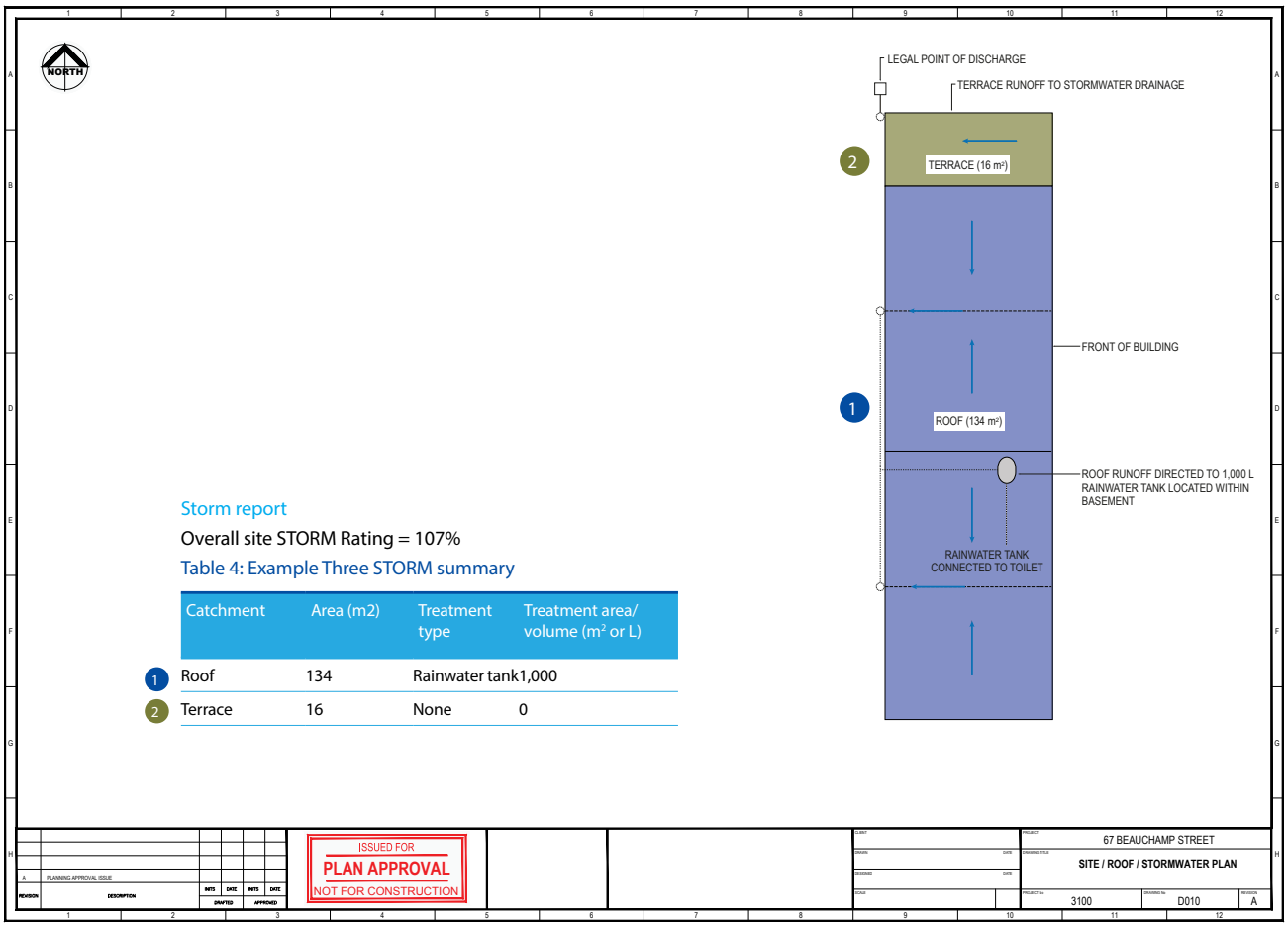
Overall site STORM Rating = 107%

Table 4: Example Three STORM summary.

Catchment	Area (m2)	Treatment type	Treatment area/ volume (m^2 or L)	Occupants/Number of bedrooms	Treatment %	Tank water supply reliability (%)
Roof	134	Rainwater tank	1,000	10	119.5	54
Terrace	16	None	0	0	0	0

(From www.storm.melbournewater.com.au)

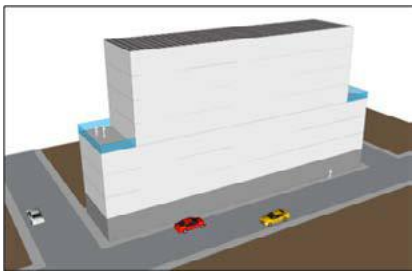
Figure 4: Example Three – Commercial site layout plan.



Example Four:
Mixed use

The mixed use development comprises of retail outlets at ground level and residential apartments on floors one to seven. The total area of the development is 502 m^2, comprising of a 402 m^2 roof area above the seventh floor and two 50 m^2 terraces at either end of the fourth floor (Figure 5). There are 12 residential units, each with three bedrooms.

Stormwater run-off from a portion of the roof (242 m^2) will be diverted to a 2,500 L rainwater tank located within the basement. Rainwater will be used within the building for toilet flushing. Stormwater runoff from the remaining areas of the roof at either end of the building (80 m^2 x 2) will be diverted to planter box raingardens located on the balconies. Treated stormwater from the raingardens and untreated run-off from the balconies will be discharged to the stormwater system at the legal point of discharge.



STORM Report

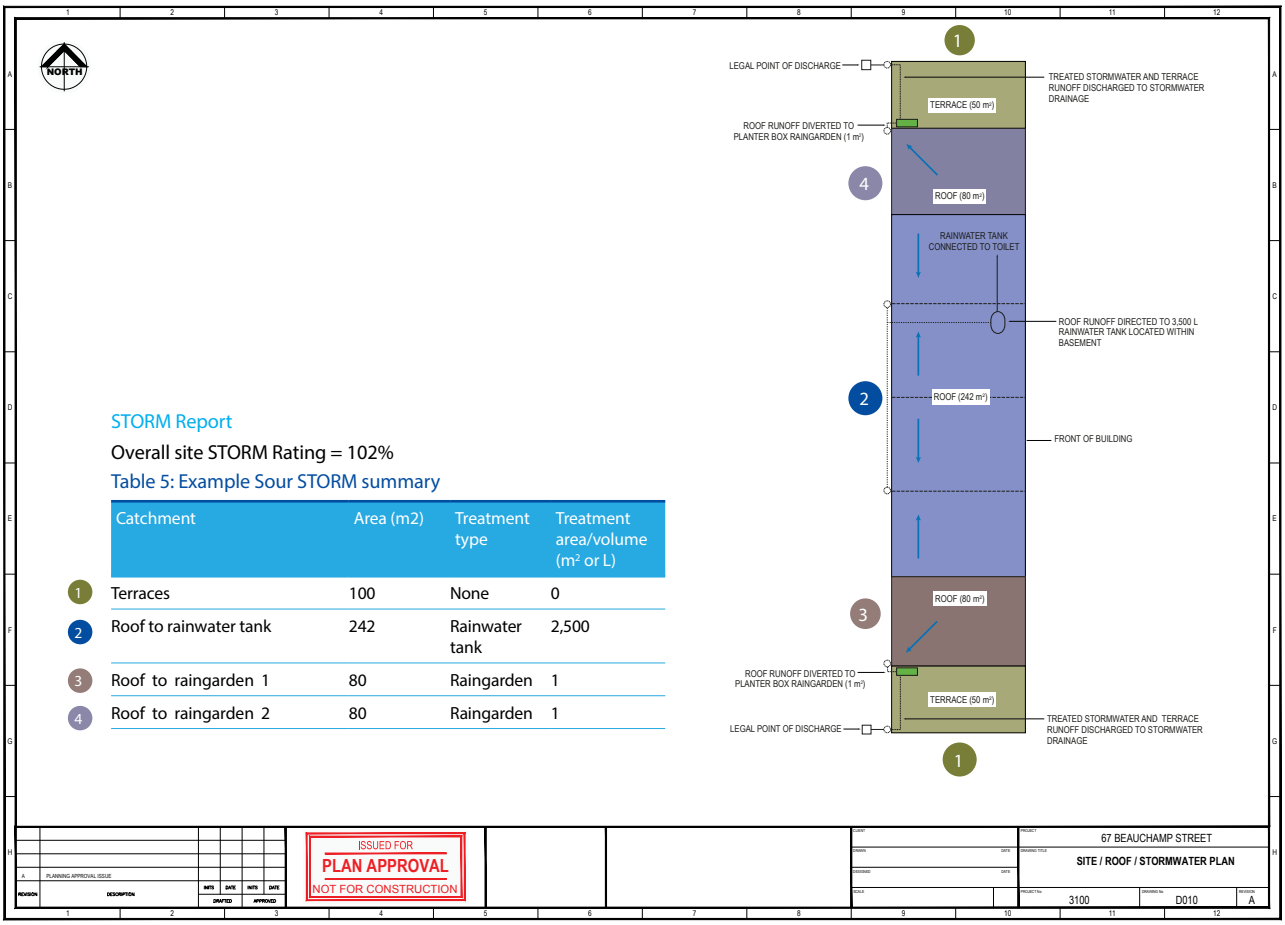
Overall site STORM Rating = 102%

(From www.storm.melbournewater.com.au)

Table 5: Example Sour STORM summary.

Catchment	Area (m2)	Treatment type	Treatment area/volume (m^2 or L)	Occupants/Number of bedrooms	Treatment %	Tank water supply reliability (%)
Terraces	100	None	0	0	0	0
Roof to rainwater tank	242	Rainwater tank	2,500	36	132.5	62
Roof to raingarden 1	80	Raingarden	1	0	118.5	0
Roof to raingarden 2	80	Raingarden	1	0	118.5	0

Figure 5: Example Four – Mixed use site layout plan.



Appendix C: Example Site Management Plan - Large Scale Developments

C1: Introduction

This Site Management Plan (SMP) has been developed for the proposed development at 34 Granite Road, Port Melbourne. The proposed development comprises of 12 two storey residential units.

Stormwater runoff from the site is directed to two legal points of discharge; a) a side entry pit located in Granite Road, and b) a stormwater drain located in Tyler Lane (located at the rear of the allotment).

The project proponent recognises the need to identify and mitigate the potential environmental impacts associated with stormwater runoff, including erosion and sediment control during the construction process. This includes managing the site in conjunction with the current best practice environmental management practices to prevent sediments and pollutants from entering the local stormwater drainage system or adjoining properties.

The SMP is separated into two components:

1. An erosion and sediment risk assessment, and
2. A site plan identifying risks and mitigation requirements.

C2: Risk Assessment Methodology

An erosion and sediment risk assessment was undertaken based on the risk methodology outlined in EPA Victoria – Site Management Plan Guidance Notes, 2015. The risk assessment requires the consideration of 'likelihoods' and 'risks' for potential risks. The risk matrix from the EPA document is provided in Table 6.

C3: Site risk assessment and proposed mitigation measures

The potential risks and proposed mitigation responses associated with erosion and sediment control for the proposed development are outlined in Table 7.

Table 6: Risk matrix adopted from the EPA Victoria – Site Management Plan Guidance Notes.

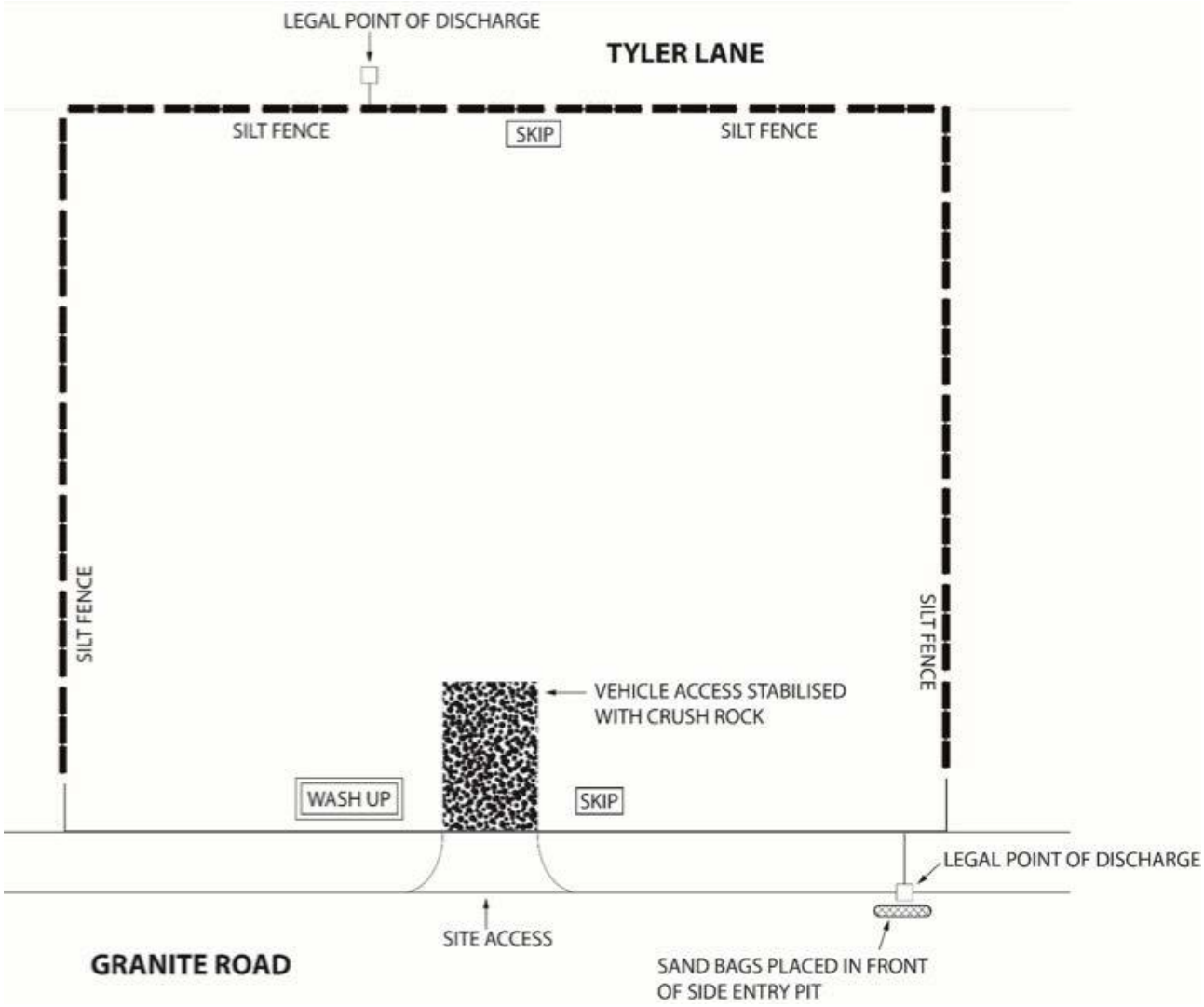
Likelihood		Rare	Unlikely	Likely	Certain
Consequence	Catastrophic	Medium	Significant	Significant	Significant
	Major	Medium	Significant	Significant	Significant
	Moderate	Low	Medium	Significant	Significant
	Minor	Low	Low	Medium	Medium

Table 7: Potential risks and proposed mitigation measures associated with erosion and sediment control for the proposed development at 34 Granite Road, Port Melbourne.

Risk	Overall risk	Mitigation measure
Erosion and pollutants from vehicle access and works	Low	Vehicle access to development site to be limited. Vehicle access points to be stabilised with crushed rock. Signage on 'no go' areas to be provided. Provide sediment retention structures (Figure 6).
Erosion and deposition from stockpiles	Significant	Construction works to be limited to dryer periods when possible. Stockpiling of soils/brickies sand to be limited. Sediment retention barriers to be placed around stockpiles. Erosion control blankets to be placed over stockpiles. Sediment retention barriers to be placed between construction site and adjoining properties, roads and lanes.
General erosion and site runoff	Medium	Construction works to be limited to dryer periods when possible. Vehicle access to development site is to be limited. External stormwater runoff should not be allowed to enter the development site. Signage on 'no go' areas to be provided. Sediment traps/filters to be placed in front of side entry pits (legal points of discharge on Granite Road) and any areas of the site that are subject to overland runoff from the site. Place sediment retention barrier around the stormwater pit located to the rear of the property. Sediment traps/filters are to be checked on a weekly basis to ensure that they are functioning as intended. Temporary down pipes are to be installed and stormwater runoff from the roof areas diverted to the legal points of discharge prior to the installation and commission of the rainwater tank. Side entry pits and stormwater junction pits to be cleaned of sediment following completion of the construction works.
Litter management	Low	Rubbish bins are to be provided including recycling bins. Rubbish bins are to be regularly emptied. Signage is to be provided for contractors identifying the requirement to use rubbish bins. Separate bins for paints and solvents to be provided. Rubbish bins are to be shut (where fitted with lids) or tarps installed following the completion of construction work each day. The construction site is to be swept each day following works to ensure that loose waste is not blown from the site. Bricks should be cleaned by brick layers during construction. No acid brick cleaning to occur on site. Ensure that the site superintendent understands the importance of onsite litter management.

C4: Site plan identifying risks and mitigation requirements

Figure 6: Site plan identifying proposed sediment and erosion control mitigation measures at 34 Granite Road, Port Melbourne.



Appendix D:
Port Phillip Planning Scheme Clause 22.12

22.12 Stormwater Management (Water Sensitive Urban Design)

This policy applies to applications for:

- New buildings
- Extensions to existing buildings which are 50 square metres in floor area or greater.
- A subdivision in a commercial zone
- This policy does not apply to an application for:
- A subdivision of an existing building.

22.12-1 Policy Basis

Increased development can result in greater hard surface area and changes to the volume, velocity and quality of stormwater drainage into natural waterways.

Achieving improved stormwater quality is a key objective in reducing the environmental impact of urban development on waterways and receiving water bodies in the Port Phillip catchment, this policy implements the best practice performance objective outlined in the Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO 1999 (or as amended) to achieve the objectives of the State Environment Protection Policy (Water of Victoria).

Waterways are an important environmental asset and measures that protect, or improve, water quality will be of significant benefit environmentally, socially and economically.

Incorporating stormwater treatment measure into the design of development, including wetlands, bio-retention systems and porous pavements to filter pollutants, will help to protect and improve the condition of the natural waterways and passively irrigate urban vegetation.

Water sensitive urban design (WSUD) is the design of buildings, subdivisions and works to minimise the hydrological impact of urban development on the surrounding environment. WSUD provides the means for treating stormwater run-off in a variety of ways so that the flow is reduced, and the quality of run-off is improved. Stormwater management can take various forms in the urban environment including infrastructure upgrades, streetscape layout changes, piping reconfigurations, storage tanks, and the use of different paving.

22.12-2 Objectives

- To achieve the best practice water quality performance objectives set out in the Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO 1999 (or 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 re-use.
- 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 wellbeing.

22.12-3 Policy

It is policy to:

- Require that development applications provide for the achievement of the best practice performance objectives for suspended solids, total phosphorus and total nitrogen, as set out in the Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO 1999 (or as amended).
- Require the use of stormwater treatment measures that improve the quality and reduce the flow of water discharged to waterways. This can include but is not limited to:
  - collection and reuse of rainwater and stormwater on site
  - vegetated swales and buffer strips
  - rain gardens
  - installation of water recycling systems
  - multiple uses of water within a single manufacturing site
  - direction of flow from impervious ground surfaces to landscaped areas.
- Encourage the use of measures to prevent litter being carried off-site in stormwater flows, including:
- Appropriately designed waste enclosures and storage bins, and
- The use of litter traps for developments with the potential to generate significant amounts of litter.
- Encourage the use of green roofs, walls and façades on buildings where practicable (to be irrigated with rainwater/stormwater) to enhance the role of vegetation on buildings in managing the quality and quantity of stormwater.

22.12-4 Application requirements

An application must be accompanied by a Water Sensitive Urban Design Response including, as appropriate

Requirement	Detail Required
A site layout plan showing the location of proposed stormwater treatment measures.	Show location, area draining to a treatment measure, and the connection points, of any: 1. Harvesting and Reuse Measures: such as raingarden tanks (must identify what the tank is connected to; toilets, gardens etc). 2. Water Quality Treatment Measures: such as raingardens, wetlands, buffers and swales. 3. Infiltration Measures: such as porous paving and infiltration trenches/sumps. 4. Passive Irrigation Measures: such as directing
A report outlining how the application achieves the objectives of this policy.	A report including an assessment from an industry accepted performance measurement tool such as STORM or MUSIC (or equivalent).
Design details, such as cross sections, to assess the technical effectiveness of the proposed stormwater treatment measures	Design details as appropriate to the stormwater treatment measure proposed.
A site management plan which details how the site will be managed through construction.	A statement is required outlining construction measures to prevent litter, sediments and pollution entering stormwater systems.
A maintenance program which sets out future operational and maintenance arrangements.	A statement is required outlining operational and maintenance measures to check the effective operation of all systems.

If the water quality performance objectives set out in the Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO 1999 (or as amended) are not met, an application must include justification for how the development meets the objectives of this policy.

22.12-5 Decision guidelines

Before deciding on an application, the responsible authority will consider, as appropriate:

- The extent to which the development meets the objectives and requirements of this policy.
- The Water Sensitive Urban Design Response.
- Whether the application meets the best practice performance objective and treatment measures.
- Whether the proposal is designed and incorporates works to maintain, or improve, the quality of stormwater within or exiting the site.
- Whether the proposal will significantly add to the stormwater discharge or adversely affect water quality entering the drainage system.
- Opportunities for water conservation and reuse that influence the use of water sensitive urban design.
- The level of ongoing management required to achieve and maintain the desired stormwater quality measures that will be used during the construction phase to prevent a loss of stormwater quality as a result of building activities, such as silt traps.

Appendix E: Design Detail Requirements for Various WSUD Types

22.12-6 Reference documents

City of Port Phillip Water Sensitive Urban Design Guidelines, 2009.

State Environment Protection Policy (Waters of Victoria), Environment Protection Authority, 2003 (as amended from time to time).

Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO, 1999 (as amended from time to time).

Water Sensitive Urban Design – Engineering Procedures: Stormwater, Melbourne Water, CSIRO Publishing, 2005 (as amended from time to time).

STORM calculator (as amended from time to time)

MUSIC – model for urban stormwater improvement conceptualisation tool (as amended from time to time).

22.12-7 Expiry

This policy will expire when superseded (as determined by the Minister for Planning) by Water Sensitive Urban Design provisions in the Victoria Planning Provisions or the Building Code of Australia Regulations, whichever happens first.

Rainwater Tanks

The design details for rainwater tanks are to include:

- Rainwater tank dimensions
- Details of the downpipe connections to the rainwater tank overflow connection
- Details and location of the pump system and mains water switch system
- Details of the pipe connections between the rainwater tank and toilet/s, laundry cold water taps and garden (if applicable).
- Details of the rainwater tank overflow connection (and backflow control if located underground) to the legal point of discharge

Raingardens

The design details for inground raingardens (and planter boxes) are to include:

- Raingarden area (m2)
- Raingarden layout (plan view)
- Cross-section plans outlining all drainage pipe infrastructure connected to the raingarden, batter slope to raingarden surface (to ensure safe level change), levels and specifications for the extended detention depth (ponding depth), filter layers, underdrain system, overflow pipe and connection to legal point of discharge.
- Planting schedule indicating plant species to be used and planting densities.

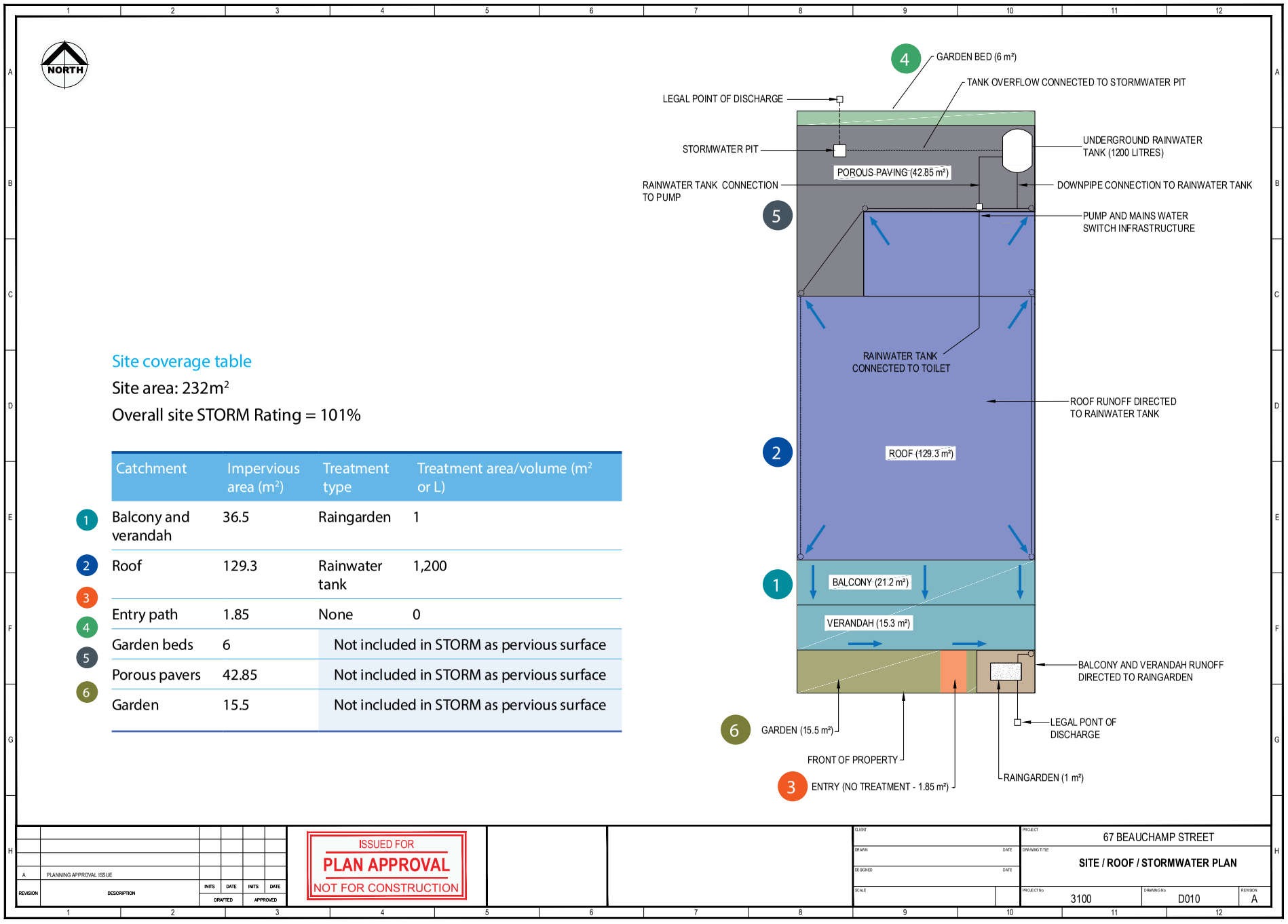
Permeable Pavements

The design details for permeable pavements are to include;

- Permeable paving area (m2)
- Type of permeable pavement to be used
- Cross sections showing the filter and bedding layers, and underdrain system (if applicable)
- Overflow connection to legal point of discharge

Appendix F: Example Stormwater Management Assessment Plans and Detail Sheets

Figure 2: Example One – Residential site layout plan.



Site coverage table

Site area: 232m²

Overall site STORM Rating = 101%

	Catchment	Impervious area (m²)	Treatment type	Treatment area/volume (m² or L)
1	Balcony and verandah	36.5	Raingarden	1
2	Roof	129.3	Rainwater tank	1,200
3	Entry path	1.85	None	0
4	Garden beds	6	Not included in STORM as pervious surface	
5	Porous pavers	42.85	Not included in STORM as pervious surface	
6	Garden	15.5	Not included in STORM as pervious surface	

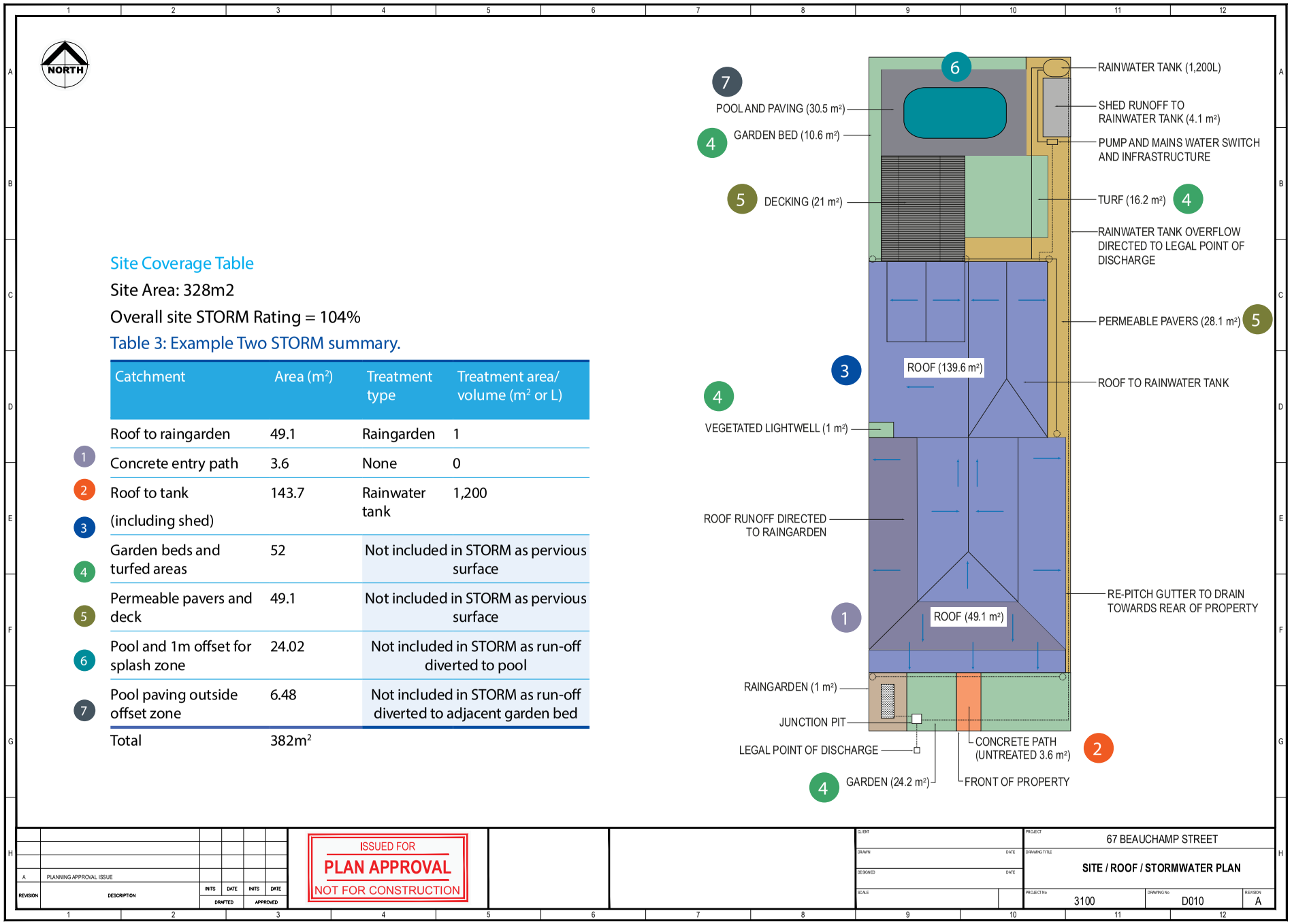
REVISION	DESCRIPTION	INITS	DATE	INITS	DATE
A	PLANNING APPROVAL ISSUE			DRAFTED	APPROVED

ISSUED FOR
PLAN APPROVAL
NOT FOR CONSTRUCTION

CLIENT
DRAWN DATE
DESIGNED DATE
SCALE

PROJECT: 67 BEAUCHAMP STREET
DRAWING TITLE: SITE / ROOF / STORMWATER PLAN
PROJECT No: 3100 | DRAWING No: D010 | REVISION: A

Figure 3: Example Two – Residential extension site layout plan.



Site Coverage Table

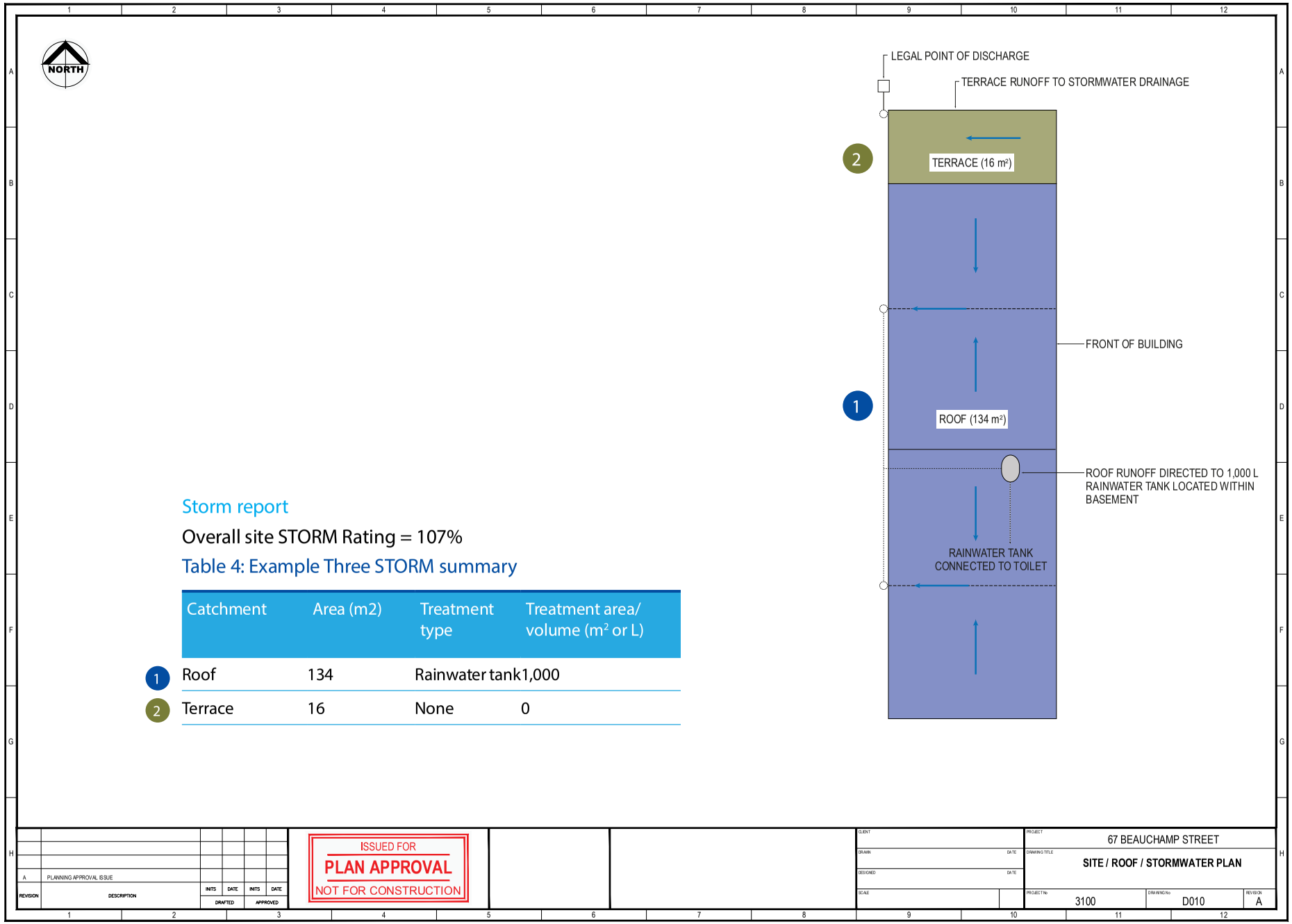
Site Area: 328m2

Overall site STORM Rating = 104%

Table 3: Example Two STORM summary.

	Catchment	Area (m²)	Treatment type	Treatment area/ volume (m² or L)
	Roof to raingarden	49.1	Raingarden	1
1	Concrete entry path	3.6	None	0
2	Roof to tank	143.7	Rainwater tank	1,200
3	(including shed)			
4	Garden beds and turfed areas	52	Not included in STORM as pervious surface	
5	Permeable pavers and deck	49.1	Not included in STORM as pervious surface	
6	Pool and 1m offset for splash zone	24.02	Not included in STORM as run-off diverted to pool	
7	Pool paving outside offset zone	6.48	Not included in STORM as run-off diverted to adjacent garden bed	
	Total	382m²		

Figure 4: Example Three – Commercial site layout plan.



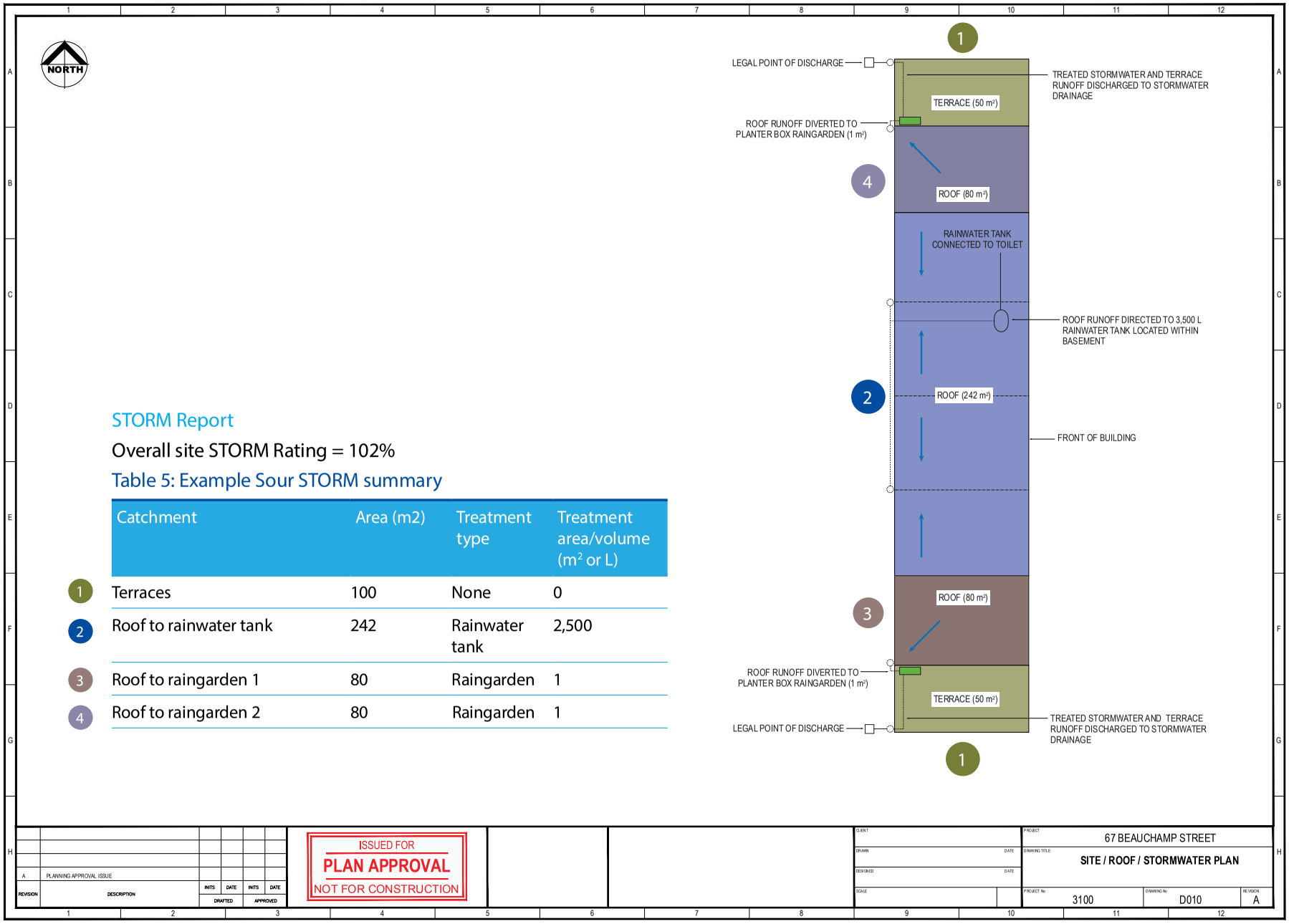
Storm report

Overall site STORM Rating = 107%

Table 4: Example Three STORM summary

Catchment	Area (m2)	Treatment type	Treatment area/ volume (m^2 or L)
1 Roof	134	Rainwater tank	1,000
2 Terrace	16	None	0

Figure 5: Example Four – Mixed use site layout plan.



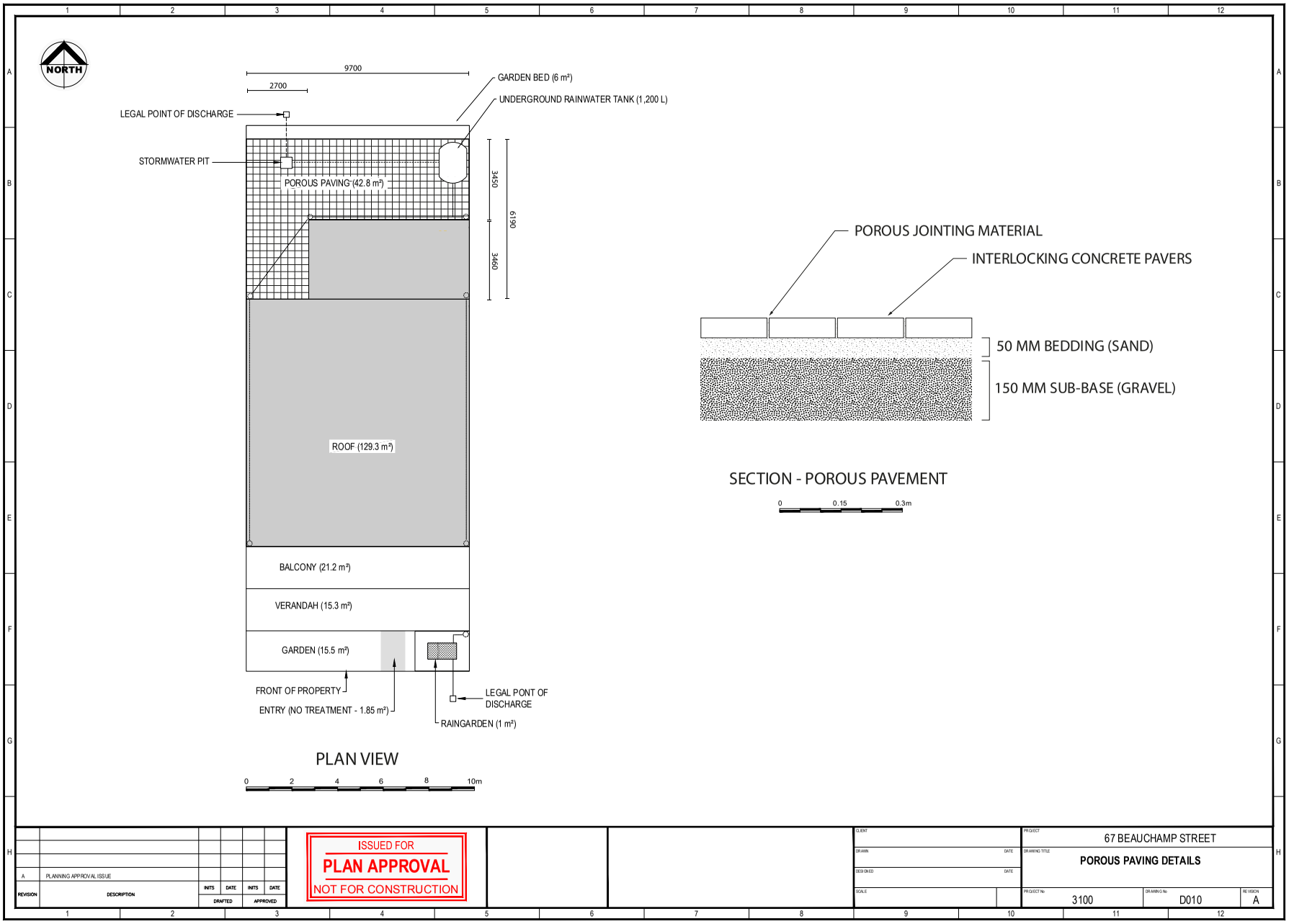
STORM Report

Overall site STORM Rating = 102%

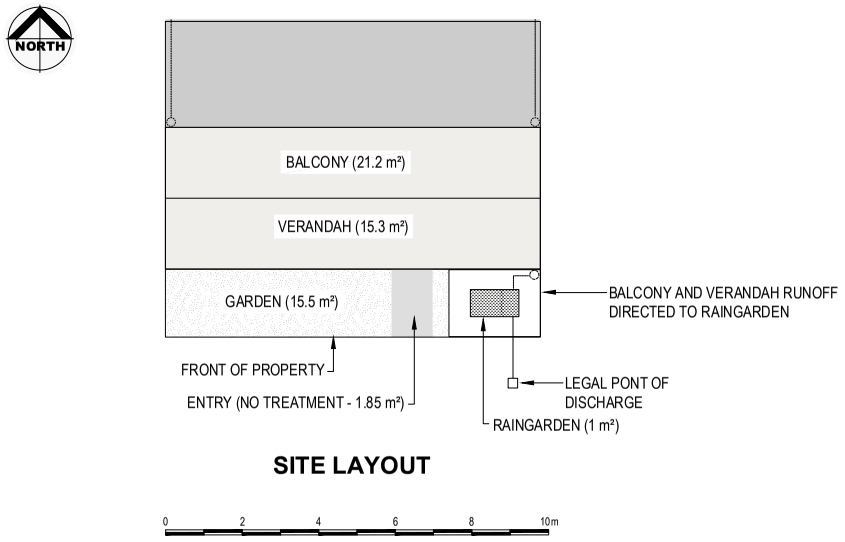
Table 5: Example Sour STORM summary

	Catchment	Area (m2)	Treatment type	Treatment area/volume (m^2 or L)
1	Terraces	100	None	0
2	Roof to rainwater tank	242	Rainwater tank	2,500
3	Roof to raingarden 1	80	Raingarden	1
4	Roof to raingarden 2	80	Raingarden	1

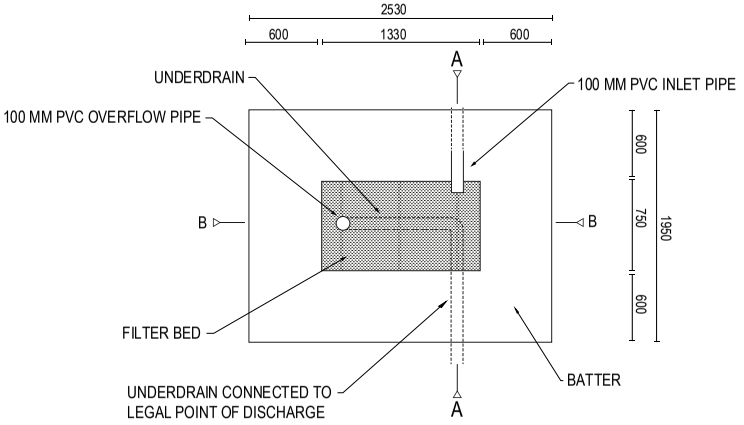
Porous paving design details



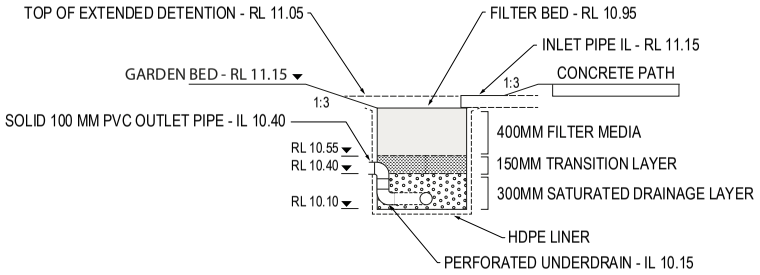
Raingarden design details



SITE LAYOUT

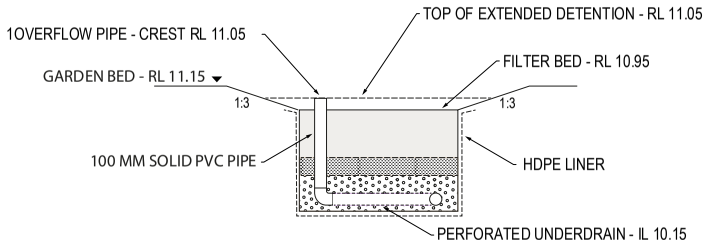


PLAN VIEW



SECTION A-A

0 0.5 1.0 1.5m



SECTION B-B

0 0.5 1.0 1.5m

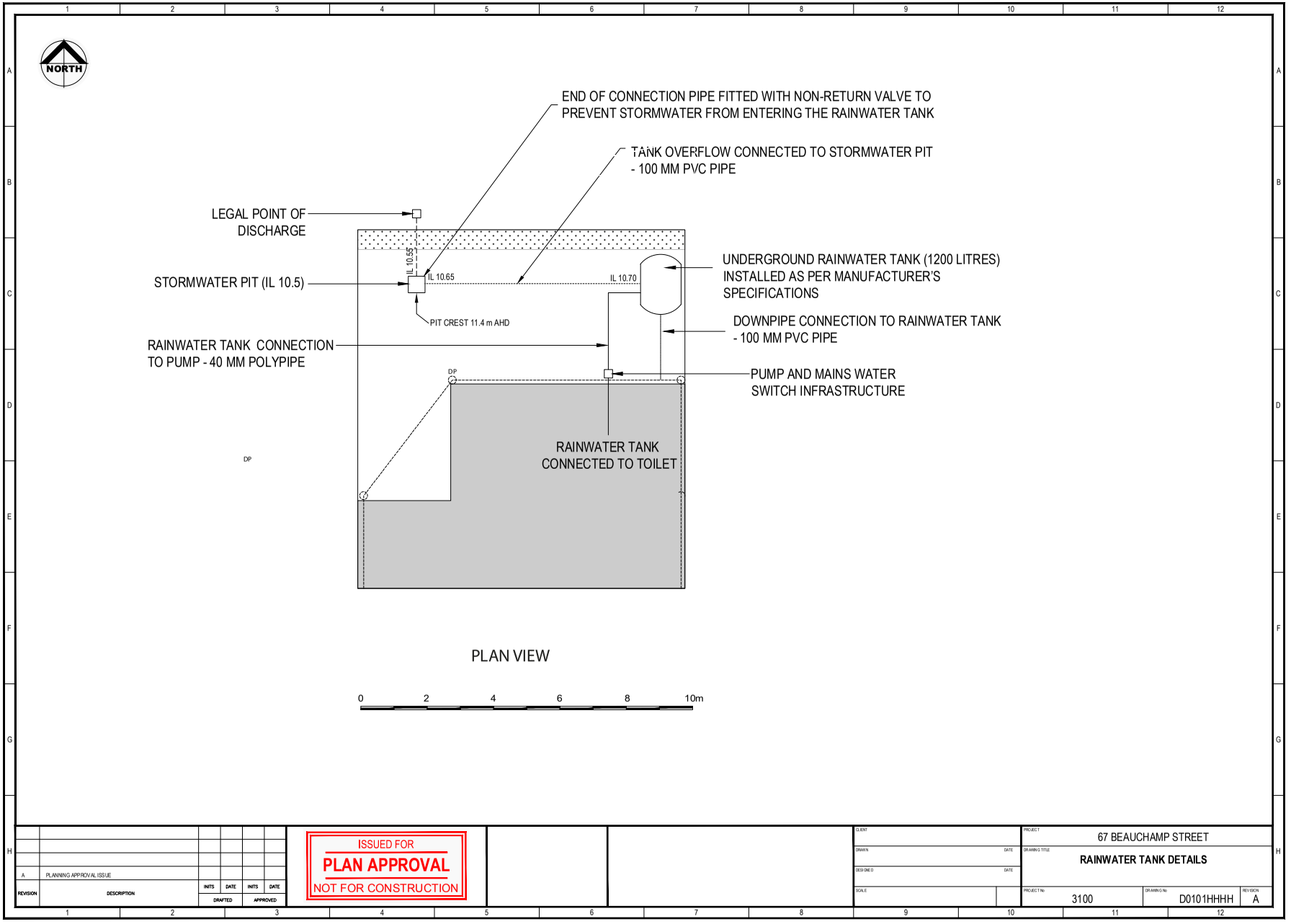
REVISION	DESCRIPTION	INITS	DATE	INITS	DATE
A	PLANNING APPROVAL ISSUE				

DRAFTED APPROVED

ISSUED FOR
PLAN APPROVAL
NOT FOR CONSTRUCTION

CLIENT
DRAWN DATE
DESIGNED DATE
SCALE

PROJECT: 67 BEAUCHAMP STREET
DRAWING TITLE: **RAINGARDEN DESIGN DETAILS**
PROJECT No: 3100
DRAWING No: D0101HHHH
REVISION: A


NORTH
END OF CONNECTION PIPE FITTED WITH NON-RETURN VALVE TO PREVENT STORMWATER FROM ENTERING THE RAINWATER TANK
TANK OVERFLOW CONNECTED TO STORMWATER PIT - 100 MM PVC PIPE
LEGAL POINT OF DISCHARGE
IL 10.55
STORMWATER PIT (IL 10.5)
IL 10.65
IL 10.70
PIT CREST 11.4 m AHD
UNDERGROUND RAINWATER TANK (1200 LITRES) INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS
DOWNPIPE CONNECTION TO RAINWATER TANK - 100 MM PVC PIPE
RAINWATER TANK CONNECTION TO PUMP - 40 MM POLYPIPE
DP
PUMP AND MAINS WATER SWITCH INFRASTRUCTURE
DP
RAINWATER TANK CONNECTED TO TOILET
PLAN VIEW
0 2 4 6 8 10m
A PLANNING APPROVAL ISSUE
REVISION DESCRIPTION INITS DATE INITS DATE
DRAFTED APPROVED
ISSUED FOR
PLAN APPROVAL
NOT FOR CONSTRUCTION
CLIENT
DRAWN DATE
DESIGNED DATE
SCALE
PROJECT 67 BEAUCHAMP STREET
DRAWING TITLE RAINWATER TANK DETAILS
PROJECT No 3100
DRAWING No D0101HHHH
REVISION A

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