20 November 2024

Emmaus College Saint Timothy's Campus

17-23 Stevens Road, Vermont VIC 3133

Sustainability Management Plan

Job no: SH364582

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Date	No.	Prepared by	Checked by
20/11/2024	Final	Tushar Hanashi	Yamini Shrikhande

Document Version

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EXECUTIVE SUMMARY

SUHO was engaged by ROAM Architects to provide a Sustainability Management Plan for a proposed extension to an educational development at 17-23 Stevens Road, Vermont VIC 3133. The proposed development is within the jurisdiction of the Whitehorse City Council, and for a development of this size, the council requires a Sustainability Management Plan or equivalent (SMP) to be produced as part of its planning approval process.

The Built Environment Sustainability Scorecard (BESS) has been used to quantitatively assess the proposed development's sustainable design measures. The BESS report summarises the sustainable design initiatives incorporated into the proposed development and benchmarks them against industry best practice.

Categories	Minimum required	Category score	Weighting	Compliance Achieved?
Management	-	33%	4.5%	
Water	50%	64%	9.0%	YES
Energy	50%	52%	27.5%	YES
Stormwater	100%	100%	13.5%	YES
Indoor Environment Quality (IEQ)	50%	56%	16.5%	YES
Transport	-	0%	9.0%	
Waste Management	-	66%	5.5%	
Urban Ecology	-	62%	5.5%	
Innovation	-	0%	9.0%	
Overall BESS Score	50%	51%	100%	YES

Overall, the development has met the requirements outlined in the BESS assessment, achieving an overall score of 51%.

DOCUMENT EVIDENCE

The items below are required to be marked on the plans and specified in the ESD table within the town planning drawing sets.

Items to be marked on drawings:

- Site / Floor plans showing a notation regarding water efficient fixtures and appliances.
- Drawings indicating catchment areas to tanks, slope of paved surfaces to treatment systems, construction details of proposed treatment systems, e.g. rainwater tanks.
- Site / Floor plans showing Rainwater tank(s), drawn at the correct size and labelled as connected to all proposed toilets or other re-use opportunities.
- Provide evidence for proposed maximum illumination power density (W/m^2) in at least 90% of the area of the relevant building class meet the requirements in Table J7D3a of the NCC 2022 Vol 1.
- Roof plans showing location of 10 kW solar photovoltaic system.
- Proposed approach or provision to ensure CO2 concentration remains below 800ppm.
- Indicate bicycle parking spaces for employees/staff and visitors/students on the floor plans.
- Organic waste system/bin marked on plans.
- Showing the location of general and recycling bins on floor plans.
- Note showing light colour roof (low absorptance value < 0.45) on roof plans and elevations.

Items to be included in the ESD Table:

ESD Initiatives	Description
General	> The project will align with the Sustainability Management Plan report prepared by SUHO for all ESD initiatives.
Management	> A preliminary facade assessment has been undertaken in accordance with NCC2022 Section J4D6. > A preliminary energy modelling has been undertaken in accordance with NCC 2022 Section J.
Water Efficiency	> The proposed development is to be provided with a total minimum of 20,000L rainwater tank. > Rainwater tank is to be connected to all the proposed toilets for flushing purposes. > WELS rating for water fittings/fixtures – Taps (bathroom and kitchen) – 5 Star – Dishwasher – 5 Star – Toilets – 4 Star
Stormwater	> Refer to InSite Water Report.
Energy	> The maximum illumination power density (W/m^2) of the development will meet the requirements in NCC2022. > 10kW Solar PV on the roof of the development.
Indoor Environment Quality	> O/A provision to ensure CO2 concentration remains below 800ppm. > All paints, sealants and adhesives meet the maximum total indoor pollutant emission limits. > 62% of the nominated floor area achieves at least 2% daylight factor. > 96% of regular use areas will be effectively naturally ventilated.
Transport	> Total 61 bicycle spaces will be provided for both employees and visitors. > Refer to the Traffic Engineering Assessment Report by Traffix Group for further details.
Waste	> Facilities provided for on-site management of food and garden waste. > Recycling facilities provided at least as convenient for occupants as facilities for general waste. > Refer to the Waste Management Plan Report by Traffix Group for further details.
Urban Ecology	> 40% of the site is covered with vegetation. > 96m² of Covered outdoor plaza to be proposed for communal use. > Light colour roof (low absorptance value <0.45) to minimise urban heat island effect.

PROJECT OVERVIEW

The proposed educational development is located at 17-23 Stevens Road, Vermont VIC 3133.

Description	Area
Site Area	1270m^2
Built Up Area	1422m^2
BESS Score	51%

The development is in NCC Climate Zone 6. The following aerial photo shows the location of the site.

Figure 1: Aerial view of subject site

MANAGEMENT

Credit	Categories	Description
2.3	Thermal Performance Modelling	A preliminary façade assessment and a preliminary energy modelling has been undertaken in accordance with NCC 2022 Section J requirement. See Appendix B Preliminary J1V3 report for details.

WATER EFFICIENCY

Credit	Categories	Description
1.1	Water Efficient Fittings	The development will include efficient fittings and fixtures to reduce the volume of mains water used. The following WELS star ratings are specified: > Taps (bathroom and kitchen) – 5 Star > Dishwasher – 5 Star > Toilets – 4 Star
1.1	Rainwater Tanks	Rainwater runoff from the proposed roof area of the building will be collected and stored in rainwater tanks. A total minimum of 20,000L rainwater tank will be provided for toilet flushing purposes. Of the 20,000L capacity, 6,000L will be allocated for retention, while 14,000L will be designated for detention. If required, a charged pipe system will be installed. The charged pipes will not be running underneath the building footprint and the stakeholders will be required to explicitly acknowledge this solution and have the capacity to install it. Rainwater tanks are to be connected to all proposed toilets on ground and first floor level.

ENERGY EFFICIENCY

<table>
<tr><th>Credit</th><th>Categories</th><th>Description</th></tr>
<tr><td>1.1, 2.1</td><td>Energy Efficiency</td><td>J1V3 modelling using Design Builder was undertaken for the development. See Appendix B Preliminary J1V3 report for details.
<table>
<tr><td colspan="2">Proposed fabric achieves below specifications:</td></tr>
<tr><td>Roof and Ceiling</td><td>Total R-Value of R2.3</td></tr>
<tr><td>Walls</td><td>Brick Veneer Wall: R1.3
Metal Clad Wall: R1.1</td></tr>
<tr><td>Glazing</td><td>Glazing Performance values are required to be equal to or less than those specificized below.
U-value = 4.50
SHGC = 0.45</td></tr>
<tr><td>Floor</td><td>Ground Floor with Carpet covering: R2.4
Ground Floor with Vinyl Covering: R2.2
External Floor: R1.1</td></tr>
</table></td></tr>
<tr><td>3.7</td><td>Internal Lighting</td><td>The maximum illumination power density (W/m^2) in at least 90% of the area of the relevant building class meet the requirements in Table J7D3a of the NCC 2022 Vol 1.</td></tr>
<tr><td>4.2</td><td>Renewable Energy Systems - Solar PV</td><td>The building will be provided with 10kW Solar PV systems on the roof.

The tilt angle will be at least 30 degrees to allow for appropriate energy production and self-cleaning.</td></tr>
</table>

STORMWATER MANAGEMENT

Credit	Categories	Description
1.1	InSite Result	A storm rating of over 118% has been achieved by implementing the below WSUD treatments.
	Rainwater Tanks	Rainwater runoff from the roof area of the building will be collected and stored in rainwater tanks. The building will be provided with a minimum of 20,000L rainwater tank that will be used for rainwater harvesting for toilets flushing. The 20,000L rainwater tank will have retention capacity of 6,000L and 14,000L for detention storage. > 690m^2 of roof area will be diverted into a 20,000L rainwater tank. If required, a charged pipe system will be installed. The charged pipes will not be running underneath the building footprint and the stakeholders will be required to explicitly acknowledge this solution and have the capacity to install it.
	Untreated Concrete Driveway	The untreated concrete surfaces will be graded to fall to the engineer designed drainage system.

INDOOR ENVIRONMENT QUALITY

Credit	Categories	Description
1.4	Daylight Access	See below summary for the percentage of the floor area to achieve a Daylight factor of at least 2%. Regular use areas: **62%** Please refer to Appendix F for daylight report showing compliance with best practice requirements.
2.3	Ventilation	96% of regular use areas will be effectively naturally ventilated. All proposed labs, maker space and food tech rooms achieve natural crossflow ventilation and these rooms account for approximately 96% of the regular occupied areas. 96% has been entered in BESS Credit IEQ2.3. Please refer to Appendix G for ventilation markups. O/A will be provided in the office spaces to ensure that CO2 concentration in the rooms remains below 800ppm.
4.1	Air Quality (VOC & Formaldehyde)	All paints, adhesives and sealants, carpets, and engineered wood will meet the total indoor pollutant emission limits.

The following building materials will comply with TVOC Content limit as per the table below:

> Low VOC paints, adhesives and sealants

Product Category	TVOC Limit [g/L]*
General purpose adhesives	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

Table 1: TVOC Content - Paints, Adhesives and Sealants

TRANSPORT

Below is a summary of BESS credits which have been targeted for this project.

Credit	Categories	Description
1.4, 1.5	Bicycle Parking	Employees/staff and visitors/students will be able to securely park their bicycles within the development. A total of 61 spaces will be provided for the development. Refer to the Traffic Engineering Assessment Report by Traffix Group for further details.

WASTE MANAGEMENT

Credit	Categories	Description
2.1	Operational Waste - Food & Garden Waste	Facilities have been provided for on-site management of food and garden waste. Refer to the Waste Management Plan Report by Traffix Group for further details.
2.2	Operational Waste - Convenience of Recycling	Recycling facilities are as convenient for occupants as facilities for general waste. The development will be provided with bins for general waste and recycling waste. Refer to the Waste Management Plan Report by Traffix Group for further details.
Construction Environment Management		The builder will identify environmental risks related to construction and include management strategies such as maintaining effective erosion and sediment control measures during construction and operation and ensure that appropriate staging of earthworks.

URBAN ECOLOGY

Credit	Categories	Description
1.1	Communal Spaces	96m^2 of the communal space will be provided for the development. Please refer Figure 2 below.
2.1	Vegetation	Vegetated areas will be incorporated throughout the site. 40% of the site will be covered with vegetation, excluding permeable non-vegetated areas such as gravel and permeable pathways. Please refer Figure 3 below.
Light Colour Roof		Light colour roof will be provided for the development with a low absorptance value < 0.45 to reduce the urban heat island effect.

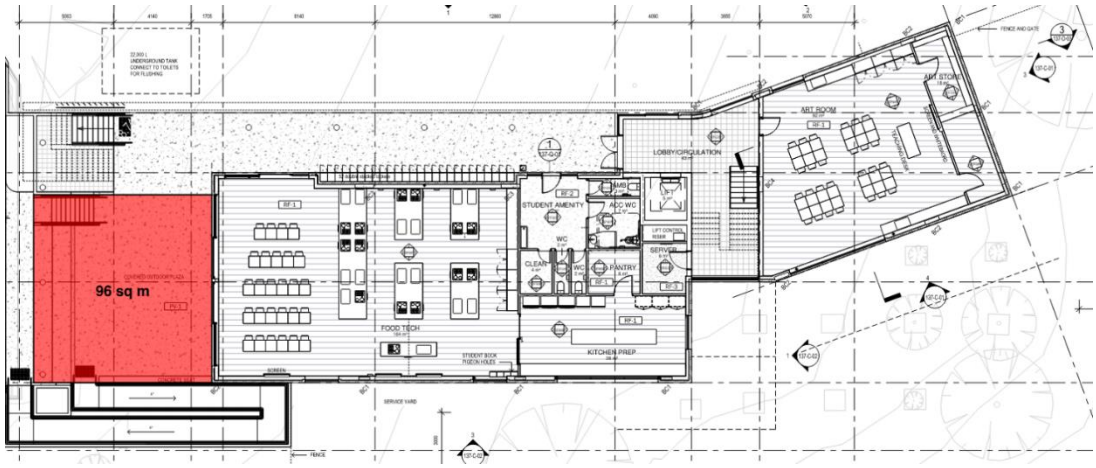


Figure 2: Proposed Covered Outdoor Plaza (Communal Area)

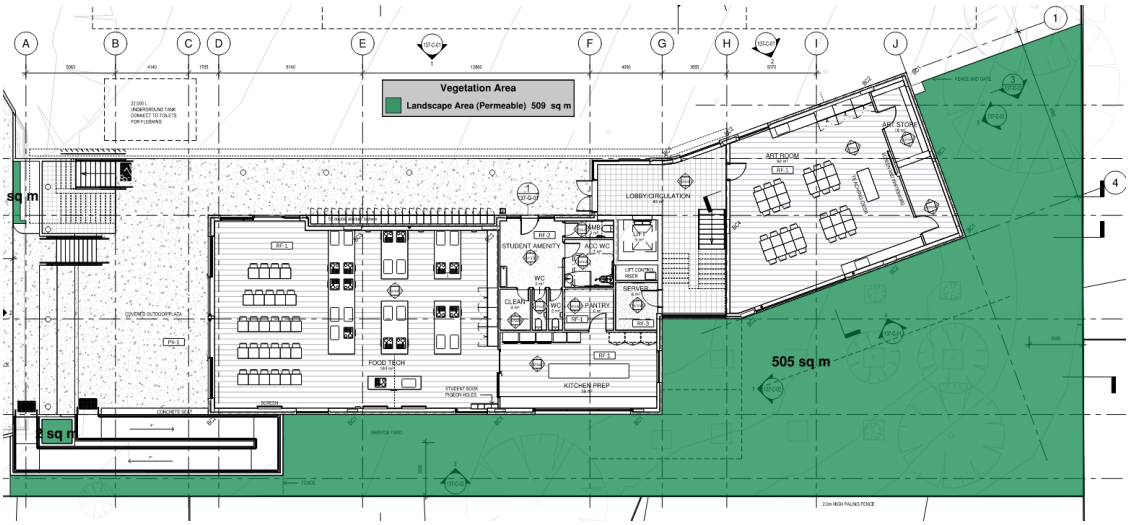


Figure 3: Proposed Vegetation Area

MATERIAL

Categories	Description
Timber	All timber used in the development will be Forest Stewardship Council (FSC) or Program for the Endorsement of Forest Certification (PEFC) certified, or recycled/reused.
Steel	Steel for the development will be sourced from a Responsible Steel Make that have facilities with a currently valid and certified ISO 14004 Environmental Management System (EMS) in place, and be a member of the World Steel Association's (WSA) Climate Action Program (CAP). Reinforcing steel will be manufactured using energy-reducing processes commonly used by large manufacturers such as Bluescope or OneSteel.
Joinery	Wherever possible, joinery will be manufactured from materials/products certified under any of the following: > Global GreenTag - https://www.globalgreentag.com/; and > Good Environmental Choice (GECA)
Flooring	Wherever possible, flooring will be selected from products/materials certified under any of the following: > Carpet Institute of Australia Limited, Environmental Certification Scheme (ECS); > Global GreenTag - https://www.globalgreentag.com/; and > Good Environmental Choice (GECA). Alternatively, flooring must be durable, include some eco-preferred content, be modular and/or come from a manufacturer with a product stewardship program and ISO 14001 certification.
VOC & Formaldehyde	All paints, adhesives and sealants, carpets, and engineered wood will meet the total indoor pollutant emission limits.

APPENDIX A – BESS OUTPUT REPORT

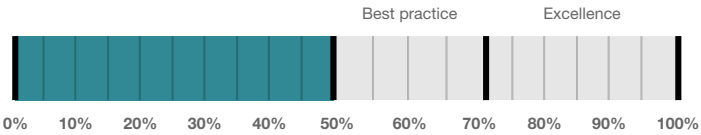
BESS Report

Built Environment Sustainability Scorecard

This BESS report outlines the sustainable design commitments of the proposed development at 17-23 Stevens Rd Vermont Victoria 3133. 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 Whitehorse 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

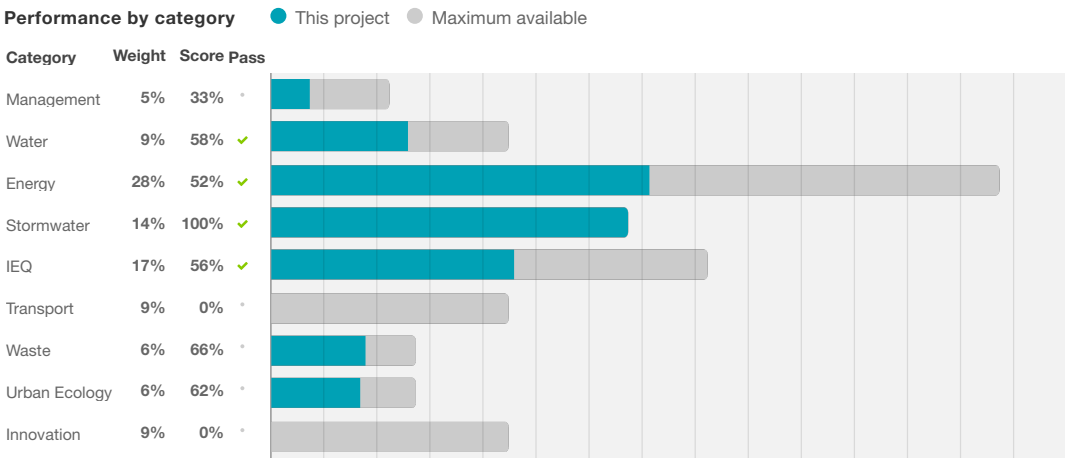


51%

Project details

Name	17-23 Stevens Rd, Vermont VIC 3133, Australia
Address	17-23 Stevens Rd, Vermont VIC 3133
Project no	6DCE36E6-R1
BESS Version	BESS-8
Site type	Non-residential development
Account	esd@sustainabilityplanning.com
Application no.	
Site area	1,270 m²
Building floor area	1,422 m²
Date	20 November 2024
Software version	2.0.1-B.572

Performance by category



Buildings

Name	Height	Footprint	% of total footprint
Proposed Building	2	744 m²	100%

Dwellings & Non Res Spaces

Non-Res Spaces

Name	Quantity	Area	Building	% of total area
Public building				
Proposed Development	1	1,422 m²	Proposed Building	100%
Total	**1**	**1,422 m²**	**100%**	

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Energy 4.2	Location and size of solar photovoltaic system	To be printed to be marked in architecture plans	✔
Stormwater 1.1	Location of any stormwater management systems (rainwater tanks, raingardens, buffer strips, ponds, wetlands)	To be printed to be marked in architecture plans	✔
Waste 2.1	Location of food and garden waste facilities	To be printed to be marked in architecture plans	✔
Waste 2.2	Location of recycling facilities	To be printed to be marked in architecture plans	✔
Urban Ecology 1.1	Location and size of communal spaces	To be printed to be marked in architecture plans	✔
Urban Ecology 2.1	Location and size of vegetated areas	To be printed to be marked in architecture plans	✔

Supporting evidence

Credit	Requirement	Response	Status
Management 2.3a	Section J glazing assessment	To be printed Preliminary J1V3 Report Refer to Preliminary J1V3 Report	✔
Management 2.3b	Preliminary modelling report	To be printed Preliminary J1V3 Report Refer to Preliminary J1V3 Report	✔
Energy 1.1	Energy Report showing calculations of reference case and proposed buildings	To be printed Preliminary J1V3 Report Refer to Preliminary J1V3 Report	✔
Energy 3.7	Average lighting power density and lighting type(s) to be used	To be printed Architectural Drawings refer to notes in architecture plans	✔
Energy 4.2	Specifications of the solar photovoltaic system(s)	To be printed Architectural Drawings refer to architecture plans	✔

Credit	Requirement	Response	Status
Stormwater 1.1	STORM report or MUSIC model	To be printed SMP Report Refer to SMP Appendix	✔
IEQ 1.4	A short report detailing assumptions used and results achieved.	To be printed SMP Report Refer to SMP Appendix	✔

Credit summary

Management Overall contribution 4.5%

		33%
1.1 Pre-Application Meeting		0%
2.3 Thermal Performance Modelling - Non-Residential		100%
3.2 Metering - Non-Residential		N/A ✣ Scoped Out
		Single Tenancy
3.3 Metering - Common Areas		N/A ✣ Scoped Out
		Single Tenancy
4.1 Building Users Guide		0%

Water Overall contribution 9.0%

	Minimum required 50%	58% ✔ Pass
1.1 Potable Water Use Reduction		70%
3.1 Water Efficient Landscaping		0%
4.1 Building Systems Water Use Reduction		N/A ✣ Scoped Out
		The proposed development does not have a sprinkler system.

Energy Overall contribution 27.5%

	Minimum required 50%	52%	✔ Pass
1.1 Thermal Performance Rating - Non-Residential		18%	
2.1 Greenhouse Gas Emissions		100%	
2.2 Peak Demand		0%	
2.6 Electrification		0%	⊘ Disabled
	Credit is available when the energy supply is set to all-electric (no gas or wood).		
2.7 Energy consumption		100%	
3.1 Carpark Ventilation		N/A	✣ Scoped Out
	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.		
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%

	Minimum required 100%	100%	✔ Pass
1.1 Stormwater Treatment		100%	

IEQ Overall contribution 16.5%

	Minimum required 50%	56%	✔ Pass
1.4 Daylight Access - Non-Residential		62%	✔ Achieved
2.3 Ventilation - Non-Residential		81%	✔ Achieved
3.4 Thermal comfort - Shading - Non-Residential		0%	
3.5 Thermal Comfort - Ceiling Fans - Non-Residential		0%	
4.1 Air Quality - Non-Residential		100%	

Transport Overall contribution 9.0%

	0%
1.4 Bicycle Parking - Non-Residential	0%
1.5 Bicycle Parking - Non-Residential Visitor	0%
1.6 End of Trip Facilities - Non-Residential	0% ⊘ Disabled
	Credit 1.4 must be complete first.
2.1 Electric Vehicle Infrastructure	N/A ⌖ Scoped Out
	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.
2.2 Car Share Scheme	0%
2.3 Motorbikes / Mopeds	N/A ⌖ Scoped Out
	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.

Waste Overall contribution 5.5%

	66%
1.1 - Construction Waste - Building Re-Use	0%
2.1 - Operational Waste - Food & Garden Waste	100%
2.2 - Operational Waste - Convenience of Recycling	100%

Urban Ecology Overall contribution 5.5%

	62%
1.1 Communal Spaces	100%
2.1 Vegetation	100%
2.2 Green Roofs	0%
2.3 Green Walls and Facades	0%
3.2 Food Production - Non-Residential	0%

Innovation Overall contribution 9.0%

	0%
1.1 Innovation	0%

Credit breakdown

Management **Overall contribution 4.5%**

33%

1.1 Pre-Application Meeting	0%
Score Contribution	This credit contributes 50% 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

2.3 Thermal Performance Modelling - Non-Residential	100%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	Has a preliminary facade assessment been undertaken in accordance with NCC2022 Section J4D6?
Question	Criteria Achieved ?
Public building	Yes
Criteria	Has a preliminary modelling been undertaken in accordance with either NCC2022 Section J (Energy Efficiency), NABERS or Green Star?
Question	Criteria Achieved ?
Public building	Yes

3.2 Metering - Non-Residential	N/A	Scoped Out
		Single Tenancy
This credit was scoped out	Single Tenancy	

3.3 Metering - Common Areas	N/A	Scoped Out
		Single Tenancy
This credit was scoped out	Single Tenancy	

4.1 Building Users Guide	0%
Score Contribution	This credit contributes 16.7% towards the category score.
Criteria	Will a building users guide be produced and issued to occupants?
Question	Criteria Achieved ?
Project	No

Water Overall contribution 9.0%

Minimum required 50%	58%	✔	Pass

Water Approach	
What approach do you want to use for Water?:	Use the built in calculation tools
Do you have a reticulated third pipe or an on-site water recycling system?:	No
Are you installing a swimming pool?:	No
Are you installing a rainwater tank?:	Yes
Fixtures, fittings & connections profile	
Showerhead:	Scope out
Bath:	Scope out
Kitchen Taps:	>= 5 Star WELS rating
Bathroom Taps:	>= 5 Star WELS rating
Dishwashers:	>= 5 Star WELS rating
WC:	>= 4 Star WELS rating
Urinals:	Scope out
Washing Machine Water Efficiency:	Scope out
Which non-potable water source is the dwelling/space connected to?:	20000L RWT
Non-potable water source connected to Toilets:	Yes
Non-potable water source connected to Laundry (washing machine):	No
Non-potable water source connected to Hot Water System:	No
Rainwater tank profile	
What is the total roof area connected to the rainwater tank?: 20000L RWT	690 m²
Tank Size: 20000L RWT	20,000 Litres
Irrigation area connected to tank: 20000L RWT	0.0 m²
Is connected irrigation area a water efficient garden?: 20000L RWT	No
Other external water demand connected to tank?: 20000L RWT	-
1.1 Potable Water Use Reduction	70%

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	2592 kL
Output	Proposed (excluding rainwater and recycled water use)
Project	1894 kL
Output	Proposed (including rainwater and recycled water use)
Project	1351 kL
Output	% Reduction in Potable Water Consumption
Project	47 %
Output	% of connected demand met by rainwater
Project	63 %
Output	How often does the tank overflow?
Project	Never / Rarely
Output	Opportunity for additional rainwater connection
Project	280 kL

3.1 Water Efficient Landscaping			0%
Score Contribution	This credit contributes 16.7% towards the category score.		
Criteria	What measures are used in landscaping to reduce the demand for potable water?		
Question	Criteria Achieved?		
Project	No		
4.1 Building Systems Water Use Reduction		N/A	Scoped Out
	The proposed development does not have a sprinkler system.		
This credit was scoped out	The proposed development does not have a sprinkler system.		

Energy Overall contribution 27.5%

Minimum required 50%	52%	✔	Pass

Use the BESS Deem to Satisfy (DtS) method for Non-residential spaces?:	No
Are you installing a cogeneration or trigeneration system?:	No
Non-residential buildings profile	
Heating, Cooling & Comfort Ventilation - Electricity Reference fabric & services:	13,857 kWh
Heating, Cooling & Comfort Ventilation - Electricity - proposed fabric and reference services:	13,539 kWh
Heating, Cooling & Comfort Ventilation - Electricity Proposed fabric & services:	13,539 kWh
Heating - Gas - Reference fabric and services:	0.0 MJ
Heating - Gas - Proposed fabric and Reference services:	0.0 MJ
Heating - Gas - Proposed fabric and services:	0.0 MJ
Heating - Wood - reference fabric and services:	-
Heating - Wood - proposed fabric and reference services:	-
Heating - Wood - proposed fabric and services:	-
Hot Water - Electricity - Reference:	200 kWh
Hot Water - Electricity - Proposed:	200 kWh
Hot Water - Gas - Baseline:	0.0 MJ
Hot Water - Gas - Proposed:	0.0 MJ
Lighting - Reference:	11,797 kWh
Lighting - Proposed:	11,797 kWh
Peak Thermal Cooling Load - Reference:	
Peak Thermal Cooling Load - Proposed:	
Solar Photovoltaic system profile	
System Size (lesser of inverter and panel capacity): 10kW	10.0 kW peak
Orientation (which way is the system facing)?: 10kW	North
Inclination (angle from horizontal): 10kW	30.0 Angle (degrees)

1.1 Thermal Performance Rating - Non-Residential 18%

Score Contribution	This credit contributes 36.4% towards the category score.
Criteria	What is the % reduction in heating and cooling energy consumption against the reference case (NCC2022 Section J)?
Output	Total Improvement
Public building	2 %

2.1 Greenhouse Gas Emissions 100%

Score Contribution	This credit contributes 9.1% towards the category score.
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?
Output	Reference Building with Reference Services (BCA only)
Public building	11,948 kg CO2
Output	Proposed Building with Proposed Services (Actual Building)
Public building	11,678 kg CO2
Output	% Reduction in GHG Emissions
Public building	2 %

2.2 Peak Demand 0%

Score Contribution	This credit contributes 4.5% towards the category score.
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?

2.6 Electrification 0% ⊘ Disabled

Credit is available when the energy supply is set to all-electric (no gas or wood).

This credit is disabled	Credit is available when the energy supply is set to all-electric (no gas or wood).

2.7 Energy consumption 100%

Score Contribution	This credit contributes 18.2% towards the category score.
Criteria	What is the % reduction in annual energy consumption against the benchmark?
Output	Reference Building with Reference Services (BCA only)
Public building	50,605 MJ
Output	Proposed Building with Proposed Services (Actual Building)
Public building	49,460 MJ
Output	% Reduction in total energy
Public building	2 %

3.1 Carpark Ventilation N/A ⟡ Scoped Out

No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.

This credit was scoped out	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.

3.2 Hot Water 100%

Score Contribution	This credit contributes 4.5% towards the category score.
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?
Output	Reference
Public building	720 MJ
Output	Proposed
Public building	720 MJ
Output	Improvement
Public building	0 %

3.7 Internal Lighting - Non-Residential 100%

Score Contribution	This credit contributes 9.1% 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

4.1 Combined Heat and Power (cogeneration / trigeneration) N/A Scoped Out

No cogeneration or trigeneration system in use.

This credit was scoped out	No cogeneration or trigeneration system in use.

4.2 Renewable Energy Systems - Solar 100%

Score Contribution	This credit contributes 4.5% 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	13,030 kWh
Output	% of Building's Energy
Public building	51 %

4.4 Renewable Energy Systems - Other N/A Scoped Out

No other (non-solar PV) renewable energy is in use.

This credit was scoped out	No other (non-solar PV) renewable energy is in use.

Stormwater Overall contribution 13.5%

Minimum required 100% 100% Pass

Which stormwater modelling software are you using?:	Melbourne Water STORM tool

1.1 Stormwater Treatment 100%

Score Contribution	This credit contributes 100% towards the category score.
Criteria	Has best practice stormwater management been demonstrated?
Question	STORM score achieved
Project	118
Output	Min STORM Score
Project	100

IEQ Overall contribution 16.5%

	Minimum required 50%	56%	✔ Pass

1.4 Daylight Access - Non-Residential		62%	✔ 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?		
Question	Percentage Achieved?		
Public building	62 %		
2.3 Ventilation - Non-Residential		81%	✔ 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	96 %		
Criteria	What increase in outdoor air is available to regular use areas compared to the minimum required by AS 1668.2:2012?		
Question	Percentage Achieved?		
Public building	0 %		
Criteria	What CO2 concentrations are the ventilation systems designed to achieve, to monitor during occupancy?		
Question	Value		
Public building	600 ppm		
3.4 Thermal comfort - Shading - Non-Residential		0%	
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	0 %		
3.5 Thermal Comfort - Ceiling Fans - Non-Residential		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	-		
4.1 Air Quality - Non-Residential		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

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

Transport Overall contribution 9.0%

	0%

1.4 Bicycle Parking - Non-Residential		0%
Score Contribution	This credit contributes 40% 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	No	
Question	Bicycle Spaces Provided ?	
Public building	1	
1.5 Bicycle Parking - Non-Residential Visitor		0%
Score Contribution	This credit contributes 20% 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	No	
Question	Bicycle Spaces Provided ?	
Public building	60	
1.6 End of Trip Facilities - Non-Residential		0% ⊘ Disabled
		Credit 1.4 must be complete first.
This credit is disabled	Credit 1.4 must be complete first.	
2.1 Electric Vehicle Infrastructure		N/A ⟡ Scoped Out
	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.	
This credit was scoped out	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.	
2.2 Car Share Scheme		0%
Score Contribution	This credit contributes 20% towards the category score.	
Criteria	Has a formal car sharing scheme been integrated into the development?	
Question	Criteria Achieved ?	
Project	No	
2.3 Motorbikes / Mopeds		N/A ⟡ Scoped Out
	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.	
This credit was scoped out	No new parking spaces are proposed. Refer to the Traffic Engineering Assessment Report by Traffix Group.	

Waste **Overall contribution 5.5%**

66%

1.1 - Construction Waste - Building Re-Use		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	
2.1 - Operational Waste - Food & Garden Waste		100%
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	Yes	
2.2 - Operational Waste - Convenience of Recycling		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	

Urban Ecology Overall contribution 5.5%

62%

1.1 Communal Spaces	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 : * 1m² for each of the first 50 occupants * Additional 0.5m² for each occupant between 51 and 250 * Additional 0.25m² for each occupant above 251?
Question	Common space provided
Public building	96.0 m²
Output	Minimum Common Space Required
Public building	96 m²

2.1 Vegetation	100%
Score Contribution	This credit contributes 50% 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	40 %

2.2 Green Roofs	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Does the development incorporate a green roof?
Question	Criteria Achieved ?
Project	No

2.3 Green Walls and Facades	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

3.2 Food Production - Non-Residential	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 m²
Output	Min Food Production Area
Public building	36 m²

Innovation **Overall contribution 9.0%**

	0%

1.1 Innovation		0%
Score Contribution	This credit contributes 100% towards the category score.	
Criteria	What percentage of the Innovation points have been claimed (10 points maximum)?	

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APPENDIX B – PRELIMINARY ENERGY REPORT

DOCUMENT CONTROL

Document prepared by: Hanuman Pty Ltd A.C.N. 091 349 021 trading as SUHO

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Jim Woolcock
Member of BDAV, AIBA, HIA and MBA

[TABLE A] – Document Control

Project:	Emmaus College Saint Timothy's Campus	SUHO ref: SH364582
Project Address	17-23 Stevens Road, Vermont VIC 3133	
Building Class	9b	
NCC Version	Code of Australia 2022, Volume 1 (Amendment 1)	
Council	Whitehorse City Council	
Report commissioned by	Roam Architects	
Client reference	Emmaus College St Timothy's Campus, Vermont	

Date:	Version:	Prepared by:	Checked by:	Drawing no:
20/11/2024	1	Yamini Shrikhande	-	ROAM 137 (137-B-02, Issue DD1) (137-B-03, Issue 8)

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1. ACTION SUMMARY

All actions/items mentioned in '1. Action Summary' must be met to comply with the Performance Requirements of Section J (JP1 - Energy Use).

Specification Upgrades

The following performance upgrades must be made to the supplied building specification in order to achieve compliance:

1.	J5	All envelope doors and openable windows or the like must be sealed.
2.	J5	All entrance to the building to a conditioned space of greater than 50m2, must have an airlock, self-closing door, rapid roller door, revolving door or the like.
3.	J5	Exhaust fans in conditioned spaces or habitable rooms (in climate zones 4 - 8) must be fitted with a sealing device such as a self closing damper or the like.
4.	J5	Ceilings, walls and floors to be enclosed by internal (close fitting) lining systems or constructed at junctions and penetrations to minimise air leakage in accordance with requirements of J5D7 (2)(a).
5.	J5	Openings in ceilings, walls and floors are to be constructed to minimise air leakage at junctions and penetrations in accordance with J5D7 (2)(b)

Additional Compliance Requirements

Insufficient information was provided to verify the following items. These must be adopted in order to achieve compliance:

1.	J4D3	All insulation should be both tested and labelled in accordance with in accordance with AS4859.1 and installed to the requirement of J4D3 (1) and (3).
2.	J4D3	All reflective insulation must be installed in accordance with the requirements of J4D3 (2) for compliance.

Thermal Comfort Requirements

A prescribed thermal comfort level must be achieved to the building's occupied zones during its hour of operation. Appendix TCA of this report includes the thermal comfort assessment details and results.

For Relevant BCA Clauses

For the full statement of specific BCA clauses refer to the NCC Volume One online version located at https://www.abcb.gov.au/ncc-online/NCC.

2. COMPLIANCE REPORT

2.1 INTRODUCTION

SUHO was engaged by Roam Architects to assess the proposed Emmaus College Saint Timothy's Campus building for compliance with Section J - Energy Efficiency of the National Construction Code (NCC) 2022, Volume 1 (Amendment 1).

The building is located at 17-23 Stevens Road, Vermont VIC 3133 (NCC Climate Zone 6) and has been classified as a Class 9b Building.

There are no amendments listed in NCC Volume 1, Schedule 1 – State & Territory appendices, that apply specifically to the Section J requirements for this building

2.2 COMPLIANCE SUMMARY

The Performance Requirement J1P1 must be satisfied by complying with the J2D2 under Application of Section J.

J1P1

This report shows compliance using a Performance Solution. It uses a combination of 'Assessments Methods' including:

1. Verification Method J1V3, facilitated for parts J4 and
2. A 'Deemed-to-Satisfy' (DTS) comparison for Parts J5 - J9 (as applicable).

Building Fabric

For a Class 9b (primary), 9b, 9b Building, thermal performance and the necessary level of human comfort required of the building fabric, is covered by NCC Volume 1, Parts J4 (Building Fabric), and J5 (Building Sealing), in accordance with Part J2 Energy Efficiency, J2D2(1).

Building Services

Additionally, the operational energy efficiency of the building services is covered by J6 (Air-conditioning and ventilation services), J7 (Artificial lighting and power), J8 (Heated water supply and swimming pool and spa pool plant) and J9 (Facilities for energy monitoring), also in accordance with J2D2(1) – (4).

However, the following building services as required by Section J, are to be assessed by another consultant.

- J6 – Air-conditioning and ventilation services
- J7 – Artificial Lighting and power
- J8 – Heated water supply and swimming pool and spa pool plant
- J9 – Energy monitoring and on-site distributed energy resources

A full list of actions and items requiring further detail to achieve compliance with the Performance requirements is provided in part '1. Action Summary' on page 1 of this report.

Notes:

1. The verification process does not assess all items required by Section J in calculating the GHG theoretical estimate for the building. All DTS requirements, including those required by Part J1, have been satisfied or otherwise documented, except where review of that part has been completed by others.
2. The content of this report stipulates the minimum requirements to achieve compliance with the NCC 2022 Section J Energy Efficiency. It should not be interpreted as sustainable advice.

Greenhouse Gas Emissions

The thermal performance of this building is quantified as the energy consumed by the operation of the building's services, conveyed as an annual (theoretical) amount of greenhouse gas emissions for state/ territory of VIC.

Under the J1V3 Verification Method, the greenhouse gas (GHG) emissions of a reference building (based on the Deemed-to-Satisfy Provisions for both envelope and minimum services) is modelled. This sets a target amount of energy consumption that the proposed building must not exceed. The simulated energy consumption of the Reference Building is expressed as the maximum allowable annual GHG emissions, and are calculated to be **29,830** $kgCO_2$-e/annum for this building.

The material construction ~~(or fabric) of the proposed building envelope~~ is modelled with the same building services. Compliance is verified when it is determined that the annual greenhouse gas emissions of the proposed building, is not more than reference building. The proposed GHG emissions is calculated to be **29,461** $kgCO_2$-e/annum.

This is an overall **1.2%** reduction in greenhouse gas emissions from the reference building.

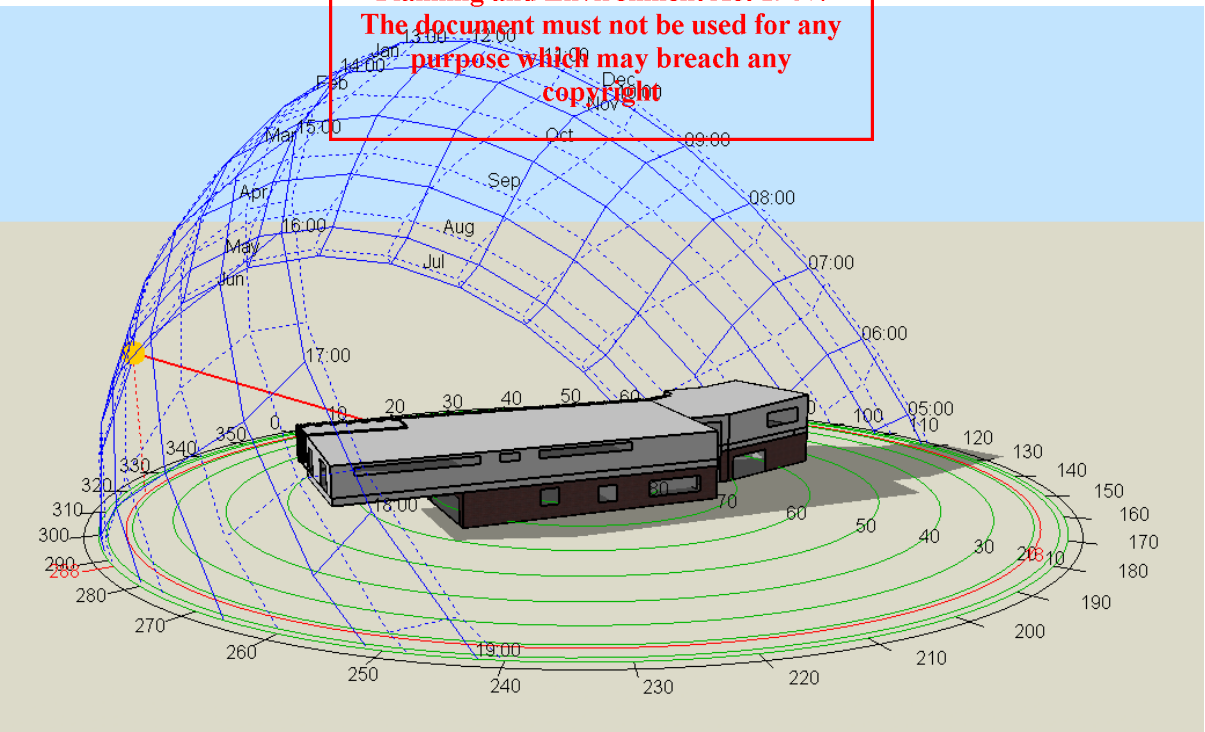


Figure 1 – Energy Plus (Design Builder) energy modelling

Thermal Comfort Assessment

The proposed building with the proposed services, must also achieve thermal comfort.

The code requirement for a thermal comfort level of between a Predicted Mean Vote of -1 to +1, is achieved across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building, meaning the thermal comfort compliance requirement is satisfied. (See Appendix TCA for further details.)

The combined Thermal Comfort results for all Room/Spaces is **99.9%**. Thermal comfort modelling results for the nominated areas are shown in the table below.

[TABLE 3] – Thermal Comfort Results

Room/Space	Zone	Average PMV	PMV % in range	Compliance Achieved
GF_Food Tech	Single	0.107	100.0	YES
GF_Kitchen Prep	Single	0.071	99.9	YES
GF_Art	Single	0.154	99.9	YES
FF_Lab 1	Single	0.107	100.0	YES
FF_Lab 2	Single	0.174	99.9	YES
FF_Prep	Single	0.167	99.9	YES
FF_Collab/Staff	Single	0.023	99.7	YES
FF_Maker Space	Single	0.066	99.9	YES
Overall Result		**0.109**	**99.9**	**YES**

Performance Solutions – Duty of Care Statement

The intent of this Verification Method is to demonstrate that a Performance Solution meets the Performance Requirements, providing flexibility from prescriptive Deemed-to-Satisfy (DTS) provisions, where they are not mandatory under Specification 33.

The trade-off is that performance solutions derived in this report must not have unintended consequences on any other Section or Part of the NCC. In satisfying the requirements, all practitioners and stakeholder utilising the outcomes of this report, should exercise a duty of care.

3. FINAL BUILDING SPECIFICATION

3.1 STRUCTURE

Envelope Description

The following describes the building envelope to be assessed:

> *The building envelope is defined as illustrated in the stamped plans attached to this report.*

[TABLE 2] – Parts

Ground level

Qnty	Name	Classification of Part	Floor Area (m²)
1	Ground Floor	9b - education	455.0
Total area of parts:			**455.0**

Level 1

Qnty	Name	Classification of Part	Floor Area (m²)
1	First Floor	9b - education	650.0
Total area of parts:			**650.0**
Total area of building:			**1,105.0**

3.2 J4 FABRIC

The following items apply to the elements forming the building envelope of the Parts of the building listed in the table above.

J4D3 – Thermal construction - general

Refer to Part 1. Action Summary, 'Additional Compliance Requirements'.

J4D4 – Roofs and Ceilings Constructions
The proposed roof in the building envelope must achieve the minimum R-value shown in the calculations below.

[TABLE 4] - Raked Roof, Non ventilated

Outer solar absorptance: 0.45 or less

Layer	Specification	R-Value [Downwards] (m^2.K/w)
External Air Film	Wind speed: Up to 3 m/s	0.03
Roof Sheeting - Steel sheeting	Conductivity: 47.5 W/m.K, Thickness: 0.48 mm, Material Density: 7850	0
R1.3 Roofing Blanket (Compressed)	Achieved R-Value of 0.95 K.m^2/W	0.95
Reflective Air Gap	Thickness: 20mm, Not ventilated, Emissivity: 0.05, undefined	Combined in bridged layer
R2.0 Ceiling Insulation	Achieved R-Value of 1.92 K.m^2/W [Bridged layer]	1.06
Ceiling Lining - Gypsum plasterboard	Conductivity: 0.17 W/m.K, Thickness: 10 mm, Material Density: 880	0.06
Internal Air Film	Wind speed: Still - 0m/s	0.16
Bridging Framing (mm):	450 c/c, 51 W, 102 D, 1.2 Web	**Total: 2.3**

J4D5 – Roof Lights

There are no roof light/s in the nominated building envelope.

J4D6 – Walls

The proposed walls in the building envelope must achieve the minimum R-value shown in the calculations below.

[TABLE 5] - Brick Veneer Wall (external)

Outer solar absorptance: 0.40 or less

Layer	Specification	R-Value [Inwards] (m^2.K/w)
External Air Film	Wind speed: Up to 3 m/s	0.03
Clay brick – 3.25 kg	Conductivity: 0.65 W/m.K, Thickness: 110 mm, Material Density: 1690	0.17
Air Space	Emittance: None, Thickness 40 mm	0.15
R2.0 Insulation Batts	Achieved R-Value of 1.88 K.m^2/W [Bridged layer]	0.72
Gypsum plasterboard	Conductivity: 0.17 W/m.K, Thickness: 13 mm, Material Density: 880	0.08
Internal Air Film	Wind speed: Still - 0m/s	0.12
Bridging Framing (mm):	450 c/c, 36 W, 92 D, 0.75 Web Noggings 1575 c/c	**Total: 1.3**

[TABLE 6] - Metal Clad Wall (external)

Outer solar absorptance: 0.40 or less

Layer	Specification	R-Value [Inwards] (m^2.K/w)
External Air Film	Wind speed: Up to 3 m/s	0.03
External Cladding - Steel sheeting	Conductivity: 47.5 W/m.K, Thickness: 0.42 mm, Material Density: 7850	0
Air Space	Emittance: None, Thickness 35 mm	0.16
R2.0 Insulation Batts	Achieved R-Value of 1.88 K.m^2/W [Bridged layer]	0.72
Gypsum plasterboard	Conductivity: 0.17 W/m.K, Thickness: 13 mm, Material Density: 880	0.08
Internal Air Film	Wind speed: Still - 0m/s	0.12
Bridging Framing (mm):	450 c/c, 36 W, 92 D, 0.75 Web Noggings 1575 c/c	**Total: 1.1**

J4D6 – Glazing

Glazing (including all glazed door elements) in the building envelope must be equal to or better than the following proposed values (U-value and SGHC) as per the table below.

Compliant Minimum Proposed Glazing Specification

[TABLE 7] – Ground level, Level 1

Window ID./ Name	Description	Total System U-value	SHGC
All external glazing	Window, Door	<=4.5	<=0.45

Note: These proposed minimum values are derived from thermal modelling based the J1V3 Verification Method. The DTS glazing values applied in the reference building simulation be found in Appendix C.

J4D7 – Floors

The proposed floors in the building envelope must achieve the minimum R-value shown in the calculations below.

[TABLE 8] – Concrete Slab on Ground - Carpet Covering

Layer	Specification	R-Value [Downwards] (m^2.K/w)
Internal Air Film	Wind speed: Still - 0m/s	0.16
Floor Covering - Carpet	Conductivity: 0.05 W/m.K, Thickness: 7 mm, Material Density: 0	0.14
Flooring - Solid concrete	Conductivity: 1.44 W/m.K, Thickness: 200 mm, Material Density: 2400	0.14
Soil	Soil Contact Resistance	1.91
		Total: 2.4

[TABLE 9] – Concrete Slab on Ground - Vinyl Covering, CSOG

Layer	Specification	R-Value [Downwards] (m^2.K/w)
Internal Air Film	Wind speed: Still - 0m/s	0.16
Floor Covering - Vinyl floor tiles	Conductivity: 0.79 W/m.K, Thickness: 2 mm, Material Density: 2050	0
Flooring - Solid concrete	Conductivity: 1.44 W/m.K, Thickness: 200 mm, Material Density: 2400	0.14
Soil	Soil Contact Resistance	1.91
		Total: 2.2

[TABLE 10] – External Floor, Suspended floor

Open sub-floor

Layer	Specification	R-Value [Downwards] (m^2.K/w)
Internal Air Film	Wind speed: Still - 0m/s	0.16
Flooring - Solid concrete	Conductivity: 1.44 W/m.K, Thickness: 200 mm, Material Density: 2400	0.14
Air Space	Emittance: undefined, Thickness 40 mm	0
R2.0 Insulation	Achieved R-Value of 2.04 K.m^2/W [Bridged layer]	0.69
Fibre-cement	Conductivity: 0.25 W/m.K, Thickness: 9 mm, Material Density: 1360	0.04
External Air Film	Wind speed: Up to 3 m/s	0.03
Bridging Framing (mm):	480 c/c, 51 W, 102 D, 1.2 Web	**Total: 1.1**

Building Fabric (Additional)

There are “non-envelope” fabrics. The specifications below must be meet in order to ensure compliance is satisfied.

[TABLE 11] - Non-Envelope Fabric

Type	Description	R value
Internal Wall	Internal walls within conditioned spaces	Nil
Ceiling	Ground Floor Ceiling	Nil
Internal Floor	First Floor Flooring	Nil

3.3 J5 BUILDING SEALING

The following items apply to the elements forming the envelope of the following parts of the building:

1. Ground Floor, Class 9b - education
2. First Floor, Class 9b - education

J5D2 – APPLICATION OF PART

There are no exemptions under this Part.

J5D3 – CHIMNEYS AND FLUES

There are no open solid-fuel burning appliances with a chimney or flue that is to be sealed under the requirements of J5D3.

J5D4 – ROOF LIGHTS

There are no roof lights in a conditioned space or a habitable room to be sealed under the requirement of J5D4

J5D5 – WINDOWS AND DOORS

The sealing requirements of Section J5D5 are not met. Refer to the Specification Upgrades on Page 3

There are no loading dock entrances required to meet the requirements of J5D5.

J5D6 – EXHAUST FANS

The sealing requirements of Section J5D6 are not met. Refer to the Specification Upgrades on Page 3.

J5D7 – CONSTRUCTION OF CEILING, WALLS AND FLOORS

The sealing requirements of Section J5D7 are not met. Refer to the Specification Upgrades on Page 3.

J5D8 – EVAPORATIVE COOLERS

There are no evaporative coolers.

For further details on Building Sealing go to:

www.airtightness.com.au – or contact SUHO for more information on air tightness testing.

3.4 J6 AIR CONDITIONING AND VENTILATION SYSTEMS

The client had advised that this section is to be provided in a separate report by their nominated consultant, therefore it has been excluded from this report.

3.5 J7 ARTIFICIAL LIGHTING AND POWER

The client had advised that this section is to be provided in a separate report by their nominated consultant, therefore it has been excluded from this report.

3.6 J8 HEATED WATER SUPPLY

The client had advised that this section is to be provided in a separate report by their nominated consultant, therefore it has been excluded from this report.

3.7 J9 ENERGY MONITORING and ON-SITE DISTRIBUTED ENERGY RESOURCES

The client had advised that this section is to be provided in a separate report by their nominated consultant, therefore it has been excluded from this report.

4. APPENDIX JP1- ENERGY USE

4.1 PERFORMANCE REQUIREMENT J1P1

A building, other than a *sole-occupancy* unit of a Class 2 building or a Class 4 part of a building, including its *services*, must have features that facilitate the efficient use of energy appropriate to –

(a) the function and use of the building; and

(b) the level of human comfort required for the building use; and

(c) solar radiation being—

  (i) utilised for heating; and

  (ii) controlled to minimise energy for cooling; and

(d) the energy source of the services; and

(e) the sealing of the building envelope against air leakage; and

(f) for a *conditioned space*, achieve an hourly *regulated energy* consumption, average over the annual *hours of operation*, of not more than -

  (i) for a class 6 building, 80 kJ/m^2.hr, and

  (ii) for a Class 5, 7b, 8, 9a building other than a *ward area*, or a Class 9b *school*, 43 kJ/m^2.hr, and

  (iii) for all other building classifications, other than a *sole-occupancy unit* of a Class 2 building or a Class 4 part of a building, 15 kJ/m^2.hr.

Assessment Method – NCC Volume 1, Part A2G4

The building has been assessed using a combination of Performance and Deemed-to-Satisfy Solutions including; Verification Method J1V3 (using a modelled reference building) and the Deemed-to-Satisfy (DTS) provisions, as provided for in the NCC (Part A2G2).

Thermal modelling simulations were conducted with EnergyPlus software, compliant with ANSI/ASHRAE Standards 140, 'Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs'.

Specifications for the 'required' modelling parameter, have been used for calculating the annual greenhouse gas emissions of a building as per 'Specification 34' – 'Modelling parameters'. A summary of the parameters can be found in the 'Fixed Inputs' below.

Additional Requirements – NCC Volume 1, Specification 33

In addition to modelling requirements, a building must also comply with the requirements of Specification 33. These additional requirements are not executed within the energy modelling; therefore, it must be properly demonstrated that the project documentation meets the DTS Provisions.

These additional requirements have been assessed, and the appropriate observations recorded based on the extent of the works commissioned, as described under Part 2. COMPLIANCE REPORT, 'Scope of Assessment'.

Fixed Inputs

The following table lists the fixed input data used to establish J1V3 annual greenhouse gas emission calculations. This data is from Specification 34 and 35 of NCC 2022, unless otherwise stated.

[TABLE 12] – Fixed Inputs Data

Input	Specification
Common Inputs:	
Weather file selection:	Melbourne Olympic Park
Infiltration Rate:	0.7 ac/hr – when there is no mechanically outdoor air supply; 0.35 ac/hr at all other times.
Conditioned Space Temperature Settings:	21-24°C for 98% of annual hours of operation – (18-25°C for conditioned transitory occupancy)
External Shading:	As per drawing and specification.
Class 9b School - Inputs:	
Occupancy and operation profiles:	As per Table S35C2j, Specification 35, Modelling profiles for J1V9b.
Internal heat gains from appliances and equipment:	As per Table S35C2l, Specification 35, Modelling profiles – 5W/m².
Internal heat gains for occupants and hot meals:	As per Table S35C2n, Specification 35, Modelling profiles - 130W (75 W sensible heat and 55W latent heat).
Number of Persons accommodated:	As per Table D2D18 of part D1 - Area per person according to usage.
Heated (daily) water supply consumption rates:	As per Table S35C2m, Specification 35, Modelling profiles – 3.5L/m².
Outside air cycle:	As per minimum mechanical ventilation required by Part F6.

Variable Inputs

This following table compares the differences between the proposed building and the Deemed-to-Satisfy (DTS) compliant 'reference building' assessed using Verification Method J1V3.

[TABLE 13] - Variable Inputs Data

Construction Type	Proposed Fabric	Reference Fabric
J4D4 Roof & Ceilings:		
Raked Roof	2.3	3.2
J4D6 Walls:		
Brick Veneer Wall (external)	1.3	See Appendix C.
Metal Clad Wall (external)	1.1	See Appendix C.
J4D6 Glazing:	U-value / SHGC	U-value / SHGC
All external glazing	4.5 / 0.45	See Appendix C.
J4D7 Floors:		
Ground Floor - Carpet Covering	2.4	2.0
Ground Floor - Vinyl Covering	2.2	2.0
External Floor	1.1	2.0

Notes:

1. Proposed roof and external wall colours have been simulated as per the solar absorptances in Part 3 Final Building Specification. The reference inputs for solar absorptances have been input as 0.6 for External Walls (Specification 34) and roof solar absorptance of 0.45.

Reference Information:

The values in the Variable Input table above, were calculated in accordance with:

1. Specification 36, Table S36C2a – S36C2e for material properties.
2. AS/NZS 4859.2 for roof and floor (including allowance for thermal bridging).
3. Specification 37 for wall-glazing construction (AS/NZS 4859.2, (including allowance for thermal bridging).
4. Specification 38 for spandrel panels.
5. Specification 39 for soil and or sub-floor spaces.
6. Glazing proposed values are calculated from the thermal performance model and are summarized under 'GLAZING' in the Part 3. Final Building Specification.
7. Glazing reference value are calculated for each facade and storey and are presented in J4D6 Wall-Glazing Calculations in Appendix C.
8. As per clause S34C2(f) of Specification 34, where services are not covered by Parts J6 and Parts J8, MEPS must be applied.
9. As per Part J6D12, as described in the Energy Efficiency Vol. 1 Handbook, unitary equipment with capacity of less than 65kW, must comply with MEPS, the national Minimum Energy Performance Standards. For further details see: https://www.energyrating.gov.au/products-0

4.2 SIMULATION OUTPUTS

The greenhouse gas emissions calculated in the following table are generated using design conditions and calculations methods as required by Verification Method J1V3 and requirements stipulated by Specification 34 Modelling parameters and represents theoretical values for the operation of the building. These values provide a means for the comparison of the building fabric (and services) performance, against the minimum DTS requirements of Section J.

[TABLE 14] – GHG Emission Simulation Outputs

Energy Use Components	Proposed Fabric DTS Services	Reference Building
Heating	4,149	3,856
Cooling	11,594	12,257
Internal Lighting	13,718	13,718
Total Annual GHG Emissions ($KgCO_2$-e/GJ)	**29,461**	**29,830**

Note: Not all Energy Use Components as identified in Section J are represented in the table above. As compliance has been undertaken as a Performance Solution, some energy use components may have either been assessed to DTS requirements or assessed by other consultants. Refer to Part 2.2 Compliance Summary, 'J1P1' for clarification.

5. APPEXDIX B – THERMAL COMFORT ASSESSMENT

This Appendix explains how a mandatory Thermal Comfort Assessment is undertaken, required for all J1V3 – J1V3 Verification assessments under Section J.

5.1 BACKGROUND

The aim of Thermal Comfort of NCC2022 is to ensure that projects achieve a minimum benchmark for the occupant thermal comfort, equivalent to ≥75% of all occupants being satisfied in the space.

This project is demonstrating compliance via the "Verification using a reference building" pathway which has the following requirements:

- The space must meet specified prescriptive criteria for Thermal Comfort or the Predicted Mean Vote (PMV) levels are between -1 and +1 (1 point);
- PMV levels are calculated in accordance with either ASHRAE Standard 55-2013 or ISO 7730-2005;
- PMV levels to be met for each room or space and not averaged;
- Modelling carried out in accordance with ASHRAE Standard 55-2013 and justified and sourced from either ASHRAE Standard 55-2013 or ISO 7730-2005.

Predicted Mean Vote

The Predicated Mean Vote (PMV) is a measure of how satisfied a typical occupant would be with the thermal conditions based on the following Fanger PMV scale:

Predicted Mean Vote (PMV)	Sensation
+3	Hot
+2	Warm
+1	Slightly Warm
0	Neutral
-1	Slightly Cool
-2	Cool
-3	Cold

The PMV calculation is based on the following factors:

- Air Temperature (Dry Bulb)
- Mean Radiant Temperature
- Relative Humidity
- Air Velocity

- Metabolic Rate
- Clothing Resistance to Heat Transfer

Achieving Compliance

To achieve compliance under NCC2022, the proposed building must achieve a thermal comfort level between a PMV of -1 to +1. This should be achieved across ≥95% of the floor area of all occupied zones, for ≥98% of the building's annual operational hours.

5.2 METHOD

The thermal comfort simulation was performed using Design Builder which uses the Energy Plus simulation engine. The proposed model and services from the energy simulations are used. This model considers construction types, materials, internal loads, occupancy profile and local weather data. It also factors in occupant activity, clothing levels, and relative air velocities.

In line with the credit requirements the following modelling and design parameters were included:

- All perimeter zones modelled with a maximum depth of 4m;
- Perimeter zones are reported independently of interior zones;
- Zoning to match the air conditioning zones (except for perimeter zones which must be 4m in depth) with exceptions permitted for small enclosed spaces at the discretion of the mechanical engineer (e.g., a small perimeter office);
- Modelling of Inter-zone virtual partitions;
- Perimeter air conditioning zones not exceeding 75m^2;
- Model completed with all systems assessed simultaneously;
- Comfort predictions measured at the midpoint of each zone (i.e., 2m from the perimeter in a 4m deep zone) and at a height of between 0.8m and 1.5m above FFL, or comfort predictions shall be taken as an average across the zone.

The nominated areas for which the PMV calculations have performed are based on the NCC 2022 definitions of occupied zone.

ASHRAE Standard 55-2013 has been used to source and justify values throughout the assessment. The following outlines the inputs used:

- Metabolic Rates of Occupants:
  - 77 W/m^2 (Sedentary activity - office, dwelling, school, laboratory)
- Skin Surface Areas of Occupants (to determine metabolic rate per person)
  - Adults: 1.80m^2
- Clothing of Occupants:
  - Summer: 0.36 CLO (walking shorts, short-sleeve shirt)
  - Winter: 1.37 CLO (Trousers, Long-sleeve shirts, long-sleeve sweater)
- Air Velocity:
  - 0.2 m/s
- Hours of Operation:
  - The number of hours when occupancy of the building is greater than 20% of the peak occupancy
- Occupancy Profile:
  - Is expressed as a percentage of the maximum number of people that can be accommodated in that building class.

- Design Temperature Setpoints
  - Summer Cooling Setpoint: 24°C
  - Winter Heating Setpoint: 21°C
- Internal Loads:
  - As per NCC Section J.

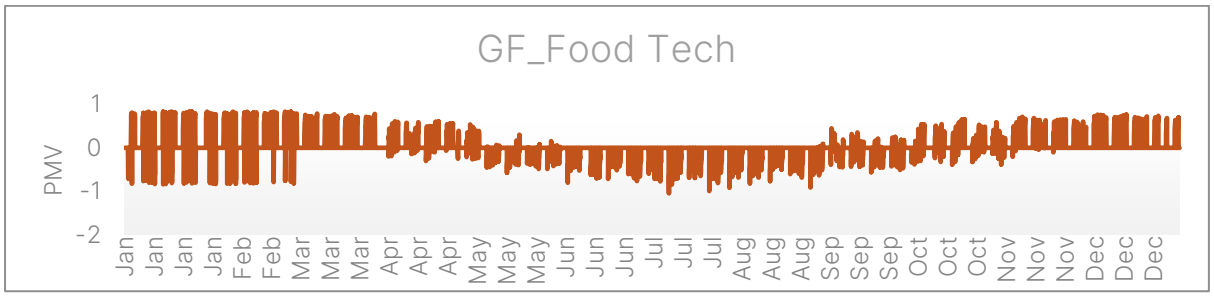
5.3 RESULTS

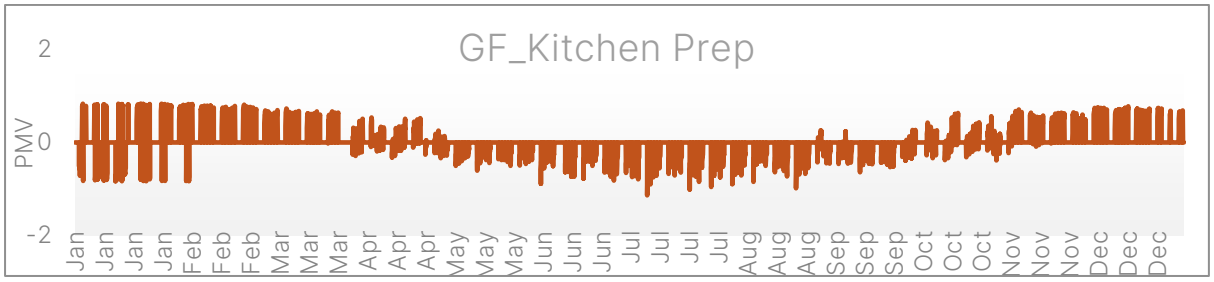
The building maintains a PMV of between -1 and +1 for **99.9%** of the nominated area. The Thermal comfort results for each of the zones assessed is included in Part 2: Compliance Summary of this report.

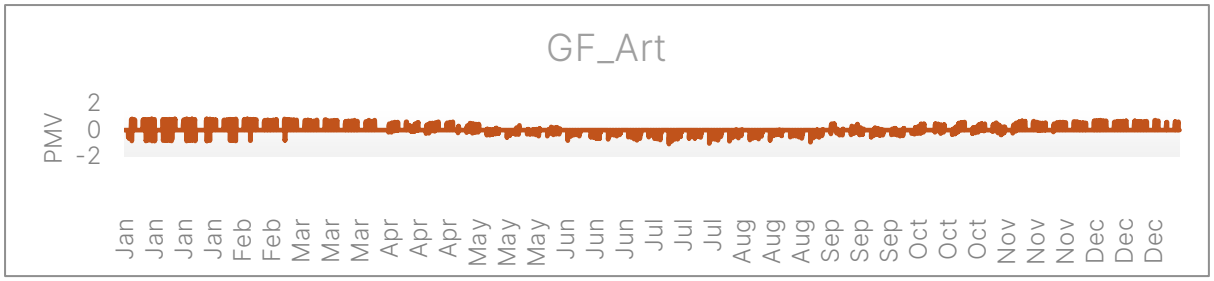
Thermal comfort graphs

The following graphs display the PMV that the building maintains for each room or space at each Level of the building.

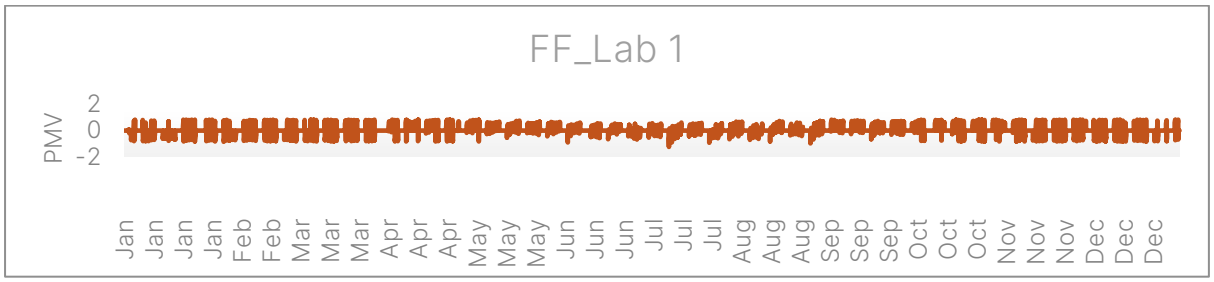
Ground level, 3 zones

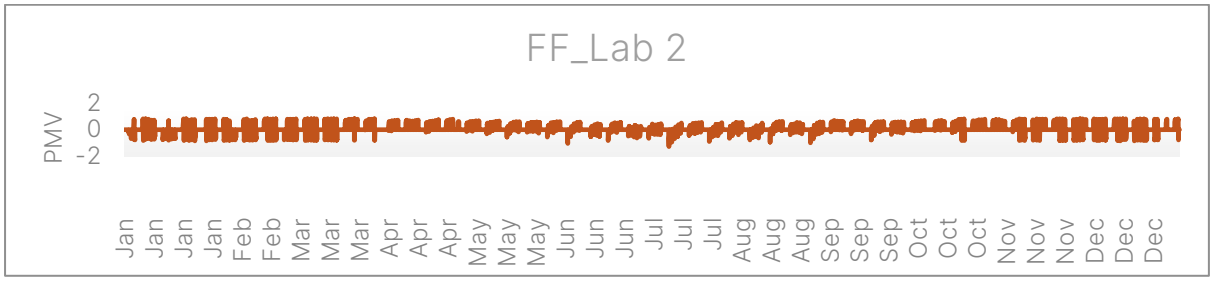


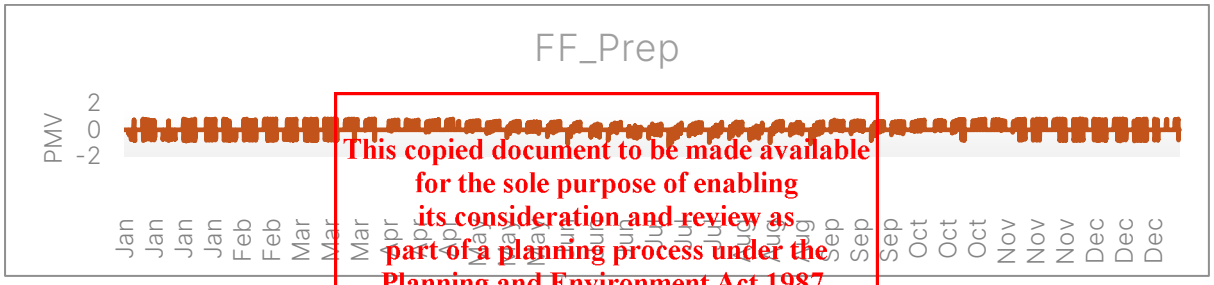


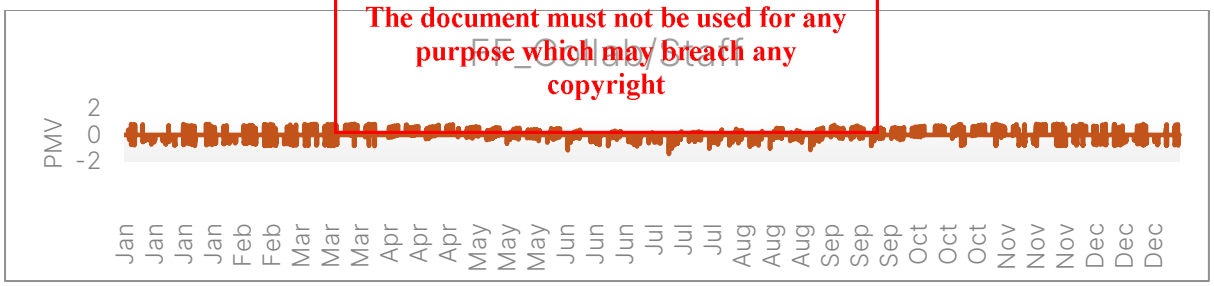


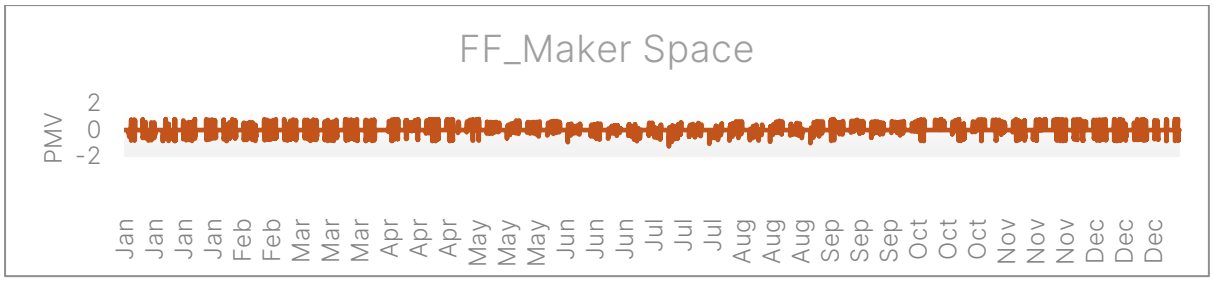
Level 1, 5 zones











6. APPENDIX C – CODE COMPLIANCE CALCULATIONS

This Appendix includes derived calculations undertaken to determine minimum DTS reference building requirements for assessment.

J4D6 – WALLS AND GLAZING

Project Name:	Emmaus College Saint Timothy's Campus

SUHO Job #:	364582
Floor Level:	Ground

Climate Zone:	6
Building Class:	Other

Wall Details:

	CPS Wall Name	Location	R-value	U-value
Fabric 1	External Wall	External	1	1.00
Fabric 2	MF			0.00
Fabric 3				0.00
Fabric 4				0.00
Fabric 5				0.00
Fabric 6				0.00
Fabric 7				0.00
Fabric 8				0.00

Total Façade Area Details (m²):

North	East	South	West
312.9	103.0	292.2	97.7

Door Details:

Name	Area (m²)
Internal Door	1.9

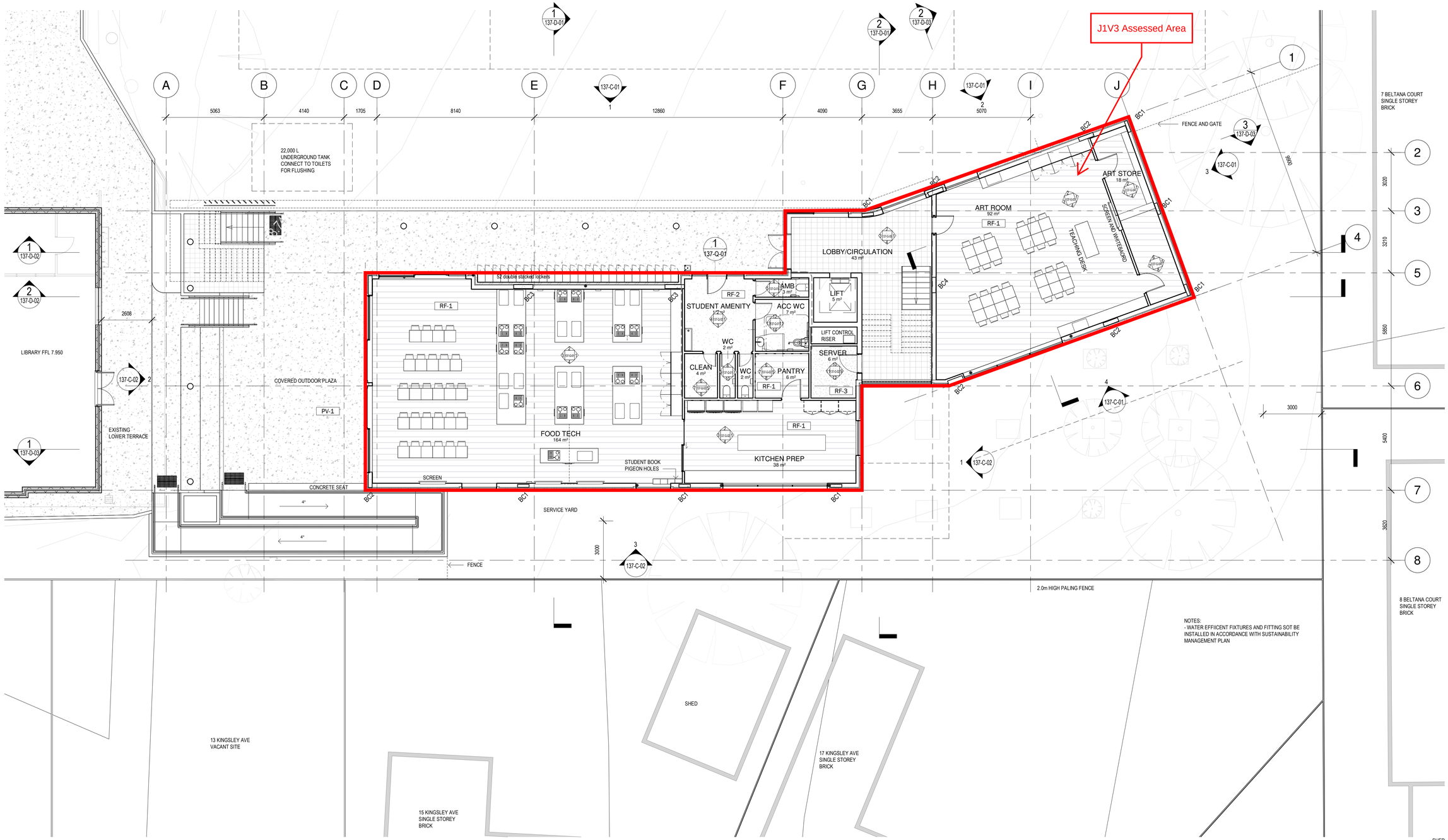
Glazing Details:

Window Entry							Proposed Values		Shading Entry		Factors	
Name	Orientation	Fabric #	Height (m)	Width (m)	Window Multiplier	Area (m²)	Proposed U-value	Proposed SHGC	P (m)	H (m)	Blind Factor	Display Glazing
GF						0.00						
W1	N	Fabric 1	2.4	4.5		10.80			3.2	3.3		
W2+D1	N	Fabric 1	2.4	3		7.20			3.2	3.3		
D2+W3	W	Fabric 1	3.3	2.9		9.57			1.9	3.3		
W4	N	Fabric 1	3.3	3		9.90						
W5	N	Fabric 1	3.3	2.4		7.92						
D3	N	Fabric 1	3.3	1.8		5.94						
W6	S	Fabric 1	2.4	5.4		12.96						
W7 (Stairs)	S	Fabric 1	6.3	3.5		22.05						
W8	E	Fabric 1	2.4	1.8		4.32						
W9	S	Fabric 1	1.5	5.4		8.10						
W10	S	Fabric 1	1.5	1.8		2.70						
W11	S	Fabric 1	1.5	1.8		2.70						
W12	W	Fabric 1	2.4	9.2		22.08			11	3.3		
						0.00						
FF						0.00						
W1-W7	N	Fabric 1	2.4	1.8	7	30.24						
W8	W	Fabric 1	2.4	1.2		2.88						
W9	N	Fabric 1	2.4	3.6		8.64						
W10	N	Fabric 1	2.4	1.8		4.32						
W11	E	Fabric 1	2.4	1		2.40						
W12	S	Fabric 1	1.5	5.4		8.10						
W13	E	Fabric 1	2.4	3.6		8.64						
W14	S	Fabric 1	0.7	9		6.30						
W15	S	Fabric 1	0.7	1.8		1.26						
W16	S	Fabric 1	0.7	10.8		7.56						
W17	W	Fabric 1	2.4	2.7		6.48						
W18	W	Fabric 1	2.4	1.8		4.32						
D1	W	Fabric 1	2.4	1.9		4.56						

There are two methods of calculation provided under the NCC 2022 requirements. The following methodology has been used to calculate the minimum DTS reference requirements:

Method 2. Combines all four orientations to provide one combined performance requirement.

Method 2 - Combined	
Glazing Percentage (%)	27.5%
DTS Minimum Wall R-value	1.00
Achieved Wall R-value	1.00
Maximum Glazing U-value	4.63
Maximum SHGC	0.49



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ISSUE	DATE	REVISIONS
DD1	14.11.2024	DD Consultant Issue

CLIENT
EMMAUS COLLEGE

PROJECT TITLE
EMMAUS COLLEGE SAINT TIMOTHY'S CAMPUS

PROJECT NUMBER
ROAM 137

PROJECT NORTH

GRAPHIC SCALE

SCALE
1 : 100 AT A1 DO NOT SCALE

STATUS
SCHEMATIC DESIGN

DRAWING
GROUND FLOOR PLAN

DRAWING NUMBER	ISSUE
137-B-02	DD1

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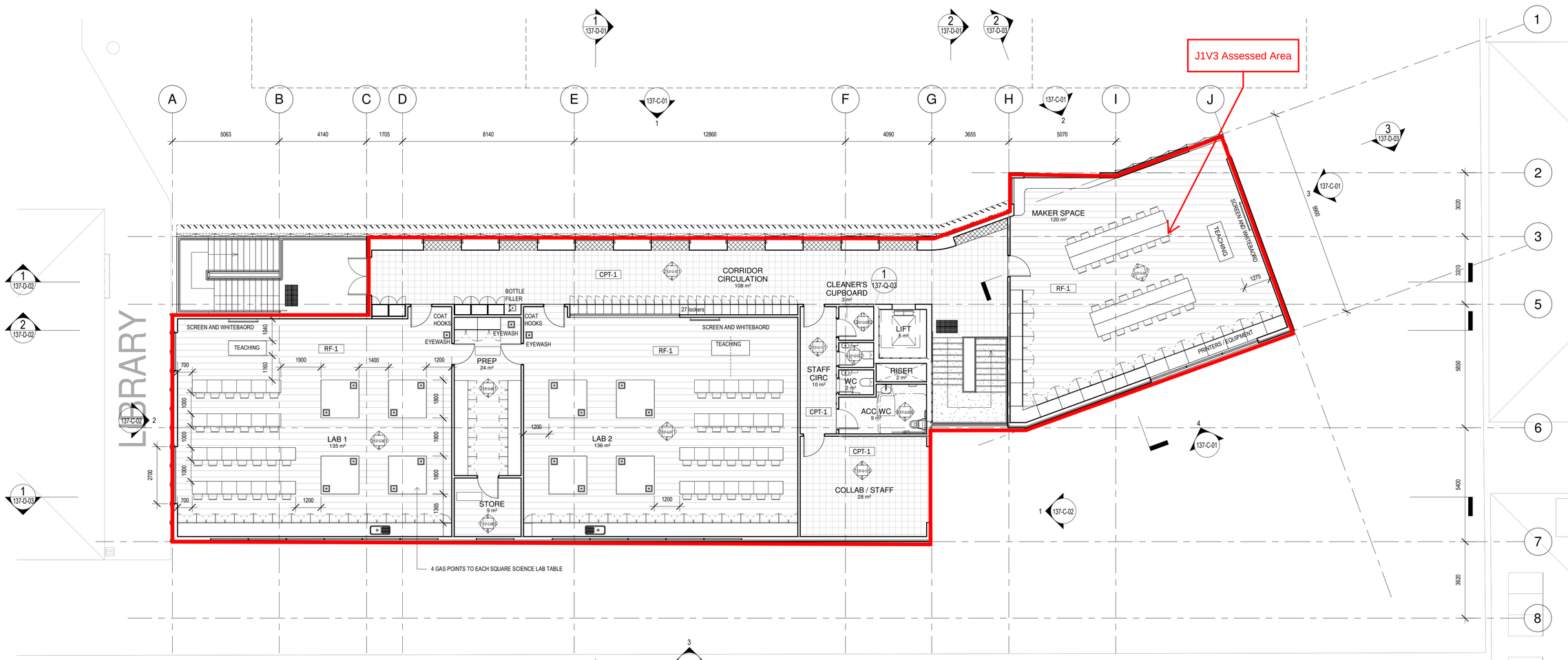
ISSUE	DATE	REVISIONS
1	2.09.24	SD
2	20.09.2024	COST PLAN A
3	25.09.2024	COST PLAN A 2
4	11.10.2024	CONSULTANT ISSUE SD
5	23.10.2024	ESD TP ISSUE 2
6	30.10.2024	CONSULTANT ISSUE
7	31.10.2024	COST PLAN B
8	8.11.2024	CCONSULTANT ISSUE 2



Department Legend

- ADMINISTRATION / STAFF
- AMENITIES
- CORE
- MAKER SPACE
- CIRCULATION
- STORE
- SCIENCE

ADVERTISED PLAN

1 FIRST FLOOR-PROPOSED
1 : 100

CLIENT
EMMAUS COLLEGE

PROJECT TITLE
EMMAUS COLLEGE SAINT TIMOTHY'S CAMPUS

PROJECT NUMBER
ROAM 137

PROJECT NORTH

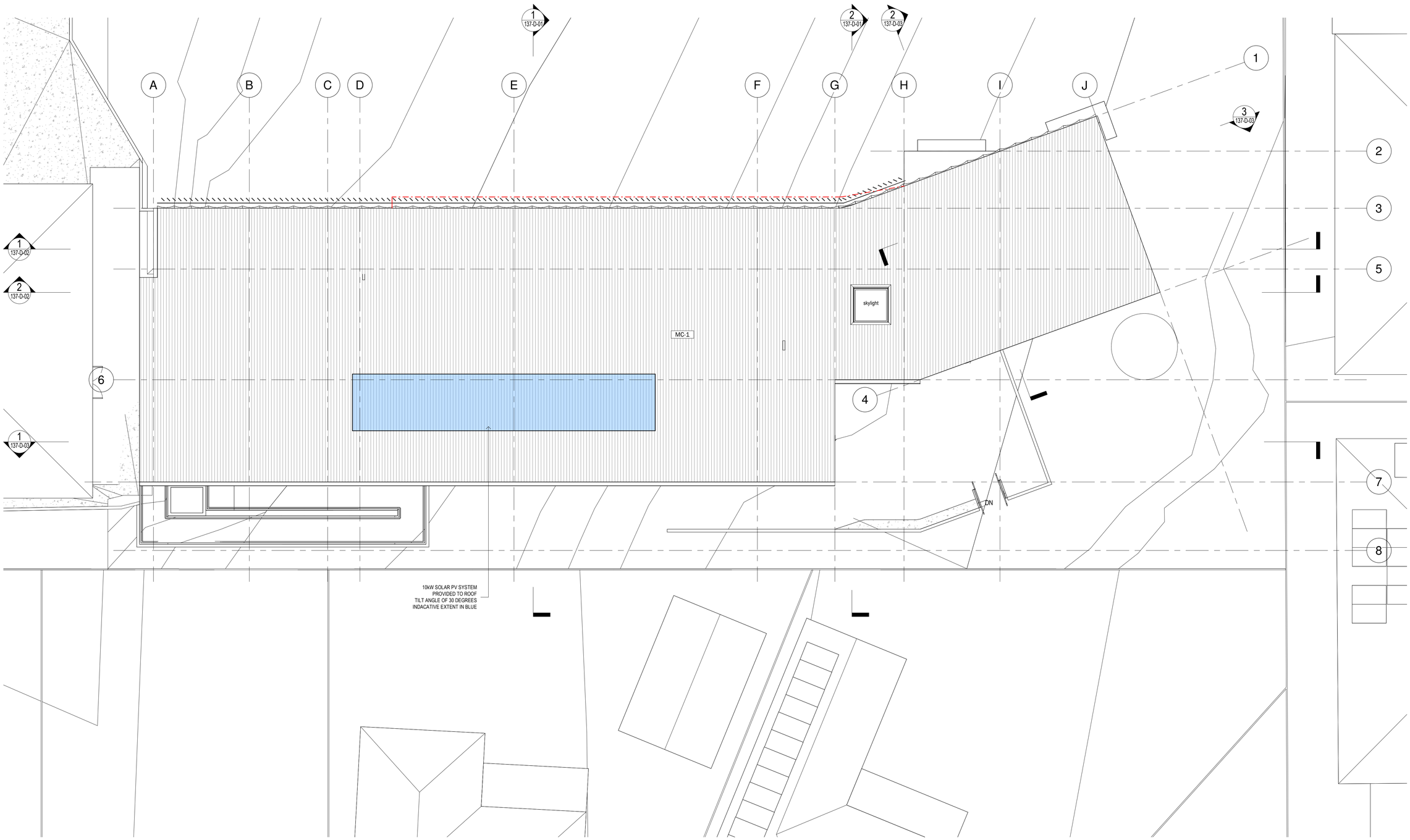
GRAPHIC SCALE

SCALE
1 : 100 AT A1 DO NOT SCALE

STATUS
SCHEMATIC DESIGN

DRAWING
LEVEL 1 FLOOR PLAN

DRAWING NUMBER	ISSUE
137-B-03	8



1 **ROOF**
1 : 100

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ISSUE	DATE	REVISIONS
1	2.09.24	SD
2	11.10.2024	CONSULTANT ISSUE SD
3	23.10.2024	ESD TP ISSUE 2
4	30.10.2024	CONSULTANT ISSUE
5	31.10.2024	COST PLAN B
6	8.11.2024	CONSULTANT ISSUE 2

CLIENT
EMMAUS COLLEGE

PROJECT TITLE
EMMAUS COLLEGE SAINT TIMOTHY'S CAMPUS

PROJECT NUMBER
ROAM 137

PROJECT NORTH

GRAPHIC SCALE

SCALE
1 : 100 AT A1 DO NOT SCALE

STATUS
SCHEMATIC DESIGN

DRAWING
ROOF PLAN - PROPOSED

DRAWING NUMBER	ISSUE
137-B-05	6

APPENDIX C – INSITE REPORT

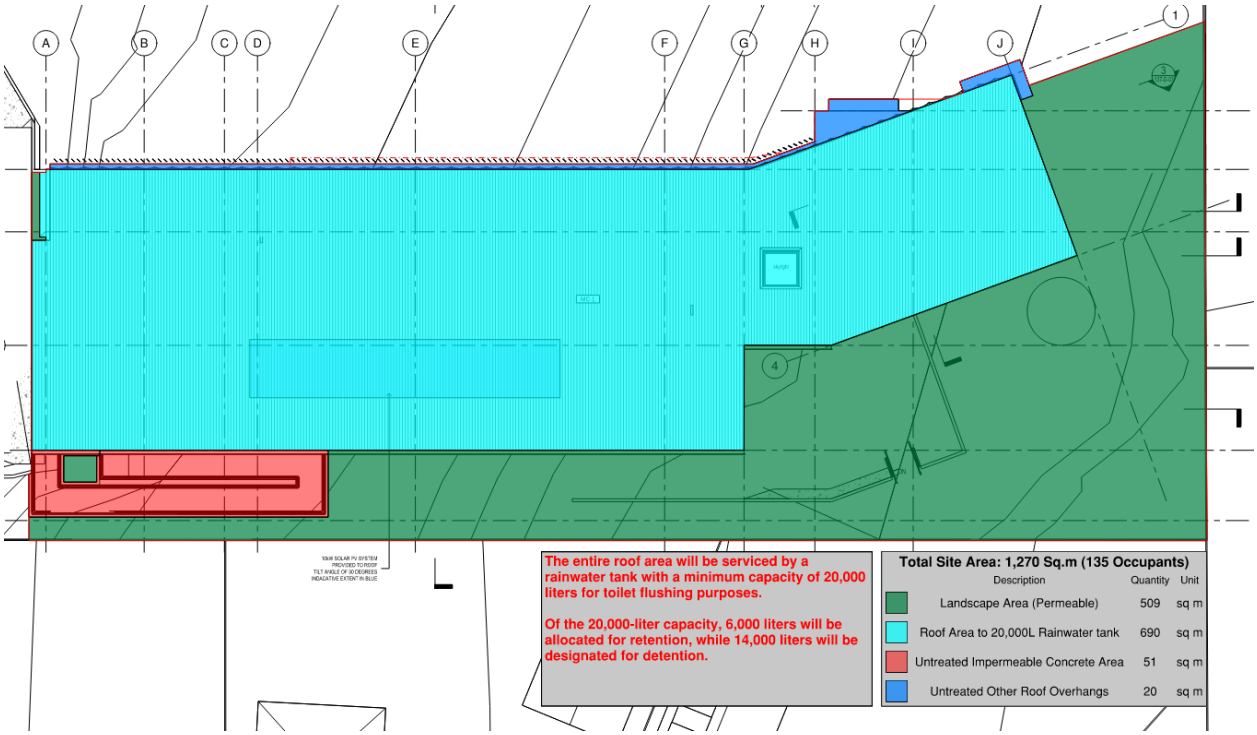


Figure 4: Stormwater Treatment Diagram

Stormwater Calculations

Report for **Whitehorse**

Date report printed: 19/11/2024

Project Details

Project Name	Emmaus College Saint Timothy's Campus		
InSite User Email	commercial@suho.com.au		
Web files link			
Site Area (m2)	1270	Project ID	4602
Planning number			
Development type	Non-residential development		
Existing site details	Proposed Extension to Emmaus College		
Street address	17-23 Stevens Rd, Vermont VIC 3133, Australia		

Results

VOLUME	FLOW	QUALITY	EFFICIENCY
Objective: Reduce annual average runoff volume by harvesting or infiltrating stormwater	**Objective**: Control peak discharge flow (litres per second) with adequate on site detention	**Objective**: Improve stormwater runoff water quality (Equivalent to STORM score)	**Objective**: Increase drought resilience
Target: No increase in pre-development annual average runoff volume (Up to a 10% increase is allowed to account for uncertainties)	**Target:** less than or equal to zero. If greater than zero this is the additional Site Storage Requirement (SSR) volume required	**Target**: Achieve a score of 100 or more This corresponds to a 45% reduction in nitrogen runoff	**Target**: Achieve greater than 25% potable water use reduction
VOLUME RESULT	**FLOW RESULT**	**QUALITY RESULT**	**EFFICIENCY RESULT**
0.0	-2.5	118	33.5
% change in annual average volume	m^3 of additional site storage required	Pollution reduction score (out of 100)	% water saving
VOLUME PASSES	FLOW PASSES	QUALITY PASSES	EFFICIENCY PASSES

Design Criteria

The items on this page must be reflected on other project plans, specifications and engineering drawings.
The development must be designed and constructed in accordance with the following:

Rainwater Tank Specifications

Total rainwater tank volume (L)	20000	*This is the rainwater tank volume retention + detention	
Total rainwater retention* tank volume (L)	6000	*This is the rainwater tank volume that is available for reuse	
Total rainwater detention* tank volume (L)	14000	*This is the rainwater tank volume that is reserved for slow release to stormwater	
Roof connected to rainwater tank (m^2)	690.0		
Rainwater tanks connected to	Toilet		
Other rainwater tank end uses (L/day)		Irrigated Garden Area (m^2)	
% building rainwater end uses connected (to rainwater tanks)	100	First Flush Device?	0
Additional* Site Storage (L)		*Site storage added adjacent to the legal point of discharge for peak flow detention or volume infiltration	
Recycled water source (Yes/No)			
Water tank reliability %	42.7		
Rainwater tank overflow %	41.5	*Note if this number is under 25%, then 30% of the tank's *retention* volume will be counted toward the *detention* volume	

Water Efficiency Specifications

Basin WELS star rating	> 4 Star WELS rating
Toilet WELS rating	> 4 Star WELS rating
Bath WELS star rating	Not Applicable
Washing Machine WELS star rating	Not Applicable
Kitchen Taps WELS rating	> 5 Star WELS rating
Urinal WELS rating	Not Applicable
Shower WELS star rating	Not Applicable
Dishwasher WELS star rating	> 5 Star WELS rating

Stormwater management measures selected are

This includes all impervious areas in the site connected to Council or Stormwater Authority drains. This excludes pervious areas like garden, gravel, and lawn areas)

- For the 690m^2 roof area Proposed Roof Area, Raintank Volume = 20000 litres connected to 690m^2 of roof, additional water tank based detention volume = 14000 litres. Total tank volume (retention + detention volumes) = 20000.0 litres
- 20m^2 of Other Untreated Roof Overhangs/shading
- 51m^2 of Courtyard Untreated Impervious Concrete Area

Building Occupancy Calculations

Building Spaces

•Manually entered occupancy = 135

Estimated Total Building Occupancy	135.0

Stormwater VOLUME Calculations

Site Area (m^2)	1270
Post development total impervious area (m2)	761.0
Rainwater Tank Overflow (kL/annum)	246.4
Pre-development Volume (kL/annum)	0.0
Post-development Volume (kL/annum)	301.4
Change in volume %	

Stormwater QUALITY Calculations

Rainwater Tank Runoff reduction (%)	58.5
Rainwater Tank(s) Total Nitrogen (TN) reduction	897.0
Total Nitrogen (TN) % reduction	53.0
Equivalent STORM Score	118

Water EFFICIENCY Calculations

Benchmark water use (kL/year)	4575.4		
Predicted potable water use (kL/year)	3041.4		
Predicted potable water use (L/person/day)	68.8		
Water savings from tank (kL/year)	347.5		
Water saving from efficiency (kL/year)	1186.50		
Total water saving % (efficiency + tank + recycled water)	33.5	Water saving (kL/year)	1534.0

Stormwater FLOW Calculations - **Swinburne Method**

This section outlines rational method calculations for On Site Detention (OSD) and Site Storage Requirements (SSR)

Permissible Site Discharge (PSD) Calculations

Calculated PSD	4.0
PSD Override Value Used	

Site Storage Calculations

Preliminary On Site Detention (OSD) tank size required estimate (m^3)	13.46	Swinburne Method Tank formula
OSD and storages* provided (m^3)	16.0	Includes storages: rainwater tank retention allowance, rainwater tank detention, and additional added storage volumes
Additional detention / retention volume required (m^3)	-2.5	
Base case (pre-development) fraction impervious (ratio)	0.00	
Base case runoff coefficient	0.15	
Post development total impervious area (in hectares)	0.0761	
Post development fraction impervious (ratio)	0.60	
Post development runoff coefficient	0.603	
Pre-development design storm	20% AEP (~1 in 5 year ARI) - default residential	
Post development detention required	10% AEP (~1 in 10 ARI) - default residential	
Critical Storm Duration - the Catchment time of concentration – Tc(catchment) in minutes	20	
Rainfall Depth (mm) for Critical Storm Duration - Tc(catchment)	15.00	
Rainfall intensity - i at Tc(catchment) (mm/h)	45.000	
Travel time from discharge point to catchment outlet (min) - Tcs	20.0	
Rainfall Depth (mm) for Tcs - (IFD at Tcs)	18.99	
Rainfall intensity - i at tc(site) (mm/h)	56.97	

OSD tank flow restrictor orifice diameter = 44 mm

Detention Calculator - Site Storage Requirement (SSR)

Storm Duration (mins)	Rainfall Depth (mm)	Stored Volume (m^3)
5		
7.5		
10		
12.5		
15		
20		
30		
40		
60		

About In-Site Water

This report is generated by user inputs from the toolkit at InSite Water. In-Site water is an online Integrated Water Management tool designed for use on smaller sites (less than 2 hectares) in Australia that need quick and accurate stormwater engineering answers. InSite water is simple to use but provides robust stormwater design and engineering answers.

This report includes outputs from the InSite tool that has investigated:

– water tank sizing
– detention tank sizing
– water savings through efficiency
– water WSUD treatments such as raingardens

For enquiries, contact us through www.insitewater.com.au

Disclaimer

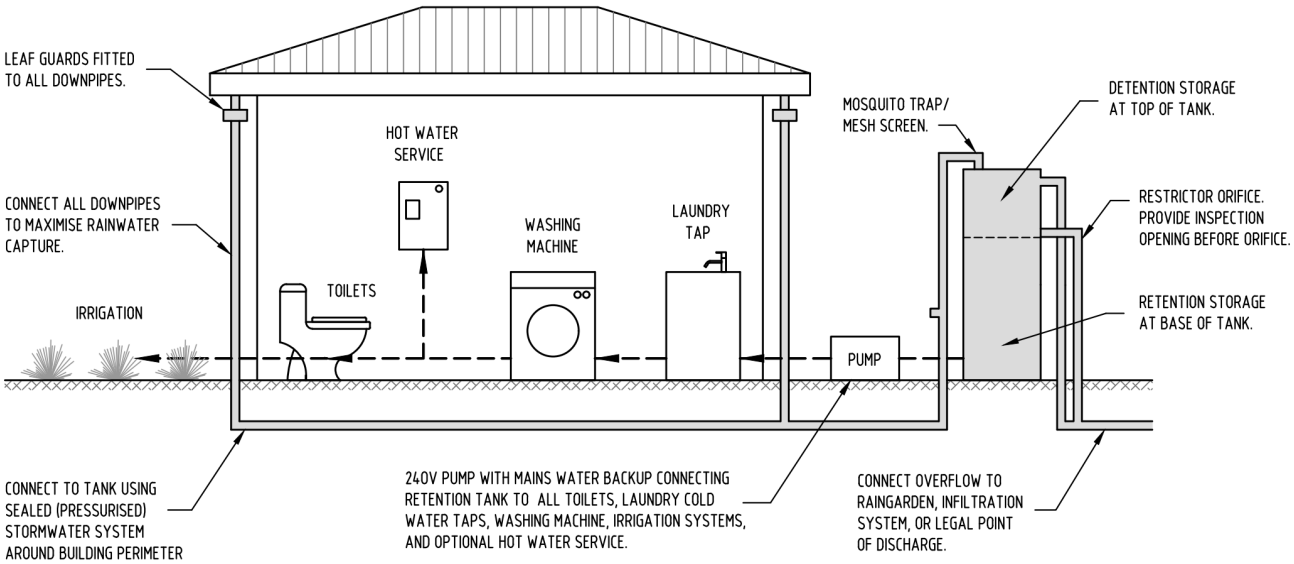
This guide is of a general nature only. Advice from a suitably qualified professional should be sought for your particular circumstances. Depending on each unique situation, there may be occasions where compliance is not achieved.

This report does not provide a detailed design and layout for the piping and general drainage system in your development, which should be prepared by a suitably qualified professional. In addition, InSite Water does not consider compliance for slope stability or foundation / slab / footing protection, which needs to come from a qualified geotechnical or structural engineer.

The following is outside the scope of InSite Water, however it is critical that all designers consider the following in drainage design and in using Water Sensitive Urban Design (WSUD) devices and approaches:

- *Manage expectations and risks around occasional surface water and ponding.*
- *Ensure that uncontrolled stormwater does not flow over property boundaries or otherwise cause a nuisance.*
- *Plan for major flood pathways – locate buildings away from, adapt (raise floors above predicted flood levels) and defend buildings against potential major flooding.*
- *Seek professional advice to reduce damage and safety risks.*
- *Design for local conditions such as vegetation, topography and soils (soil type, reactivity, permeability, water table level, salinity, dispersiveness, acid sulphate soils, contaminated land etc).*
- *Ensure that soil moisture and building clearance is considered in areas of reactive clays or where varying soil moisture levels could damage buildings or other infrastructure.*
- *For steeper sites, ensure the design includes geotechnical considerations such as slope stability with varying soil saturation levels.*
- *Ensure that a Stormwater Risk Assessment and Environmental Management Plan is undertaken for sites that pose a pollution risk.*
- *Ensure that a Construction Environmental Management Plan (CEMP) is implemented to control sediments and reduce stormwater pollution during construction.*
- *Compliance with ARR 2019, Australian Rainfall and Runoff: A Guide to Flood Estimation* http://arr.ga.gov.au/
- *Compliance with NCC plumbing and building standards.*
- *Compliance with AS/NZS 3500.*
- *Compliance with EPA and other environmental regulations.*
- *Compliance with other relevant Australian Standards, regulations and Council requirements.*

Appendix A: attach further details for this project (if applicable):



RETENTION TANK RETICULATION DETAIL

N.T.S.
NOTE: THE DESIGN AND INSTALLATION OF ALL STORMWATER SYSTEMS SHALL COMPLY WITH AS/NZS 3500.3:2018 "STORMWATER DRAINAGE".

Above: Proposed Roof Area treatment drawing (draft for planning approvals only: not for construction, not to scale)

APPENDIX D – WSUD MAINTAINANCE PLAN AND TYPICAL RAINGARDEN EXAMPLE

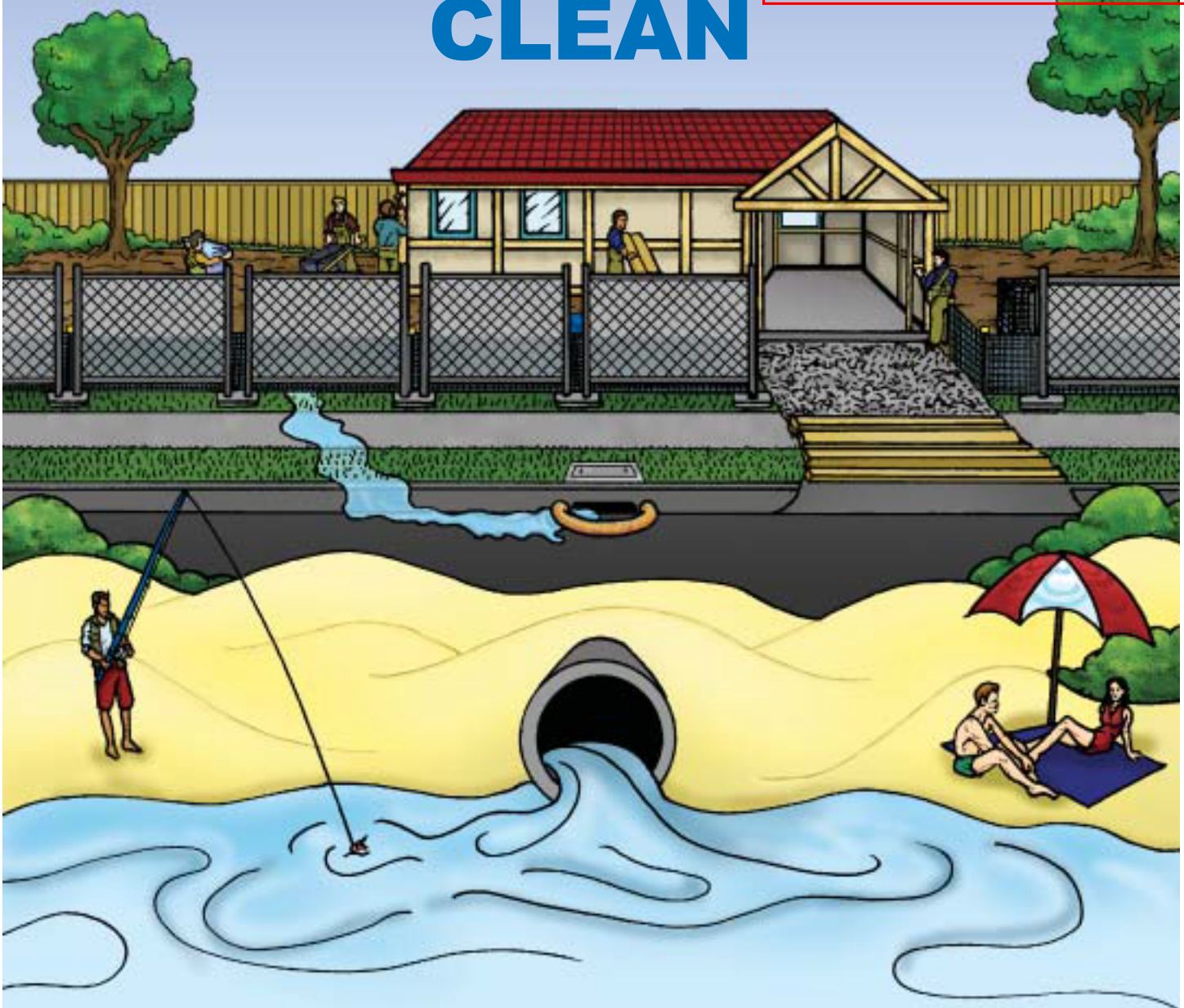
The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Roof	Remove leaf litter and debris Check general condition of roof for signs of leakage, including broken tiles, and rusting	1 month
Gutters and Downpipes	Remove leaf litter and gross pollutants Check general condition of drainage systems for signs of leakage, including damaged pipes and rusting	1 month
First Flush Device	Inspect inlet screens for blockages or fouling Inspect silt traps and collection pits, clean as required Inspect diversion pit and remove any build-up of sludge blocking the diversion valve Check all float operations and activation switches (if applicable) Check general condition of components for loose connections, wear and tear, and signs of leakage	1 - 3 months
	Arrange licensed EPA contractor to remove built-up sludge accrued in all pits (if applicable)	6 months
Tanks	Ensure inlet and overflow screens are not blocked or fouled Remove excess layers of sludge and biofilms on tank walls if affecting the colour or smell of the tank water Check general condition of tank for signs of damage or leakage	3 – 6 months
Pumps	Pumping systems are to be maintained in accordance with the manufacturers' specifications	Refer manufacturers' details
Vegetation	Prune surrounding vegetation and overhanging trees to reduce leaf litter and debris	6 months
Filtration Pits	Full inspection including cleaning of the grate and sediment trap.	12 months
Filtration Media Inspection	Filter media inspection to look for sediment build up at inflow and outlets points. Holes that appear in the filter media (or other signs of erosion in preferential flow paths) should be filled. In addition to the regular inspection schedule, this inspection should be conducted after major storm events.	3 months
Filtration Media Replacement	Filtration media cartridge replacement	4 years

Table 2: WSUD maintenance program

APPENDIX E - CONSTRUCTION STORMWATER SITE MANAGEMENT PLAN

KEEPING OUR STORMWATER CLEAN



A BUILDER'S GUIDE

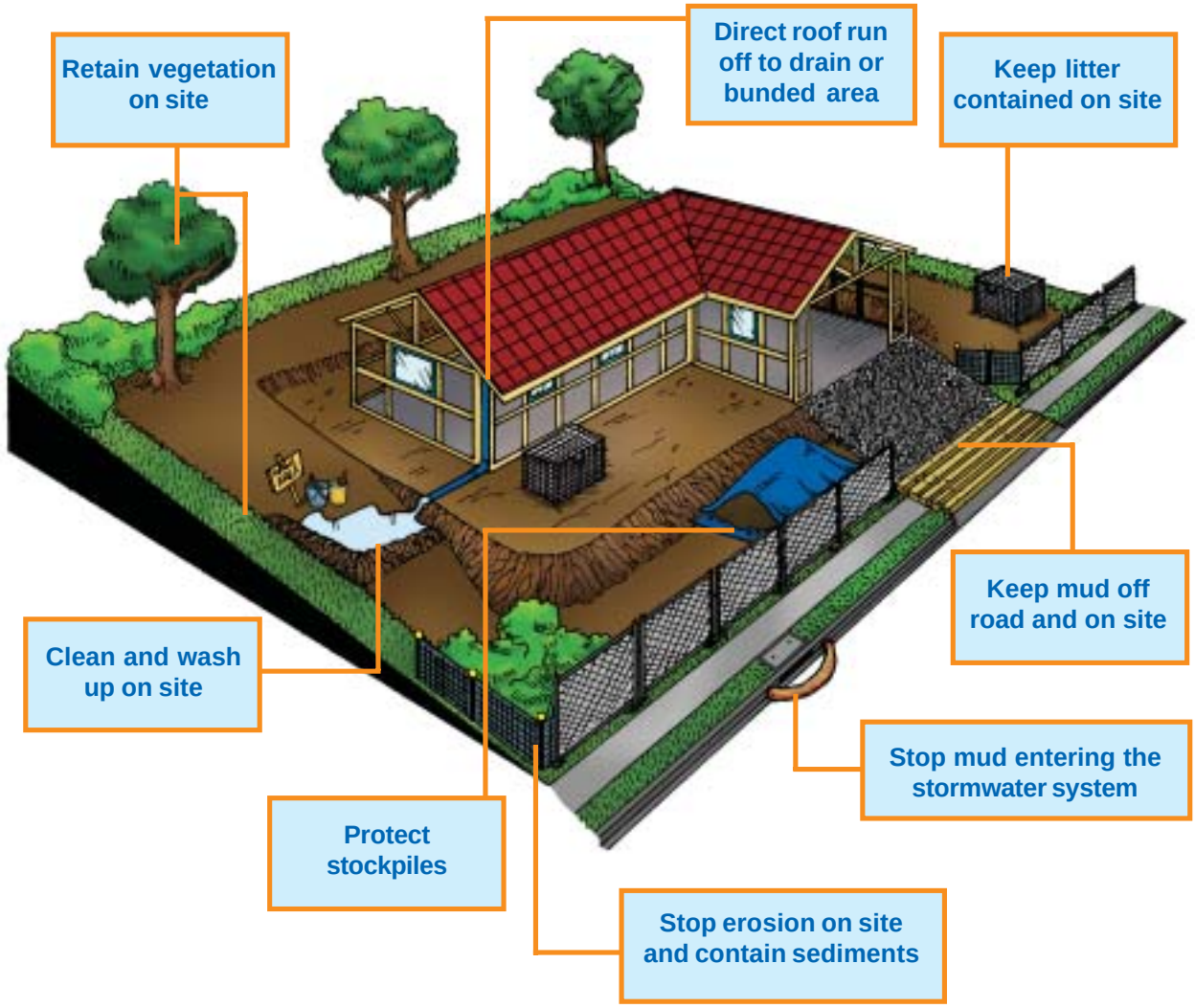
Information to help you control sediment and litter from your building site and comply with Council and State regulations

VICTORIA State Government
Melbourne Water
EPA VICTORIA | Environment Protection Authority Victoria
ntepa Northern Territory Environment Protection Authority

ACKNOWLEDGEMENTS

This revised booklet was originally produced with the support of the Victorian EPA, Melbourne Water, Cities of Kingston, Casey, Hume, Melbourne, Moreland and Moonee Valley.

Check Council requirements and plan before you start work on site



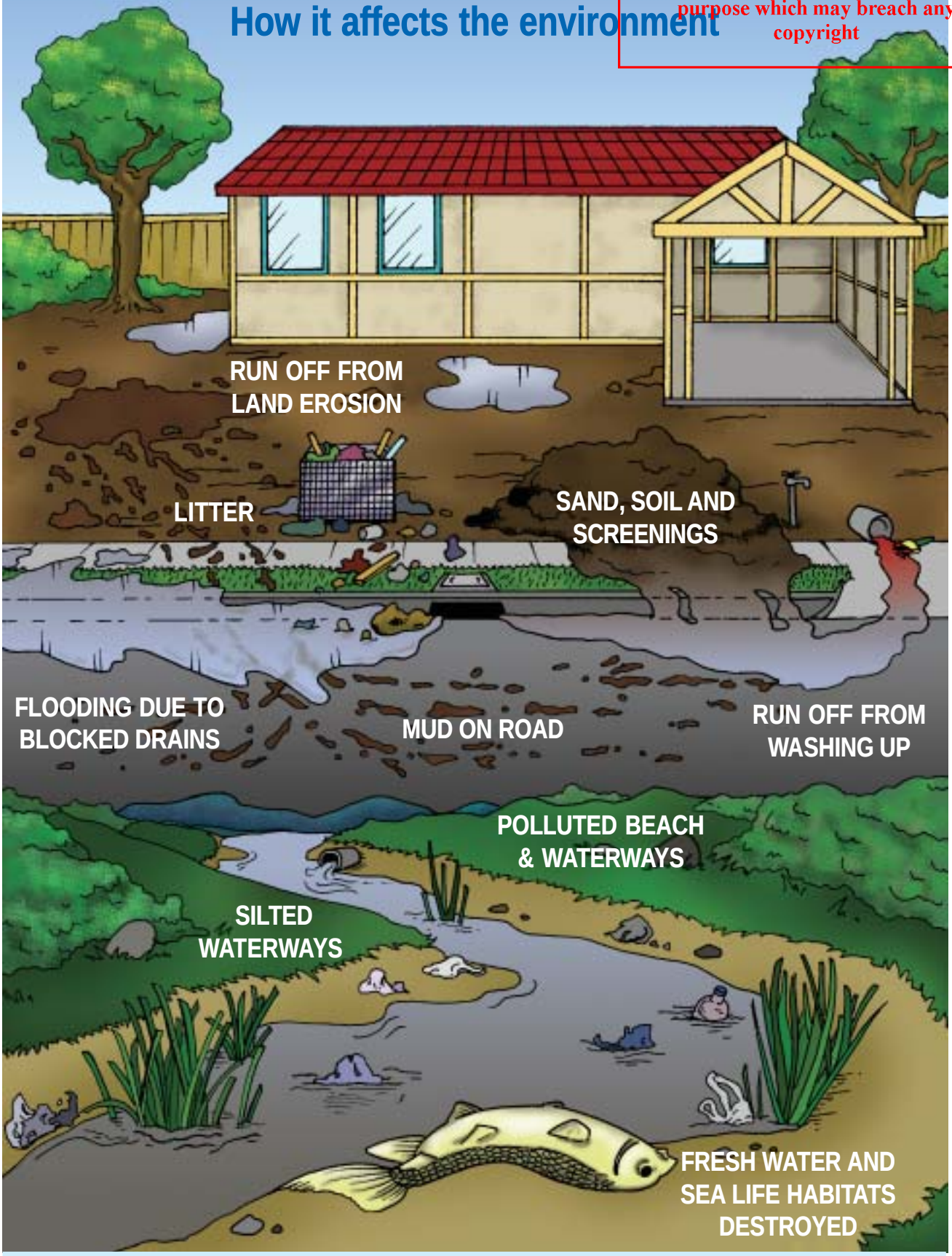
Supplier information for sediment & erosion control on page 3

CONTENTS

6 SITE RULES TO KEEP STORMWATER CLEAN

PROBLEMS ON OUR BUILDING SITES

How it affects the environment



WHY DO I NEED TO PROTECT OUR ENVIRONMENT?

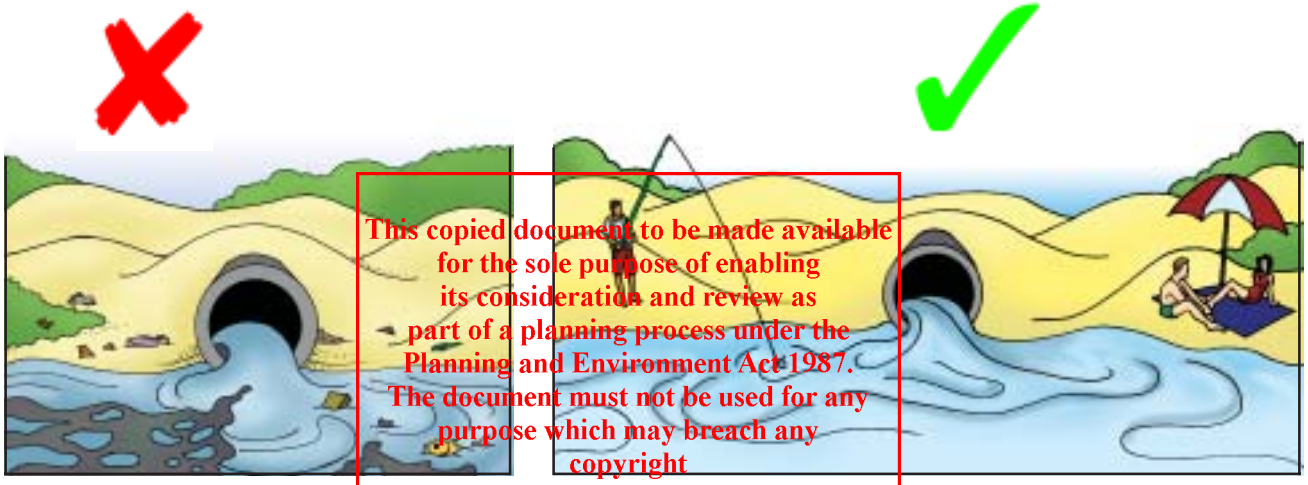
It's the law!

Sediment from building sites can pollute stormwater. There are State and local council laws which make this an offence.

The developer or person managing the building site has the responsibility of making sure that the stormwater is not polluted.

Penalties apply for polluting stormwater.

To enjoy using our environment - now and in the future



Stormwater is not treated and carries pollution to local waterways and bays. Pollution in our stormwater can lead to short and long term damage to our environment.

To benefit builders

The site looks good (which is good for attracting new customers) **and you'll be helping to protect our environment**.

The site has fewer hazards. A well organised site has less loose material lying around causing a hazard. This reduces health and safety issues on a building site.

Downtime is reduced. A well managed and organised site is more efficient. This saves time and money.

USEFUL SUPPLIER INFORMATION

This information is provided for helpful contact details only. The companies are not listed in any particular order and are not necessarily recommended over others that may provide similar services.

SEDIMENT CONTROL

Approximate Price:
Geofabric fencing
100 m roll from $55 to $130
stakes $12 for 10
Filter socks unfilled: 2 m $4.50 filled $8 - $25

Geofabrics Australasia
03 8586 9111 www.geofabrics.com.au
Products: silt fencing

Southern Geosynthetics Supplies
0419 478 238 www.geosynthetics.com.au
Products: Silt fences, Silt Sausages

Statewide River & Stream Management
03 9702 9757 www.stateplanthire.com
Products: silt fence, stakes, silt logs
Installation service and site kits
Approx cost: $220 for 20 m frontage installed, $88 self installation

Treemax
03 98787 4111 www.treemax.com.au
Products:filter fence, silt worm, silt sock

Zerosion
0408 351 566 www.zerosion.com.au
Products: silt fence installation
Approx cost: $215 for up to 20 m frontage

For NT Contractors look under Sediment Control in the NT Yellow Pages

STABILISED DRIVEWAYS

For aggregate look under sand, soil and gravel in the NT Yellow Pages.
Recycled aggregate available from major suppliers.

TEMPORARY DOWNPIPE

Available from major plumbing suppliers

Art Plastic 25 m rolls of temporary plastic downpipe approx: $25

Temporary Flexible Downpipe
03 9786 3711 www.tfd.com.au
$135 per kit - does 2-3 16 sq houses

OTHER EQUIPMENT

Coates Shorco Sykes 131994
Supply : silt fence $125 100 m
Hire: Rumble Grids $180 p/week for 2 panels
Hire: Environmental settlement tanks 4 m tank $542 p/week
See also silt fencing – in the NT Yellow Pages

PORTABLE TOILETS

See Toilets – Portable in the NT Yellow Pages

TEMPORARY FENCING

See Temporary Fencing Hire Contractors in the NT Yellow Pages

BRICK AND TILE CUTTING

Slop Mop Recycling Products
www.slopmop.com.au 0418 825 301
Brikasaurus: capture and recycle waste water for brick and tile cutting operations.
Slopmop: water delivery & waste clean up system for use behind concrete saws and grinders.

Useful information is available from:

Master Builders Green Living Builders
www.mbav.com.au

HIA GreenSmart Program
www.greensmart.com.au

Civil Contractors Federation NT
www.civilcontractors.com

Keep Australia Beautiful Victoria – CleanSites Program
www.kabcnt.org.au/

Victorian Litter Action Alliance
www.litter.vic.gov.au

NT Environment Protection Authority
www.ntepa.nt.gov.au

Environment Protection Authority Victoria
www.epa.vic.gov.au

Melbourne Water
www.melbournewater.com.au

SITE RULE 1

Check Council requirements and plan before you start work on site.

Questions to ask BEFORE you start

Planning, BEFORE you start a job, will make a big difference to how well you manage your site. Check Council requirements for site management. Complete a site management plan (one can be found at the back of this booklet).

Where is the lowest point on the site?

Water always runs to the lowest point. It is important to know where this point is when planning your site. It will affect where you put your crossover, stockpile materials and sediment fence. Leave a buffer of vegetation along the lowest boundary.

Where will I put the crossover?

Try to put the crossover as far away from the lowest point as possible. As water runs to the lowest point it is more likely to be wet and muddy. [See Page 16.]

Where will I keep my stockpile?

Stockpiles are best kept on site, as far away from the lowest point as practical. [See Page 12.]

Where will I build my sediment control fence?

Sediment control fences should be built on the lowest side/s of a site prior to erecting a temporary fence. A flat site may not need sediment control fences. [See Page 9.] These are a primary management measure to keep sediment on site.

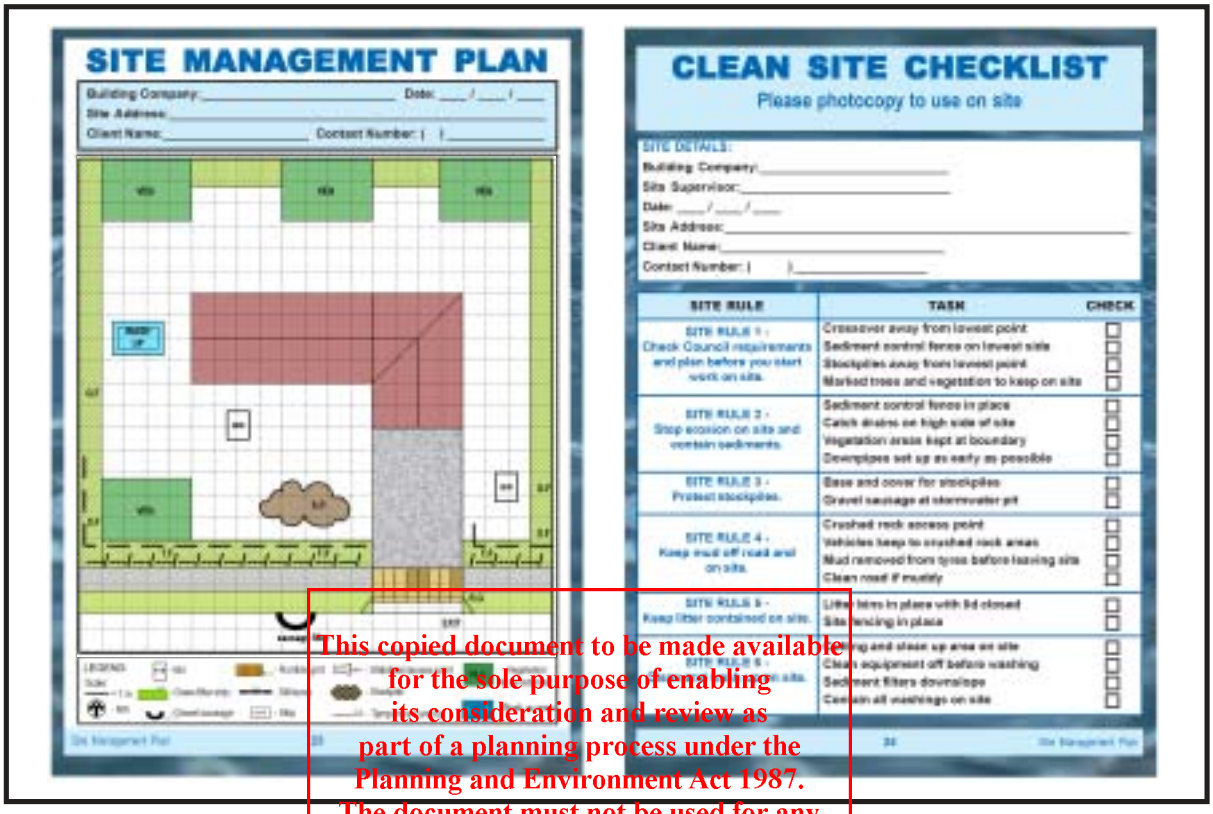
Which trees and vegetation will be kept on site?

Rope or fence off the areas you are going to keep. Keeping vegetation such as grassed areas will help to prevent damage to the surface of the site later on and may trap sediment. [See Page 7.]

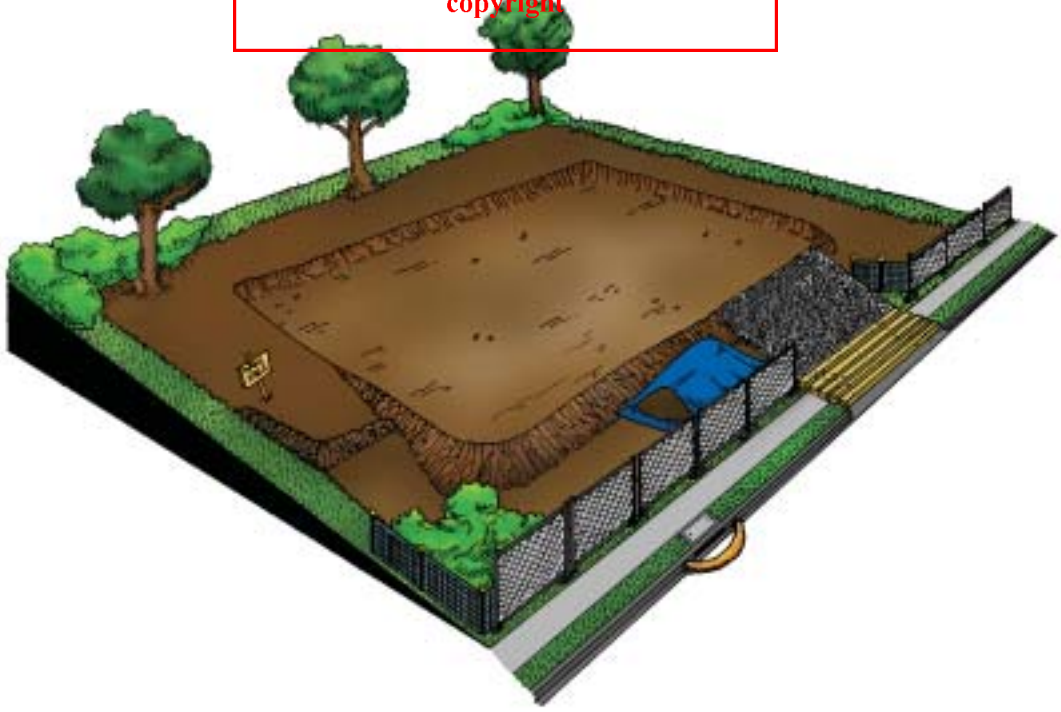
Why fence my site?

Many councils require sites to be fenced. Site fencing helps to keep building activities to the site, helps stop movement of litter, and helps to keep a site safe by stopping members of the public wandering on site. [See Page 20.]

SITE READY TO START JOB



For copy of plan & checklist photocopy pages 23 & 24.



Site Rule 1 - Plan before you start work on site. **5**

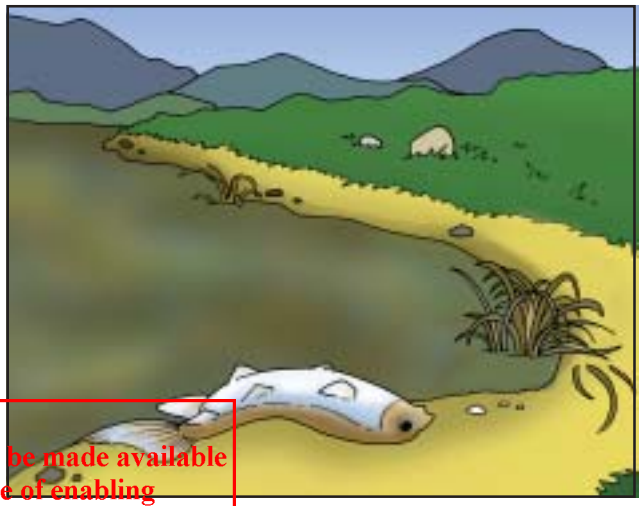
SITE RULE 2

Stop erosion and keep sediment on site

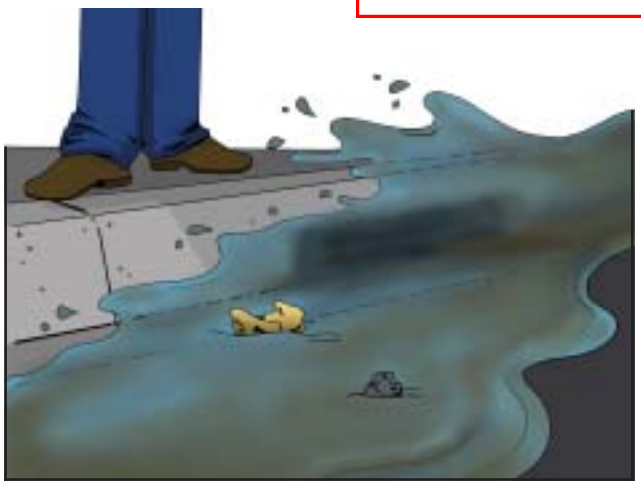
Why is erosion a problem?

Sediment escaping from building sites can:

1. Make roads and footpaths slippery for vehicles and pedestrians, increasing public liability risk.



2. Enter the stormwater system and make stream and river water cloudy which can kill plants and animals in creeks and the bay.



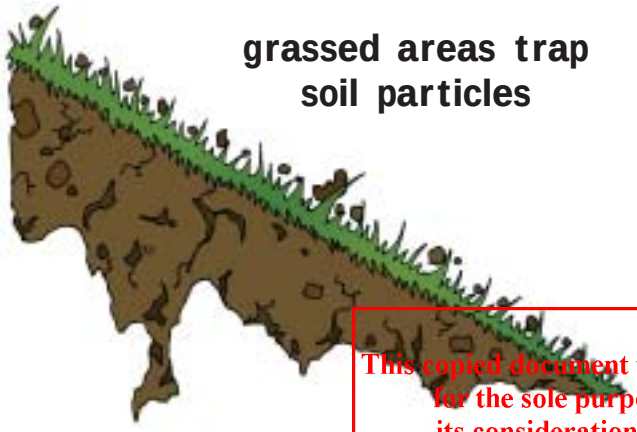
3. Cause blockages to the stormwater system including the side entry pit and pipes, increasing the chance of flooding and requiring regular cleaning.

4. Overload and clog local stormwater filtration systems such as raingardens and swales.

METHODS TO CONTROL EROSION

Control Method 1 - Keep areas of vegetation as a buffer strip at the site boundary.

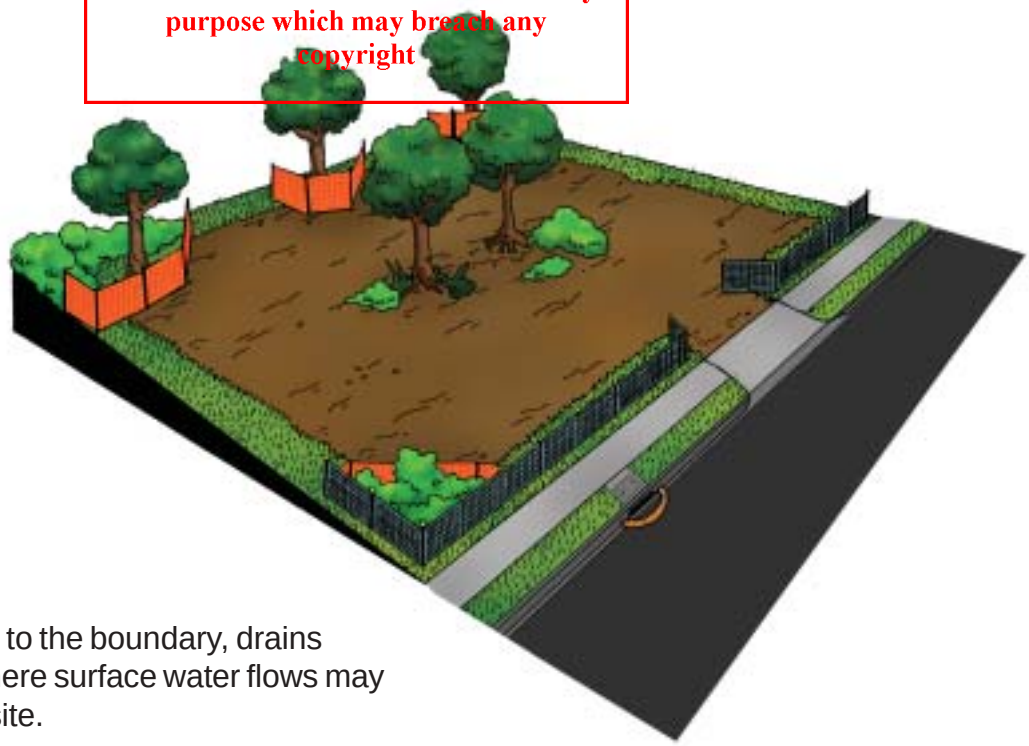
To prevent sediment leaving site use existing grassed areas and a sediment control fence.



Vegetation helps protect the soil from the effects of rain and surface water by:

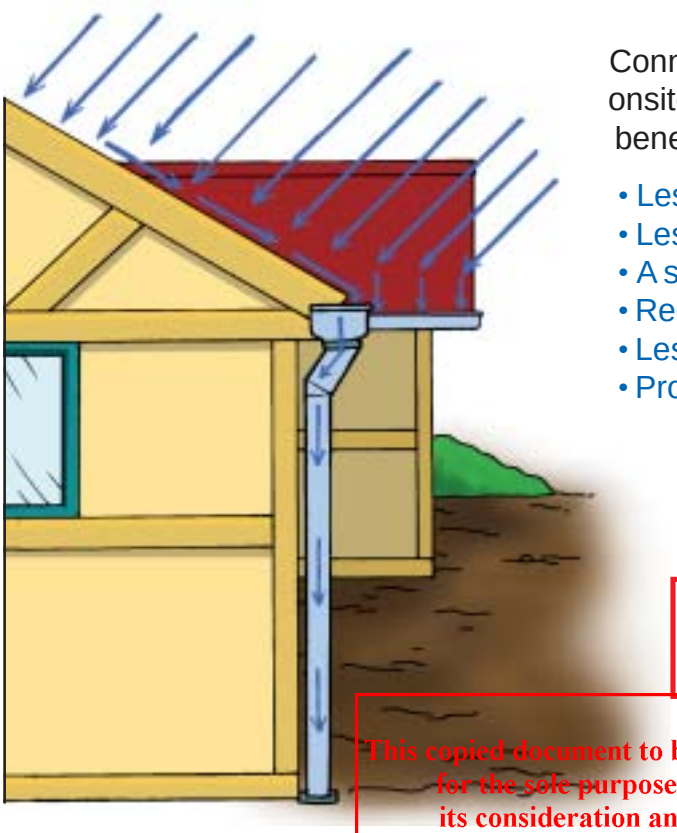
- Slowing the flow of water across the ground. Fast water is able to carry more soil particles off site
- Holding the soil together and minimising erosion
- Acting as a filter to trap soil particles.

Decide what areas of vegetation you are going to keep on site. Mark and protect trees, shrubs and grassed areas that you are keeping. Then apply for the relevant permits to remove vegetation.



Protect areas close to the boundary, drains and gutters, and where surface water flows may carry sediment off site.

Control Method 2 - Early downpipe connection



Connecting downpipes to the stormwater or onsite detention system has a number of benefits:

- Less drainage problems on site
- Less mud on site after rain
- A safer site
- Reduce damage to building foundations
- Less downtime after storms
- Projects get finished sooner.

Aim to have the downpipes connected as soon as the roof is installed (temporary or permanent).

Control Method 3 - Pipe roof water onto a grassed or bunded area.

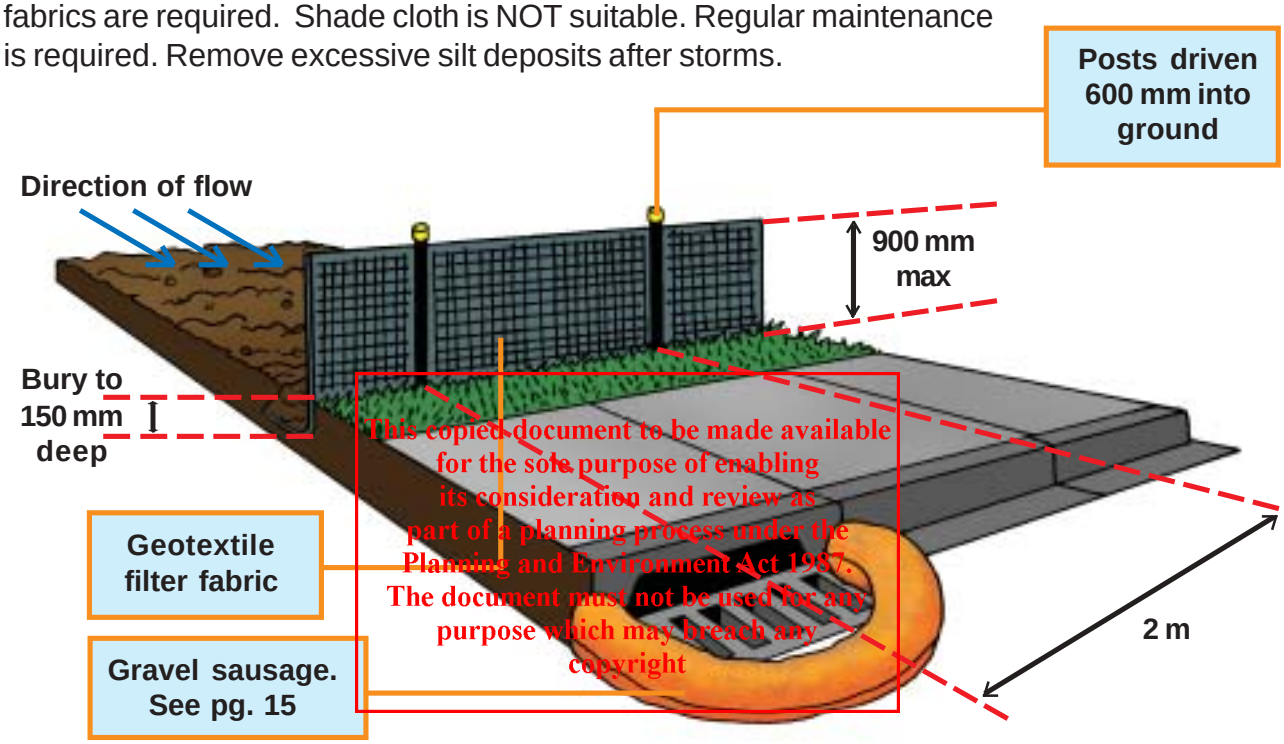
If you cannot connect to the stormwater system, pipe the water away from the building onto a vegetated area where there is good ground cover or to a bunded area.

This lets water seep into the ground with less damage to the surface of the soil.

METHODS TO CONTAIN SEDIMENT ON SITE

Method 1 - Sediment Control Fences

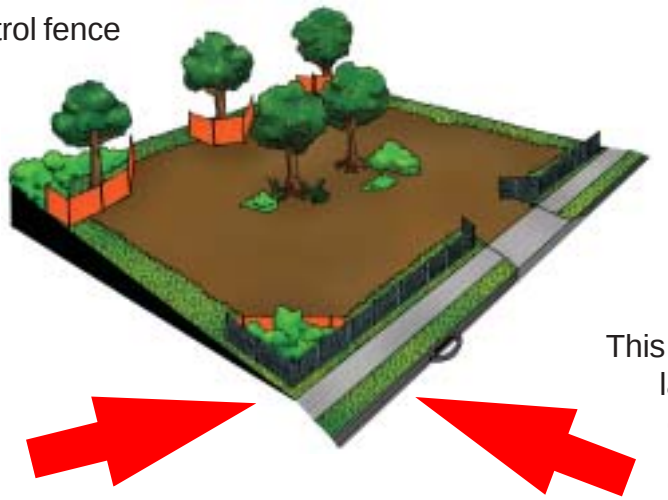
Sediment control fences stop sediment from being washed off site. The fence allows muddy water to pond behind it and for sediment to settle as the water slowly filters through. Geotextile fabrics are required. Shade cloth is NOT suitable. Regular maintenance is required. Remove excessive silt deposits after storms.



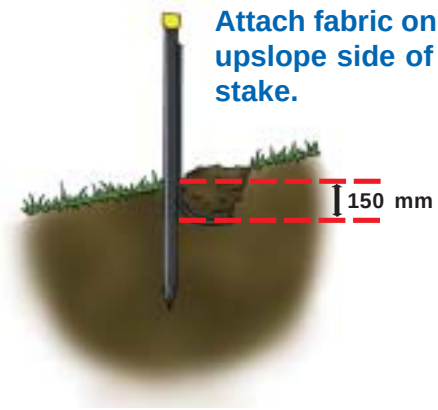
TO BUILD A SEDIMENT CONTROL FENCE:

a) Identify the low point of site.

Place sediment control fence along boundaries where the low point is.



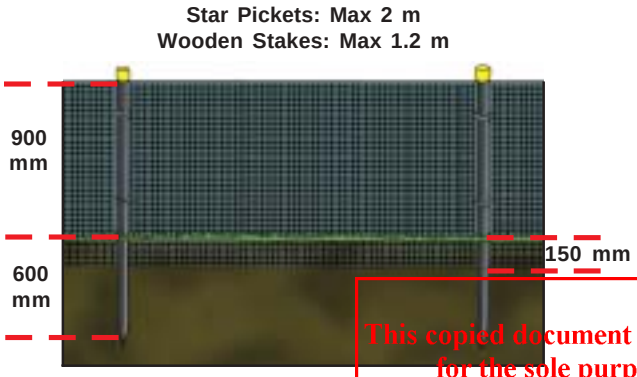
This is the point where the land will allow water to carry sediment off the building site.



b) Dig a trench along the fence line before temporary site fencing is installed.

The trench will be used to bury the base of the sediment control fabric.

The trench should be 150 mm deep.

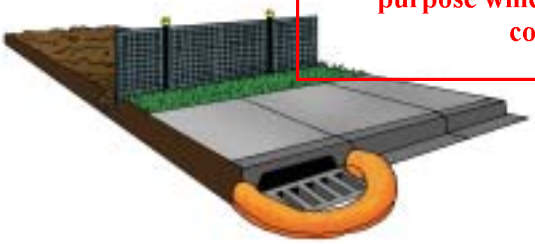


c) Put in 1500 mm wooden posts (38 mm) or star pickets.

Put 1.5 m star pickets at a maximum of 2 m apart and 600 mm deep.

Put 1.5 m wooden posts (38 mm) at 1.2 m intervals (max 2 m) and 600 mm deep.

d) Fix geotextile to posts



Geotextile material allows water to pass through but traps sediments.

Use cable ties or staples to attach the geotextile to the upslope side of the fence posts.

Only join fabric at the pickets with a 150 mm overlap (wrap around post).

e) Spread volume of water.

Put a star picket 1.5 m upslope of the others every 20 m (if the fence is longer than 20 m). This spreads the volume of water that flows through each section of fence.

Turn ends up slope to allow for ponding.

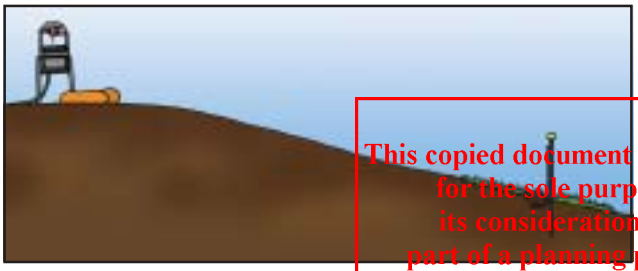
Method 2 - Control dust and slurry from cutting

A large amount of dust can be made from cutting materials such as concrete, bricks and tiles. When mixed with water this material can be turned into slurry and washed into waterways. Cement changes the acidity of water which may then kill water plants and animals. The following methods will help keep this waste on site and out of the waterways:

a) Cut materials on site

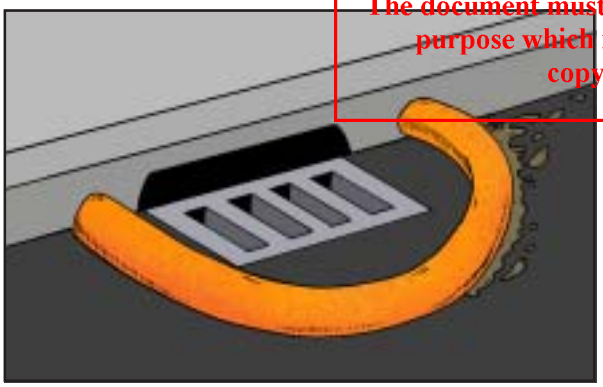
Choose a set area to do all your cutting. This area should be on the building site and away from all stormwater drains.

Equipment is available that captures water used in the cutting process (see page 3).



b) Put sediment control filters downslope

Sediment logs should be placed downslope to catch cutting slurry. A back-up sediment fence may also be used.



c) Use a gravel sausage or sediment log

When cutting must take place near stormwater drains, use gravel sausages or sediment logs.

Alternatively, you can buy sleeves from geotextile companies and fill these with sand.

Always clean up and correctly dispose of captured sediment.

d) Clean up when finished

When you have finished cutting, clean up your equipment in the cutting area.

Use a broom to clean up and get rid of the slurry where it can't get into the stormwater system. Dispose of in waste container

DO NOT HOSE THE SLURRY AWAY

SITE RULE 3

Contain stockpiles on site

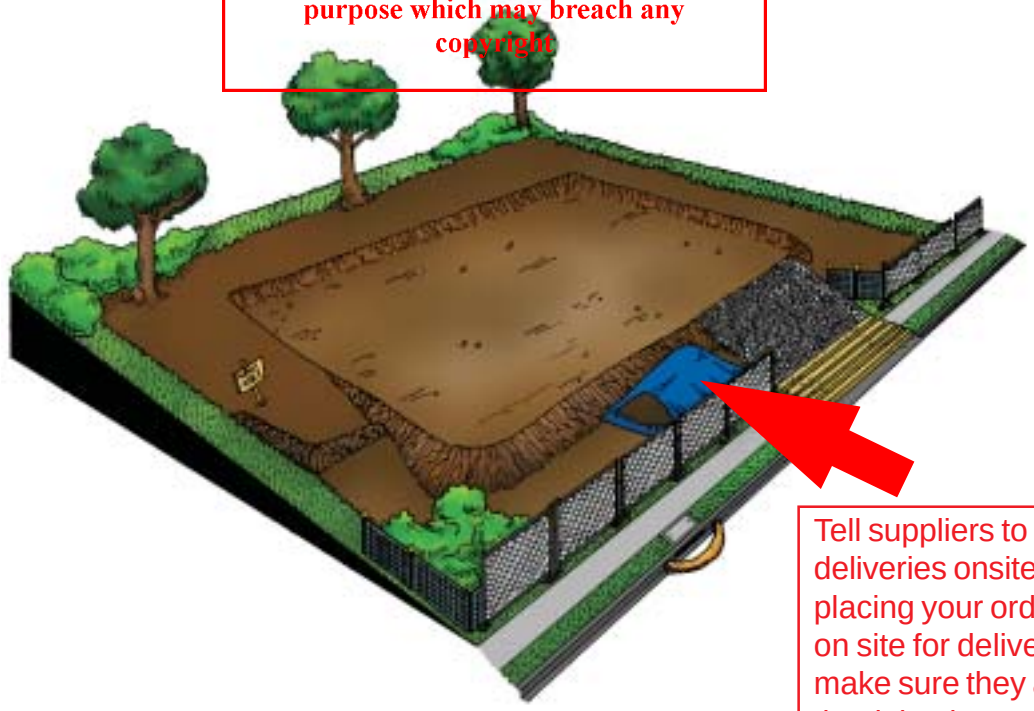
Why are sand, soil and screenings a problem?

Sand, soil, screenings, dust or sludge from concrete and brick cutting, and other materials escaping from building sites can cause many problems.

Putting stockpiles such as sand, gravel, topsoil and mulch across footpaths and roads will cause a hazard to both vehicles and pedestrians.

Sediment can smother stormwater filtering systems including swales and raingardens.

Stockpiles should be stored on site, not on footpaths or roads.

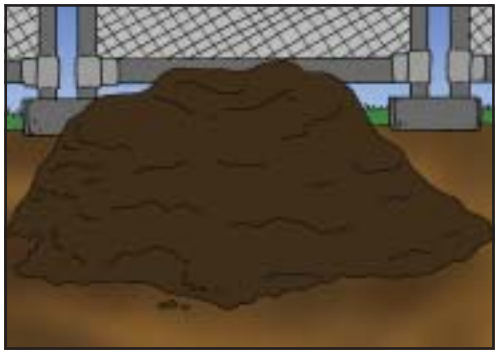


Tell suppliers to place deliveries onsite when placing your order or be on site for deliveries to make sure they are put in the right place.

Stockpiles not stored properly can get washed or blown away and pollute the stormwater.

This is particularly true of stockpiles that:

- Are high
- Have steep sides
- Are put on hard surfaces where they can be blown or washed away.



KEEPING STOCKPILES ON SITE

Place the stockpile in a designated area on site, and upslope of the sediment control fence.

If exposed for some time, stockpiles should be covered with a tarp.

In some cases it may be impossible to store stockpiles on site. In this case, a different set of control methods will be used.

WHEN UNABLE TO STORE STOCKPILES ON SITE

You may have to store a stockpile off site (although never on the footpath, gutter or road). Contact the council to make sure that you have the appropriate council permits.

The council will tell you how stockpiles stored off site are to be managed. Materials may be stored on tarps or on pallets. Containers such as rubbish skips with opening sides that you can get into easily are a good idea.

Material must not get into drains, gutters or the stormwater system

The following control methods can be used when storing materials or working off site.

Method 1 - Cover Stockpile

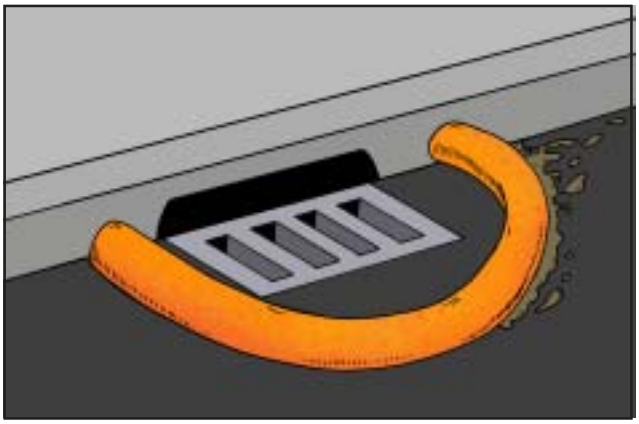
a) Place a tarp, plastic or bunded pallet under the area where the stockpile will be placed.

b) Place a secured covering over the stockpile.

c) Then place sediment control logs around the downslope base of the stockpile.

Method 2 - Protect Downstream Stormwater Pit with a Gravel Sausage or Sediment Log

A gravel sausage or sediment log is a temporary collection device that can be used when stockpiles are stored or cutting is done off site.
It is also a useful precautionary measure at all sites.

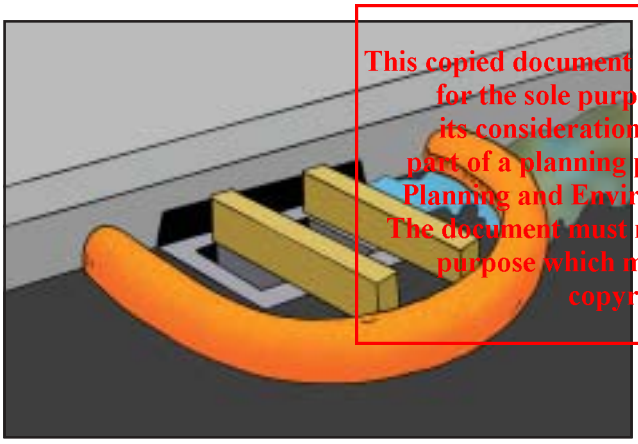


TO BUILD A GRAVEL SAUSAGE:

a) Make the sausage sleeve

A gravel sausage is made from a geotextile sleeve filled with 25 - 50 mm gravel.

The gravel sausage should be 150 mm high.



b) Put the gravel sausage across the opening of the inlet pit

Make sure that the sausage is tight with the kerbing on the upslope side of the inlet pit and extends beyond the grate.

There should be a 100 mm gap between the front of the pit and sausage. Use wooden blocks to keep the 100 mm gap.

c) Clean out gravel sausage regularly

When soil and sand builds up around the gravel sausage, this should be collected and disposed of on site.

Regular maintenance is required.

DO NOT HOSE SEDIMENT DOWN THE GUTTER

SITE RULE 4

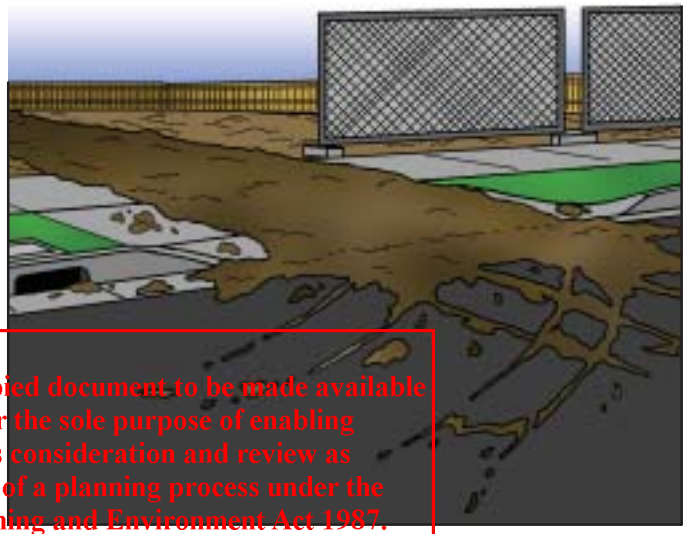
Keep mud off road and on site

Why is mud a problem?

Two things happen when vehicles go on and off the site:

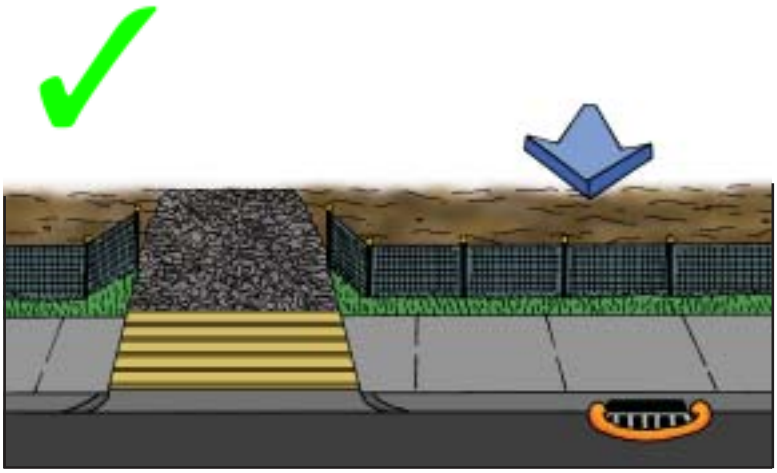
1. The surface area of the site is damaged making it dangerous.

2. Mud is carried back onto the roads and footpaths, and washes into the stormwater system.



METHODS TO CONTROL MUD

The following simple methods will help you to protect the surface of your site and help stop vehicles from dropping mud on the road from their wheels. The best way to do this is to put crushed rock on the crossover or access point of your building site.



Putting crushed rock on the access point of your site is a good way to prevent damage and provide a dry access point for vehicles. Where possible park vehicles off site.

Make sure gravel does not collect in the gutter or on the footpath.

Control Method 1: Build a crushed rock crossover

Remove a 3m or greater strip of soil from road (or where concrete crossover ends) to nearest building point or a minimum of 5 m.

Use road base or 40 mm aggregate or crushed rock to a depth of 200 mm.

Restrict vehicle access to this point.

Control Method 2: Keep to crushed rock path

Only drive where you need to. Keep to a set path (preferably on crushed rock).

Control Method 3: Remove mud from tyres

Use a shovel to remove mud from truck tyres before leaving site.

Control Method 4: Clean road

If mud goes on road, remove as much as possible and put it back on site.

Use a broom or a shovel.
DO NOT USE A HOSE.

SITE RULE 5

Keep litter contained on site

Why is litter a problem?

Many building sites have both building rubble and other rubbish spread across them.

This causes many problems:

You may now have an **UNSAFE WORK ENVIRONMENT!**
This could increase the chance of legal and public liability problems

Litter blowing off site can block stormwater drains.

Litter may spoil local creeks and eventually find its way to the coast.

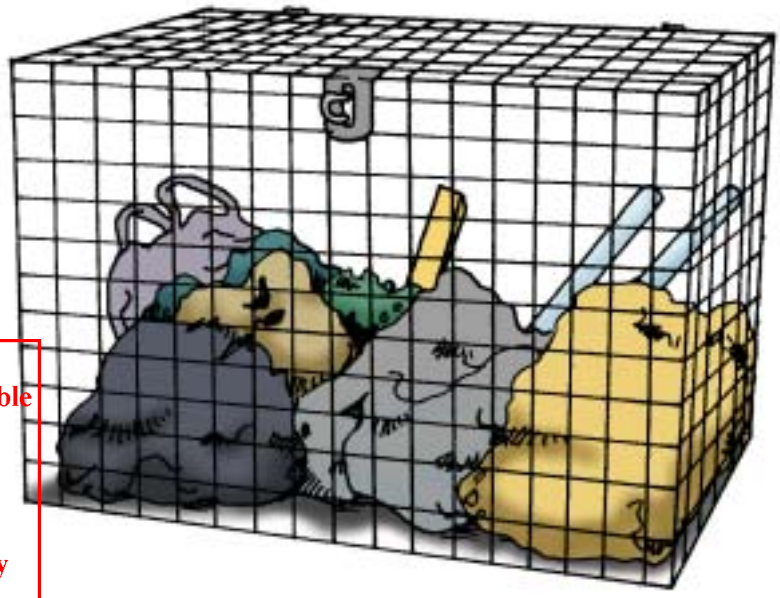
METHODS TO CONTROL LITTER

The following simple methods will help you to stop litter leaving your site or being a hazard on site.

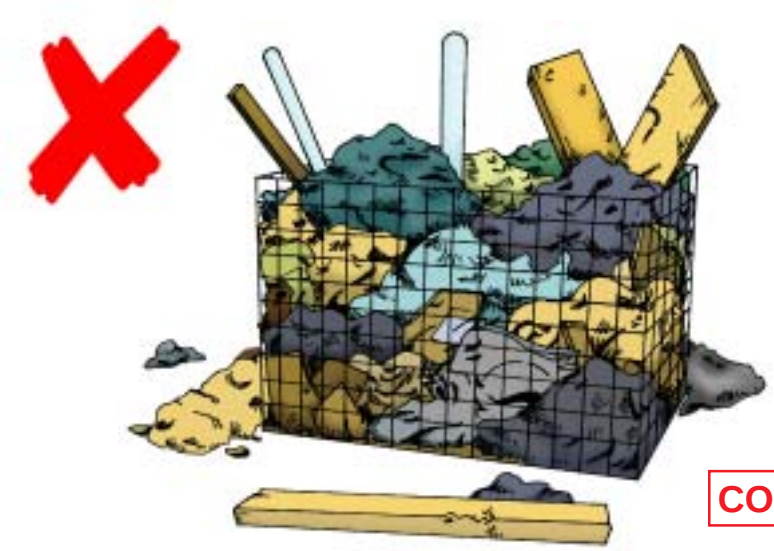
Control Method 1: Litter bins or covered skips

A mesh bin with a closeable lid is suitable for larger items like cardboard boxes, plastic wrapping and polystyrene.

Mesh to be 50 mm or smaller



A smaller bin is okay for smaller rubbish like paper, food wrapping and drink containers that may be blown off site. Council bins may be restricted from building sites.



Empty the litter bin regularly. Don't allow overflow. Where possible, collect the materials from the litter bin for recycling and /or keep different materials in separate bins.

CONSIDER A RECYCLING BIN

Control Method 2: Site fencing

Site fencing will help to keep litter from being carried off site by wind or water and provide security.

A FENCE DOES NOT NEGATE THE NEED FOR A BIN.

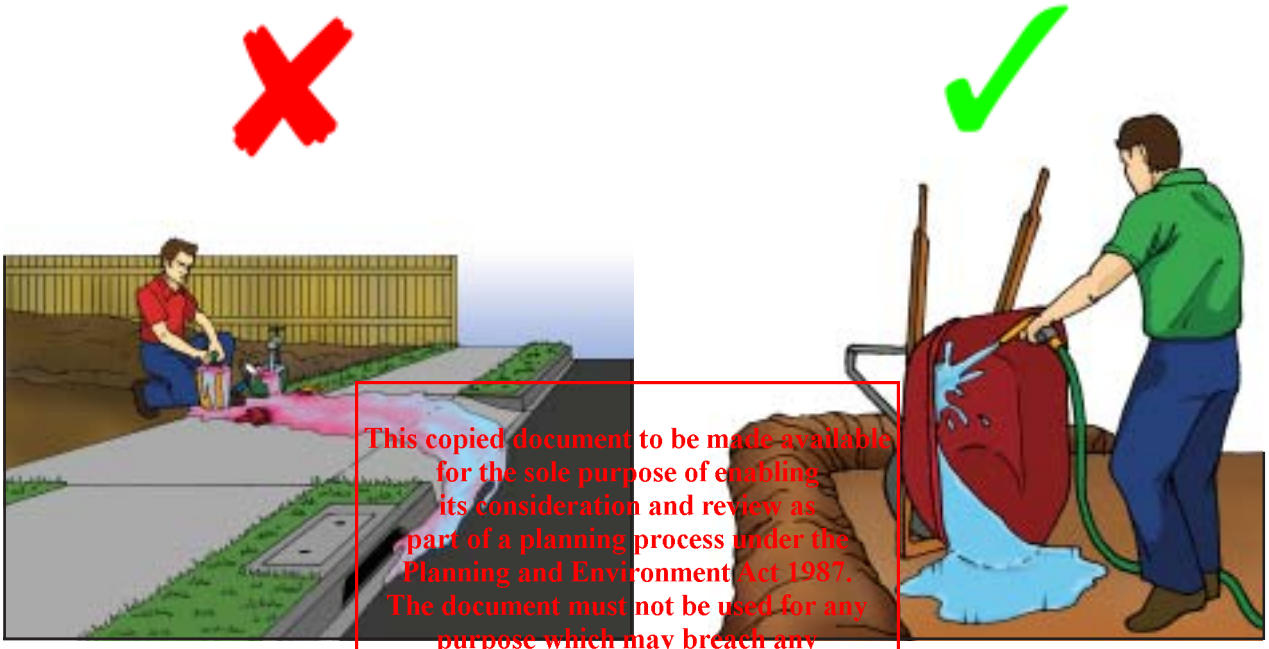
Check council requirements for temporary fencing and avoid trip hazards on footpath.

Remember to install a sediment control fence prior to installation of the temporary fence.

SITE RULE 6

Clean and wash up on site

Why is washing up a problem?



When cleaning up after painting, plastering or concreting it's most important to keep the wash water out of the stormwater system.

Problems to the environment include:

1. Oil based paints form a thin film over the surface of the water. This starves water plants and animals of oxygen

2. Paints and petrol chemicals can contain toxic compounds

3. Concrete changes the acidity of waterways which can kill water plants and animals. Concrete washings can harden and block drains

4. Roads around a building site can become dirty, slippery and dangerous.

METHODS TO CONTROL WASHING UP

The following simple methods will help you to stop the contamination of stormwater from paint, plaster or concrete washings.

Control Method 1: Have a set washing up area

Choose a set area to do all your washing up. This area should be on the building site and away from all stormwater drains. It should be bunded and contain wash out barrels.

You could use the same area you have chosen for tile and brick cutting.
Contain chemicals and slurry onsite.
Put sediment control fences downslope.

NOTE: SEDIMENT CONTROL FENCES WILL NOT STOP CHEMICALS

Control Method 2: Get rid of concrete slurry on site

Collect wash water from concrete mixers and pumps in a wheel barrow and get rid of it in your wash area. You can also safely get rid of concrete slurry by tipping small amounts in a ditch lined with plastic or geotextile liners. When the water evaporates or soaks into the surface the solids can then be put into a skip bin or recycled in construction or as road base.

Control Method 3: Clean equipment off before washing

Brush dirt and mud off equipment before you wash it. Spin rollers and brushes to remove paint before you wash them in a wash out bin.

You will then need less water to clean this equipment.

Control Method 4: Clean painting tools carefully

Use one container to wash the brush and another to rinse it. Let the first container stand overnight to let solids settle. Then pour out the water on to the ground if it is not too dirty and put settled solids in a bin.

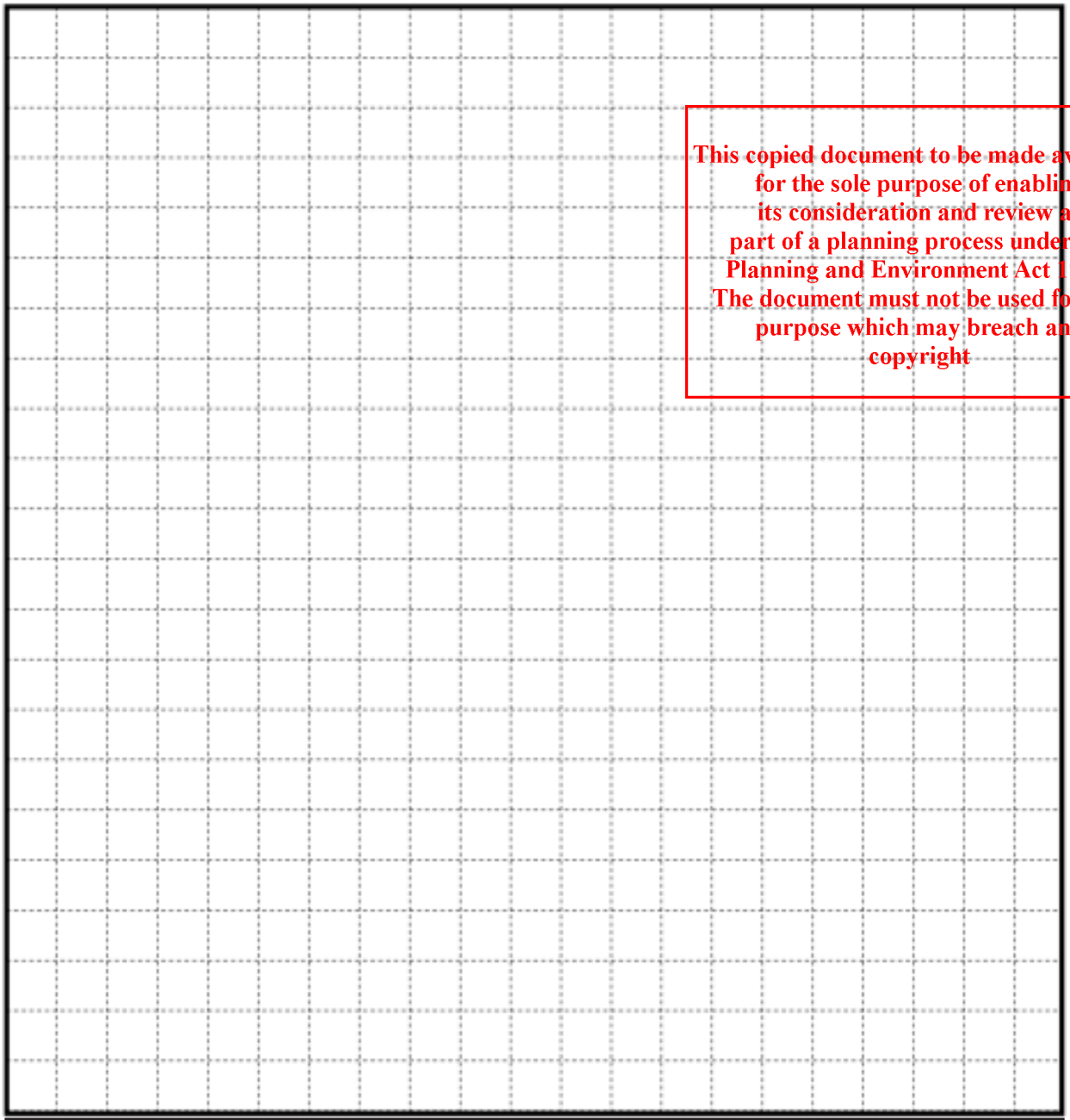
Wash oil based paints in solvent baths until clean. DO NOT PUT THE SOLVENT ON THE GROUND. Contact a waste disposal company for removal.

SITE MANAGEMENT PLAN

Building Company:_____ **Date:** ____ / ____ / ____

Site Address:_____

Client Name:_____ **Contact Number: ( )** _____



LEGEND:

Scale:

= 1 m

- Nth

- Bin

- Grass filter strip

- Gravel sausage

- Rumble grid

- Silt fence

- Skip

- Stabilised access point

- Stockpile

- Temporary Fencing

VEG. - Vegetation to be retained

- Wash up area

CLEAN SITE CHECKLIST

Please photocopy to use on site

SITE DETAILS:

Building Company:_____ **Date:** ____ / ____ / ____

Site Supervisor:_____

Site Address:_____

Client Name:_____ **Contact Number: ( )** _____

SITE RULE	TASK	CHECK
SITE RULE 1 - Check Council requirements and plan before you start work on site.	Crossover away from lowest point	☐
	Sediment control fence on lowest side	☐
	Stockpiles away from lowest point	☐
	Marked trees and vegetation to keep on site	☐
SITE RULE 2 - Stop erosion on site and contain sediments.	Sediment control fence in place	☐
	Catch drains on high side of site	☐
	Vegetation areas kept at boundary	☐
	Gravel sausage at stormwater pit	☐
	Downpipes set up as early as possible	☐
SITE RULE 3 - Protect stockpiles.	Base and cover for stockpiles	☐
	Gravel sausage at stormwater pit	☐
SITE RULE 4 - Keep mud off road and on site.	Crushed rock access point	☐
	Vehicles keep to crushed rock areas	☐
	Mud removed from tyres before leaving site	☐
	Clean road if muddy	☐
	Clean stormwater pit and maintain gravel sausage	☐
SITE RULE 5 - Keep litter contained on site.	Litter bins in place with lid closed	☐
	Site fencing in place	☐
SITE RULE 6 - Clean and wash up on site.	Cutting and clean up area on site	☐
	Clean equipment off before washing	☐
	Sediment filters downslope	☐
	Contain all washings on site	☐

6 RULES FOR A CLEAN WORKSITE

SITE RULE 1 -

Check Council requirements and plan before you start work on site.

SITE RULE 2 -

Stop erosion on site and contain sediments.

SITE RULE 3 -

Protect stockpiles.

SITE RULE 4 -

Keep mud off road and on site.

SITE RULE 5 -

Keep litter contained on site.

SITE RULE 6 -

Clean and wash up on site.

Melbourne Water

VICTORIA State Government

EPA VICTORIA | Environment Protection Authority Victoria

ntepa Northern Territory Environment Protection Authority

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APPENDIX F – DAYLIGHT REPORT

The table below summaries the percentage of floor area to achieve at least 2% of Daylight factor.

Area	% DF Achieved
Regular use areas	62%

Daylight simulation calculations have been undertaken using Design Builder v7, which uses the Radiance Daylighting simulation engine. The Design Builder Radiance simulation provides a detailed multi-zone physics-based calculation of illumination levels on the working plane of a building. The calculations allow light to be transmitted through exterior and interior windows and the shading and reflective effect of local shading devices and component/assembly blocks is included.

Modelling parameters and assumptions are generally based on Green Star IEQ-4 requirements as follows:

> Uniform Design Sky
> Internal floor reflectance = 30%
> Internal wall reflectance = 70%
> Internal ceiling reflectance = 80%
> Working plane defined as 0.7m

Glazing light transmittance assumptions were as follows:

> High performance Double Glazing with following values
> Visible Light Transmittance = 60% for windows

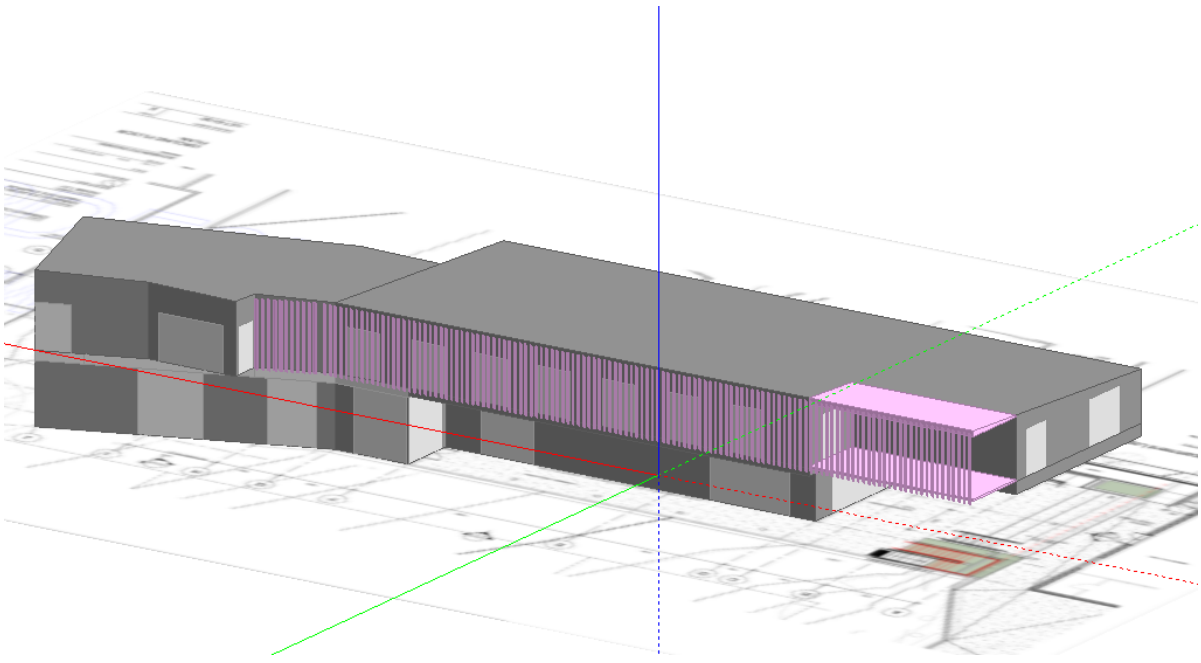

Figure 5: Model Geometry used for Daylight Modelling

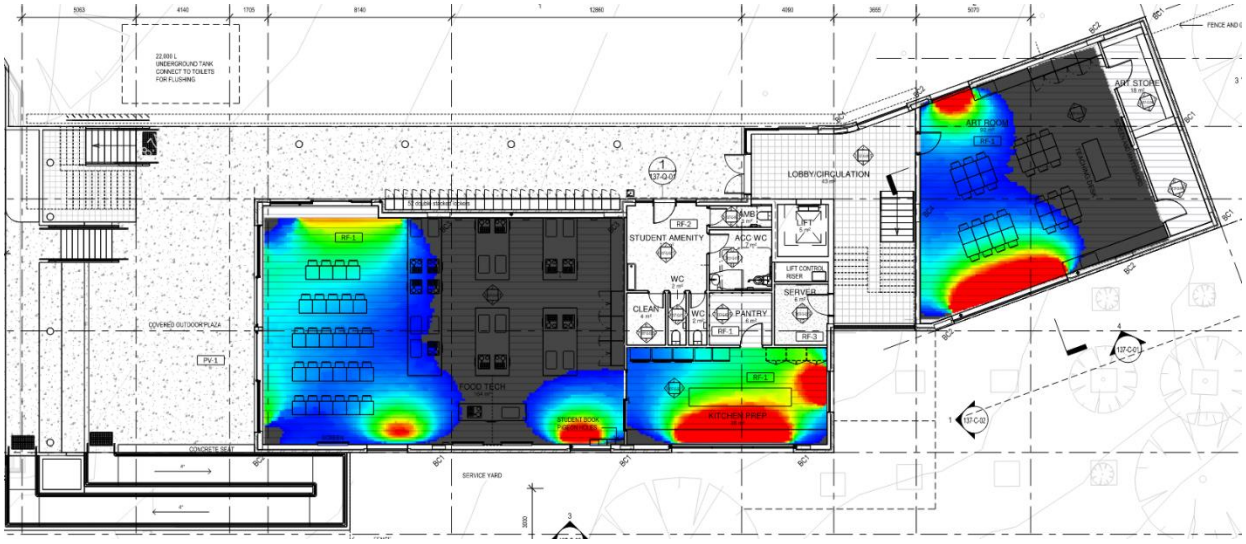

Figure 6: Daylight Map for Ground Floor

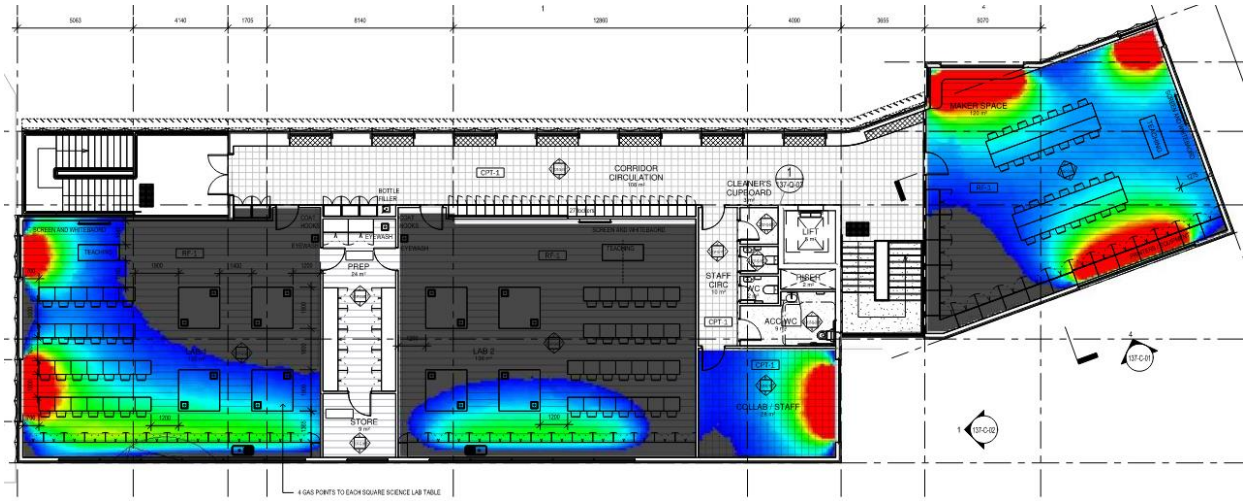

Figure 7: Daylight Map for First Floor

Space	Nominated Area (m2)	Compliant Area (m2)	Compliant Area (%)
Staff	34	33	96%
Maker Space	130	112	86%
Lab 2	140	33	24%
Lab 1	144	89	61%
Kitchen Prep	45	45	100%
Food Tech	176	109	62%
Art	102	56	55%
Total	**771**	**476**	**62%**

Table 2: Daylight Compliance zone

APPENDIX G – VENTILATION MARK-UPS

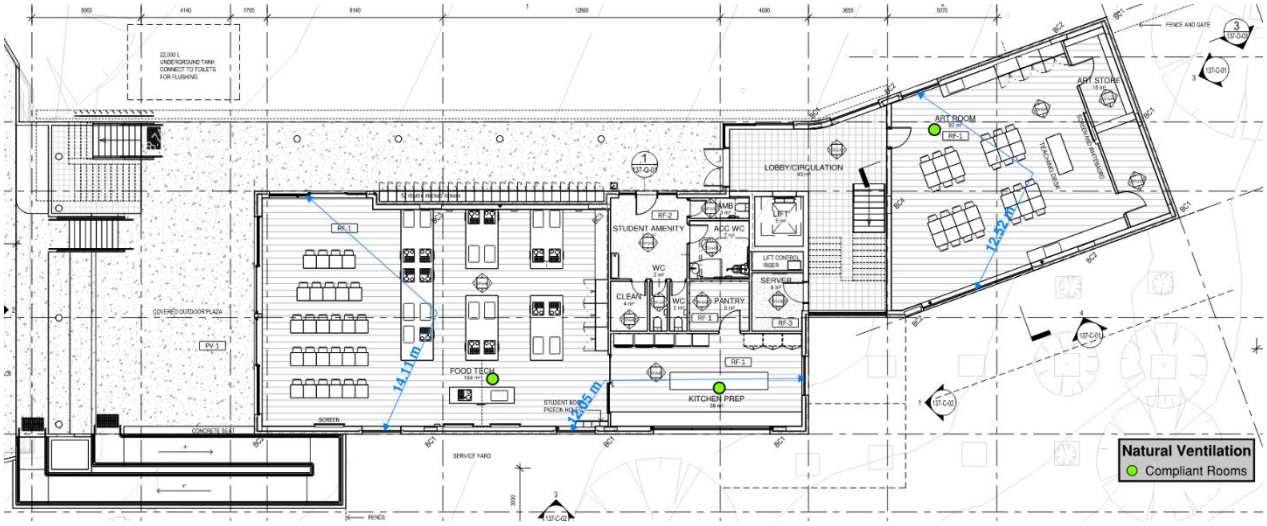

Figure 8: Ventilation Mark-up Ground Floor

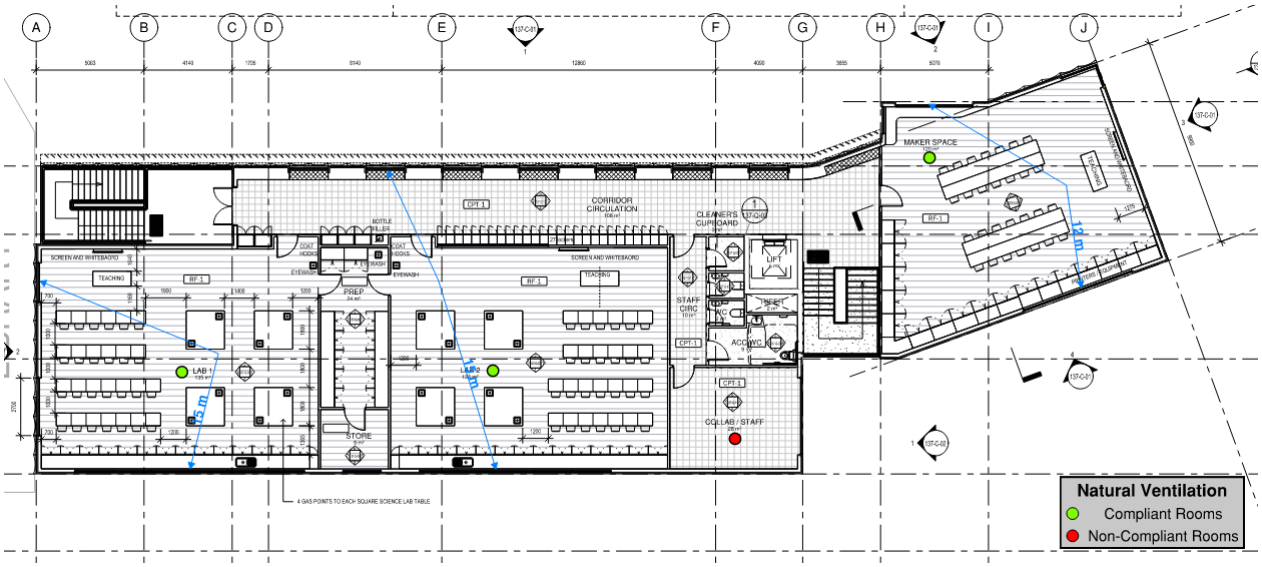

Figure 9: Ventilation Mark-up First Floor