



# Sustainability Management Plan for TLC Melbourne Pty Ltd, Integrated Community Facility

ADVERTISED PLAN  
Application No. P4/2024

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Revision	Date	Description	Author	Reviewer
P1	10/11/23	Preliminary Issue	AA	KNR
P2	10/11/23	Preliminary Issue – Minor updates	AA	--
0	19/12/23	Final Issue	AA	--
1	12/04/24	Final Issue – As per Council RFI	AA	--

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# Executive Summary

This Sustainability Management Plan (SMP) has been prepared for the proposed TLC Melbourne Pty Ltd, Integrated Community Facility at 321 Lower Heidelberg Road, Ivanhoe East VIC 3079, to summarise the ESD initiatives proposed for the project. This SMP report takes into consideration the comments provided by council in the Preliminary Assessment Report dated 16 February 2024, and addresses the key additional deliverables / clarification notes as agreed with council.

This report covers the following requirements from the Banyule Council Planning Scheme:

- Clause 22.05-1 Environmentally Sustainable Development
  - Non-residential – Development of non-residential building with a gross floor area of more than 1000m<sup>2</sup>:
  - Sustainability Management Plan Example tools include Green Star and BESS
  - STORM / MUSIC Assessment
  - Green Star Hand Calculation for daylight calculations

This SMP shows that the building has the design potential to achieve Best Practice in accordance with BESS, which is in line with the environmental performance outcomes as stipulated in the Banyule Planning Scheme.

## Key ESD Initiatives

The design for the commercial development includes ESD initiatives in line with council's objectives. BESS has been used to benchmark performance. The following summarises the ESD initiatives:

- High performance insulation beyond the minimum requirement in National Construction code (NCC);
- Reduction of potable water consumption through efficient high WELS rated sanitary fixtures and appliances;
- Recycling waste facilities to encourage diversion of waste to landfill;
- Adequate natural daylight to regularly occupied interiors of the building;
- Water-efficient landscape;
- Total capacity of 25kL Rainwater tank for reuse in toilets and connected to 500m<sup>2</sup> of irrigation;
- A total of 26m<sup>2</sup> raingarden of 300mm depth are proposed to treat the impervious areas;
- A total of 62kW Solar PV panels installed on the roofs for the development;
- Large Communal areas are designed for the occupants;
- The development is all-electric and no use of gas on-site for heating or cooking;
- Green roof is incorporated in the design for occupants and community use.

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# Introduction

This SMP has been developed to demonstrate the design potential of the development in line with the ESD requirements of the Banyule Planning Scheme for the proposed TLC Melbourne Pty Ltd, Integrated Community Facility at 321 Lower Heidelberg Road, Ivanhoe East VIC 3079. This SMP report takes into consideration the comments provided by council in the Preliminary Assessment Report dated 16 February 2024, and addresses the key additional deliverables / clarification notes as agreed with council.

## Building Description

The proposed development includes a double-storey community-based building considering the topography of the site. The development is mixed used developed which comprises of an early learning centre, medical centre, café, community centre, gym, indoor pool area with outdoor splash area, and health & wellbeing with admin space.

## Reference Documents

This report is based on the following architectural drawings received from VIA Architects:

Architect: VIA Architects  
 Level 3, 377 Lonsdale Street  
 Melbourne VIC 3000

The relevant documents and drawings used in compiling this report are as follows:

Project reference No.	Drawing No.	Revision	Title
1910034	TP-10-001	G	BASEMENT LEVEL 02
	TP-10-002	G	BASEMENT LEVEL 01
	TP-10-003	I	LOWER GROUND FLOOR PLAN
	TP-10-004	I	GROUND FLOOR PLAN
	TP-10-005	I	UPPER GROUND FLOOR PLAN
	TP-10-006	I	LEVEL 1 FLOOR PLAN
	TP-10-007	G	ROOF PLAN
	TP-40-001	G	BUILDING ELEVATIONS WEST & NORTH
	TP-40-002	G	BUILDING ELEVATIONS EAST & SOUTH

Table 1: Reference documents

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# ESD Initiatives

The BESS categories include Management, Water, Energy, Stormwater, Indoor Environment Quality (IEQ), Transport, Waste, Urban Ecology and Innovation. The development intends to target all the initiatives listed in this section. It has the preliminary design potential to achieve Best Practice with a BESS score of 61%. The disciplines responsible for each initiative during design are also listed below. The Head Contractor will be responsible for incorporating the ESD initiatives during construction and should substitute initiatives if the requirements listed in this report become unfeasible. This ensures that the sustainability requirements of the council are ultimately met.

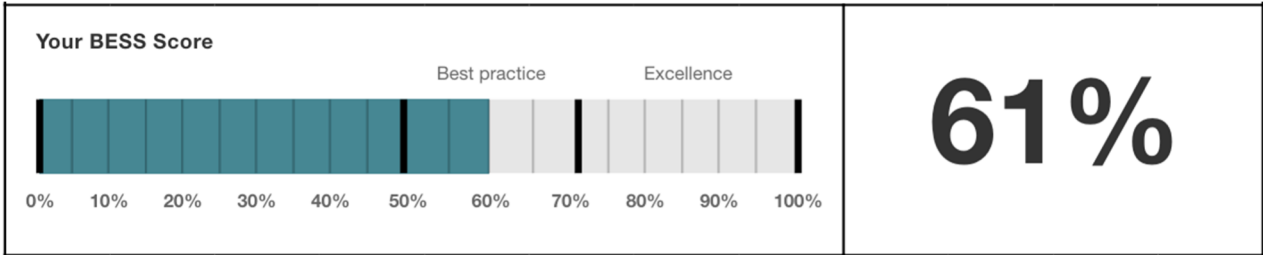


Figure 1: Best Practice has been achieved with a BESS score of 61%

## Management

The management category initiatives encourage passive design principles, monitoring of energy and water consumption, and engagement of stakeholders to use the building more effectively. The category is achieving a score of 37%.

Requirement	Requirement details	Design responsibility
3.2 & 3.3 Metering - Non-Residential and Common Areas	Utility meters provided for all individual commercial tenants and major common area services will be separately sub metered.	Head contractor
4.1 Building Users Guide	A building users guide be produced and issued to occupants. A Building Users' Guide should use non-technical language and be targeted to building occupants (and building managers where required). The Building Users' Guide may be a simple booklet and/or a combination of interpretative signage throughout the building. Its purpose is to help facilitate more sustainable behaviour by building occupants.	Head contractor

## Water

The objective of the requirements listed under the water category is to reduce potable water usage, achieving a score of 55%.

Requirement	Requirement details	Design responsibility
1.1 Potable Water Use Reduction	Provision of efficient water fixtures, fittings and connections. Bathrooms and kitchens will install fixtures with the following minimum WELS rating: <ul style="list-style-type: none"> <li>Commercial Kitchen taps: &gt;= 5 Star</li> <li>Bathroom taps: &gt;= 6 Star WELS rating</li> </ul>	Architect

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	<ul style="list-style-type: none"> <li>Washbasins: <math>\geq</math> 5 Star WELS rating</li> <li>Showers: 4 Star (<math>\geq</math> 4.5 but <math>\leq</math> 6.0)</li> <li>Toilets: <math>\geq</math> 5 Star WELS rating</li> <li>Dishwashers: <math>\geq</math> 4 Star WELS rating</li> </ul>	
Rainwater reuse	2 x 12.5kL rainwater tank is connected to all toilets in the development and part of landscape area as detailed in landscape drawings.	Architect / Hydraulic consultant
3.1 Water Efficient Landscaping	Approximately 500sqm of the landscape area to be connected to the RWT for irrigation. The remaining part of the landscape area to be xeriscape garden, which does not require irrigation system, will be installed. Landscaping featured on site will use water efficiency principles, including low water use plant selection and use of mulch.	Landscape consultant

## Energy

The objective of the requirements listed under the energy category is to minimize energy consumption for the development, achieving a score of 78%.

Requirement	Requirement details	Design responsibility
1.1 Building envelope	All exposed floors and ceilings that are part of the thermal envelope demonstrate a minimum 10% improvement in required NCC2022 insulation levels (total R-value upwards and downwards). All wall and glazing demonstrate meet at least the minimum requirement of the NCC2019 facade calculator.	Architect
2.6 Electrification	The development is all-electric and there is no use of gas for heating or cooking.	Architect/ Mechanical consultant
2.7 Heating and cooling	Heating and cooling systems are within one Star of the most efficient equivalent capacity unit available, or Coefficient of Performance (CoP) & Energy Efficiency Ratios (EER) not less than 85% of the CoP & EER of the most efficient equivalent capacity unit available.	Mechanical consultant
3.2 Water heating system	Water heating systems are within one star of the best unit available at the time of selection, or 85% or better than the most efficient equivalent capacity unit.	Hydraulic consultant
3.1 Carpark Ventilation	The basement carparks consist of Carbon Monoxide monitoring to control the operation and speed of the ventilation fans.	Architect/ Mechanical consultant
3.7 Internal Lighting	Maximum power density in at least 90% of the relevant building area meets the requirements in Table J7D3a of the NCC 2022 Vol 1. Refer to table no 1 below.	Electrical consultant
4.2 Photovoltaic system	A total of 62kW solar PV panels are installed on the roof facing West and South-West orientation of the Health & Wellbeing and on the indoor pool roof area respectively connected to the entire development. West and South-West orientation has been considered as a conservative approach. North orientation will be investigated with the installer for maximum solar gain.	Electrical consultant

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	during the later stages of design development.	
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Space	Illumination power density (W/m <sup>2</sup> )
Kindergarten rooms/Tutorial rooms	4.5
Offices	4.5
Staff room	3
Corridors	4
Community area	8
Kitchen and food preparation area	4
Entry lobby	9
Toilets	3
Meeting room	5
Storage/Cleaner's room	1.5
Café and a space for the serving and consumption of food or drinks	14

Table 2 – Illumination power density used in the development according to NCC 2022 Vol 1 table J7D3a.

### Stormwater

The objective of the stormwater category is to achieve best practice stormwater quality objectives through reduction of pollutant load (suspended solids, nitrogen and phosphorus), achieving a total score of 100%.

Requirement	Requirement details	Design responsibility
1.1 Stormwater Treatment	<p>Treatment of stormwater to reduce the following pollutant loads: total suspended solids, gross pollutants, total nitrogen, and total phosphorus.</p> <p>Stormwater from a roof area of approximately 817m<sup>2</sup> will be diverted into 2 x 12.5kL rainwater tanks situated in Basement 1. The roof area over indoor pool, health and well-being centre, entrance and community centre are drained into the RWT to reduce the potable water consumption.</p> <p>Stormwater from impervious areas of approximately 1077m<sup>2</sup> will be diverted into 3 different rain gardens of sizes 2 X 8 m<sup>2</sup> and 1 X 10 m<sup>2</sup> with 300mm extended detention depth. The treated areas treated via rain gardens includes the childcare roof area, impervious entrance and pathways and impervious paths around the outdoor splash area (refer to landscape plans for details and STORM markup for locations).</p> <p>The STORM assessment achieves a score of 120%, refer to Appendix B for the STORM calculator and STORM markup.</p> <p>Having a combination of 3 rain gardens to treat the impervious areas and 2 x 12.5kL rainwater tank provides a suitable and effective WSUD approach for the project. This results in the reduction of potable water consumption for the</p>	<p>Architect / Hydraulic consultant / Landscape</p>

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	development by 30%. The tank water supply reliability for both the tanks are 82% and 81% as shown in the Melbourne STORM Calculator.	
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### Indoor Environment Quality

The indoor environment quality (IEQ) category provides a high level of amenity and energy efficiency by designing for natural lighting, ventilation, and passive cooling opportunities. This category achieves a score of 50%.

Requirement	Requirement details	Design responsibility
1.4 Daylight Access – Non-Residential	45% of the floor area of the regularly occupied areas achieves a daylight factor of at least 2%. Windows must have VLT equal to or greater than 40%. Refer to Appendix C for daylight mark up carried out via Green Star Hand Calculation.  The transit spaces such as waiting areas and passages have been excluded from the calculations. Areas such as storerooms, lifts, stairs, lift lobby and all amenities are excluded from the daylight hand calculations as well.  Refer to Appendix C demonstrating daylight compliance calculation which is carried out through Green Star hand calculation methodology for each floor and the overall compliance % area is stated on the Lower ground floor plan for the development.	Architect
2.3 Ventilation - Non-Residential	The ventilation systems are designed to achieve 800 ppm CO2 concentrations, also to monitor and to maintain.	Mechanical consultant
3.4 Thermal comfort - Shading	90% of the east, north and west glazing regular-use areas have appropriate external shading.	Architect
4.1 Air Quality	All paints, sealants, adhesives, carpet, and engineered wood meet the maximum total indoor pollutant emission limits. To use products with low total VOC emissions in the development.	Architect

### Transport

The objective of the transport category is to minimise the usage of private passenger cars. This category achieves a score of 66%.

Requirement	Requirement details	Design responsibility
1.4 Bicycle Parking – Non-Residential	The development exceeds the planning scheme requirements for employees and visitors bicycle parking by at least 50%, as required by BESS. The development consists of 36 total bicycle spaces. 16 bicycle spaces for employees and 20 for visitors.	Architect
1.6 End of Trip Facilities - Employees	There are End of Trip facilities provided across Lower ground and Ground floor levels with total of 2 showers and 16 lockers for the employees.	Architect
2.1 Electric Vehicle Infrastructure	Facilities are provided for the charging of electric vehicles in the basement 01 level car park. A total of 7 EV charging ports are provided.	Architect

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The Electric vehicle charging capacity specified is to support a minimum of Level 2 (Mode 3) 32 Amp EV car charging.

7 EV charging car spaces

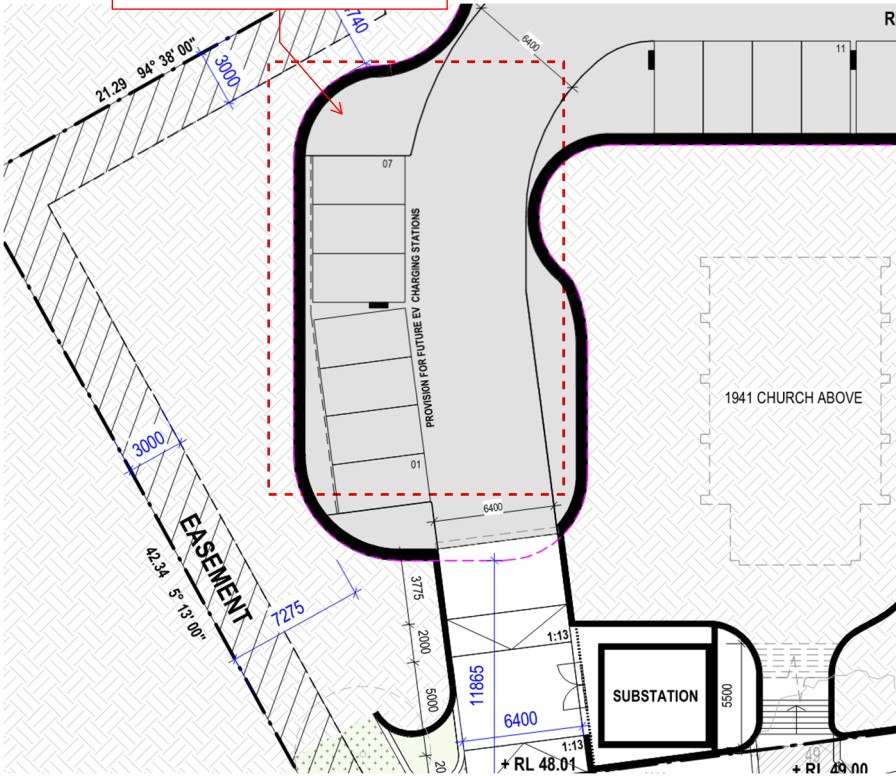


Figure 2: Basement 01 level showing 7 number of EV charging car spaces

### Waste

Requirements listed under the waste category aim to minimise organic waste and recyclable material going to landfill. This category achieves a score of 33%.

Requirement	Requirement details	Design responsibility
2.2 Operational Waste - Convenience of Recycling	Recycling and general waste bin facilities are available and accessible equally.	Architect/Waste consultant

### Urban Ecology

Requirements listed under the urban ecology category aim to encourage green spaces for the development. This category achieves a score of 75%.

Requirement	Requirement details	Design responsibility
1.1 Communal Spaces	400 sqm of Community areas include gym, terrace garden, and community centre.	Architect
2.1 Vegetation	Approximately 57% of the site area is covered with vegetation including the green roof/terrace garden.	Architect/Landscape
2.2 Green Roofs	The development incorporates a green roof/terrace garden as detailed in the landscape plans.	Architect/Landscape

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## Innovation

This category has not been targeted for the project.

## Other Strategies

Requirements listed below are not exhaustive but is recommended to be integrated into the design. These initiatives do not fit into the above categories.

Requirement	Requirement details	Design responsibility
Urban heat island effect	Light colour roof materials are nominated for the roof.	Architect
Sustainable construction materials	For concrete used as part of the development, approximately 25% of cement is replaced with Supplementary Cement Materials (SCM); e.g., fly ash or ground granulated blast furnace slag (GGBFS)	Architect / Head Contractor
	All timber is responsibly sourced and FSC or PEFC certified. Use of recycled timber will be investigated further at Design development stage.	
	All paints, sealants, adhesives, carpet, and engineered wood meet the maximum total indoor pollutant emission limits. To use products with low total VOC emissions in the development for example specify products that meet current GECA, Global GreenTag GreenRate, Carpet Institute Australia Environmental Classification Scheme Level 2, Green Star or WELL standards for TVOC in paints, adhesives and sealants (by volume) and carpets (by area) and for Formaldehyde in engineered wood (by area).	
Construction waste	At least 70% of construction and demolition waste to be diverted from landfill by recycling and reuse	

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# Appendix A – BESS report

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# BESS Report

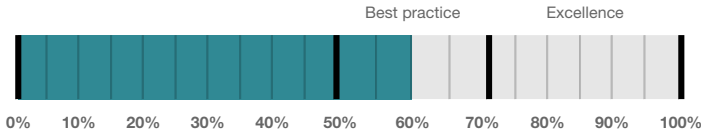
Built Environment Sustainability Scorecard



This BESS report outlines the sustainable design commitments of the proposed development at 321 Lower Heidelberg Rd Ivanhoe East Victoria 3079. The BESS report and accompanying documents and evidence are submitted in response to the requirement for a Sustainable Design Assessment or Sustainability Management Plan at Banyule City Council.

Note that where a Sustainability Management Plan is required, the BESS report must be accompanied by a report that further demonstrates the development's potential to achieve the relevant environmental performance outcomes and documents the means by which the performance outcomes can be achieved.

## Your BESS Score



# 61%

## Project details

**Address** 321 Lower Heidelberg Rd Ivanhoe East Victoria 3079  
**Project no** 25F8528B-R2  
**BESS Version** BESS-8

**Site type** Non-residential development  
**Account** bess@erbas.com.au  
**Application no.**  
**Site area** 6,293.00 m<sup>2</sup>  
**Building floor area** 3,747.00 m<sup>2</sup>  
**Date** 11 April 2024  
**Software version** 1.8.1-B.407



## Performance by category

● Your development ● Maximum available

Category	Weight	Score	Pass
Management	5%	37%	*
Water	9%	55%	✓
Energy	28%	78%	✓
Stormwater	14%	100%	✓
IEQ	17%	50%	✓
Transport	9%	66%	*
Waste	6%	33%	*
Urban Ecology	6%	75%	*
Innovation	9%	0%	*

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## Buildings

Name	Height	Footprint	% of total footprint
Multi-use facility	2	2,135 m <sup>2</sup>	100%

## Dwellings & Non Res Spaces

### Non-Res Spaces

Name	Quantity	Area	Building	% of total area
<b>Public building</b>				
Early learning centre	1	1,187 m <sup>2</sup>	Multi-use facility	31%
Gym and Pool	1	1,125 m <sup>2</sup>	Multi-use facility	30%
Medical center	1	587 m <sup>2</sup>	Multi-use facility	15%
Cafe	1	479 m <sup>2</sup>	Multi-use facility	12%
Health & well being + Community Centre	1	369 m <sup>2</sup>	Multi-use facility	9%
<b>Total</b>	<b>5</b>	<b>3,747 m<sup>2</sup></b>	<b>100%</b>	

## Supporting information

### Floorplans & elevation notes

Credit	Requirement	Response	Status
Management 3.2	Annotation: Individual utility meters to be provided to all individual commercial tenancies	To be printed Refer to SMP and drawings	✓
Management 3.3	Annotation: Sub-meters to be provided to all major common area services (list each)	To be printed Refer to drawings	✓
Water 3.1	Annotation: Water efficient garden details	To be printed Refer to SMP and landscape drawings	✓
Energy 3.1	Carpark with natural ventilation or CO monitoring system	To be printed Refer to SMP and architectural drawings	✓
Energy 4.2	Location and size of solar photovoltaic system	To be printed Refer to architectural drawings	✓
Stormwater 1.1	Location of any stormwater management systems (rainwater tanks, raingardens, buffer strips)	To be printed Refer to SMP and architectural drawings	✓
Transport 1.4	Location of non-residential bicycle parking spaces	To be printed Refer to architectural drawings	✓
Transport 1.5	Location of non-residential visitor bicycle parking spaces	To be printed Refer to architectural drawings	✓
Transport 1.6	Location of showers, change rooms and lockers as nominated	To be printed Refer to Architectural drawings - Lower ground floor level and Ground floor level	✓
Transport 2.1	Location of electric vehicle charging infrastructure	To be printed Refer to architectural drawings	✓

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Credit	Requirement	Response	Status
Waste 2.2	Location of recycling facilities	To be printed Refer to architectural drawings	✓
Urban Ecology 1.1	Location and size of communal spaces	To be printed Refer to architectural drawings	✓
Urban Ecology 2.1	Location and size of vegetated areas	To be printed Refer to architectural drawings	✓
Urban Ecology 2.2	Location and size of green roof	To be printed Refer to architectural drawings	✓

### Supporting evidence

Credit	Requirement	Response	Status
Energy 1.1	Energy Report showing calculations of reference case and proposed buildings	To be printed SMP Refer to SMP for the 10% improvement commitment over NCC	✓
Energy 3.1	Details of either the fully natural carpark ventilation or CO monitoring system proposed	To be printed Architectural drawings Refer to architectural drawings and SMP	✓
Energy 3.7	Average lighting power density and lighting type(s) to be used	To be printed SMP Refer to SMP	✓
Energy 4.2	Specifications of the solar photovoltaic system(s)	To be printed SMP Refer to architectural drawings and SMP	✓
Stormwater 1.1	STORM report or MUSIC model	To be printed SMP Refer to SMP	✓
IEQ 1.4	A short report detailing assumptions used and results achieved.	To be printed SMP Refer to SMP	✓

### Credit summary

#### Management Overall contribution 4.5%

		37%
1.1 Pre-Application Meeting		0%
2.3 Thermal Performance Modelling - Non-Residential		0%
3.2 Metering - Non-Residential		100%
3.3 Metering - Common Areas		100%
4.1 Building Users Guide		100%

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**Water Overall contribution 9.0%**

		<b>Minimum required 50%</b>	<b>55%</b>	<b>✔ Pass</b>
1.1 Potable Water Use Reduction			46%	
3.1 Water Efficient Landscaping			100%	
4.1 Building Systems Water Use Reduction			N/A	✦ Scoped Out
This credit is scoped out as there are no sprinklers in the project.				

**Energy Overall contribution 27.5%**

		<b>Minimum required 50%</b>	<b>78%</b>	<b>✔ Pass</b>
1.1 Thermal Performance Rating - Non-Residential			37%	
2.1 Greenhouse Gas Emissions			100%	
2.2 Peak Demand			100%	
2.6 Electrification			100%	
2.7 Energy consumption			100%	
3.1 Carpark Ventilation			100%	
3.2 Hot Water			100%	
3.7 Internal Lighting - Non-Residential			100%	
4.1 Combined Heat and Power (cogeneration / trigeneration)			N/A	✦ Scoped Out
No cogeneration or trigeneration system in use.				
4.2 Renewable Energy Systems - Solar			100%	
4.4 Renewable Energy Systems - Other			N/A	✦ Scoped Out
No other (non-solar PV) renewable energy is in use.				

**Stormwater Overall contribution 13.5%**

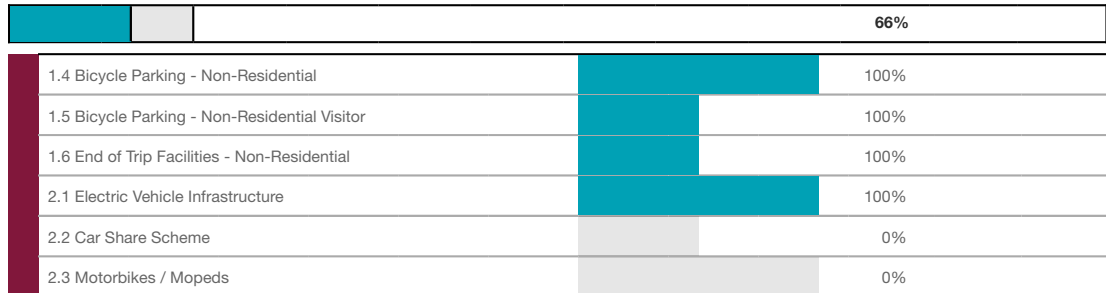
		<b>Minimum required 100%</b>	<b>100%</b>	<b>✔ Pass</b>
1.1 Stormwater Treatment			100%	

**IEQ Overall contribution 16.5%**

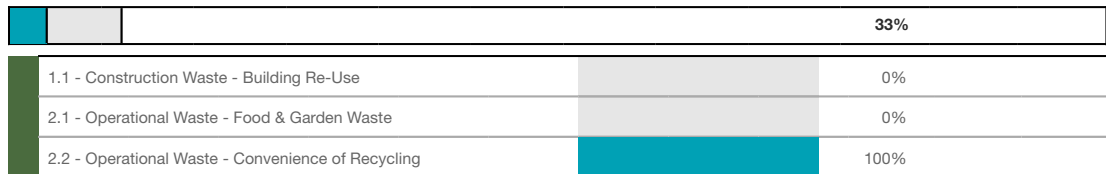
		<b>Minimum required 50%</b>	<b>50%</b>	<b>✔ Pass</b>
1.4 Daylight Access - Non-Residential			45%	✔ Achieved
2.3 Ventilation - Non-Residential			33%	✔ Achieved
3.4 Thermal comfort - Shading - Non-Residential			93%	
3.5 Thermal Comfort - Ceiling Fans - Non-Residential			0%	
4.1 Air Quality - Non-Residential			100%	

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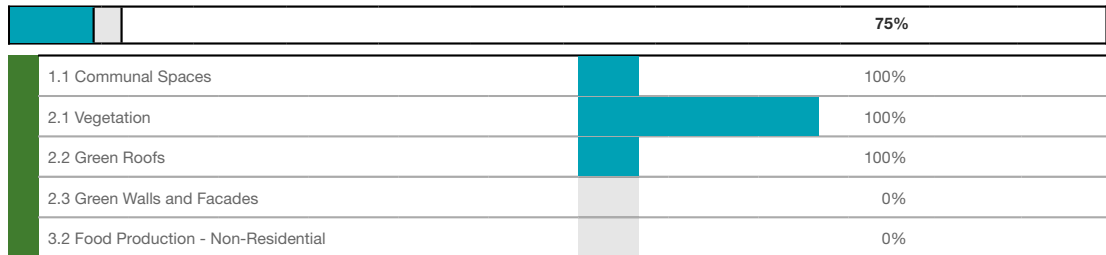
**Transport Overall contribution 9.0%**



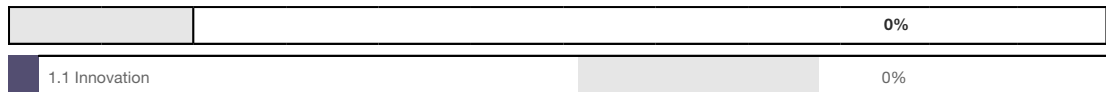
**Waste Overall contribution 5.5%**



**Urban Ecology Overall contribution 5.5%**



**Innovation Overall contribution 9.0%**



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## Credit breakdown


### Management Overall contribution 2%

<b>1.1 Pre-Application Meeting</b>	0%
Score Contribution	This credit contributes 37.5% towards the category score.
Criteria	Has an ESD professional been engaged to provide sustainability advice from schematic design to construction? AND Has the ESD professional been involved in a pre-application meeting with Council?
Question	Criteria Achieved ?
Project	No
<b>2.3 Thermal Performance Modelling - Non-Residential</b>	0%
Score Contribution	This credit contributes 25.0% towards the category score.
Criteria	Has a preliminary facade assessment been undertaken in accordance with NCC2022 Section J4D6?
Question	Criteria Achieved ?
Public building	No
Criteria	Has preliminary modelling been undertaken in accordance with either NCC2022 Section J (Energy Efficiency), NABERS or Green Star?
Question	Criteria Achieved ?
Public building	No
<b>3.2 Metering - Non-Residential</b>	100%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Have utility meters been provided for all individual commercial tenants?
Question	Criteria Achieved ?
Public building	Yes
<b>3.3 Metering - Common Areas</b>	100%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Have all major common area services been separately submetered?
Question	Criteria Achieved ?
Public building	Yes
<b>4.1 Building Users Guide</b>	100%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Will a building users guide be produced and issued to occupants?
Question	Criteria Achieved ?
Project	Yes

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**Water** Overall contribution 5% Minimum required 50%

<b>Water Approach</b>		
What approach do you want to use for Water?:	Use the built in calculation tools	
<b>Project Water Profile Question</b>		
Do you have a reticulated third pipe or an on-site water recycling system?:	No	
Are you installing a swimming pool?:	Yes	
Are you installing a rainwater tank?:	Yes	
<b>Water fixtures, fittings and connections</b>		
<b>Showerhead:</b>		
Medical center	Scope out	
Early learning centre		
Cafe		
Health & well being + Community Centre		
Gym and Pool	4 Star WELS (>= 4.5 but <= 6.0)	
<b>Bath:</b> All	Scope out	
<b>Kitchen Taps:</b>		
Medical center	Default or unrated	
Early learning centre		
Gym and Pool		
Health & well being + Community Centre		
Cafe	>= 5 Star WELS rating	
<b>Bathroom Taps:</b> All	>= 6 Star WELS rating	
<b>Dishwashers:</b>		
Medical center	Scope out	
Early learning centre		
Gym and Pool		
Health & well being + Community Centre		
Cafe	>= 4 Star WELS rating	
<b>WC:</b> All	>= 5 Star WELS rating	
<b>Urinals:</b> All	Scope out	
<b>Washing Machine Water Efficiency:</b> All	Scope out	
<b>Which non-potable water source is the dwelling/space connected to?:</b> All	Rainwater tank	
<b>Non-potable water source connected to Toilets:</b> All	Yes	
<b>Non-potable water source connected to Laundry (washing machine):</b> All	No	<div style="border: 1px solid red; padding: 5px;">                     ADVERTISED PLAN                      Application No. P4/2024                       This copied document is made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning Environment Act 1987.                       The document must not be used for any purpose which may breach any copyright.                 </div>
<b>Non-potable water source connected to Hot Water System:</b> All	No	
<b>Rainwater Tank</b>		
<b>What is the total roof area connected to the rainwater tank?:</b> Rainwater tank	817 m <sup>2</sup>	
<b>Tank Size:</b> Rainwater tank	25,000 Litres	
<b>Irrigation area connected to tank:</b> Rainwater tank	500 m <sup>2</sup>	
<b>Is connected irrigation area a water efficient garden?:</b> Rainwater tank	Yes	

<b>Other external water demand connected to tank?:</b> Rainwater tank -	
<b>1.1 Potable Water Use Reduction</b> 46%	
Score Contribution	This credit contributes 83.3% towards the category score.
Criteria	What is the reduction in total potable water use due to efficient fixtures, appliances, rainwater use and recycled water use? To achieve points in this credit there must be >25% potable water reduction.
Output	Reference
Project	8474 kL
Output	Proposed (excluding rainwater and recycled water use)
Project	6426 kL
Output	Proposed (including rainwater and recycled water use)
Project	5925 kL
Output	% Reduction in Potable Water Consumption
Project	30 %
Output	% of connected demand met by rainwater
Project	22 %
Output	How often does the tank overflow?
Project	Never / Rarely
Output	Opportunity for additional rainwater connection
Project	1253 kL
<b>3.1 Water Efficient Landscaping</b> 100%	
Score Contribution	This credit contributes 16.7% towards the category score.
Criteria	Will water efficient landscaping be installed?
Question	Criteria Achieved ?
Project	Yes
<b>4.1 Building Systems Water Use Reduction</b> N/A  Scoped Out	
This credit was scoped out	This credit is scoped out as there are no sprinklers in the project.

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**Energy** Overall contribution 21% Minimum required 50%

Use the BESS Deem to Satisfy (DtS) method for Energy?:	Yes
Do all exposed floors and ceilings (forming part of the envelope) demonstrate meeting the required NCC2022 insulation levels (total R-value upwards and downwards)?:	Yes
Does all wall and glazing demonstrate meeting the required NCC2022 facade calculator (or better than the total allowance)?:	Yes
Are heating and cooling systems within one Star of the most efficient equivalent capacity unit available, or Coefficient of Performance (CoP) & Energy Efficiency Ratios (EER) not less than 85% of the CoP & EER of the most efficient equivalent capacity unit available?:	Yes
Are water heating systems within one star of the best available, or 85% or better than the most efficient equivalent capacity unit?:	Yes
<b>Non-Residential Building Energy Profile</b>	
Heating, Cooling & Comfort Ventilation - Electricity Reference fabric & services:	-
Heating, Cooling & Comfort Ventilation - Electricity - proposed fabric and reference services:	-
Heating, Cooling & Comfort Ventilation - Electricity Proposed fabric & services:	-
Heating - Wood - reference fabric and services:	-
Heating - Wood - proposed fabric and reference services:	-
Heating - Wood - proposed fabric and services:	-
Hot Water - Electricity - Reference:	-
Hot Water - Electricity - Proposed:	-
Lighting - Reference:	-
Lighting - Proposed:	-
Peak Thermal Cooling Load - Reference:	-
Peak Thermal Cooling Load - Proposed:	-
<b>Solar Photovoltaic systems</b>	
System Size (lesser of inverter and panel capacity):	
Solar PV 1	15.0 kW peak
Solar PV 1	47.0 kW peak
Orientation (which way is the system facing)?:	
Solar PV 1	West
Solar PV 1	South-West
Inclination (angle from horizontal):	
Solar PV 1	18.0 Angle (degrees)
Solar PV 1	18.0 Angle (degrees)

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<b>1.1 Thermal Performance Rating - Non-Residential</b>	37%
Score Contribution	This credit contributes 34.8% towards the category score.
Criteria	What is the % reduction in heating and cooling energy consumption against the reference case (NCC2022 Section J)?
<b>2.1 Greenhouse Gas Emissions</b>	100%
Score Contribution	This credit contributes 8.7% towards the category score.
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?
<b>2.2 Peak Demand</b>	100%
Score Contribution	This credit contributes 4.3% towards the category score.
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?
<b>2.6 Electrification</b>	100%
Score Contribution	This credit contributes 13.0% towards the category score.
Criteria	Is the development all-electric?
Question	Criteria Achieved?
Project	Yes
<b>2.7 Energy consumption</b>	100%
Score Contribution	This credit contributes 17.4% towards the category score.
Criteria	What is the % reduction in annual energy consumption against the benchmark?
<b>3.1 Carpark Ventilation</b>	100%
Score Contribution	This credit contributes 4.3% towards the category score.
Criteria	If you have an enclosed carpark, is it: (a) fully naturally ventilated (no mechanical ventilation system) or (b) 40 car spaces or less with Carbon Monoxide monitoring to control the operation and speed of the ventilation fans?
Question	Criteria Achieved ?
Project	Yes
<b>3.2 Hot Water</b>	100%
Score Contribution	This credit contributes 4.3% towards the category score.
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?
<b>3.7 Internal Lighting - Non-Residential</b>	100%
Score Contribution	This credit contributes 8.7% towards the category score.
Criteria	Does the maximum illumination power density (W/m2) in at least 90% of the area of the relevant building class meet the requirements in Table J7D3a of the NCC 2022 Vol 1?
Question	Criteria Achieved ?
Public building	Yes
<b>4.1 Combined Heat and Power (cogeneration / trigeneration)</b>	N/A Scoped Out
This credit was scoped out	No cogeneration or trigeneration system in use.

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<b>4.2 Renewable Energy Systems - Solar</b>		100%
Score Contribution	This credit contributes 4.3% towards the category score.	
Criteria	What % of the estimated energy consumption of the building class it supplies does the solar power system provide?	
Output	Solar Power - Energy Generation per year	
Public building	64,223 kWh	
Output	% of Building's Energy	
Public building	46 %	
<b>4.4 Renewable Energy Systems - Other</b>		N/A ✦ Scoped Out
This credit was scoped out	No other (non-solar PV) renewable energy is in use.	

**Stormwater** Overall contribution 14% Minimum required 100%

Which stormwater modelling are you using?:		Melbourne Water STORM tool
<b>1.1 Stormwater Treatment</b>		100%
Score Contribution	This credit contributes 100.0% towards the category score.	
Criteria	Has best practice stormwater management been demonstrated?	
Annotation	2 x 12.5kL tanks are proposed for the development located in the Basement 01. The tank water supply reliability for both the tanks are 82% and 81% as shown through the Melbourne STORM Calculator.	
Question	STORM score achieved	
Project	120	
Output	Min STORM Score	
Project	100	

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**IEQ** Overall contribution 8% Minimum required 50%

<b>1.4 Daylight Access - Non-Residential</b>		45%	✓ Achieved
Score Contribution	This credit contributes 35.3% towards the category score.		
Criteria	What % of the nominated floor area has at least 2% daylight factor?		
Annotation	Green Star Hand Calculation method has been used to demonstrate compliance for all the regular occupied areas in the development. The project achieves 45% regular used floor area daylight compliance with 2% daylight factor for the entire development.		
Question	Percentage Achieved?		
Public building	45 %		
<b>2.3 Ventilation - Non-Residential</b>		33%	✓ Achieved
Score Contribution	This credit contributes 35.3% towards the category score.		
Criteria	What % of the regular use areas are effectively naturally ventilated?		
Question	Percentage Achieved?		
Public building	0 %		
Criteria	What increase in outdoor air is available to regular use areas compared to the minimum required by AS 1668.2:2012?		
Question	What increase in outdoor air is available to regular use areas compared to the minimum required by AS 1668:2012?		
Public building	-		
Criteria	What CO2 concentrations are the ventilation systems designed to achieve, to monitor and to maintain?		
Question	Value		
Public building	800 ppm		
<b>3.4 Thermal comfort - Shading - Non-Residential</b>		93%	
Score Contribution	This credit contributes 17.6% towards the category score.		
Criteria	What percentage of east, north and west glazing to regular use areas is effectively shaded?		
Question	Percentage Achieved?		
Public building	90 %		
<b>3.5 Thermal Comfort - Ceiling Fans - Non-Residential</b>		0%	
Score Contribution	This credit contributes 5.9% towards the category score.		
Criteria	What percentage of regular use areas in tenancies have ceiling fans?		
Question	Percentage Achieved?		
Public building	0 %		
<b>4.1 Air Quality - Non-Residential</b>		100%	
Score Contribution	This credit contributes 5.9% towards the category score.		
Criteria	Do all paints, sealants and adhesives meet the maximum total indoor pollutant emission limits?		
Question	Criteria Achieved ?		
Public building	Yes		

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Criteria	Does all carpet meet the maximum total indoor pollutant emission limits?
Question	Criteria Achieved ?
Public building	Yes
Criteria	Does all engineered wood meet the maximum total indoor pollutant emission limits?
Question	Criteria Achieved ?
Public building	Yes

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**Transport** Overall contribution 6%

<b>1.4 Bicycle Parking - Non-Residential</b>		100%
Score Contribution	This credit contributes 22.2% towards the category score.	
Criteria	Have the planning scheme requirements for employee bicycle parking been exceeded by at least 50% (or a minimum of 2 where there is no planning scheme requirement)?	
Question	Criteria Achieved ?	
Public building	Yes	
Question	Bicycle Spaces Provided ?	
Public building	16	
<b>1.5 Bicycle Parking - Non-Residential Visitor</b>		100%
Score Contribution	This credit contributes 11.1% towards the category score.	
Criteria	Have the planning scheme requirements for visitor bicycle parking been exceeded by at least 50% (or a minimum of 1 where there is no planning scheme requirement)?	
Question	Criteria Achieved ?	
Public building	Yes	
Question	Bicycle Spaces Provided ?	
Public building	20	
<b>1.6 End of Trip Facilities - Non-Residential</b>		100%
Score Contribution	This credit contributes 11.1% towards the category score.	
Criteria	Where adequate bicycle parking has been provided. Is there also: * 1 shower for the first 5 employee bicycle spaces plus 1 to each 10 employee bicycles spaces thereafter, * changing facilities adjacent to showers, and * one secure locker per employee bicycle space in the vicinity of the changing / shower facilities?	
Question	Number of showers provided ?	
Public building	2	
Question	Number of lockers provided ?	
Public building	16	
Output	Min Showers Required	
Public building	1	
Output	Min Lockers Required	
Public building	16	
<b>2.1 Electric Vehicle Infrastructure</b>		100%
Score Contribution	This credit contributes 22.2% towards the category score.	
Criteria	Are facilities provided for the charging of electric vehicles?	
Question	Criteria Achieved ?	
Project	Yes	

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<b>2.2 Car Share Scheme</b>		0%
Score Contribution	This credit contributes 11.1% towards the category score.	
Criteria	Has a formal car sharing scheme been integrated into the development?	
Question	Criteria Achieved ?	
Project	No	
<b>2.3 Motorbikes / Mopeds</b>		0%
Score Contribution	This credit contributes 22.2% towards the category score.	
Criteria	Are a minimum of 5% of vehicle parking spaces designed and labelled for motorbikes (must be at least 5 motorbike spaces)?	
Question	Criteria Achieved ?	
Project	No	

**Waste** Overall contribution 2%

<b>1.1 - Construction Waste - Building Re-Use</b>		0%
Score Contribution	This credit contributes 33.3% towards the category score.	
Criteria	If the development is on a site that has been previously developed, has at least 30% of the existing building been re-used?	
Question	Criteria Achieved ?	
Project	No	
<b>2.1 - Operational Waste - Food &amp; Garden Waste</b>		0%
Score Contribution	This credit contributes 33.3% towards the category score.	
Criteria	Are facilities provided for on-site management of food and garden waste?	
Question	Criteria Achieved ?	
Project	No	
<b>2.2 - Operational Waste - Convenience of Recycling</b>		100%
Score Contribution	This credit contributes 33.3% towards the category score.	
Criteria	Are the recycling facilities at least as convenient for occupants as facilities for general waste?	
Question	Criteria Achieved ?	
Project	Yes	

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**Urban Ecology** Overall contribution 4%

<b>1.1 Communal Spaces</b>		100%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Is there at least the following amount of common space measured in square meters : * 1m <sup>2</sup> for each of the first 50 occupants * Additional 0.5m <sup>2</sup> for each occupant between 51 and 250 * Additional 0.25m <sup>2</sup> for each occupant above 251?	
Annotation	Community areas included are gym, terrace garden (green roof) and community center on lower ground level	
Question	Common space provided	
Public building	400 m <sup>2</sup>	
Output	Minimum Common Space Required	
Public building	231 m <sup>2</sup>	
<b>2.1 Vegetation</b>		100%
Score Contribution	This credit contributes 50.0% towards the category score.	
Criteria	How much of the site is covered with vegetation, expressed as a percentage of the total site area?	
Question	Percentage Achieved ?	
Project	57 %	
<b>2.2 Green Roofs</b>		100%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Does the development incorporate a green roof?	
Question	Criteria Achieved ?	
Project	Yes	
<b>2.3 Green Walls and Facades</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Does the development incorporate a green wall or green façade?	
Question	Criteria Achieved ?	
Project	No	
<b>3.2 Food Production - Non-Residential</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	What area of space per occupant is dedicated to food production?	
Question	Food Production Area	
Public building	0.0 m <sup>2</sup>	
Output	Min Food Production Area	
Public building	94 m <sup>2</sup>	

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## Innovation Overall contribution 0%

<b>1.1 Innovation</b>	0%
Score Contribution	This credit contributes 100.0% towards the category score.
Criteria	What percentage of the Innovation points have been claimed (10 points maximum)?

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# Appendix B – STORM Report and Markup



## STORM Rating Report

TransactionID: 0  
 Municipality: BANYULE  
 Rainfall Station: BANYULE  
 Address: 321 Lower Heidelberg Rd  
 Ivanhoe East  
 VIC  
 VIC 3079  
 Assessor: Aditi Abnave  
 Development Type: Other  
 Allotment Site (m2): 6,293.00  
 STORM Rating %: 120

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
Roof catchment area 1 - H+W + Community Center	290.00	Rainwater Tank	12,500.00	100	170.00	82.00
Roof catchment area 2 - Entry + Pool roof	527.00	Rainwater Tank	12,500.00	100	158.60	81.00
Treated Childcare roof	332.00	Raingarden 300mm	8.00	0	132.95	0.00
Impervious Terrace garden pathways - Untreated	170.00	None	0.00	0	0.00	0.00
Untreated Indoor pool roof area	240.00	None	0.00	0	0.00	0.00
Treated Outdoor pool and play area	345.00	Raingarden 300mm	8.00	0	132.55	0.00
Treated impervious areas - play area and pathways	400.00	Raingarden 300mm	10.00	0	133.00	0.00

Figure 3: STORM Calculator

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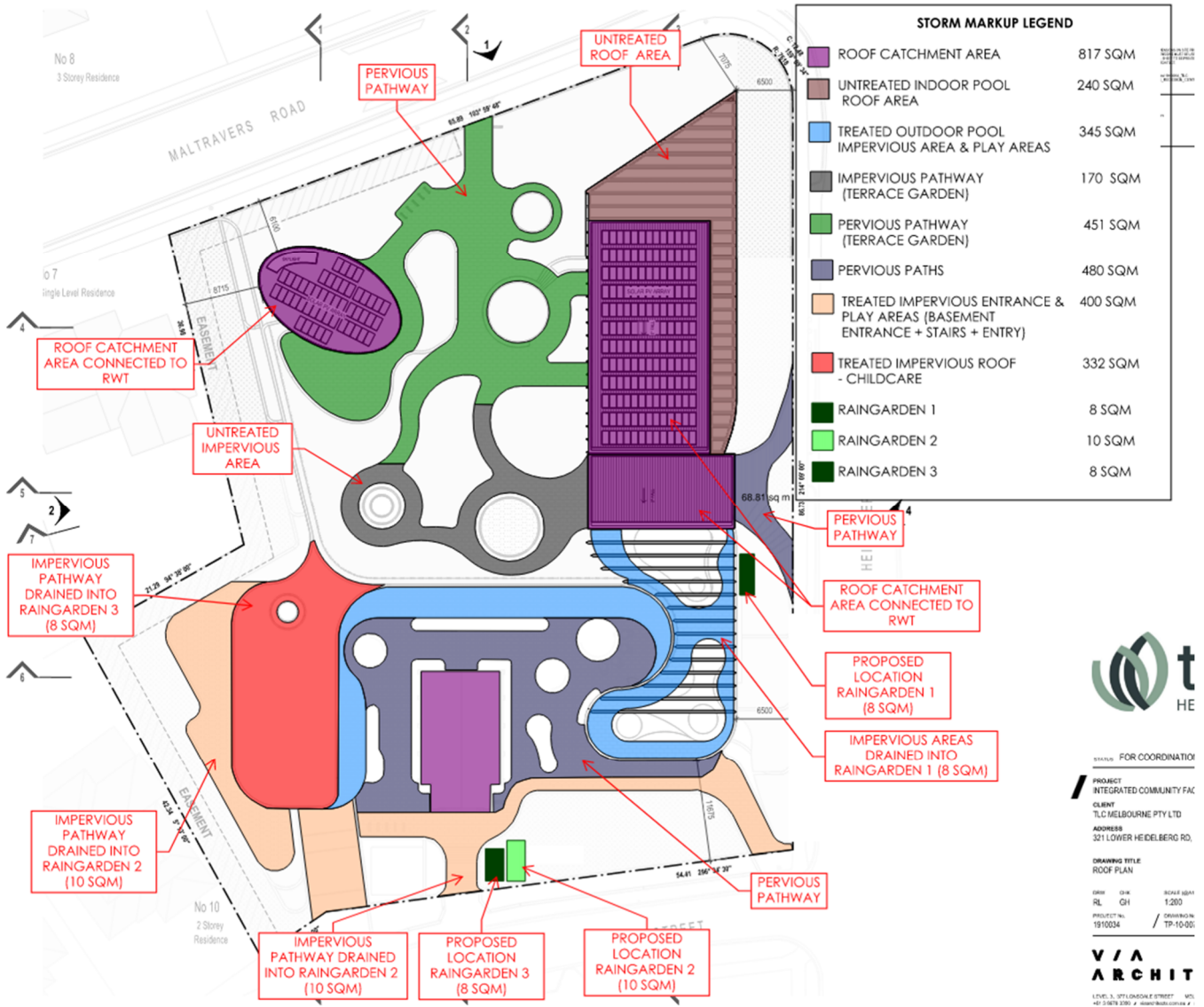


Figure 4: STORM calculation Markup

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# Appendix C – Daylight Compliance through Green Star hand calculation methodology

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**NOTE**

REFER TO LANDSCAPE CONSULTANT DRAWINGS FOR DETAILED LANDSCAPING PROPOSAL

**VIA ARCHITECTS**  
 1910034  
 HEALTH & WELLBEING  
 2024.04.15  
 HEALTHCARE\_IVANHOE\_REDESIGN\_CENTRAL\_19\_19ofar0830ck.rvt  
 12/04/2024 2:26:49 PM  
 PROJECT: C:\Users\jvanho\Documents\1910034\_TLC\_HEALTHCARE\_IVANHOE\_REDESIGN\_CENTRAL\_19\_19ofar0830ck.rvt

REV	DESCRIPTION	DATE	BY
C	Issue for Coordination	2023.11.10	RL/GH
D	Issue for Client Review	2023.11.10	RL/GH
E	Tree Retention Update	2023.11.30	RL/GH
F	Town Planning Submission	2023.12.18	RL/GH
G	Issue for Coordination	2024.04.09	RL/GH
H	Issue for Coordination	2024.04.10	RL/GH
I	Issue for RFI Response Submission	2024.04.15	RL/GH

**GREEN STAR HAND CALCULATION METHODOLOGY SI USED FOR CALCULATING THE OVERALL DAYLIGHT COMPLIANCE FOR THE DEVELOPMENT**

**NOMINATED AREAS = 1,479.45 SQM**

**DAYLIGHT COMPLIANT AREAS = 665.8 SQM**

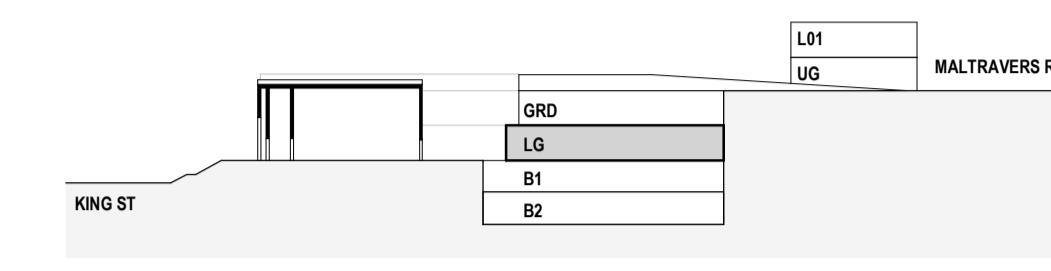
**% OF DAYLIGHT COMPLIANCE = 45.0%**

**DAYLIGHT COMPLIANCE AREA LOWER GROUND FLOOR**

**NOMINATED AREAS = 793 SQM**

**DAYLIGHT COMPLIANT AREAS = 400.7 SQM**

**% OF DAYLIGHT COMPLIANCE = 50.53%**



**LEGEND - VERTICAL CIRCULATION (PUBLIC/VISITOR)**

- PRIMARY CIRCULATION ALL FUNCTIONS
- GYM / HEALTH & WELLBEING PATRONS ONLY (INCL. EMERGENCY EGRESS)
- EARLY LEARNING CENTRE (INTERNAL USE ONLY)
- EMERGENCY EGRESS ONLY

**LEGEND**

- PROPOSED NEW TREES
- EXISTING TREES TO BE RETAINED
- LANDSCAPING @ NATURAL GROUND
- LANDSCAPING PROPOSED/BUILT-UP
- DEEP SOIL ZONE

**LEVEL AREA SUMMARY**

SERVICES	65m <sup>2</sup>
EARLY LEARNING CENTRE	16 x NURSERY 12 x INFANT
<b>SUBTOTAL</b>	<b>28</b>
MEDICAL CAFE	05 x CONSULTANTS
BOH (PLANT)	290m <sup>2</sup>
COMMUNITY CENTRE / GALLERY	120m <sup>2</sup>
<b>BIKE / SCOOTER STORE SPACES</b>	
BIKE (VISITOR)	10
<b>TOTAL FLOOR AREA</b>	<b>2,135m<sup>2</sup></b>



STATUS: RFI RESPONSE SUBMISSION

**PROJECT**  
INTEGRATED COMMUNITY FACILITY

**CLIENT**  
TLC MELBOURNE PTY LTD

**ADDRESS**  
321 LOWER HEIDELBERG RD, IVANHOE EAST

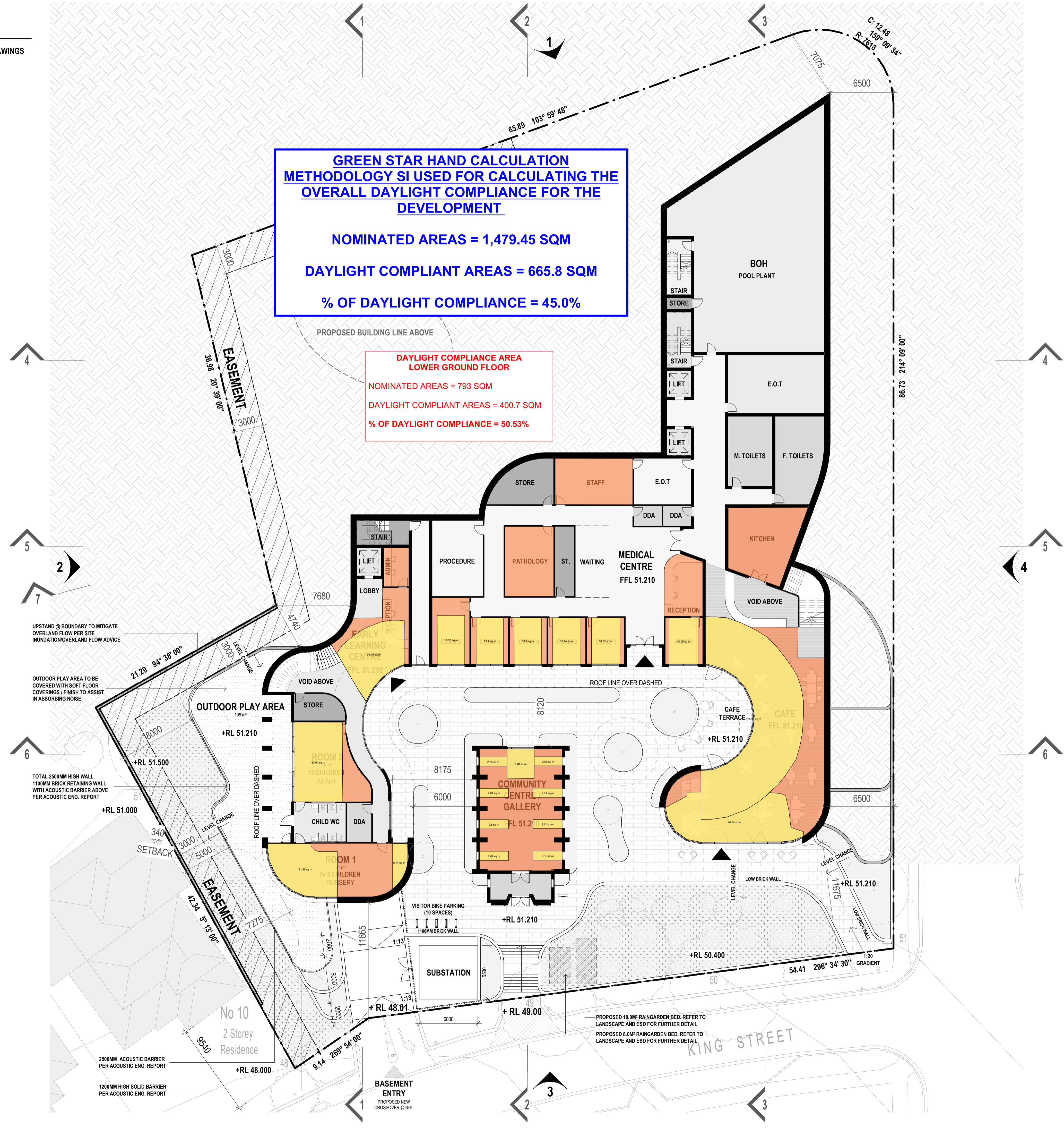
**DRAWING TITLE**  
LOWER GROUND FLOOR PLAN

DRW	CHK	SCALE (@A1)
RL	GH	1:200

PROJECT No. 1910034 / DRAWING No. TP-10-003  
 Application No. P4/2024

**VIA ARCHITECTS**

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UPSTAND @ BOUNDARY TO MITIGATE OVERLAND FLOW PER SITE INUNDATION/OVERLAND FLOW ADVICE  
 OUTDOOR PLAY AREA TO BE COVERED WITH SOFT FLOOR COVERINGS / FINISH TO ASSIST IN ABSORBING NOISE.  
 TOTAL 2500MM HIGH WALL 1100MM BRICK RETAINING WALL WITH ACOUSTIC BARRIER ABOVE PER ACOUSTIC ENG. REPORT

2500MM ACOUSTIC BARRIER PER ACOUSTIC ENG. REPORT  
 1200MM HIGH SOLID BARRIER PER ACOUSTIC ENG. REPORT



NOTE

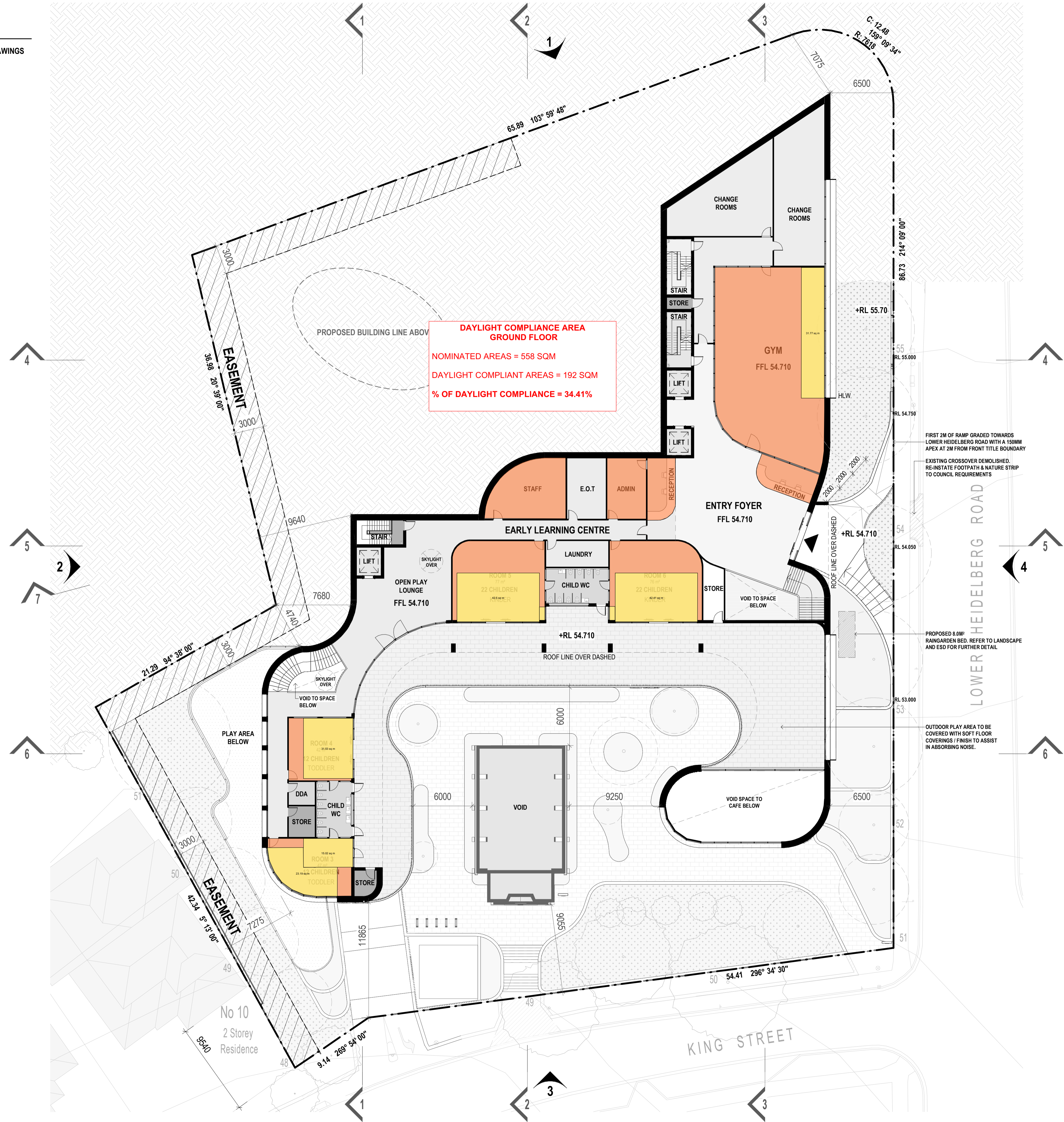
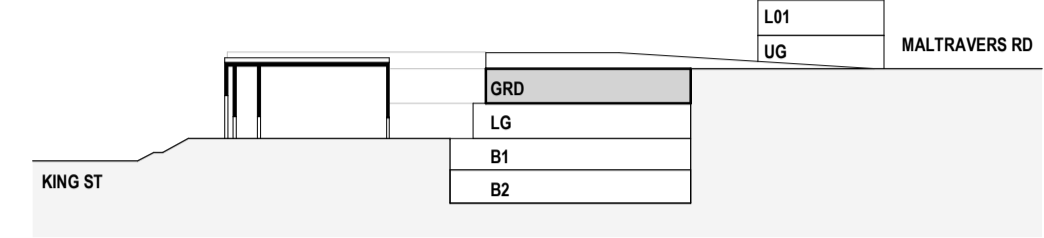
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REV	DESCRIPTION	DATE	BY
C	Issue for Coordination	2023.11.10	RL/GH
D	Issue for Client Review	2023.11.10	RL/GH
E	Tree Retention Update	2023.11.30	RL/GH
F	Town Planning Submission	2023.12.18	RL/GH
G	Issue for Coordination	2024.04.09	RL/GH
H	Issue for Coordination	2024.04.10	RL/GH
I	Issue for RFI Response Submission	2024.04.15	RL/GH



**DAYLIGHT COMPLIANCE AREA GROUND FLOOR**  
 NOMINATED AREAS = 558 SQM  
 DAYLIGHT COMPLIANT AREAS = 192 SQM  
 % OF DAYLIGHT COMPLIANCE = 34.41%

**LEGEND - VERTICAL CIRCULATION (PUBLIC/VISITOR)**

[Light Grey Box]	PRIMARY CIRCULATION ALL FUNCTIONS
[Orange Box]	GYM / HEALTH & WELLBEING PATRONS ONLY (INCL. EMERGENCY EGRESS)
[Yellow Box]	EARLY LEARNING CENTRE (INTERNAL USE ONLY)
[Dark Grey Box]	EMERGENCY EGRESS ONLY

**LEGEND**

[Dotted Circle]	PROPOSED NEW TREES
[Solid Circle]	EXISTING TREES TO BE RETAINED
[Dotted Area]	LANDSCAPING @ NATURAL GROUND
[Hatched Area]	LANDSCAPING PROPOSED/BUILT-UP
[Cross-hatched Area]	DEEP SOIL ZONE

**LEVEL AREA SUMMARY**

SERVICES	65m <sup>2</sup>
EARLY LEARNING CENTRE	24 x TODDLER 44 x KINDER
SUBTOTAL	68
TOTAL (INCL. LOWER GROUND FLOOR)	96
GYM	208m <sup>2</sup>
BIKE / SCOOTER STORE SPACES	
BIKE (VISITOR)	-
TOTAL FLOOR AREA	2,190m <sup>2</sup>



STATUS RFI RESPONSE SUBMISSION

**PROJECT**  
INTEGRATED COMMUNITY FACILITY

**CLIENT**  
TLC MELBOURNE PTY LTD

**ADDRESS**  
321 LOWER HEIDELBERG RD, IVANHOE EAST

**DRAWING TITLE**  
GROUND FLOOR PLAN

DRW	CHK	SCALE (@A1)	NORTH
RL	GH	1:200	
PROJECT No.	DRAWING No.	REV	
1910034	TP-10-004	I	

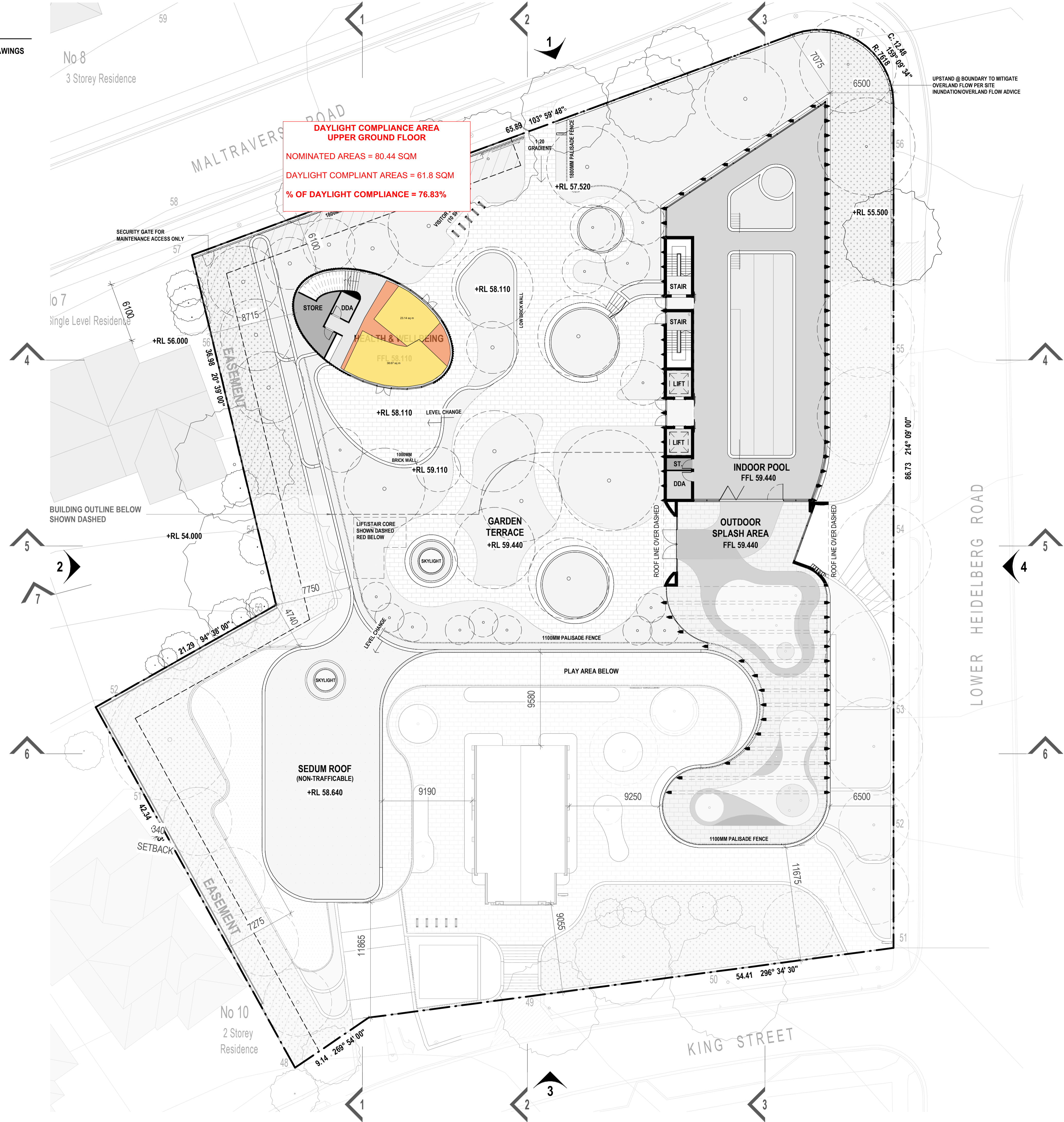
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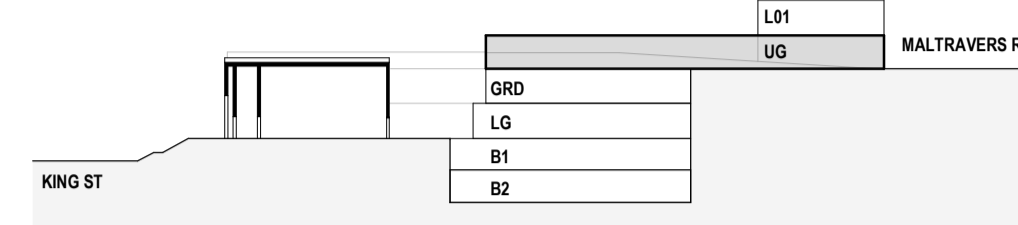
**DAYLIGHT COMPLIANCE AREA  
UPPER GROUND FLOOR**  
 NOMINATED AREAS = 80.44 SQM  
 DAYLIGHT COMPLIANT AREAS = 61.8 SQM  
 % OF DAYLIGHT COMPLIANCE = 76.83%

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D	Issue for Client Review	2023.11.10	RL/GH
E	Tree Retention Update	2023.11.30	RL/GH
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H	Issue for Coordination	2024.04.10	RL/GH
I	Issue for RFI Response Submission	2024.04.15	RL/GH



- LEGEND - VERTICAL CIRCULATION (PUBLIC/VISITOR)**
- PRIMARY CIRCULATION ALL FUNCTIONS
  - GYM / HEALTH & WELLBEING PATRONS ONLY (INCL. EMERGENCY EGRESS)
  - EARLY LEARNING CENTRE (INTERNAL USE ONLY)
  - EMERGENCY EGRESS ONLY

- LEGEND**
- PROPOSED NEW TREES
  - EXISTING TREES TO BE RETAINED
  - LANDSCAPING @ NATURAL GROUND
  - LANDSCAPING PROPOSED/BUILT-UP
  - DEEP SOIL ZONE

**LEVEL AREA SUMMARY**

SERVICES	40m <sup>2</sup>
INDOOR POOL	511m <sup>2</sup>
OUTDOOR SPLASH AREA	435m <sup>2</sup>
HEALTH & WELLBEING	102m <sup>2</sup>
<b>BIKE / SCOOTER STORE SPACES</b>	
BIKE (VISITOR)	10
<b>TOTAL FLOOR AREA</b>	<b>2,180m<sup>2</sup></b>



STATUS: RFI RESPONSE SUBMISSION

**PROJECT**  
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**CLIENT**  
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**ADDRESS**  
 321 LOWER HEIDELBERG RD, IVANHOE EAST

**DRAWING TITLE**  
 UPPER GROUND FLOOR PLAN

DRW	CHK	SCALE (@A1)	NORTH
RL	GH	1:200	
PROJECT No. 1910034	DRAWING No. TP-10-005	REV I	

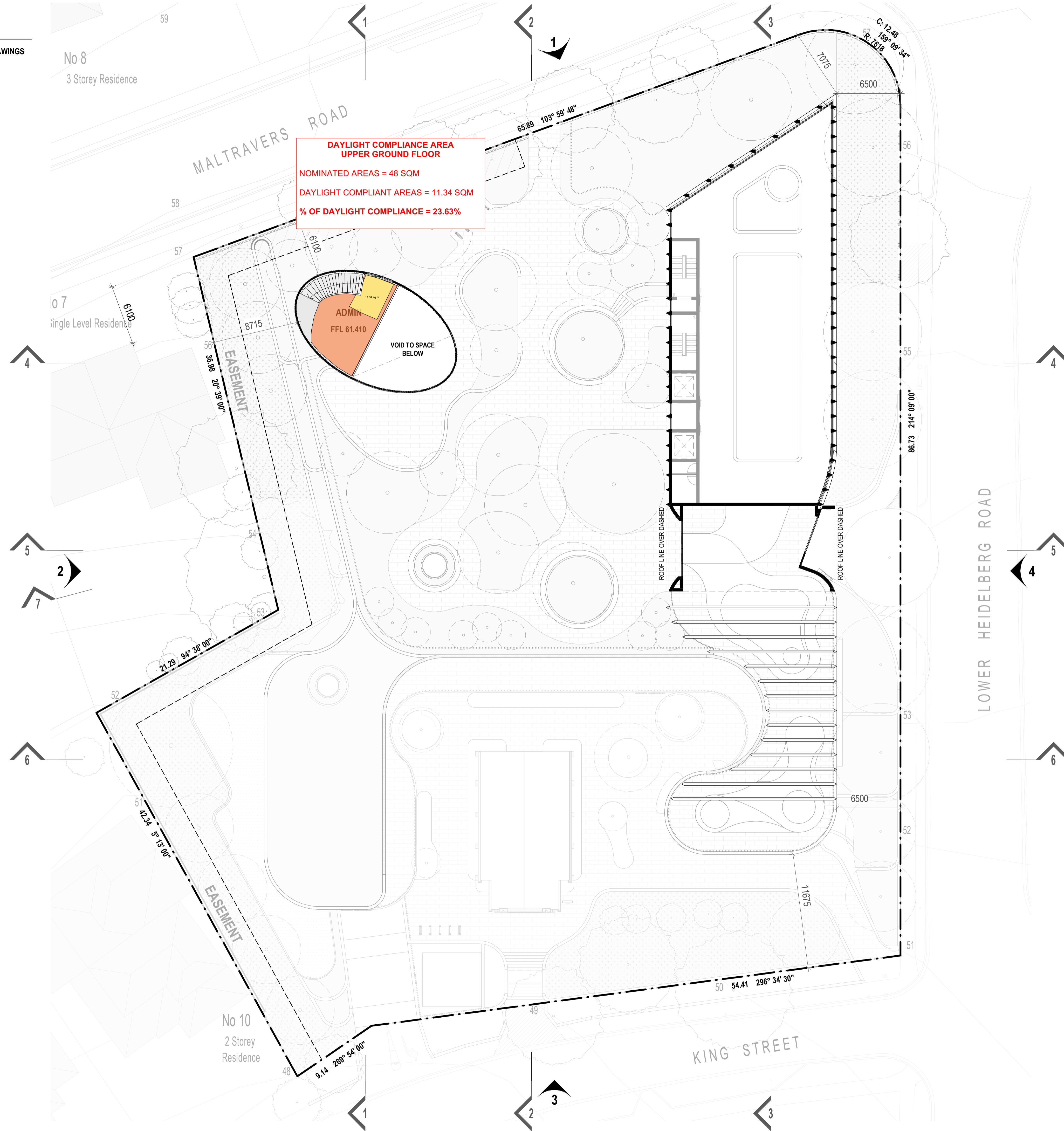
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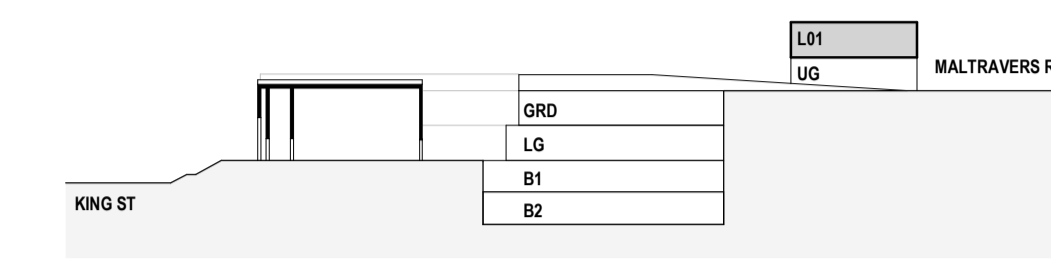


QUALITY HEALTH & SAFETY  
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 5/20/2019

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C	Issue for Coordination	2023.11.10	RL/GH
D	Issue for Client Review	2023.11.10	RL/GH
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H	Issue for Coordination	2024.04.10	RL/GH
I	Issue for RFI Response Submission	2024.04.15	RL/GH



- LEGEND - VERTICAL CIRCULATION (PUBLIC/VISITOR)**
- PRIMARY CIRCULATION ALL FUNCTIONS
  - GYM / HEALTH & WELLBEING PATRONS ONLY (INCL. EMERGENCY EGRESS)
  - EARLY LEARNING CENTRE (INTERNAL USE ONLY)
  - EMERGENCY EGRESS ONLY

- LEGEND**
- PROPOSED NEW TREES
  - EXISTING TREES TO BE RETAINED
  - LANDSCAPING @ NATURAL GROUND
  - LANDSCAPING PROPOSED/BUILT-UP
  - DEEP SOIL ZONE

**LEVEL AREA SUMMARY**

ADMIN (HEALTH & WELLBEING)	55m <sup>2</sup>
BIKE / SCOOTER STORE SPACES	
BIKE (VISITOR)	
<b>TOTAL FLOOR AREA</b>	<b>75m<sup>2</sup></b>



STATUS RFI RESPONSE SUBMISSION

**PROJECT**  
 INTEGRATED COMMUNITY FACILITY

**CLIENT**  
 TLC MELBOURNE PTY LTD

**ADDRESS**  
 321 LOWER HEIDELBERG RD, IVANHOE EAST

**DRAWING TITLE**  
 LEVEL 1 FLOOR PLAN

DRW	CHK	SCALE (@A1)	NORTH
RL	GH	1:200	
PROJECT No.	DRAWING No.	REV	
1910034	TP-10-006	I	

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# Appendix D – Green roof and raingarden maintenance schedules

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Application No. P4/2024

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# MAINTENANCE REQUIREMENTS OF BIODIVERSITY GREEN ROOFS

Maintenance is crucially important in sustaining green roof design and function. Maintenance should be driven by objectives, formed during the design phase of the project, and then delivered through a maintenance plan specific to the green roof. Determining maintenance for a biodiversity green roof can be particularly complex and specialist advice will generally be needed. This includes specifying the maintenance of vegetation and any roof features that provide biodiversity outcomes. While ideally the maintenance needs are low (particularly resource needs), they need to be identified, planned for, and then budgeted as part of the maintenance plan.

Planning maintenance is influenced by the design and layout of the green roof, but also by the site conditions such as the building topography, orientation, aspect and microclimate. Planning also needs to consider roof access for maintenance activities, including access for specific tasks, personnel, and training requirements (such as 'Working at heights') materials and equipment. Ease of access will also determine how maintenance is delivered and influence the likely ongoing costs for this.

Maintenance tends to be classified into two lifecycle phases in a landscape, the establishment phase and the post-establishment phase<sup>112</sup>.

## Establishment maintenance

includes initial maintenance following construction and any treatments or interventions to sustain the design outcomes. During establishment, green roof plantings have high water and nutrition requirements<sup>113</sup> and as in any landscape, the horticultural inputs can be quite high to ensure successful plant growth outcomes<sup>114,115</sup>. Establishment maintenance can be as short as a few months and up to two years post-completion.

## Post-establishment maintenance

is referred to as recurrent or routine maintenance and includes the regular activities and tasks undertaken to ensure the green roof is functional, safe and meets the broad design outcomes. Some of this maintenance will be based around seasonal or annual tasks, both for vegetation but also for the hard landscape and infrastructure (e.g. functional checks to ensure drainage points are not blocked by roots).

The most common vegetation maintenance tasks on green roofs includes fertilising, irrigation, pruning and weeding<sup>7,116-118</sup>. While these may be undertaken differently on a biodiversity green roof to a standard green roof, they do need to be planned for.

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## Irrigation

Irrigation needs to be planned for when designing biodiverse green roofs in Melbourne. Most biodiversity green roofs require a period of 12 months of irrigation during establishment to assist with plant growth and coverage. Note that irrigation for many green roofs, particularly during establishment, can be significant; with some high demand species requiring 6.3 litres of water per square metre per day<sup>119</sup>. Post-establishment irrigation is more complex and application rates (i.e. quantity and frequency) should be based on the vegetation community, substrate depth, season, location and the substrate physical properties.

Most green roofs in dry climates need some form of irrigation to be successful<sup>101</sup>. Even where drought-tolerant plants have been used, irrigation on green roofs has been shown to assist plant survival<sup>120</sup>, improve plant growth rates<sup>117</sup> and increase plant diversity<sup>119</sup>. Planning irrigation on green roofs is best completed by a specialist as many factors, particularly climate and microclimate, substrate depth and properties, vegetation design and maintenance, will influence irrigation design. Efficient irrigation systems, such as microsprays, driplines (surface and subsurface) and hand watering are all used widely on green roofs<sup>117,119</sup>. Best practice design should explore incorporating aspects of integrated water management to maximise passive irrigation and stormwater re-use where possible to reduce potable water use.

The plants we have selected as suitable for biodiversity green roofs in Melbourne (Table 2), grow naturally in seasonally hot and dry environments and therefore can survive periods of water stress once established. For many species we have also demonstrated this experimentally<sup>97,105,121,122</sup>. However, research and green roof growing experience has demonstrated that almost no native plants growing on shallow green roofs (< 12.5 cm) can survive the extreme summer heatwaves that Melbourne can experience<sup>109</sup>. Consequently, emergency irrigation, typically with a hose and with rose or sprinkler attachment, needs to be applied during

extended periods of hot, dry weather when evaporative demand is high on all green roofs in Melbourne including biodiversity roofs. Emergency irrigation is also used to support diverse flora on 150 mm deep Mediterranean green roofs<sup>96</sup>.

## Fertilising

Fertilisers needs to be applied carefully on green roofs and are closely linked to the vegetation community. Fertiliser practice should be based around providing sufficient nutrients to support vegetation, whilst minimising nutrient run off<sup>123</sup>. Green roof design and substrate properties also play a role here, particularly in the storage and recycling of nutrients<sup>124</sup>. Most fertilisers used are either synthetic, controlled-release fertilisers (CRF) or organic, slow-release fertilisers with application rates generally lower than that of ground-level landscapes. The elevated temperatures of green roofs can lead to excessive fertiliser release rates, particularly when coupled with increased moisture or rainfall events. Ideally fertiliser application is based on the nutritional needs of the green roof, through a biannual or annual analysis of substrate pH and electrical conductivity (EC). Biodiversity green roofs in south-eastern Australia will typically have low fertiliser requirements (i.e. CRF rates can be one quarter to one-eighth of the recommended rates).

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## Weed control

Weed control has been identified as the most problematic and important of maintenance tasks on green roofs<sup>113,117</sup>. Tree seedlings can be particularly serious weeds<sup>113</sup> and spontaneous annual or perennial weeds can be extremely difficult to manage long-term<sup>125</sup>. Gravel mulches can be used effectively to reduce weeds on roofs where weight loading allows<sup>126</sup>, but the most effective means of weed control on green roofs is maintaining high plant density and cover<sup>125,126</sup> and balancing substrate nutrition<sup>125</sup>. Many species planted can themselves become a source of future weeds<sup>126</sup> so plant selection for biodiversity green roofs is of particular importance. Maintenance interventions to control weeds should be undertaken early in the life of a green roof by staff who have skills in weed identification<sup>119</sup> and understand weed lifecycles and flowering times so maintenance can be targeted to remove weeds before they set seed<sup>126</sup>. Most weed control on green roofs involves hand tools, but contact herbicides may also be useful, provided they are applied carefully.

Any runoff from a green roof via stormwater will enter the broader city environment, therefore chemical use on green roofs should be minimal. Good hygiene practices during maintenance, such as cleaning footwear, tools and equipment prior to access, and the careful removal of any weed seeds and propagules off site (e.g. stolons, seeds, bulbs, etc.) can minimise weed spread. Care is always needed in the use of hand tools on green roofs, to reduce the risk of damage to underlying layers; and during removal of any woody or stoloniferous weeds, to that ensure lower layers of the profile (i.e. filter fabric or drainage layer) are not damaged.

The remaining maintenance tasks important to biodiversity green roofs relate to vegetation maintenance. While for most green roofs of this type, it will be beneficial to have some decaying plant materials for habitat value, in some cases it may be necessary to include periodic pruning and biomass removal in the maintenance plan. This is particularly relevant for vegetation around access and drainage infrastructure locations and to reduce any potential fire hazard. For some species such as native grasses, pruning is also required to maintain their vigour and to prevent them out competing and eliminating other lower growing species<sup>127</sup>.

Pests such as possums or rodents are best controlled by physical controls, such as removing access to the roof, rather than the use of poisonous baits that may harm other fauna. Plant replacement will also be needed over time. This should be approached through careful plant selection and timed to maximise post-planting success on the roof. Specialist horticultural or ecological advice may be needed to assist with some aspects of biodiversity green roofs maintenance.

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## Example of a maintenance schedule for a biodiversity green roof

Details on maintenance of a biodiversity green roof in south-east Australia is provided below in Table 3, extracted from Rayner et al. (2022)<sup>128</sup>. This was developed as part of the Hort Innovation project *Researching the benefits of demonstration green roofs across Australia (GC16002)*.

Table 3. Biodiversity green roof maintenance requirements.

MAINTENANCE CONSIDERATION	DESCRIPTION
<b>Design and function</b>	A green roof designed primarily to enhance biodiversity using a largely indigenous plant palette and a range of features to create habitat and resources for invertebrates, birds and other wildlife.
<b>Maintenance objective</b>	Plants and other habitat features provide ecological resources – primarily habitat and food – for a range of biota, including target species where appropriate. Biodiversity on the roof increases ensuring connectivity with ground-level populations. Plants are healthy and weeds do not negatively impact plants, habitat features or biota. Species diversity is maintained to 80% of original plant list in routine maintenance.
<b>Maintenance inputs</b>	Low maintenance: bimonthly or quarterly schedule
<b>Substrate depth</b>	200 mm with some variation in topography (+/- 100 mm) to allow for habitat features
<b>Accessibility</b>	Access for maintenance purposes only, use of a fall-arrest system
<b>Vegetation type</b>	A mixture of largely native/indigenous herbaceous plants, mainly grasses and forbs.
<b>Irrigation system</b>	Yes – low pressure microspray system.
<b>Infrastructure and hard landscape elements</b>	<ul style="list-style-type: none"> <li>• Drains, gutters and flashings</li> <li>• Safety harness attachment points</li> <li>• Non-vegetated zones</li> <li>• Retaining edges</li> <li>• Structures/elements for habitat provision such as logs and old wood, piles of sticks, native bee/insect hotels, bird/bat boxes, rocks, water provision e.g. ephemeral pond/other water feature</li> </ul>

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## Maintenance schedule summary

Table 4 shows maintenance tasks and a suggested frequency per year. Biodiverse areas should be disturbed as little as possible during maintenance so as not to upset any microhabitats that might be colonised.

**Table 4:** Example of routine maintenance schedule for biodiversity green roofs.

TASK	ESTABLISHMENT (visits/yr)	ROUTINE (visits/yr)
<b>Safe work practices</b>		
Safety procedures (3.1.1)	Every visit	Every visit
Maintain safety systems	2	2 and as required
Staff training	1	1 and as required
<b>Monitoring</b>		
Visual inspection	Every visit	Every visit
Maintenance report	Every visit	Every visit
Review maintenance plan	1	1
<b>Horticulture</b>		
Weed control	Every visit	Every visit
Pruning	1 and as required	1 and as required
Fertilisation	1	1
Plant health	Every visit	Every visit
Mulching	1	1 and as required
Biomass removal	2	2
Replanting	2	1 and as required
Check substrate depth	1	1
<b>Infrastructure and hard landscape</b>		
Irrigation maintenance	Every visit	1
Drains, gutters and flashings maintenance	4	4
Surface cleaning	1	1
Maintaining hard landscape elements	1	1
Check habitat provision (e.g. bee hotel, water feature)	1	1

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## 2 Raingardens



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Raingardens, also known as bioretention systems, biofilters, bioinfiltration systems and bioremediation systems, are vegetated infiltration systems that improve stormwater quality.

Stormwater ponds on the raingarden surface, slowly infiltrates through the filter media to the base of the system and is then conveyed to the downstream drainage system. Pollutants such as nitrogen, phosphorus and suspended solids are removed as stormwater passes through the filter media.

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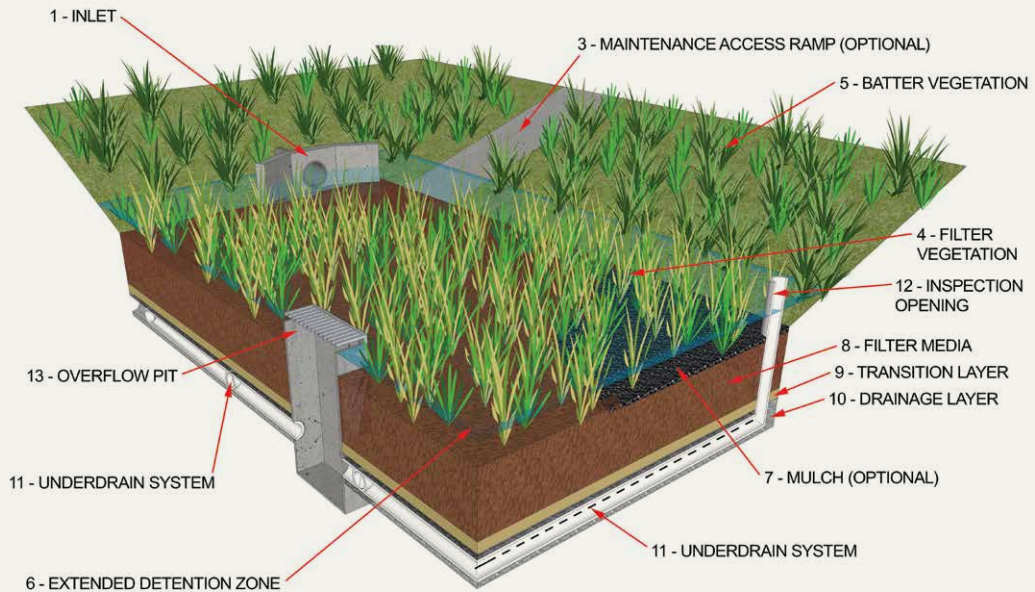
### Raingardens may comprise of up to 14 key functional components (Figures 1–4);

1. **Inlet** – Conveys stormwater into the raingarden (generally a pipe or kerb cut). The inlet may be fitted with a trash rack or screen to trap coarse litter.
2. **Sediment forebay (optional)** – Traps and prevents coarse sediment (>1 mm) from entering the raingarden and accumulating on the surface of the filter media.
3. **Maintenance access ramp (optional)** – Enables access to the sediment forebay for cleaning. Generally only present in large raingarden systems.
4. **Filter vegetation** – Healthy, actively growing plants are integral to pollutant removal processes and the long term sustainability of the raingarden.
5. **Batter vegetation (optional)** – Dense vegetation cover on the batters provides soil stability, traps litter and prevents unauthorised access to the raingarden.
6. **Extended detention zone** – Space above the surface of the raingarden which fills with stormwater during rainfall events.
7. **Mulch (optional)** – Prevents weed growth, helps to insulate and retain moisture within the filter media, particularly during the establishment phase.
8. **Filter media** – Highly permeable sandy-loam mix that enables stormwater to infiltrate the raingarden, facilitates pollutant removal and supports plant growth.
9. **Transition layer** – Coarse sand layer that prevents fine silts and sediments from being washed out of the raingarden.
10. **Drainage layer** – Coarse aggregate that enables treated stormwater to enter the underdrain system.
11. **Underdrain system (optional)** – Network of slotted pipes that convey treated stormwater from the base of the raingarden. Raingardens in sandy soil may not have underdrains as infiltrated flows may discharge directly into the underlying soil.
12. **Inspection opening** – Usually a capped PVC pipe for inspecting and cleaning the underdrain system.
13. **Overflow** – Conveys excess flows away from the raingarden when the capacity of the extended detention zone is full. Generally a grated pit or side entry pit. Underdrain pipes often discharge into an overflow pit.
14. **Submerged zone (optional)** – Raingardens can be designed so that water remains in the base (submerged zone) of the raingarden beneath the filter media (Figure 2). The submerged zone can improve nitrogen removal and be beneficial to raingarden plants in drier summer months. Submerged zone raingardens are maintained in a similar way to conventional raingardens.

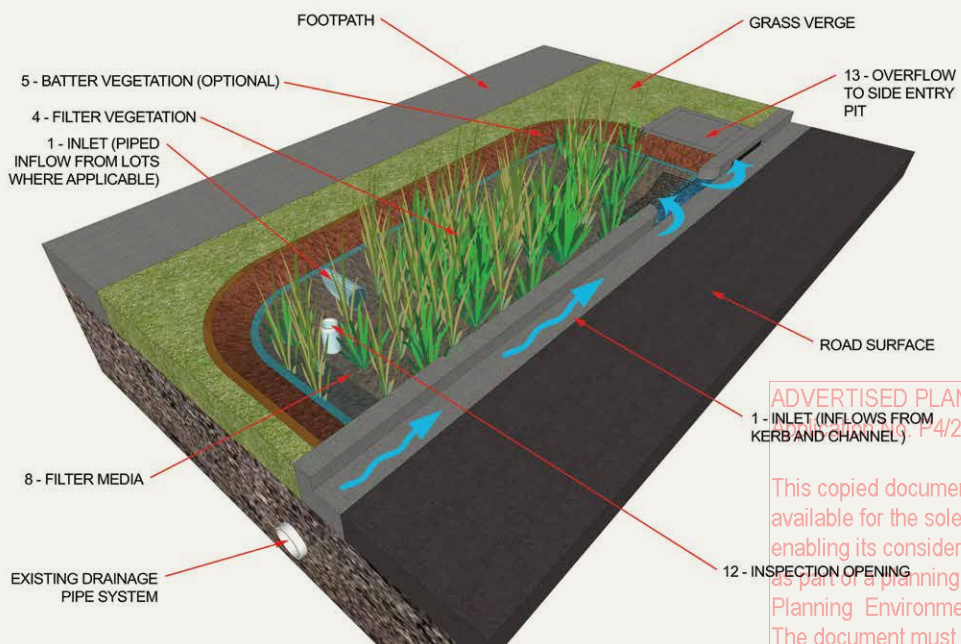
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**Figure 1** Schematic of conventional raingarden in open space (piped inflow) showing key functional elements

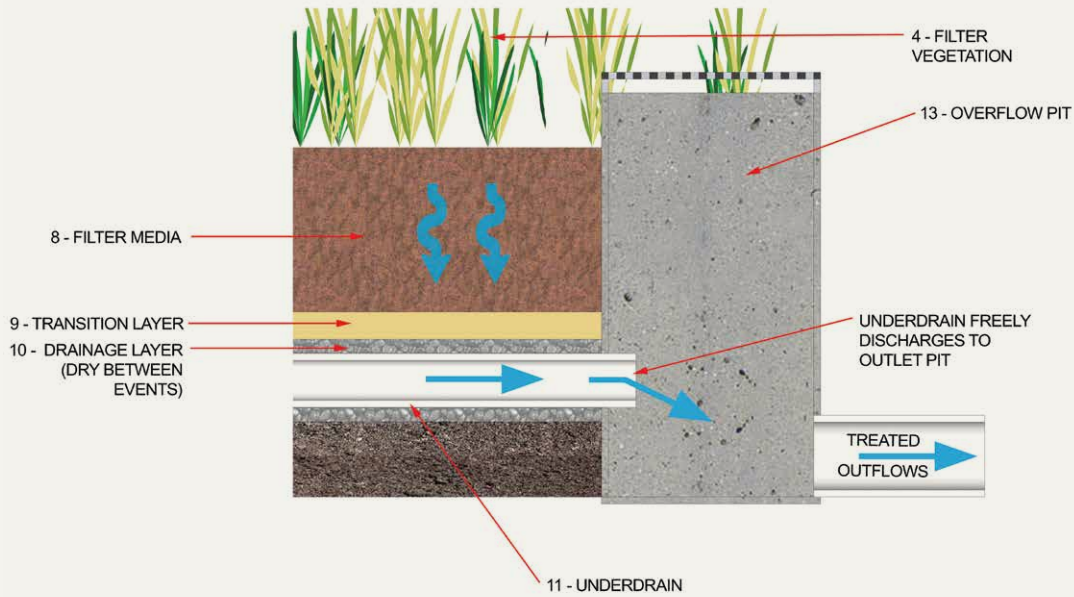


**Figure 2** Schematic of conventional raingarden integrated into streetscape connected to standard kerb and channel showing key functional elements

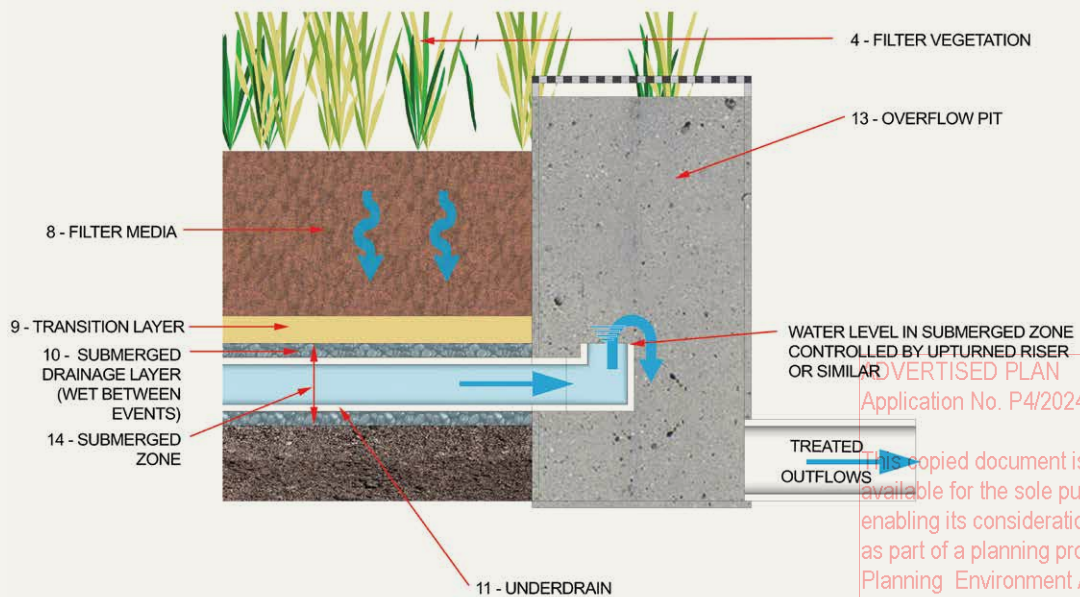


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 1 - INLET (INFLOWS FROM KERB AND CHANNEL) P4/2024  
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**Figure 3** Cross section of conventional raingarden outlet control



**Figure 4** Cross section of submerged zone raingarden outlet control



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## 2.1 RAINGARDEN SURFACE

### 2.1.1 Filter media

The filter media infiltration rate (speed that water drains through the filter media) is a key functional component of raingardens. Regular inspection of the filter media is required to monitor the infiltration rates.

Raingardens are particularly susceptible to clogging during the establishment period. After the filter media is installed, it may take 12–24 months to reach the designed infiltration rate. The infiltration rate of the filter media increases as the plant roots begin to grow down through the filter media and plant transpiration rates increase.

Maintenance crews need to be aware of potential issues associated with clogging of the upper filter media layer resulting in reduced infiltration rates. Clogging of the filter media surface is often indicated by water pooling on the surface of the raingarden for long periods of time (more than 12 hrs) following rainfall events. Raingardens with accumulated sediment (including clay/fine silt) greater than 15 mm average depth on the surface of the filter media are at risk of clogging.

Poor plant health can be an indicator of problems with clogging of the filter media. Clogging may prevent water entering the filter media and contribute to poor plant health. Plant health indicators may include yellowing of the foliage, wilting or stunted growth.

#### **Sediment accumulation**

Maintenance of the filter media may involve removing the accumulated sediment or raking (scarifying) the top ~20–50 mm. Raking the filter media should aim to disturb or remove accumulated silt/sediment (sediment crust) on top of the raingarden surface and allow stormwater to freely drain through the surface of the filter media. Care should be taken not to rake too close to vegetation with developing roots.

Note: If rock mulch is present, it may be necessary to remove the mulch prior to scarifying (physically breaking up) the filter media surface, as fine sediments often accumulate at the base of the rock mulch layer and not at the surface.

If sediment clogging persists within a raingarden, a sediment forebay or upstream sediment sump may need to be retrofitted to remove coarse sediments from the stormwater prior to entering the raingarden.

#### **Organic litter accumulation**

Large quantities of leaf litter can also contribute to clogging in raingardens. This commonly occurs in developed catchments which generally have more deciduous trees. It is important that excessive leaf litter (>70% surface area) is removed, particularly during the establishment period. Dense vegetation growth should help to trap leaf litter above the surface and reduce the need for removal after the establishment period.

#### **Incorrect filter media specification**

Incorrect initial filter media specification (e.g. high clay or fine sediment content) can also lead to reduced infiltration rates. Clogging due to incorrect filter media cannot be adequately addressed by proactive maintenance, and generally requires resetting of the filter media layer.

#### **Algal biofilms**

In some circumstances, algal biofilms may develop on the surface of the filter media leading to clogging issues. The presence of algal biofilms on the surface of the raingarden is generally indicative of other problems such as permanently wet filter media due to constant inflows, clogging or filter media with low hydraulic conductivity.

If inflows are observed for prolonged periods after rain (e.g. 24 hours after rain has stopped) an assessment of the catchment and inlet arrangement should be undertaken by an expert.

#### **Inspection and maintenance activities include:**

- Checking for sediment accumulation
- Removing sediment or scarifying filter media surface (when applicable)
- Removing leaf litter
- Checking for biofilms
- Monitoring ponding of water following rainfall events
- Checking for permanently boggy/pooled areas within the raingarden
- Monitoring plant health

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## 2.1.2 Erosion

Erosion of the raingarden surface can lead to the establishment of preferential flow paths around and through the raingarden. Erosion of the filter media often occurs due to high stormwater flow velocities passing through the raingarden.

High flow velocities may be due to excessive flows being discharged to the raingarden, the lack of infrastructure to dissipate flows, or the lack of vegetation cover. Rock protection around inlets can help to minimise scour and disperse energy.

Eroded filter media or soil (batters) should be replaced and any vegetation that has been damaged or removed restored.

The persistence of erosion problems within a raingarden may require rectification of the raingarden design. Refer to *Water by Design (2012) Rectifying Vegetated Stormwater Assets* for further information on rectifying erosion issues within raingardens.

### Inspection and maintenance activities include:

- Checking for erosion/scouring
- Checking for evidence of preferential flow paths
- Replacing filter media in eroded areas
- Adding rock protection around inlets
- Replanting dead plants.

## 2.1.3 Mulch

A mulch layer may be placed on top of the filter media surface to prevent weed growth, retain moisture and to prevent erosion of the raingarden surface.

Inorganic mulches (e.g. gravel) are commonly used in raingardens. Organic mulches are highly susceptible to scour and are easily dislodged or washed from raingardens. Regular inspection is required to ensure that the mulch layer remains intact and that an even depth of mulch is maintained across the raingarden. Note: buoyant mulch should be secured e.g. using pins and coarse jute netting or mats.

The average depth of the mulch across the raingarden is important to reduce scouring and prevent weeds from growing. Excessive mulch depths can reduce the ability of some plants to spread and establish evenly throughout the raingarden.

The accumulation of mulch around the lower stems of plants may result in plant damage and subsequent growth decline or death of the plant. Care should be taken during inspection and maintenance to ensure that the mulch layer is not touching the stems of the plants.

The level of the mulch layer in relation to the inflow point (inlet pipe, kerb and channel) is also very important, as excessive mulch may cause stormwater to bypass the raingarden. The mulch level should ideally be below the inlet height to ensure that water enters and spreads evenly across the raingarden surface.

The surface of the mulch layer should be at least 100mm below the top of the outflow pit. If the mulch layer is too thick, then the raingarden will lose treatment effectiveness due to the reduced storage volume (i.e. the extended detention depth above the filter bed is reduced).

### Inspection and maintenance activities include:

- Checking the average depth and distribution of the mulch layer
- Checking that the mulch is not touching the plant stems
- Replacing mulch that has been washed out or displaced
- Checking for evidence of sediment/silt accumulation within the mulch layer (refer to Section 2.1.1)
- Retaining mulch using jute mats or nets.

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## 2.2 VEGETATION

### 2.2.1 Filter surface

Vegetation plays an important role in reducing the velocity of stormwater entering the raingarden, removing pollutants, maintaining the porous nature of the filter media and providing an attractive landscape feature for the community.

It is very important for ongoing function of the raingarden that healthy, densely planted (6–10 plants per square metre) vegetation is established.

Vegetation should be evenly distributed across the raingarden, so that there are no bare patches for weeds to invade. It is important that at least 90% of the filter area is covered by vegetation. Bare patches (greater than 5% of the filter area) should be replanted using either new plants or by dividing and translocating existing plants.

The condition of the raingarden vegetation needs to be constantly monitored to ensure that the plants are healthy, free from disease and vigorously growing. It is important that vegetation is maintained in healthy condition, as this ensures that vigorous root systems develop throughout the raingarden filter bed. Dead or diseased plants should be removed and replaced.

Monitoring the condition of the vegetation is important, as signs of poor plant health may be indicative of other functional problems in the raingarden such as too low or high infiltration rates.

The growth of weeds within raingardens is inevitable, and some level of weed control is required to maintain the function of the asset. Regular weeding is critical to the successful establishment of vegetation, as competition from weeds may reduce the growth rate and cover of the desirable plants.

It is important that no more than 10% of the filter media surface area and batters are covered in weeds. Greater cover of weeds may indicate the need for increased maintenance or further planting to increase vegetation cover across the raingarden.

Weeds should be physically removed from the filter media surface and batters. The use of herbicides should be avoided as these may harm the desirable raingarden vegetation and contaminate the filter media.

Refer to Appendix B of *Water by Design (2012) Maintaining Vegetated Stormwater Assets* for a detailed description of weeding techniques that may be used in raingardens.

#### Inspection and maintenance activities include:

- Inspecting plant health and cover
- Removing weeds (avoid using herbicides)
- Watering plants (establishment phase)
- Replacing dead plants to maintain a consistent vegetation density (6–10 plants per m<sup>2</sup>) across the raingarden
- Pruning plants (where applicable).

**Figure 5** Healthy, densely planted vegetation is important to the long term performance of the raingarden



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## 2.2.2 Batters

Vegetated batters are sometimes used to transition from the raingarden surface to the surrounding land surface. Low vegetation, or alternative edge treatment, may be used in streetscape raingardens to maintain traffic sight lines. The batter vegetation is often the most prominent vegetation visible within the raingarden and the maintenance of healthy vegetation is important to the overall amenity of the raingarden.

The batter vegetation is important for stabilising the edges of the raingarden, trapping litter that enters the raingarden from the surrounding landscape and preventing unauthorised access to the raingarden. It is important to ensure that continuous vegetation cover is maintained along the lower batter.

### Inspection and maintenance activities include:

- Inspecting plant health and cover
- Removing weeds
- Replacing dead plants
- Pruning plants (where applicable)
- Watering plants (establishment phase).

## 2.3 CIVIL COMPONENTS

### 2.3.1 Structural damage

The structural integrity of the raingarden infrastructure is important to ensure that stormwater enters, disperses and exits the raingarden as designed. Raingarden infrastructure includes: inlet pipe, kerbing and channel, sediment forebay, overflow pit, underdrain pipes, inspection openings and walls/edges.

Damage to the raingarden infrastructure can cause stormwater to bypass the raingarden, resulting in the loss of performance or further damage to the raingarden such as scouring of the filter media or loss of vegetation.

Raingardens in high-traffic areas are particularly susceptible to vehicular damage if they are not adequately protected by bollards or similar.

Damage to the raingarden infrastructure should be noted during regular inspections and reported to the asset manager. Generally, damage to the raingarden infrastructure will require rectification measures. Advice may need to be sought from a qualified engineer/designer prior to undertaking repairs.

### Inspection and maintenance activities include:

- Checking for damage to raingarden infrastructure and repairing as required.

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### 2.3.2 Blockages

All inflow and outflow points must remain free of sediment, litter and debris to ensure that stormwater is able to freely enter and exit the raingarden.

It is particularly important to keep the outflow point (usually an overflow pit) clear of leaf litter and debris so that stormwater can exit the raingarden during and after high rainfall events.

Leaf litter is generally the primary cause of outlet blockage. After the establishment period, leaf litter should be trapped in the dense raingarden vegetation before it reaches the outlet. If litter is consistently blocking the outlet, consider installing a gross pollutant trap (GPT) at the inlet.

#### Inspection and maintenance activities include:

- Ensuring that all inlet and outlet points are clear of sediment, litter and debris.

### 2.3.3 Sediment forebay

Sediment forebays are basin-like pre-treatment measures that can be used to protect the raingarden from coarse sediment loads (and some leaf litter accumulation) (Figure 6).

Sediment, leaf debris and coarse litter will need to be periodically removed from the sediment forebay and inlet area of the raingarden. Accumulated sediment should be removed from the sediment forebay when it is more than 75% full.

The sediment forebay should be designed so that a flat shovel (small raingarden) or bobcat (large raingarden) can be used to easily remove accumulated sediment.

#### Inspection and maintenance activities include:

- Removing coarse litter from the sediment forebay and inlet areas
- Removing accumulated sediment from the sediment forebay when it is more than 75% full
- Removing accumulated sediment from the inlet area.

**Figure 6** Example of a sediment forebay at the inlet zone of a raingarden (note the raingarden surface is covered with turf to protect the filter media from construction phase sediment loads)



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### 2.3.4 Inspection opening

Most raingardens are designed with one or more inspection openings (vertical pipes) which are connected to the underdrain system of the raingarden. The inspection pipe is usually identified by a screw-cap at the surface of the raingarden (Figure 7). Inspection pipes are often covered by vegetation and can be difficult to find. Design drawings should indicate the location of inspection openings.

The inspection openings are designed so that subsurface water levels can be checked and a water jet or pipe snake can be used to flush out the underdrain. When the underdrain is flushed out, a clear stream of water should be visible at the base of the outlet pit.

Note: the underdrain systems in some raingardens are not connected to an outlet pit, and inspection of flushing water may not be possible.

For raingardens with saturated zones, the saturated zone should be drained before flushing out underdrain pipes.

#### Inspection and maintenance activities include:

- Checking the water level in the base of the raingarden
- Checking for sediment accumulation within the underdrain system
- Flushing the underdrain system.

**Figure 7** Example of inspection openings in a raingarden



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## 2.4 INSPECTION AND MAINTENANCE SCHEDULE

This is an example schedule to guide the timing of your inspection and maintenance activities. This schedule outlines the average service the assets require, but you can adjust these timings

to suit your assets. This schedule and the "Inspection and Maintenance form" (see over page) have been designed to be copied and used on site.

### Responsibility of assets

#### Example:

Regular inspections should be carried out every 3 months. The inspection and maintenance of the raingarden including all civil and landscape components is the responsibility of Council/contractor.

The operation and maintenance of adjacent stormwater infrastructure, parklands, garden beds, recreational assets, pathways and road surfaces is the responsibility of Council.

Item	What to check for	Action	Frequency
<b>Civil components – Raingarden</b>			
<b>Inlet</b>	No evidence of erosion, blockage, damage or standing water.	Clear inlet of accumulated sediment or debris.	Storm events
		Eroded areas should be locally re-profiled or reinforced, and re-planted if necessary.	3 months
		Refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> if the erosion is either recurring or severe.	
<b>Outlet</b>	No evidence of erosion, blockage, damage or standing water Outlet freely draining.	Clear outlet of accumulated sediment or debris.	Storm events
		Refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> if standing (backwatering into the raingarden) is present.	3 months
<b>Other structures</b>	No evidence of erosion and damage to other structures, e.g. pits, pipes, access ramps, walls and rock protection.	Repair minor damage to structures. Eroded areas should be repaired (reinforced). This may involve minor re-profiling or re-planting works. For severe damage, i.e. where flows have scoured down the side of a structure refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> .	3 months
<b>Batters and bunds</b>	No evidence of erosion.	Eroded areas should be locally re-profiled or reinforced, and re-planted if necessary.	Annually
<b>Hydraulic conductivity</b>	Filter media is draining freely. No water ponded on the surface of the raingarden for more than 12 hours after rainfall.	If water is ponded on the surface of the raingarden for more than 12 hours after rainfall, refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> . Note: the disposal of raingarden filter material must comply with EPA Victoria guidelines for the disposal of contaminated soil (Appendix C).	Storm events
<b>Sediment accumulation</b>	Sediment forebay less than 75% full.	Clean out accumulated sediment from the sediment forebay.	Annually
	No major sediment accumulation on surface of the raingarden.	Accumulated sediment to be removed from the surface of the raingarden and the system replanted as required.	
<b>Filter media surface</b>	No surface scour, depressions.	Filter surface to be repaired. This may involve evening out the surface, importing additional filter media and replanting.	3 months
<b>Fine sediment surface crust</b>	No impermeable or clayey surface on the filter media.	Repair surface layer by scarify filter media surface, re-profiling and re-establishing vegetation, if required.	3 months
	No major surface crusting (<3mm depth across less than 10% of the filter area is permissible).	If the problem persists refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> .	
<b>Mulch layer</b>	Even depth and distribution of the mulch layer.	Re-distribute or replace mulch that has been washed out or displaced. This may involve retaining mulch using jute mats or nets.	3 months
	Surface of the mulch layer is at least 100 mm below the top of the outflow pit.	Remove mulch that is touching plant stems.	
	Mulch is not touching the plant stems		
<b>Algal or moss growth</b>	No major algal growth (less than 10% of raingarden area is permissible).	If significant patches of algal growth or moss persist across the surface of the raingarden (i.e. greater than 10% of the surface) then refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> .	3 months
	No moss growth.		
<b>Inspection opening</b>	Water level is below filter media layer.	Refer to Water by Design (2012) <i>Rectifying Vegetated Stormwater Treatment Assets</i> if standing water is present in the filter media layer.	Annually
	No sediment accumulation in underdrain system.	Flush the underdrain system using low pressure water jet to remove accumulated sediment.	

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Item	What to check for	Action	Frequency
<b>Landscape components – Raingarden</b>			
<b>Vegetation cover – filter media</b>	Greater than 90% vegetation cover.	Remove any dead or diseased vegetation.	3 months
	Plants healthy, free from disease and vigorously growing.	Replant individual bare patches (greater than 5% of the area) using either new plants or by dividing and translocating existing plants.	
<b>Vegetation cover – batters</b>	Continuous vegetation cover along the lower batter.	If bare areas represent greater than 30% of the raingarden area, refer to <i>Water by Design (2012) Rectifying Vegetated Stormwater Treatment Assets</i> .	Annually
	Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.		
<b>Weeds – filter media – batters</b>	Less than 10% of the filter media surface area and batters covered in weeds.	Physically remove weeds from filter media surface and batters.	3 months
		Do not use herbicides as these may harm the desirable raingarden vegetation and contaminate the filter media.  Refer to <i>Water by Design (2012) Rectifying Vegetated Stormwater Treatment Assets</i> if weed ingress is a persistent problem (i.e. weed coverage is persistently greater than 30%).	
<b>Litter</b>	Filter media surface and batters free of litter (i.e. less than 1 piece litter per 4m <sup>2</sup> ).	Remove all litter and excessive debris	3 months
<b>Pests</b>	No damage by pest animals and insects.	Seek specialist advice if persistent insect damage is observed.  Refer to <i>Water by Design (2012) Rectifying Vegetated Stormwater Treatment Assets</i> if there is evidence of pest animal damage.	3 months

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## 2.5 INSPECTION AND MAINTENANCE FORM

This form should be used during inspection and maintenance, as it provides a checklist of the key inspection elements and a permanent record of the maintenance activities undertaken.

This form should be submitted to the asset manager following every inspection and maintenance event, so that any persistent problems or issues requiring further investigation can be identified and responded to.

Raingarden inspection and maintenance form			
Asset ID			
Location			
Inspection officer's name			
Date		Date of last rainfall	
<b>Photos of site (explanatory notes)</b>  1. 2. 3. 4. 5.			
<b>General comments, sketches, description of maintenance undertaken</b>          			

Item	What to check for	Inspected	Maintenance undertaken	Further action required or comment
<b>Civil components – Raingarden</b>				
<b>Inlet</b>	No evidence of erosion, blockage, damage or standing water.			
<b>Outlet</b>	No evidence of erosion, blockage, damage or standing water Outlet freely draining.			
<b>Other structures</b>	No evidence of erosion and damage to other structures, e.g. pits, pipes, access ramps, walls and rock protection.			
<b>Batters and bunds</b>	No evidence of erosion.			
<b>Hydraulic conductivity or permeability</b>	Filter media is draining freely. No water ponded on the surface of the raingarden for more than 12 hours after rainfall.			

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Item	What to check for	Inspected	Maintenance undertaken	Further action required or comment
<b>Sediment accumulation</b>	Sediment forebay less than 75% full. No major sediment accumulation on surface of the raingarden.			
<b>Filter media surface</b>	No surface scour, depressions.			
<b>Fine sediment surface crust</b>	No impermeable or clayey surface on the filter media. No major surface crusting (<3mm depth across less than 10% of the filter area is permissible).			
<b>Mulch layer</b>	Even depth and distribution of the mulch layer. Surface of the mulch layer is at least 100 mm below the top of the outflow pit. Mulch is not touching the plant stems.			
<b>Algal or moss growth</b>	No major algal growth (less than 10% of raingarden area is permissible). No moss growth.			
<b>Inspection openings</b>	Water level is below filter media layer. No sediment accumulation in underdrain system.			
<b>Landscape components – Raingarden</b>				
<b>Vegetation cover – filter media</b>	Greater than 90% vegetation cover.			
	Plants healthy, free from disease and vigorously growing.			
<b>Vegetation cover – batters</b>	Continuous vegetation cover along the lower batter. Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.			
	Greater than 90% vegetation cover.			
	Plants healthy, free from disease and vigorously growing.			
	Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.			
<b>Weeds – filter media – batters</b>	Less than 10% of the filter media surface and batters covered in weeds.			
<b>Litter</b>	Filter media surface and batters free of litter (i.e. less than 1 piece litter per 4m <sup>2</sup> ).			
<b>Pests</b>	No damage by pest animals and insects.			

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