

9.2 NO. 33 (LOT: 73; D/P: 32) SMITH STREET, HIGHGATE - PROPOSED SIX GROUPED DWELLINGS

Ward: South

- Attachments:**
1. Consultation and Location Map
 2. Development Plans
 3. Streetscape Perspective
 4. Applicant's Urban Design Study
 5. Applicant's Life Cycle Assessment
 6. Summary of Submissions - Administration's Response
 7. Summary of Submissions - Applicant's Response
 8. Determination Advice Notes

RECOMMENDATION:

That Council, in accordance with the provisions of the City of Vincent Local Planning Scheme No. 2 and the Metropolitan Region Scheme, **APPROVES** the development application for Six Grouped Dwellings at No. 33 (Lot: 73; D/P: 32) Smith Street, Highgate in accordance with the plans in Attachment 2, subject to the following conditions, with the associated determination advice notes in Attachment 8:

1. Development Plans

This approval is for Six Grouped Dwellings as shown on the approved plans dated 6 June 2023 and 20 June 2023. No other development forms part of this approval;

2. Boundary Walls

The surface finish of boundary walls shall be of a good and clean condition, prior to the occupation or use of the development, and thereafter maintained, to the satisfaction of the City. The finish of boundary walls is to be fully rendered or face brick, or material as otherwise approved, to the satisfaction of the City;

3. External Fixtures

All external fixtures, such as television antennas (of a non-standard type), radio and other antennae, satellite dishes, solar panels, external hot water heaters, air conditioners, and the like, shall not be visible from the street(s), are designed integrally with the building, and be located so as not to be visually obtrusive to the satisfaction of the City;

4. Colours and Materials

4.1 Prior to the issue of a Building Permit, a schedule detailing the colour and texture of the building materials, demonstrating that the proposed development complements the surrounding area, and including the details on the finish and design of the front elevation and portal frame feature to Smith Street, shall be submitted to and approved by the City in consultation with the City's Design Review Panel. The development must be finished, and thereafter maintained, in accordance with the schedule approved by the City, prior to occupation or use of the development; and

4.2 The meter boxes are to be painted the same colour as the wall they are attached so as to not be visually obtrusive, to the satisfaction of the City;

5. Landscaping

5.1 All landscaping works shall be undertaken in accordance with the approved plans dated 6 June 2023, prior to the occupancy or use of the development and maintained thereafter to the satisfaction of the City; and

5.2 No verge trees shall be removed without the prior written approval of the City. Verge trees shall be retained and protected from damage including unauthorised pruning to the satisfaction of the City. Prior to any pruning of verge trees, an arborist report shall be prepared by the landowner and submitted to the City;

6. Privacy Screening

Prior to occupancy or use of the development, all privacy screening shown on the approved plans shall be installed and shall be visually impermeable and is to comply in all respects with the visual privacy requirements of the Residential Design Codes, to the satisfaction of the City;

7. Sight Lines

Walls, fences, and other structures truncated or reduced to no higher than 0.75 metres within 1.5 metres of where walls, fences, other structures adjoin vehicle access points where a driveway meets a public street, with the exception of:

- **One pier at max width of 0.4 metres x 0.4 metres and 1.8 metres height, with decorative capping permitted to a height of 2.0 metres;**
- **Infill that provides a clear sight line;**
- **If a gate is proposed:**
 - **When closed: a minimum of 50 percent unobstructed view; or**
 - **When open: a clear sight line;**

unless otherwise approved by the City;

8. Street Walls and Fences

Fencing infill panels above the approved solid portions of fence shall be visually permeable in accordance with the Residential Design Codes Volume 1, to the satisfaction of the City;

9. Parking and Access

9.1 The layout and dimensions of all driveways and parking areas shall be in accordance with AS2890.1;

9.2 All driveways, car parking and manoeuvring areas which form part of this approval shall be sealed, drained, paved and line marked in accordance with the approved plans prior to the first occupation of the development and maintained thereafter by the owner/occupier to the satisfaction of the City;

9.3 Prior to the occupation or use of the development, two visitor parking bays shall be permanently marked, maintained, and legally accessible at all times for use exclusively by visitors to the property, be clearly visible or suitably sign posted from the street or communal driveway, unless otherwise approved by the City;

9.4 No goods or materials being stored, either temporarily or permanently, in the parking or landscape areas or within the access driveways or parking areas. All goods and materials are to be stored within the buildings or storage areas, where provided;

9.5 Prior to the first occupation of the development, the redundant or “blind” crossovers shall be removed, the verge area landscaped, and the kerb made good to the City’s specifications and to the satisfaction of the City, at the applicant/owner’s full expense; and

9.6 Prior to occupation or use of the development, lighting shall be installed throughout the pedestrian pathways, communal street and car parking areas in accordance with the Residential Design Codes, to the satisfaction of the City;

10. Construction Management

Prior to the issue of a Building Permit, a Construction Management Plan that details how the construction of the development will be managed to minimise the impact on the surrounding area (including demolition and/or forward works). The Construction Management Plan is required to address the following concerns that relate to any works to take place on the site:

- The delivery of and delivery times for materials and equipment to the site;
- Storage of materials and equipment on site;
- Parking arrangements for contractors and sub-contractors;
- The impact on traffic movement;
- Dilapidation reports of nearby surrounding properties (including No. 31 and No. 37 Smith Street, and No. 326 Stirling Street);
- Notification to affected land owners; and
- Construction times.

The management plan shall be complied with for the duration of the construction of the development, to the satisfaction of the City;

11. Clothes Drying Area

Each grouped dwelling shall be provided with a clothes drying area that shall be adequately screened in accordance with the Residential Design Codes, or with mechanical drying, prior to occupancy or use of the development and shall be completed to the satisfaction of the City; and

12. Stormwater

All stormwater produced on the subject land shall be retained on site or connected to the City's drainage system at the expense of the applicant/landowner, to the satisfaction of the City.

EXECUTIVE SUMMARY:

The purpose of this report is to consider an application for development approval for six two-storey grouped dwellings at No. 33 Smith Street, Highgate (subject site).

The site has an area of 805 square metres, with a lot width of 13.3 metres and lot depth of 60.4 metres. The subject site is located in a high density area where the subject site and surrounding properties are zoned Residential R80 with a building height standard of three storeys, and is also located next door to the heritage listed Serbian Orthodox Church of St. Sava at No. 31 Smith Street.

Smith Street is a mixed and varied streetscape that predominantly contains residential development such as higher density townhouses and apartments, as well as lower scale character single homes. It is absent of more recent or new developments, though the area is zoned to enable higher density developments such as grouped and multiple dwellings typologies. The subject site previously accommodated a single house that has been demolished and is intended to accommodate the proposed grouped dwellings development.

The site planning and design response for the site is to couple dwellings, each two storeys in height, and to effectively provide three sets of these across the site. There is a communal car parking area for both residents and visitors sleeved behind the first set of dwellings that face Smith Street, with this car parking area accessed via a communal driveway located to the southern boundary.

The proposed development requires a design principles assessment for various planning elements. The proposed development incorporates design measures to ensure that it is suitable for its context and would not detrimentally impact the streetscape, unduly impact the amenity of the surrounding area or the heritage significance of the adjacent Church, and would be compatible with the existing and intended future locality as a high density residential area. This includes a building form that is articulated, incorporating materials and finishes would appropriate respond to the area, and providing a street interface that enhances surveillance and deep soil and tree planting.

The proposal has been the subject of revised plans over the course of its assessment. The modifications made have resulted in the proposal being acceptable as considered against the planning framework, and it is recommended for approval subject to conditions.

PROPOSAL:

The application proposes six grouped dwellings on a vacant lot at No. 33 Smith Street, Highgate.

The dwellings are each two storeys in height and are arranged on the site as three sets of two dwellings abutting each other. Units 1 and 2 are orientated towards Smith Street and are predominantly located above a shared car parking area for the development, which includes a total of five resident and two visitor car parking bays.

The proposed development plans have been included as **Attachment 2**.

The applicant's supporting documentation including a Streetscape Perspective, Urban Design Study and Life Cycle Assessment are included in **Attachments 3, 4 and 5** respectively.

A significant amount of time has elapsed since the application was lodged. This has partially resulted from the applicant and architect changing during the application process, and from the length of time taken by the applicant to respond to the City's requests for additional information. This includes approximately five months to provide a full response to the City's first request for additional information, and approximately four months to provide a full response to City's second request.

BACKGROUND:

Landowner:	Team A2 WA Pty Ltd
Applicant:	Brendon Donaldson
Client:	Brendon Donaldson
Date of Application:	17 December 2021
Zoning:	MRS: Urban LPS2: Zone: Residential R Code: R80
Built Form Area:	Residential
Existing Land Use:	Vacant
Proposed Use Class:	Dwelling (Grouped)
Lot Area:	805m ²
Right of Way (ROW):	N/A
Heritage List:	N/A

Site Context and Zoning

The subject site is bound by Smith Street to the east, two storey residential development to the north and west, and the heritage listed Serbian Orthodox Church of St. Sava to the south. A location plan is included in **Attachment 1**.

The subject site and all adjoining properties are zoned Residential R80 under the City's Local Planning Scheme No. 2 (LPS2). The subject site and all adjoining properties are located within the Residential Built Form Area and have a building height standard of three storeys under the City's Policy No. 7.1.1 – Built Form (Built Form Policy).

The surrounding development context is predominately residential dwellings in a variety of scale, style, typology and age.

Existing Streetscape

A summary of the building height and dwelling typologies of Smith Street between Broome and Lincoln streets is as follows:

- On the eastern side, development consists of two to four storey grouped and multiple dwelling developments; and
- On the western side, development is mixed and includes single storey character dwellings, multi-storey multiple dwellings developments and the 12 storey Stirling Towers multiple dwellings development.

The street is characterised by the 1970's and 1980's grouped and multiple dwelling developments on both sides of the street. These developments include predominately lighter coloured rendered finishes. Face brick and light coloured render finishes are features of the single storey character dwellings. Where provided, upper floors are located in line with the ground floors below.

This portion of Smith Street is characterised by covered and uncovered vehicle parking, as well as extensive hardstand areas located between existing development and the street. Street setback areas also contain mature trees and landscaped areas.

Front fencing styles are a mix of visually permeable fencing on top of low solid walls and visually impermeable high solid masonry fencing.

Smith Street is lined with established street trees, with two mature trees located in the verge in front of the subject site.

There is street parking available on both sides of Smith Street between Broome and Lincoln Streets. There are two hour parking restrictions between 8:00am and 5:30pm from Monday to Friday on the eastern side, and unrestricted parking on the western side.

Serbian Orthodox Church of St. Sava

The adjoining property to the south at No. 31 Smith Street contains the Serbian Orthodox Church of St. Sava which is included on the State Register of Heritage Places and is listed on the City's Municipal Heritage Inventory as Management Category B (Conversation Recommended). Its Statement of Significance can be found [here](#).

The Serbian Orthodox Church of St. Sava is a white stucco church in the traditional orthodox style and is the second oldest Serbian Orthodox church in Australia. The church was constructed in 1954 and the bell tower was added in 1974. The church is located centrally on the site with a large setback to Smith Street. A separate two storey building including a hall, Sunday school and offices is located at the rear of the site and was constructed in 1962.

DETAILS:

Summary Assessment

The table below summarises the planning assessment of the proposal against the provisions of the State Government's Residential Design Codes (R Codes), the City's Built Form Policy and Policy No. 7.6.1 – Heritage Management – Development Guidelines for Heritage and Adjacent Properties (Heritage Management Policy). In each instance where the proposal requires the discretion of Council, the relevant planning element is discussed in the Detailed Assessment section following from this table.

Planning Element	Deemed-to-Comply / Acceptable Outcomes (or equivalent)	Requires the Discretion of Council
Site Area	✓	
Street Setback		✓
Lot Boundary Setbacks/Boundary Walls		✓
Building Height/Storeys	✓	
Street Surveillance	✓	
Street Walls and Fences		✓
Sight Lines	✓	
Open Space	✓	
Outdoor Living Areas		✓
Landscaping (R Codes)		✓
Visual Privacy	✓	
Car Parking		✓
Design of Car Parking Spaces		✓
Vehicle Access		✓
Solar Access	✓	
Site Works/Retaining Walls	✓	
External Fixtures, Utilities and Facilities		✓

Planning Element	Deemed-to-Comply / Acceptable Outcomes (or equivalent)	Requires the Discretion of Council
Heritage Management Policy		✓

Detailed Assessment

The R Codes and Built Form Policy have two pathways for assessing and determining a development application. These are through design principles and local housing objectives, or through deemed-to-comply standards.

Design principles and local housing objectives are qualitative measures which describe the outcome that is sought rather than the way that it can be achieved.

The deemed-to-comply standards are one way of satisfactorily meeting the design principles or local housing objectives and are often quantitative measures.

If a planning element of an application meets the applicable deemed-to-comply standard/s then it is satisfactory and not subject to Council’s discretion for the purposes of assessment against the Built Form Policy and R Codes.

If a planning element of an application does not meet the applicable deemed-to-comply standard/s then Council’s discretion is required to decide whether this element meets the design principles and local housing objectives.

The planning elements of the application that do not meet the applicable deemed-to-comply standards and require the discretion of Council are as follows:

Street Setback	
Deemed-to-Comply Standard	Proposal
<p>Built Form Policy Volume 1 Clause 5.1</p> <p><u>Street Setback:</u> Primary Street: 8.0 metres Communal Street (internal driveway): 1.0 metre</p> <p><u>Upper Floors</u> Walls on upper floors setback from the primary street a minimum of 2.0 metres behind the ground floor building line below.</p> <p>Walls on upper floors to be setback from the communal street 1.5 metres behind each portion of the ground floor below.</p> <p><u>Balconies</u> Balconies on upper floors setback a minimum of 1.0 metre behind the ground floor building line below.</p>	<p><i>Units 1 & 2</i></p> <p><u>Street Setback:</u> Primary Street: 3.5 metres Communal Street (internal driveway): Nil</p> <p><u>Upper Floors</u> The upper floor stairwell walls would be setback 1.7 metres behind the ground floor building line to the primary street.</p> <p>The upper floor walls would have a nil setback behind the ground floor below to the communal street.</p> <p><u>Balconies</u> The upper floor balconies would have nil setback behind the ground floor building line below.</p>

Lot Boundary Setbacks/Boundary Walls	
Deemed-to-Comply Standard	Proposal
R Codes Volume 1 Clause 5.1.3	
<u>Lot Boundary Walls</u> Boundary walls are permitted to two lot boundaries.	<u>Lot Boundary Walls</u> Boundary walls would be built to three lot boundaries.
<u>Lot Boundary Setbacks</u>	<u>Lot Boundary Setbacks</u>
<i>North</i> Unit 1 1F Balcony: 2.5 metres Unit 1 1F Kitchen – Bed 2: 1.8 metres Unit 1 1F Bulk: 2.3 metres Unit 5 1F Bulk: 1.5 metres	<i>North</i> Unit 1 1F Balcony: 1.5 metres Unit 1 1F Kitchen – Bed 2: 1.5 metres Unit 1 1F Bulk: 2.2 metres Unit 5 1F Bulk: 1.1 metres
<i>West</i> Unit 5 & Unit 6 1F Bulk: 4.4 metres	<i>West</i> Unit 5 & Unit 6 1F Bulk: 3.0 metres
<i>South</i> Unit 2 1F Balcony: 2.8 metres Unit 3 1F Bed 1 - Office: 4.0 metres Unit 4 1F Bed 1 – Bed 3: 3.1 metres Unit 6 1F Bulk: 3.1 metres	<i>South</i> Unit 2 1F Balcony: 2.0 metres Unit 3 1F Bed 1 - Office: 3.0 metres Unit 4 1F Bed 1 – Bed 3: 1.5 metres Unit 6 1F Bulk: 1.1 metres
Street Walls and Fences	
Deemed-to-Comply Standard	Proposal
Built Form Policy Volume 1 Clause 5.7	
Solid portions of fence within the primary street setback area to be a maximum height of 1.2 metres as measured from the footpath level.	A portion of fence within the primary street setback area solid to a maximum height of 1.7 metres.
Outdoor Living Areas	
Deemed-to-Comply Standard	Proposal
R Codes Volume 1 Clause 5.3.1	
Each dwelling is to be provided with an outdoor living area to the following standards: <ul style="list-style-type: none"> • Area of 16 square metres; • Minimum dimension of 4 metres; • Uncovered area of 10.7 square metres; and • Not located within the street setback area. 	Unit 1: Area of 15.5 square metres, minimum dimension of 3.6 metres and located within the street setback area. Unit 2: Area of 14.4 square metres, minimum dimension of 3.6 metres and located within the street setback area. Unit 3: Uncovered area of 9.3 square metres. Unit 4: Uncovered area of 9.9 square metres. Unit 5: Minimum dimension of 3.6 metres. Unit 6: Minimum dimension of 3.6 metres.
Landscaping (R Codes)	
Deemed-to-Comply Standard	Proposal
R Codes Volume 1 Clause 5.3.2	
<u>Impervious Surfaces</u> No more than 50% of the street setback area to consist of impervious surfaces.	<u>Impervious Surfaces</u> 72.5 percent (76.8 square metres) of the street setback area consisting of hardstand areas.
<u>Tree Planting</u> A 2.0 metre by 2.0 metre tree planting area to be provided for each dwelling.	<u>Tree Planting</u> Unit 2: A 2.0 metre by 1.7 metre tree planting area provided.

Car Parking	
Deemed-to-Comply Standard	Proposal
<p>R Codes Volume 1 Clause 5.3.3</p> <p>Six resident parking bays, being one bay per dwelling.</p>	<p>Five resident parking bays provided.</p>
Design of Car Parking Spaces	
Deemed-to-Comply Standard	Proposal
<p>R Codes Volume 1 Clause 5.3.4</p> <p>Visitor car parking bays are to be visible from the point of entry to the development and located outside of any security barrier.</p>	<p>The visitor car parking spaces would not be visible from the point of entry and would be located behind a security barrier.</p>
Vehicle Access	
Deemed-to-Comply Standard	Proposal
<p>R Codes Volume 1 Clause 5.3.5</p> <p>Driveways serving five or more dwellings are to have a minimum width of 4.0 metres.</p>	<p>The driveway would have a minimum width of 3.0 metres.</p>
External Fixtures, Utilities and Facilities	
Deemed-to-Comply Standard	Proposal
<p>R Codes Volume 1 Clause 5.4.4</p> <p><u>External Fixtures</u> Meter boxes are to be not visible from the street and surrounding properties, and integrated with the design of the building.</p> <p>Air conditioning fixtures are to be located at the rear of the ground floor and at a maximum 1.8 metres above natural ground level.</p> <p><u>Utilities and Facilities</u> Each dwelling is to be provided with a store to the following standards:</p> <ul style="list-style-type: none"> • Area of 4 square metres; and • Minimum dimension of 1.5 metres. 	<p><u>External Fixtures</u> The meter boxes would be visible from Smith Street and located in front of an existing dividing fence.</p> <p>The air conditioning units for Units 1 and 2 are located on the balconies at more than 1.8 metres above the natural ground level.</p> <p><u>Utilities and Facilities</u> Unit 1: Area of 1.9 square metres and minimum dimension of 1.1 metres. Unit 2: Area of 1.9 square metres and minimum dimension of 1.1 metres. Unit 6: Minimum dimension of 1.3 metres.</p>
Heritage Management Policy	
Acceptable Development Standard	Proposal
<p>Heritage Management Policy- Part 5 – Development Adjacent to Heritage Listed Properties</p> <p>A1.1 New development has an equivalent setback and/or is no less than that of the adjacent heritage listed place.</p> <p>The adjacent heritage listed place is setback 8.6 metres from Smith Street.</p> <p>A3.1 Side setbacks of new development reflect those of the adjacent heritage listed place.</p> <p>The adjacent heritage listed place has a minimum setback of 4.4 metres from the shared lot boundary.</p>	<p>The development would be setback 3.5 metres from Smith Street.</p> <p>The development would have a minimum setback of nil from the shared lot boundary.</p>

The above elements of the proposal do not meet the specified deemed-to-comply or acceptable development standards. These planning elements have been assessed against the design principles and local housing objectives, as well as performance criteria in the Comments section below.

CONSULTATION/ADVERTISING:

First Community Consultation Period

Community Consultation was undertaken in accordance with the *Planning and Development (Local Planning Schemes) Regulations 2015* for a period of 14 days between 14 March 2022 and 27 March 2022. The method of consultation included a notice on the City's website and 48 letters being sent to owners and occupiers of adjoining and adjacent properties in accordance with the City's Community and Stakeholder Engagement Policy, as shown in **Attachment 1**.

Two submissions were received at the conclusion of the consultation, with one in objection and one neither supporting nor objecting but providing comments.

The comments provided included support for the increase in density to the area as part of the proposal. They also included concerns which are summarised as follows:

- The reduced setback of Units 1 and 2 would negatively affect the character and amenity of the street, particularly the inability to sustain any significant canopy cover for the development.
- The loss of canopy cover will contribute to issues with urban heat island effect and biodiversity loss, and would result in reduced shade to the footpath.
- Reduced street setbacks and the resulting reduced canopy cover will set a damaging precedent, as a feature of the existing streetscape is the visual landscaping buffer between the dwellings and street.

Following the community consultation period, amended plans were received and the key changes made are summarised as follows:

- Units 1 and 2 redesigned with the layout of the upper floors 'flipped' to address Smith Street, and other modifications to the internal layouts of the dwellings to improve internal amenity.
- Increased upper floor setbacks behind the ground floor building line to Smith Street.
- Increased lot boundary setbacks for Units 1 and 2.
- Car parking area redesigned to improve vehicle manoeuvring and to reallocate two resident car parking bays to visitors.
- Additional landscaping provided for Unit 3.

Second Community Consultation Period

The amended plans were advertised for a period of 14 days between 2 December 2022 and 16 December 2022 in accordance with the City's Community and Stakeholder Engagement Policy.

Two submissions were received at the conclusion of consultation, with one in support and one in objection. The comments largely reiterated concerns raised in the first community consultation period.

The comments provided included support for the lot boundary setbacks and boundary walls proposed that do not meet the deemed-to-comply standards. They also included new concerns that were not previously raised which are summarised as follows:

- The retention of the existing verge trees.
- The location of trees adjacent to the car parking area and the inability for these to grow and facilitate canopy cover.
- The lack of deep soil provided for Unit 2 and the inability to support tree growth.
- The black metal cladding for the upper floors and roof would provide increased solar absorbance and contribute to the urban heat island effect of the development.

A summary of submissions received across both community consultation periods along with Administration's response is provided in **Attachment 6**. The applicant's response is provided in **Attachment 7**.

Following the second community consultation period, amended plans were submitted and the final development plans are included as **Attachment 2**. The changes made related to providing an increased setback to Smith Street and modifying the colours and materials in response to DRP comments.

In accordance with the City's Community and Stakeholder Engagement Policy, the final development plans were not readvertised due to the amendments presenting no greater departures to the deemed-to-comply standards than those previously advertised. Previous submitters have been notified of the changes made to the proposal following the second community consultation period.

Heritage Council of Western Australia (HCWA)

The application was referred to the HCWA for review and consideration in accordance with Section 73 of the *Heritage Act 2018* because the subject site is adjacent to a site included on the State Register of Heritage Places. The development plans together with the applicant's supporting information have been referred to the HCWA on multiple occasions as revisions have been made to them.

The Heritage Council support the proposal and provided the following comments:

- The new dwellings are two storey and located with a 3.5 metre setback from Smith Street. The building volume is set back from the boundary adjacent to the Church at ground level. The ridge height of the proposed development appears to sit below the height of the metal domes of the Church roof and bell tower.
- The Church is set well back from the street and has space either side to allow the form of the Church to be appreciated from the street front.
- The proposal does not affect any cultural heritage fabric and will not result in any adverse impacts on the significance of the Serbian Orthodox Church of St Sava.

Design Review Panel (DRP):

Referred to DRP: Yes

The proposal was presented to the City's DRP on two occasions and referred to the City's DRP Chairperson on three occasions all for comment as considered against the 10 principles of good design.

The table below provides a summary of the application's design review progress.

Design Review Progress Report					
	<i>Supported</i>				
	<i>Pending further attention</i>				
	<i>Not supported</i>				
	<i>No comment provided/Information not provided</i>				
	<i>DRP Meeting</i>		<i>DRP Chairperson</i>		
	<i>DRP 1- 1 December 2021</i>	<i>DRP 2- 23 February 2021</i>	<i>DRP Chair 1- 20 January 2023</i>	<i>DRP Chair 2- 8 June 2023</i>	<i>DRP Chair 3- 20 June 2023</i>
Principle 1 – Context & Character					
Principle 2 – Landscape Quality					
Principle 3 – Built Form and Scale					
Principle 4 – Functionality & Built Quality					
Principle 5 – Sustainability					
Principle 6 – Amenity					
Principle 7 – Legibility					
Principle 8 – Safety					
Principle 9 – Community					
Principle 10 – Aesthetics					

The table below provides a summary of the outstanding DRP Chairperson comments in respect to their last referral response on the final development plans dated 20 June 2023, as well as Administration's response to these.

The development plans submitted with the application dated 20 January 2023 were also referred separately to the City's Heritage DRP Member for comment specifically on the relationship of the proposal development to the adjacent heritage listed Church. The DRP Member confirmed the following strengths of the proposal:

- The mass, scale and materiality of the proposal is generally in keeping with the character of the area;
- The form has been sufficiently modulated to break up the overall massing of the development; and
- The dark coloured roof and wall cladding is desirable as it contrasts with the copper dome of the Church. The landmark value of the Church, which is best appreciated from the streetscape and from a distance, is unlikely to be diminished by the use of dark coloured cladding.

The DRP Member also provided comments for further consideration that are included in the table below, along with Administration's response.

Principle 1 – Context & Character	
DRP Chairperson Comments	Administration Response
<ul style="list-style-type: none"> • The upper level façade needs further refinement in relation to the proportion of the windows to timber cladding, and the protruding pop outs over the internal stair. Precedents have been provided to assist with this. 	<ul style="list-style-type: none"> • The front elevation has been treated with light coloured rendered fibre cement on the ground floor, vertical timber cladding on the upper floor, articulated setbacks, large windows, and a portal frame feature over the upper floor balconies. This would appropriately distinguish the upper floor from the ground floor below, break up the impact of visual bulk, and would tie the development into the surrounding context. <p>A condition of approval is recommended requiring a detailed schedule of colours and materials to be submitted and approved by the City in consultation with the DRP. This would allow further refinement of the finishes and design of the front elevation to Smith Street to occur in consultation with the DRP prior to a building permit being issued for the development.</p>
Principle 10 – Aesthetics	
DRP Chairperson Comments	Administration Response
<ul style="list-style-type: none"> • Further refinement of the ground floor and the upper floor including pergola to the street is required. 	<ul style="list-style-type: none"> • Refer to Administration's response above for Principle 1.
Relationship with Adjacent Heritage Listed Church	
Heritage DRP Member Comments	Administration Response
<ul style="list-style-type: none"> • The proposed built form protrudes further into the front set back than the existing built form which impacts on oblique views to the Church. 	<ul style="list-style-type: none"> • In response the applicant provided updated plans increasing the set back of the ground floor from Smith Street by 0.5 metres. This would improve the ability for oblique views to be provided to the adjacent Church. This is shown in the final development plans included as Attachment 2. <p>As per the HCWA comments supporting the proposal, the building volume is set back from the boundary adjacent to the Church at ground level. The Church is also set well back from the street and has space either side to allow the form of the Church to be appreciated from the street front.</p>

<ul style="list-style-type: none"> • The materiality of the boundary fencing facing the Church remains unclear and suggest open fencing to assist in providing views to the landscaping around the Church. • The materiality of elevations remains undefined and open to interpretation. Further information is required on the final specified colour and the type of the darker cladding proposed, as the depth of corrugations and the texture can help with breaking up monolithic dark colours. • Query the need for the covered driveway. This structure could be removed and offer clearer views through to the Church. • Query whether the existing property on the lot had a heritage assessment, as the City could require a heritage assessment be provided. 	<ul style="list-style-type: none"> • Side boundary fencing to the adjacent Church is not subject to this development application. This is an existing colourbond fence. Any modifications to the existing colourbond fence would be a civil matter between the two adjoining landowners, and outside the scope of this application. • In response the applicant provided updated plans demonstrating the colours and materials of the elevations of the development. This is shown in the final development plans included as Attachment 2. The condition of approval recommended requiring a detailed schedule of colours and materials to be submitted would allow confirmation of the exact colour and type of darker cladding proposed to be used. • The driveway along the southern side of the development is uncovered, with only a single supporting beam provided at the front. This would ensure that views are still available through to the Church either side of this supporting beam. • The existing dwelling at No. 33 Smith Street was demolished in January 2022 and the lot is a vacant cleared site. A heritage assessment cannot be completed.
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The applicant did not make any further amendments to the development plans following the final DRP Chairperson referral on 20 June 2023.

LEGAL/POLICY:

- *Planning and Development Act 2005*;
- *Planning and Development (Local Planning Schemes) Regulations 2015*;
- City of Vincent Local Planning Scheme No. 2;
- State Planning Policy 7.3 – Residential Design Codes;
- Community and Stakeholder Engagement Policy;
- Policy No. 7.1.1 – Built Form Policy.
- Policy No. 7.6.1 – Heritage Management – Development Guidelines for Heritage and Adjacent Properties.

Planning and Development Act 2005

In accordance with Schedule 2, Clause 76(2) of the *Planning and Development (Local Planning Scheme) Regulations 2015*, and Part 14 of the *Planning and Development Act 2005*, the applicant would have the right to apply to the State Administrative Tribunal for a review of Council's determination.

Planning and Development (Local Planning Schemes) Regulations 2015

In accordance with [Clause 67\(2\)](#) of the Deemed Provisions in the Planning Regulations and in determining a development application, Council is to have due regard to a range of matters to the extent that these are relevant to the development application.

The matters for consideration relevant to this application relate to the compatibility of the development within its setting, amenity and character of the locality, consistency with planning policies, comments received during community consultation and advice from the DRP.

Local Planning Scheme No. 2

The objectives of the Residential Zone under LPS2 are a relevant consideration for the application. These objectives are:

- *To provide for a range of housing and a choice of residential densities to meet the needs of the community;*
- *To facilitate and encourage high quality design, built form and streetscapes throughout residential areas;*
- *To provide for a range of non-residential uses, which are compatible with and complementary to residential development;*
- *To promote and encourage design that incorporates sustainability principles, including but not limited to solar passive design, energy efficiency, water conservation, waste management and recycling;*
- *To enhance the amenity and character of the residential neighbourhood by encouraging the retention of existing housing stock and ensuring new development is compatible within these established areas;*
- *To manage residential development in a way that recognises the needs of innovative design and contemporary lifestyles; and*
- *To ensure the provision of a wide range of different types of residential accommodation, including affordable, social and special needs, to meet the diverse needs of the community.*

State Planning Policy 7.3 – Residential Design Codes Volume 1 2023

On 23 February 2023, the State Government publicly released amendments to Volume 1 of the R Codes. The amendments split the R Codes into Part B – Low Density and Part C – Medium Density.

Part C – Medium Density will apply to grouped dwellings in areas coded R30 and above, such as the subject site.

A transitional period applies and the 2023 R Codes will be gazetted and come into operation on 1 September 2023.

During this transitional period, assessment is to be undertaken against the existing R Codes. Where deemed-to-comply provisions are not met, the assessment is required to be undertaken primarily against the design principles of the existing R Codes, with due regard given to relevant design principles of Part C – Medium Density also.

Where discretion is sought, the design principles in Part C – Medium Density are generally consistent with the existing R Codes design principles.

Delegation to Determine Applications:

This application is being referred to Council for determination in accordance with the City's Register of Delegations, Authorisations and Appointments.

This is because the delegation does not extend to proposals for more than three grouped dwellings that do not meet the deemed-to-comply standards in relation to car parking in the R Codes.

The application proposes six grouped dwellings and does not meet the deemed-to-comply residential car parking standards of the R Codes, with a one bay shortfall to the deemed-to-comply standard for resident car parking proposed.

RISK MANAGEMENT IMPLICATIONS:

There are minimal risks to Council and the City's business function when Council exercises its discretionary power to determine a planning application.

STRATEGIC IMPLICATIONS:

This is in keeping with the City's Strategic Community Plan 2018-2028:

Innovative and Accountable

We are open and accountable to an engaged community.

SUSTAINABILITY IMPLICATIONS:

The City has assessed the application against the environmentally sustainable design provisions of the City's Policy No. 7.1.1 – Built Form. These provisions are informed by the key sustainability outcomes of the City's Sustainable Environment Strategy 2019-2024, which requires new developments to demonstrate best practice in respect to reductions in energy, water and waste and improving urban greening.

PUBLIC HEALTH IMPLICATIONS:

This is in keeping with the following priority health outcomes of the City's *Public Health Plan 2020-2025*:

FINANCIAL/BUDGET IMPLICATIONS:

There are no financial or budget implications from this report.

COMMENTS:Summary Assessment

In assessing the application against the planning framework, it is recommended for approval. The following key comments are of relevance:

- The proposal's scale, mass and form is appropriate for a high density R80 coded site that has a three storey height standard under the Built Form Policy, with existing grouped and multiple dwellings in the streetscape with existing building forms reflective of a high density residential setting.
- The proposed building setbacks from the street are appropriate in considering the existing streetscape and the adjoining heritage listed Church. The streetscape setting is varied and interrupted on the western side of Smith Street where the subject site is located. The street setbacks ranges from nil for a single storey residential development, to 8.6 metres setback to the 12 storey Stirling Towers flats, to 22 metres for a two storey multiple dwelling development.
- The proposed development would provide for a desirable streetscape presentation and interaction from dwelling frontages and would contribute landscaping within the street setback area, with car parking areas sleeved behind the buildings. The predominant existing streetscape is characterised with car parking areas to front setback areas along with landscaping areas, and substantial portions of blank facades for apartments and strata units.
- The proposed setbacks from the lot boundaries would not unduly impact on the amenity of the adjoining properties. This is because the development provides suitable articulation and openings to reduce the impact of building bulk.
- The shortfall of one resident car parking bay is acceptable as the subject site is well located and access to alternative active transport options.

Street Setback

The proposed street setbacks would satisfy the [Design Principles](#) of the R Codes, the [Local Housing Objectives](#) of the Built Form Policy and the Performance Criteria and Objectives of the Heritage Management Policy for the following reasons:

- Established Streetscape: The surrounding area is varied and does not include recent or new developments.
 - The western side of the Smith Street streetscape between Broome Street and Lincoln Street is inconsistent in terms of setbacks, development scale, style and form. The existing streetscape includes:
 - The single storey residential development located on the corner of Smith and Lincoln Streets has a 1.5 metre dwelling setback and nil single garage setback to Smith Street.
 - No. 31 Smith Street is the heritage listed Serbian Orthodox Church of St. Sava that is setback 8.6 metres from Smith Street with hardstand and landscaping within this front setback area.
 - No. 37 Smith Street is a two storey multiple dwelling development constructed in the early 1970s. The development is setback 22 metres from Smith Street and is screened by carports in the front setback area and mature landscaping.
 - Nos. 41, 43 and 47 Smith Street are single storey retained character dwellings which are raised above natural ground level. The dwellings are setback between 8.2 metres and 11.4 metres

from the street and are the predominate examples of character dwellings in this section of Smith Street.

- Nos. 49-67 Smith Street is a 12 storey Stirling Towers block of flats which was built in the early 1970s. The development is setback 8.0 metres from Smith Street and presents a monolithic built form. The site is intended to be redeveloped in the future.
- Nos. 69 and 73 Smith Street are single storey retained character dwellings with 1.8 metre and nil setbacks, respectively, provided from Smith Street to the buildings.
- o The eastern side of Smith Street predominantly comprises three to four storey grouped and multiple dwelling developments constructed in the 1980s, with limited articulation and openings to the Smith Street frontage. There are limited examples of contemporary development within the streetscape immediately surrounding the subject site.
- **Streetscape Setting:** The existing surrounding streetscape comprises varied setbacks and development styles. This means there is not a consistent established streetscape character. The streetscape is also dominated by vehicle parking and hardstand areas in the street setback area. The proposal provides a reduced setback to reduce the impact of vehicle parking on the streetscape, with the communal car parking area proposed to be located behind built form and underneath the building to screen it from view from Smith Street.
- **Reducing the Impacts of Building Bulk:**
 - o **Articulation of Smith Street Frontage:** The proposed development provides an articulated frontage to Smith Street with the building on the ground floor proposed to be 7.9 metres wide. This represents less than 60 percent of the lot frontage. The remainder of the lot frontage at ground level would be provided as common property vehicle access way and pedestrian path, that are open in nature.
 - o **Upper Floor Setback:** The upper floors of the development would be clearly distinguished from the ground floor through articulation on each floor and varying material finishes. Excluding the stairwell walls, the main upper floor walls of Units 1 and 2 would be setback 3.6 metres behind the ground floor building line to Smith Street.
 - o **Building Treatment:** The ground floor of the Smith Street elevation would be finished in painted rendered fibre cement panelling, with the upper floor finished in vertical timber cladding. The upper floor and stairwell walls provide for large windows facing Smith Street. The use of varying colours and materials, the inclusion of major openings to each level and the central stairwell design element would provide articulation to Smith Street to reduce the impact of building bulk.
 - o **Landscaping to Street Setback Area:** The street setback area would provide 17.5 square metres of deep soil area for Units 1 and 2, including two trees and lower-level plantings. Two existing mature verge trees that are central to the site's street frontage would be retained. This landscaping outcome would also assist in reducing building bulk to the street.
- **Definable Entry Point:** The entry points to Units 1 and 2 would be clearly visible and directly accessible from Smith Street. The portal 'arbor' frame over the side pedestrian path provides legibility to the entry for the rear dwellings.
- **Surveillance and Interaction:** The proposed dwellings provide windows to habitable rooms across the façade of Units 1 and 2 facing the street at both the ground and upper floor levels. With the proposed visually permeable fencing proposed, these windows enhance active and passive surveillance opportunities to both Smith Street as well as the communal driveway.
- **Communal Driveway:** Units 1 and 2 are unable to meet the deemed-to-comply setback standards to the communal street under the R Codes due to the site planning that provides for a sleeved car parking arrangement away from the street. Units 1 and 2 include portions of the dwellings that are located above the communal car parking area and driveway which are assessed as a communal street. The development does allow for on-ground landscaping opportunities in the street setback area adjacent to the communal street entry point, while further plantings and landscaping area are provided adjacent to the car parking bays. The driveway width has also been minimised to 3 metres to reduce the amount of hardstand area, while still allowing adequate areas for vehicles to pass one another on the site.
- **Relationship to Adjacent Church:** The 3.5 metre street setback of the proposed development would not impact the visual prominence and significance of the heritage listed Church on the adjoining property that has a 8.6 metre street setback. The HCWA noted the Church is well set back from the street and provides sufficient side setbacks to allow the form of the Church to be appreciated from Smith Street. The proposed development would not have an unacceptable impact on existing oblique views and vistas to the principal façade of the adjoining heritage listed place, with the streetscape form of the development being sufficiently modulated to break up its overall massing, as noted by the City's DRP Member with heritage conservation expertise.

- Design Review Panel: The DRP Chair was satisfied that the modifications made throughout the application process, including ‘flipping’ the design of the internal layout of the upper floors to address Smith Street, and increasing the street setbacks of the ground floor and of the upper floor behind the ground floor demonstrated that the development would be appropriately set back from Smith Street. The DRP Chair noted that the front elevation to Smith Street needs further refinement in relation to the design and finishes to obtain support for the principles relating to ‘Context & Character’ and ‘Aesthetics’. A condition of approval is recommended requiring a detailed schedule of colours and materials to be submitted prior to the issue of a building permit for the development. This would allow for further refinement of the front elevation to occur in consultation with the DRP to address their comments.

Lot Boundary Setbacks and Boundary Walls

The proposed lot boundary setbacks and boundary walls would satisfy the [Design Principles](#) of the R Codes, the [Local Housing Objectives](#) of the Built Form Policy and the Performance Criteria and Objectives of the Heritage Management Policy for the following reasons:

- Building Bulk: The proposed development incorporates design features that assist in mitigating the impact of building bulk and scale to the adjoining properties. These include:
 - Upper Floor Treatment: Portions of the second floor would be clad in metal cladding panels which would tie in with the roof cladding and would contrast with the rendered fibre cement panel finish of the ground floor.
 - Varying Wall Setbacks: All elevations of the development would include varying wall setbacks and a number of openings which would provide visual interest to adjoining properties and reduce solid blank walls.
 - Building Separation: Units 1 and 2 would be physically separated by a minimum of 2.5 metres from Units 3 and 4. Units 3 and 4 would also be physically separated by a minimum of 2.5 metres from Units 5 and 6. With landscaping proposed in these areas, this would provide visual relief to the north and south elevations and break up the massing of the development.
- Visual Privacy: The proposed lot boundary setbacks would not result in adverse overlooking impacts on the adjoining properties, as the development satisfies the visual privacy deemed-to-comply standards of the R Codes.
- Access to Sunlight and Ventilation: Adequate setbacks to buildings on adjoining properties are provided to ensure access to sunlight and ventilation, as well as ventilation within the site through building separation between the sets of dwellings. The residential buildings on adjoining properties at No. 37 Smith Street to the north and No. 326 Stirling Street to the west are setback a minimum of 3.0 metres from the respective lot boundaries to the subject site. The Church at No. 31 Smith Street to the south is setback between 4.4 metres and 9.0 metres from the lot boundary to the subject site.
- Boundary Walls: An additional boundary wall is proposed to the western boundary, which is associated with the store of Unit 6 and has a length of 1.4 metres. The limited extent of this boundary wall ensures that there would be minimal impact on the adjoining property, whilst allowing for a more functional and regular sized outdoor living area to be provided at the rear of Unit 6.
- Relationship to Church on the Adjoining Property: The proposed development would provide setbacks of nil to 4.0 metres on the ground floor and 1.1 metres to 3.0 metres on the upper floor to the adjoining Church to the south. These setbacks to the southern lot boundary are staggered to provide greater setbacks towards Smith Street. This is to ensure the visual prominence and significance of the heritage listed Church is maintained from the street. This is supported by the comments from the HCWA that noted the building volume is setback from the boundaries adjacent to the Church at ground level sufficiently to allow the form of the Church to be appreciated from the street. The setbacks and scale of the development are respectful of the adjacent Church, with the HCWA noting that the ridge height of the proposed development sits lower than the height of the metal domes of the Church roof and bell tower. The southern elevation of the proposed development is also articulated with varied setbacks and colours and materiality, as well as balconies and major openings incorporated which would provide interaction with the Church. The City’s DRP Member with heritage conservations expertise noted that the scale and materiality of the proposal is consistent with the character of the area.
- Design Review Panel: The DRP Chair supported the proposal in relation to built form and scale, and was satisfied that the modifications made throughout the application process demonstrated that the built form and scale of the development would be sufficiently mitigated. This included increased lot boundary setbacks, particularly to the Church, and providing details on the colours and materials of the side elevations.

Landscaping

In addition to the deemed-to-comply standards of the R Codes, the application has also been assessed against the landscaping provisions of the Built Form Policy. The deemed-to-comply landscaping standards set out in the Built Form Policy have not yet been approved by the Western Australian Planning Commission. As such, these provisions are given regard only in the assessment of the application and do not have the same weight as other policy provisions.

The Built Form Policy deemed-to-comply standards are for 12 percent of the site area to be provided as deep soil areas and 30 percent of the site area to be provided as canopy coverage at maturity. The proposed development would provide 11.9 percent of the site area as deep soil areas, equivalent to 95.8 square metres (Units 1 and 2 provided with 9.7 percent and 4.6 percent of their individual site areas as deep soil areas respectively). The development would provide 17.5 percent of the site area as canopy coverage at maturity, equivalent to 141.0 square metres.

The proposed landscaping would satisfy the [Design Principles](#) of the R Codes and [Local Housing Objectives](#) of the Built Form Policy for the following reasons:

- **Streetscape Planting:** The landscaping provided to Units 1 and 2, including the provision of two trees, would soften the appearance of the proposed development and assist with reducing the overall impact of building bulk and scale when viewed from Smith Street. 23.9 square metres of soft landscaping area would be provided between the front of the dwellings and the street boundary, equivalent to 51.2 percent of this setback area.
- **Location of Planting:** The landscaping provided would be located in close proximity to the outdoor living areas of the dwellings and provide improved amenity for future residents. The landscaping for Units 3 to 6 would also be located adjacent to the lot boundaries and would assist with reducing the impact of the development on adjoining properties.
- **Tree Planting Area Dimensions:** A tree planting area with a minimum 2.0 metre by 2.0 metre dimension would be provided for all dwellings except Unit 2. These large, consolidated areas of deep soil areas would ensure there is adequate space provide to support trees to reach their maximum canopy spread. Unit 2 is provided with a tree planting area with dimensions of 2.0 metres and 1.7 metres, ensuring its overall area is sufficient to accommodate maximum canopy coverage at maturity.
- **On-Structure Landscaping:** On-structure landscaping is provided within planter boxes on the upper floor balconies of Units 1 and 2 that would introduce small shrubs and plantings cascade from the balcony. This would assist in softening the appearance of the building façade to the street and adjoining properties, while providing additional landscaping amenity to the spaces for residents.
- **Permeable Paving:** Permeable paving would be provided for approximately 19.9 square metres of the pedestrian path area. This would assist in water infiltration and to support the trees to be planted adjacent to the car parking area.
- **Environmental Benefits:** The proposed plantings and deep soil areas would contribute towards increased urban air quality, tree and vegetation coverage, and a sense of open space between the subject site and adjoining properties. A total of 17 trees would be provided across the site of varying species and sizes. This would provide landscaping amenity for residents and would make an effective contribution to the City's green canopy to assist in reducing the impact of the urban heat island effect.
- **Verge Trees:** Two existing mature street trees are located in the verge adjacent to the subject site which would assist with softening the appearance of the development as viewed from the street. The City's Parks Team has confirmed that no additional verge trees could be provided in addition to these two existing trees, as they would be planted too close to one another and interfere with the growth of each other.

Street Walls and Fences

The proposed street walls and fences would satisfy the [Design Principles](#) of the R Codes and [Local Housing Objectives](#) of the Built Form Policy for the following reasons:

- **Purpose of Fence:** The portion of fence that is to be solid to a height of 1.7 metres is to allow space for letterboxes to be provided for the proposed dwellings. This solid portion of fence to a height of 1.7 metres is limited to a length of 0.7 metres of the street frontage.
- **Low Height of Remainder of Fence:** The fence to Smith Street would be predominantly visually permeable, with a maximum solid wall height of 0.7 metres and visually permeable infill above. This would ensure the open character of the streetscape would be maintained and the fence would contribute to establishing a visual relationship between the private and public domain.

- Consistency with Dwelling: The fence style would be consistent with that of the proposed dwellings, incorporating a light rendered masonry finish and dark infill slats above.

Outdoor Living Areas

The proposed outdoor living areas would satisfy the [Design Principles](#) of the R Codes for the following reasons:

- Location and Size: All outdoor living areas would be accessed directly from the primary living space of the dwelling and would be of sufficient size to be functional and useable. Units 1 and 2 would also provide an external private open space (balconies) for the occupants that would be uncovered and open to direct northern sunlight.
- Landscaping: The outdoor living areas would provide sufficient uncovered area to allow on-structure planting areas or deep soil areas and trees. The incorporation of landscaping would increase the amenity of these spaces for future residents.
- Street Interface: The location of the outdoor living areas of Unit 1 and 2 on balconies facing Smith Street would facilitate surveillance between the dwelling and the street, whilst enabling privacy in being grade separated.
- Access to Supplementary Outdoor Areas: Units 1 and 2 would have access to other outdoor areas in addition to the primary outdoor living area. This includes the front garden area at ground level and a smaller balcony at the rear of the first floor of each dwelling, with both being accessible and functional outdoor spaces.

Car Parking, Design of Car Parking Spaces and Vehicle Access

The proposed car parking, design of car parking spaces and vehicle access would satisfy the [Design Principles](#) of the R Codes for the following reasons:

- Resident Parking and Alternative Transport Options: The R Codes design principles states that adequate car parking, including for residents, is to be provided on-site in accordance with the projected need. This includes having regard to the proximity of the development to public transport and other facilities. Nearby train and bus routes that are within walking distance of the subject site provide a practical alternate means of public transport for residents that would support a reduction in one resident parking bay for the proposed development and less of a reliance on private vehicle ownership. The subject site is located approximately 200 metres from Beaufort Street and 320 metres from Lord Street which are both high frequency bus routes and within the walkable catchment. It is also located approximately 650 metres from the East Perth Train Station which is a high frequency train route, also within the walkable catchment from the site.
- Availability of Off-Site Car Parking: The R Codes design principles for the provision of car parking requires the consideration of the availability of off-site car parking. A desktop analysis and parking data indicates that there is capacity in on-street parking in the immediate area:
 - Within the immediate vicinity of the subject site there are a total of 42 on-street parking bays located Smith Street between Broome and Lincoln Streets. Of these:
 - There are 24 car bays along the western side of Smith Street, with no time restrictions and no fee payable; and
 - There are 18 car bays along the eastern side of Smith Street, with two-hour restrictions between 8:00am and 5:30pm from Monday to Friday and no fee payable.
 - There are 112 on-street car bays located along Smith Street, located within 340 metres of the subject site. These range from unrestricted, two-hour and three-hour restricted bays. A review of the City's parking data undertaken in November and December 2018 shows that the occupancy of these on-street car bays averaged 47 percent on weekdays with a peak of 60 percent in the morning, and averaged 35 percent on the weekend with a peak of 45 percent in the evening.
- Visitor Parking: The development would provide for the two on-site visitor car parking bays located within the communal car parking area, in accordance with the R Codes deemed-to-comply standards. The provision of the visitor car bays in accordance with the deemed-to-comply standard would ensure that car parking demand for visitors is adequately catered for and the reliance on existing on-street car parking bays.

- Accessibility of Visitor Parking Bays: The visitor car bays are proposed to be provided behind an automatic gate due to their co-location on-site with residential car bays and the need to provide security for future residents of the development. Future residents would be able to allow visitors through the automatic gate, while a condition of approval is recommended that would require the bays to be suitably sign posted to ensure visitors are aware where they are located. The location of the visitor bays in the communal car parking area, behind and underneath the front two dwellings, will also reduce the visual impact of vehicle parking on a streetscape that is currently dominated by visitor parking in the street setback areas. The reduced width of the driveway for the portion closest to Smith Street has been reviewed by the City's Engineering team who are satisfied that it would provide safe and functional vehicle access. This width would also allow for the provision of landscaping on either side of the driveway to reduce the extent of hardstand areas and improve the appearance to Smith Street.
- Bicycle Parking: The proposed development provides four bicycle racks adjacent to the car parking area of the site for the use of future occupants and their visitors, supporting the use of alternate transport methods.
- Parking Permits: An advice note is recommended for inclusion to advise that in accordance with the City's Parking Permits Policy, the City will not issue residential parking permits to residents of this development.

It is noted that the Medium Density Code will come into effect on 1 September 2023 as part of the updated R Codes. The Medium Density Code would be applicable to the subject site and the deemed-to-comply standard for resident car parking bays for the proposed development would be four bays. The proposal would exceed this by providing five bays. This is because the Medium Density Code does not require a car parking bay to be provided for dwellings that are two-bedrooms or less for sites within walkable catchments to train station or high frequency bus stop, with the proposed development comprising of two two-bedroom dwellings and four three-bedroom dwellings.

External Fixtures, Utilities and Facilities

The proposed external fixtures, utilities and facilities would satisfy the [Design Principles](#) of the R Codes and [Local Housing Objectives](#) of the Built Form Policy for the following reasons:

- Visibility of Meter Boxes: The meter box location is proposed to be in front of the security gate to allow access to it while maintaining security for the dwellings. The visibility of the meter boxes from the street would be reduced as they would be adjacent to the existing 1.8 metre high dividing fence on the lot boundary and proposed landscaping. A condition of approval is recommended to require the meter boxes to be painted in the same colour as the wall behind them to minimise their visual prominence.
- Air Conditioning Units: The air conditioning units are proposed to be located on the upper floor balconies of Units 1 and 2. The air conditioning units would be visually obscured by the proposed solid balustrading and privacy screening on the front and rear balconies respectively, ensuring that they do not adversely impact the street or adjoining properties.
- Stores: The stores provided for Units 1, 2 and 6 would be conveniently located for future residents, not visible from the street and integrated into the design of the development. The store for Unit 6 is of sufficient area to allow functional use by future residents, while Units 1 and 2 would have space available in the ground floor entry areas that could be used for additional storage if this is required by future residents.

Environmentally Sustainable Design

Clause 5.11 of the Built Form Policy relating to environmentally sustainable design (ESD) sets out [Local Housing Objectives](#) to be achieved and does not prescribe deemed-to-comply standards. The Built Form Policy ESD standards have not been approved by the WAPC and in the assessment of the application is given regard only which means that it does not have the same weight as other policy provisions.

The applicant has submitted a Life Cycle Assessment report which is included in **Attachment 5**. The report and development plans identify the following built form and site planning measures that would be implemented to satisfy the local housing objectives of the Built Form Policy:

- Net fresh water use and global warming potential savings that would meet or exceed the standards in the Built Form Policy.
- A predominantly light-weight timber frame construction technique will be employed.
- Operable windows provided across the development to facilitate cross-ventilation.

- North-facing habitable rooms and outdoor living areas provided where possible, and the incorporation of building overhangs for passive shading.
- Use of water wise plants where appropriate in the landscaping plan with lawns minimised.
- Areas of permeable paving for the shared pedestrian access path to increase stormwater infiltration.

Administration has reviewed the proposal against the Built Form Policy local housing objectives and is satisfied that the development has adequately incorporated environmentally sustainable design features.

**CITY OF VINCENT
LOCAL PLANNING SCHEME NO. 2
SCHEME MAP 1 - LEEDERVILLE**

LEGEND

METROPOLITAN REGION SCHEME RESERVES

Note: The Western Australian Planning Commission care of the Department of Planning should be consulted for full information on the actual land requirements for all Metropolitan Region Scheme Reserves.

- PARKS AND RECREATION**
- R Restricted Public Access
- PRIMARY REGIONAL ROADS RESERVATION**
- OTHER REGIONAL ROADS RESERVATION**
- RAILWAYS**
- PUBLIC PURPOSES**
Particular use denoted as follows:
- H Hospital
- HS High School
- TS Technical School
- CP Car Park
- U University
- CG Commonwealth Government
- SU Special Use
- WSD Water Authority of Western Australia
- P Prison

CITY OF VINCENT LOCAL SCHEME RESERVES

- PUBLIC OPEN SPACE**
- R Restricted
- PUBLIC PURPOSES**
Particular use denoted as follows:
- PS Primary School
- CP Car Park
- CU Civic Uses
- HS High School
- I Institute for the Deaf
- W Water Supply Sewerage and Drainage
- TS Technical School

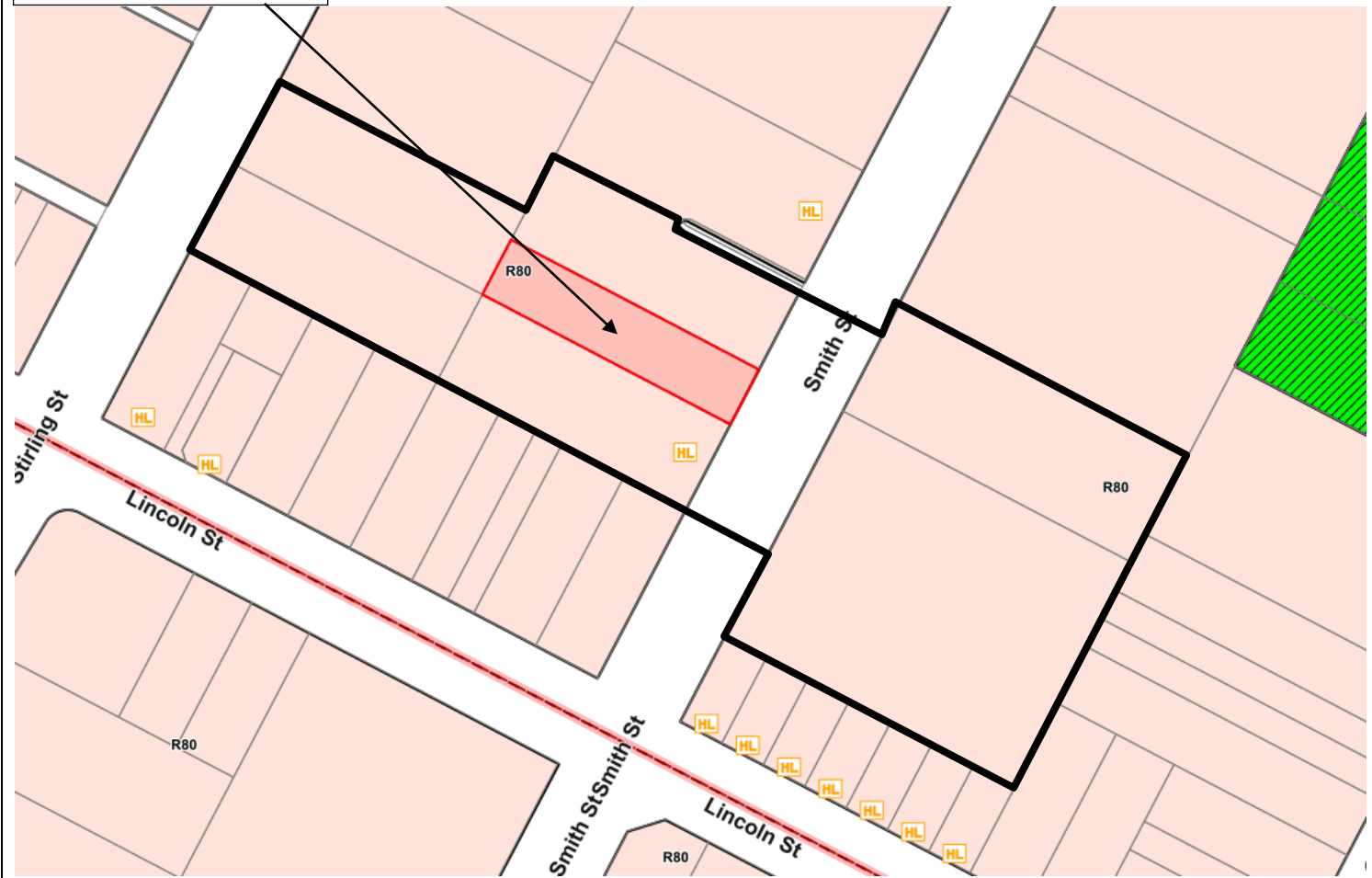
CITY OF VINCENT SCHEME ZONES

- RESIDENTIAL**
- MIXED USE**
- COMMERCIAL**
- LOCAL CENTRE**
- DISTRICT CENTRE**
- REGIONAL CENTRE**
- SPECIAL USE**
Particular use denoted as follows:
- CP Car Park
- CU Community Use
- FC Function Centre
- HC Hall and Non Residential Club
- H Hotel
- PW Place of Worship
- S Service Station

ADDITIONAL INFORMATION & RESIDENTIAL PLANNING CODES

- CODE AREA BOUNDARY**
- SCHEME AREA BOUNDARY**
- DENSITY CODE**

SUBJECT SITE



CITY OF VINCENT

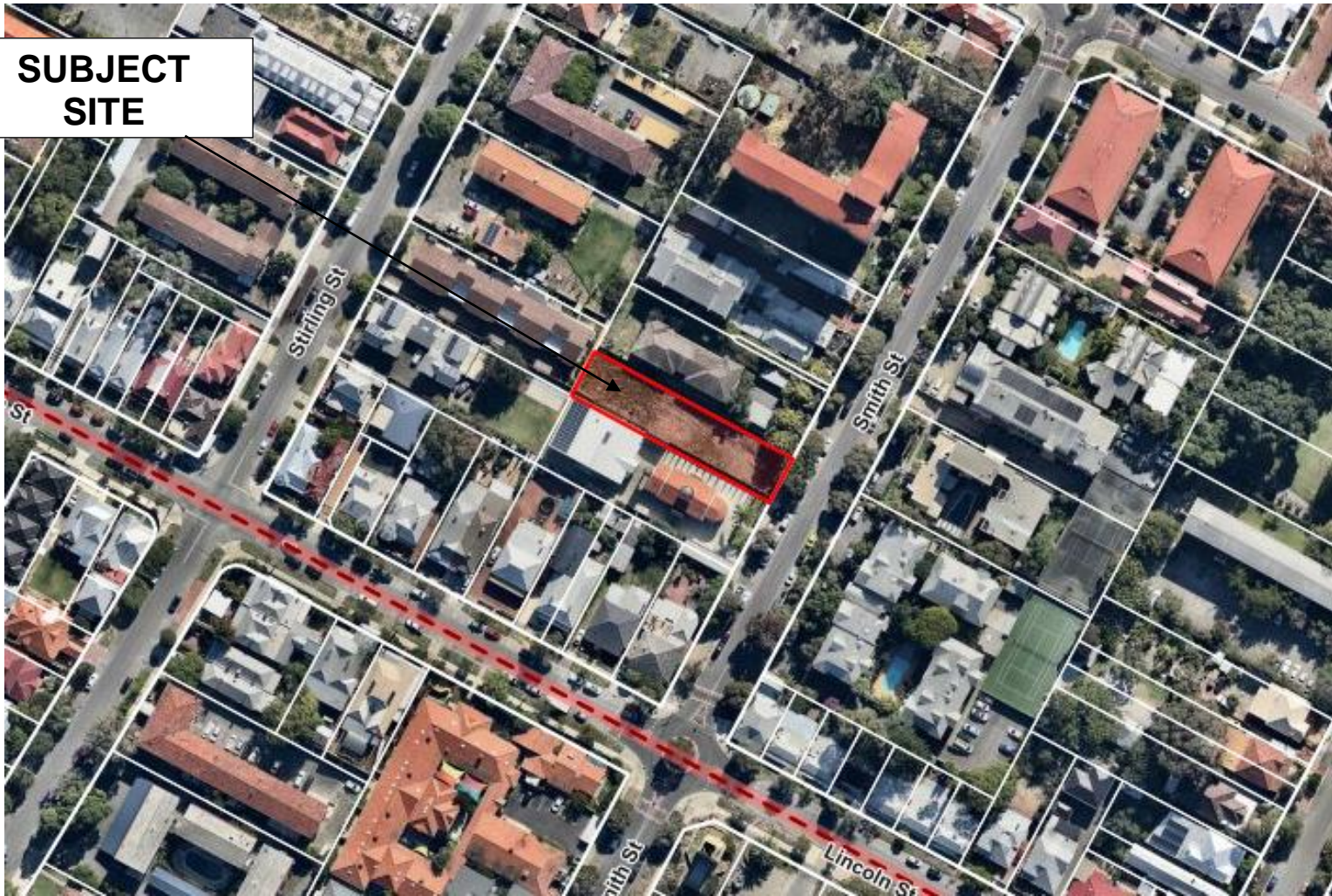
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Consultation and Location Map

33 Smith Street, Highgate

Extent of Consultation





SUBJECT SITE



CITY OF VINCENT

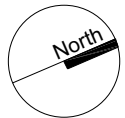
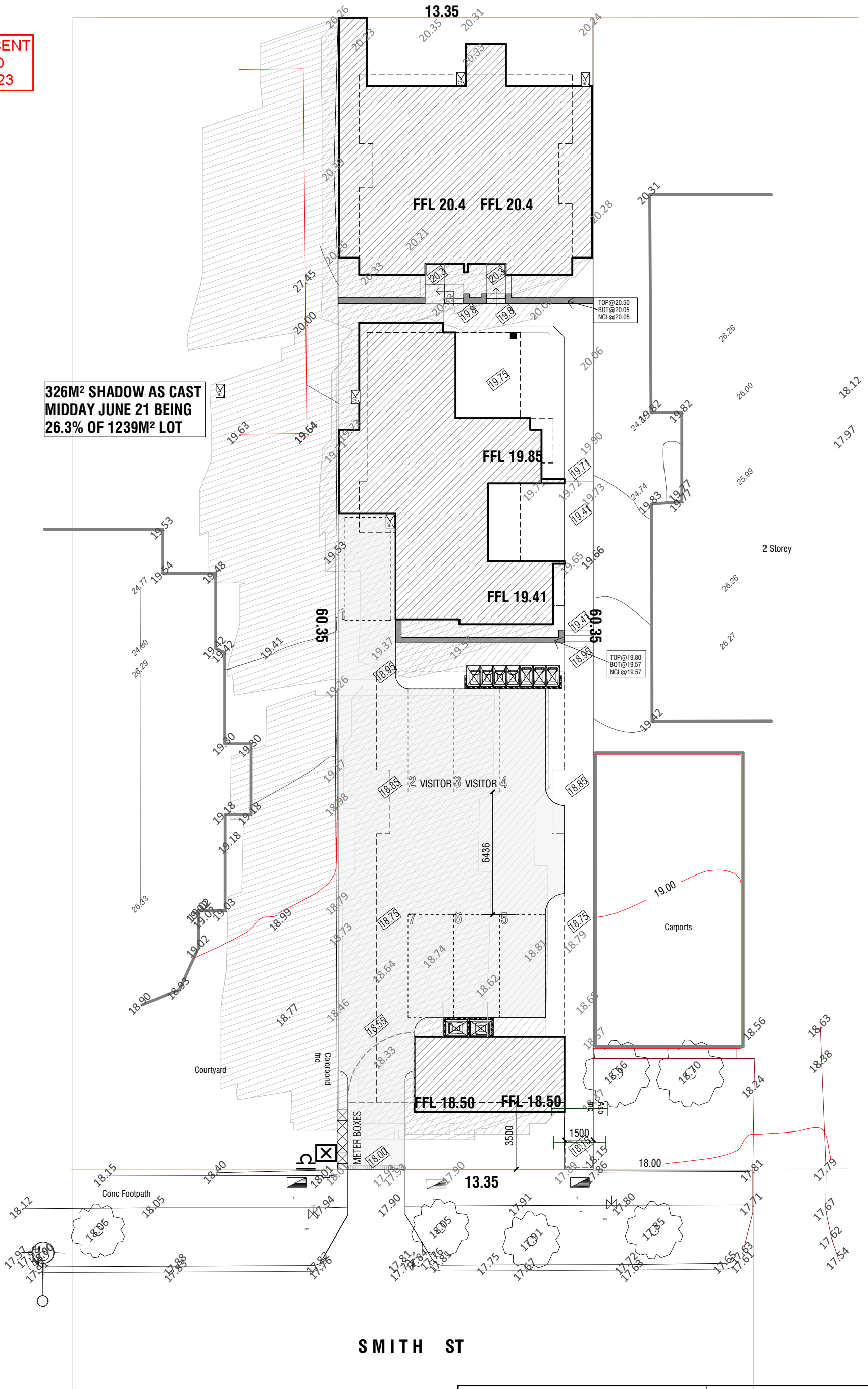
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33 Smith Street, Highgate




CITY OF VINCENT
RECEIVED
20 June 2023

326M² SHADOW AS CAST
MIDDAY JUNE 21 BEING
26.3% OF 1239M² LOT



SITE
PLAN
SCALE 1:200

STAGE	REV.	DESCRIPTION	DATE
DA	1	SUN SHADOW ADDED TO SITE PLAN	31-10-22
	2	U4 LOT ALLOCATION CHECK (> 100M2)	04-05-23
	3	RFI PLANNING REQUEST 17 FEB 2023	29-05-23
	4	RFI MEETING AMENDMENTS	20-06-23



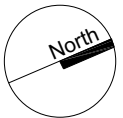
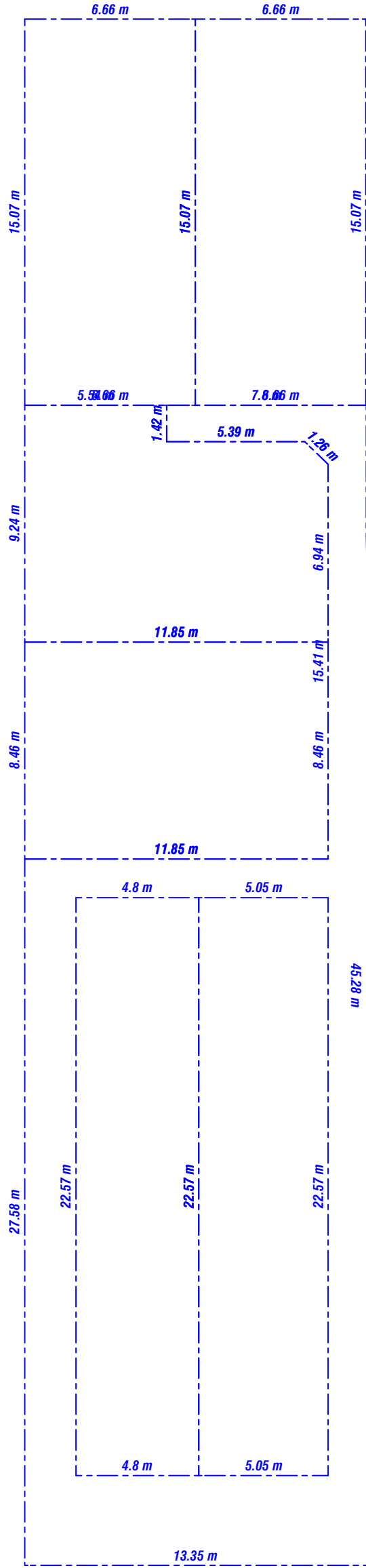
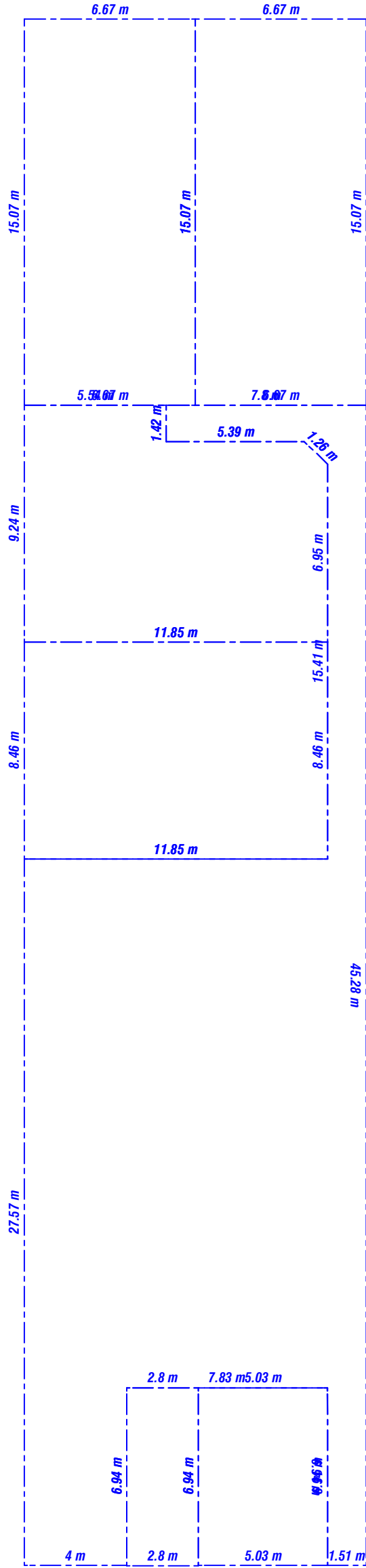
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TEAM A2 PTY LTD
33 SMITH ST HIGHGATE

SITE PLAN


PROJECT No	DESIGNED DS	CHECKED DS	DWG N°	REV
			A 1.0	4
SHEET SIZE A3	DATE 20/06/2023			

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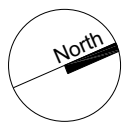
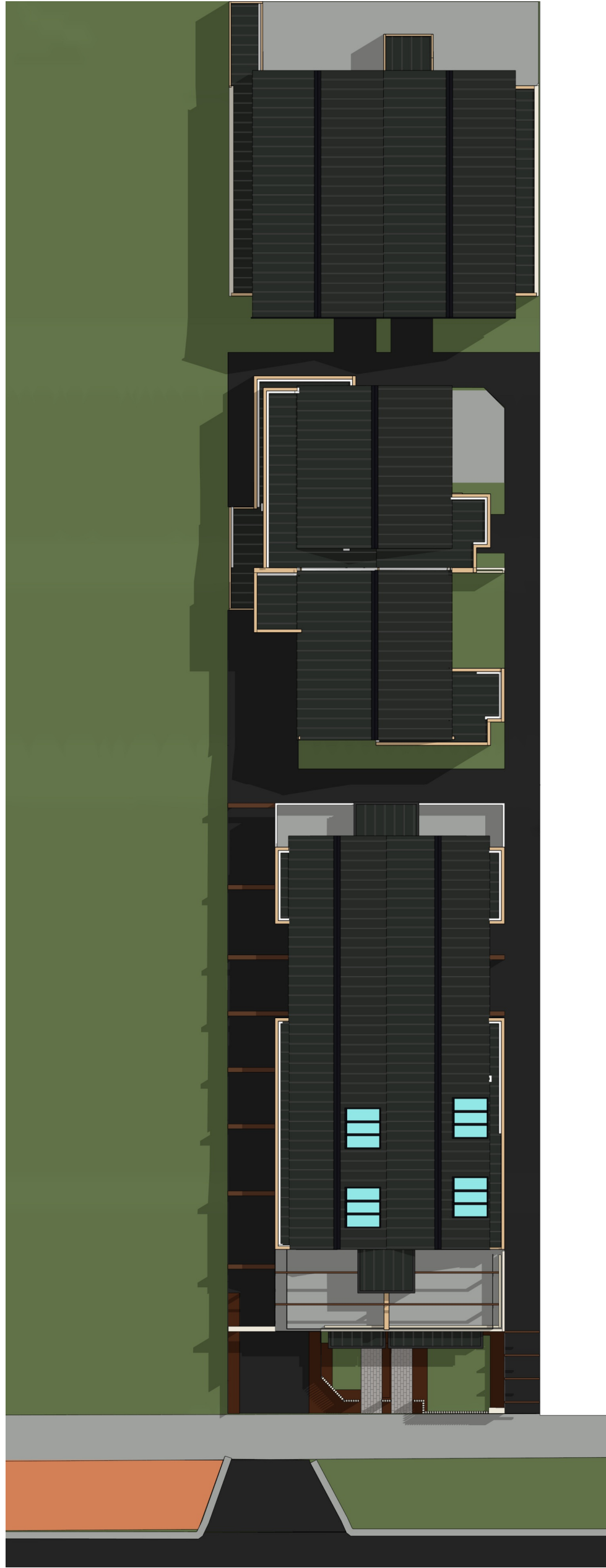


Lot Allocation Ground
SCALE 1:200

STAGE	REV.	DESCRIPTION	DATE
DA	1	SUN SHADOW ADDED TO SITE PLAN	31-10-22
	2	U4 LOT ALLOCATION CHECK (> 100M2)	04-05-23
	3	RFI PLANNING REQUEST 17 FEB 2023	29-05-23
	4	RFI MEETING AMENDMENTS	20-06-23
		RFI AMENDMENT: TIMBER CLADDING FRONT U1/2	

 <p>PO Box 388 Midland 6936 T: 08 9255 2258 M: 0439 111 969 M: 0407 255 221 admin@designsynergy.com.au www.designsynergy.com.au VITRUVIAN ELEMENT PTY LTD t/f Morris Family Trust abn 70 356 286 124</p>	TEAM A2 PTY LTD 33 SMITH ST HIGHGATE		
	LOT ALLOCATION GROUND AND UPPER LEVELS		
	PROJECT No		
	DESIGNED DS	CHECKED DS	DWG N° A 1.1
SHEET SIZE A3	DATE 20/06/2023		

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STAGE	REV.	DESCRIPTION	DATE
DA	1	SUN SHADOW ADDED TO SITE PLAN	31-10-22
	2	U4 LOT ALLOCATION CHECK (> 100M2)	04-05-23
	3	RFI MEETING AMENDMENTS	29-05-23
	4	RFI AMENDMENT - TIMBER CLADDING FRONT U1/2	20-06-23



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TEAM A2 PTY LTD
33 SMITH ST HIGHGATE

ROOF PLAN

PROJECT No		DWG N°	REV
DESIGNED DS	CHECKED DS	A 1.2	4
SHEET SIZE A3	DATE 20/06/2023		

PROJECT

6 UNIT X 2 LEVEL DEVELOPMENT
DEVELOPMENT APPLICATION - RESUBMISSION OF AMENDED PLANS.

REFERENCES ARE MADE TO PREVIOUS DOCUMENTS AND LODGEMENTS
(LODGEMENT DATE- 17-12-21)

FEATURE SURVEY (DB SURVEYS) FS980-01
LANDSCAPE PLANS (KELSIE DAVIES) 0180 PG 101,102 REV C

NOTE LANDSCAPE GREEN ZONES SHOWN ON THIS PLAN SET ARE INDICATIVE ONLY AND MAY REQUIRE AMENDING TO SUIT THE LOCAL PLANNING POLICIES

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PAGE.	DWG N.	TITLE
1	A 1.1	LOT ALLOCATION GROUND AND UPPER LEVELS
2	A 1.2	ROOF PLAN
3	A 2.0	FLOOR PLAN - GROUND FLOOR
4	A 2.1	FLOOR PLAN - UPPER FLOOR
5	A 3.0	ELEVATIONS 01,03,05,06
6	A 3.1	ELEVATIONS 02,04

GROUND AREAS (TOTALS)

SITE AREA: 805.86m²
BUILDING AREA INC STORES: 274.28m²

UNIT GREEN SPACE: 108.31m²
UNIT RETAINING: 6.34m²
UNIT OUTDOOR LIV. PAVED: 67.12m²

COM. PROP. GREEN SPACE: 19.92m²
COM. PROP. DRIVEWAY /PARKING: 246.45m²
COM. PROP PAVING /BINS: 96.75m²

UPPER FLOOR AREAS

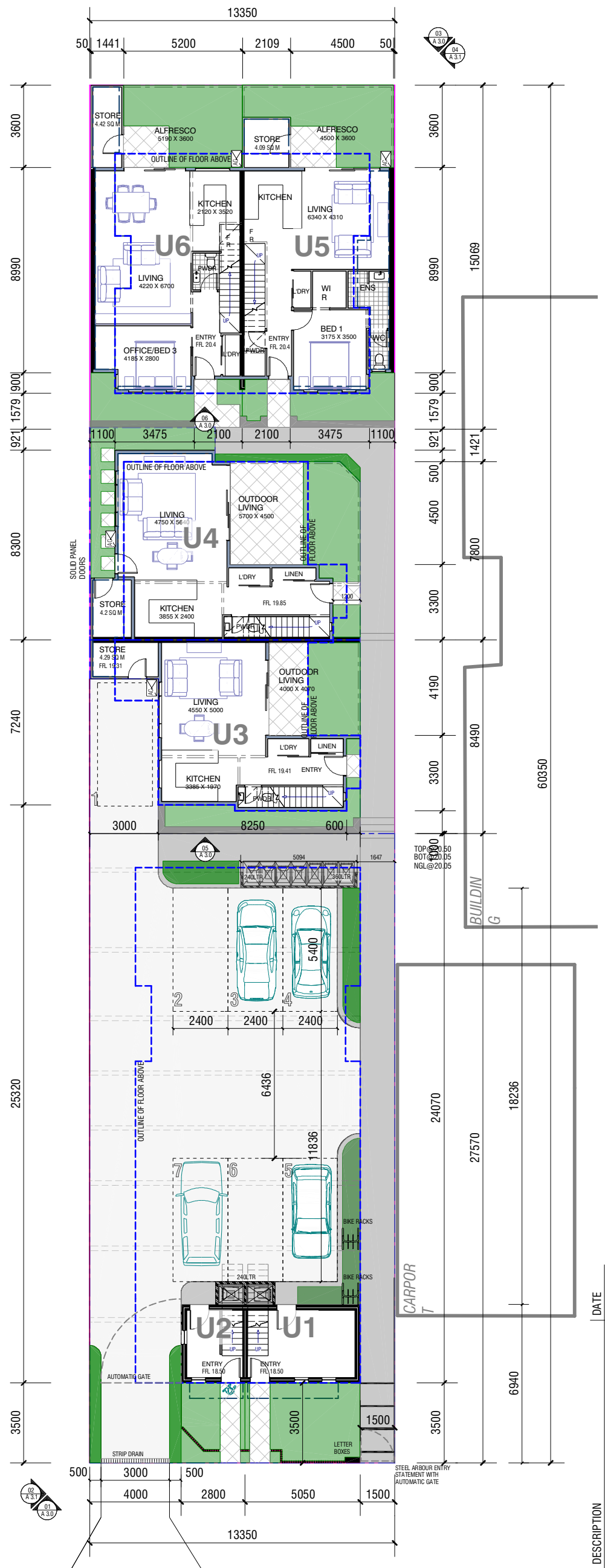
BUILDING AREA INC BALCONIES: 467.01m²

UNIT GREEN SPACE : 13.91m²
UNIT OUTDOOR LIV. PAVED: 29.42m²

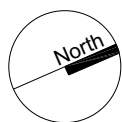
GREEN SPACE (TOTALS)

SITE AREA: 805.86m²


UNIT GREEN SPACE GROUND: 108.31m²
COM. PROP. GREEN SPACE GROUND: 19.92m²
UNIT GREEN SPACE UPPER : 13.91m²
TOTAL 142.14m²



STAGE	REV.	DESCRIPTION	DATE
DA	1	SUN SHADOW ADDED TO SITE PLAN	31-10-22
	2	U4 LOT ALLOCATION CHECK (> 100M2)	04-05-23
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		RFI AMENDMENT -TIMBER-CLADDING FRONT U1/2	



GROUND LEVEL
SCALE 1:200



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33 SMITH ST HIGHGATE

FLOOR PLAN - GROUND FLOOR

PROJECT No		DWG N°	REV
DESIGNED DS	CHECKED DS	A 2.0	4
SHEET SIZE A3	DATE 20/06/2023		

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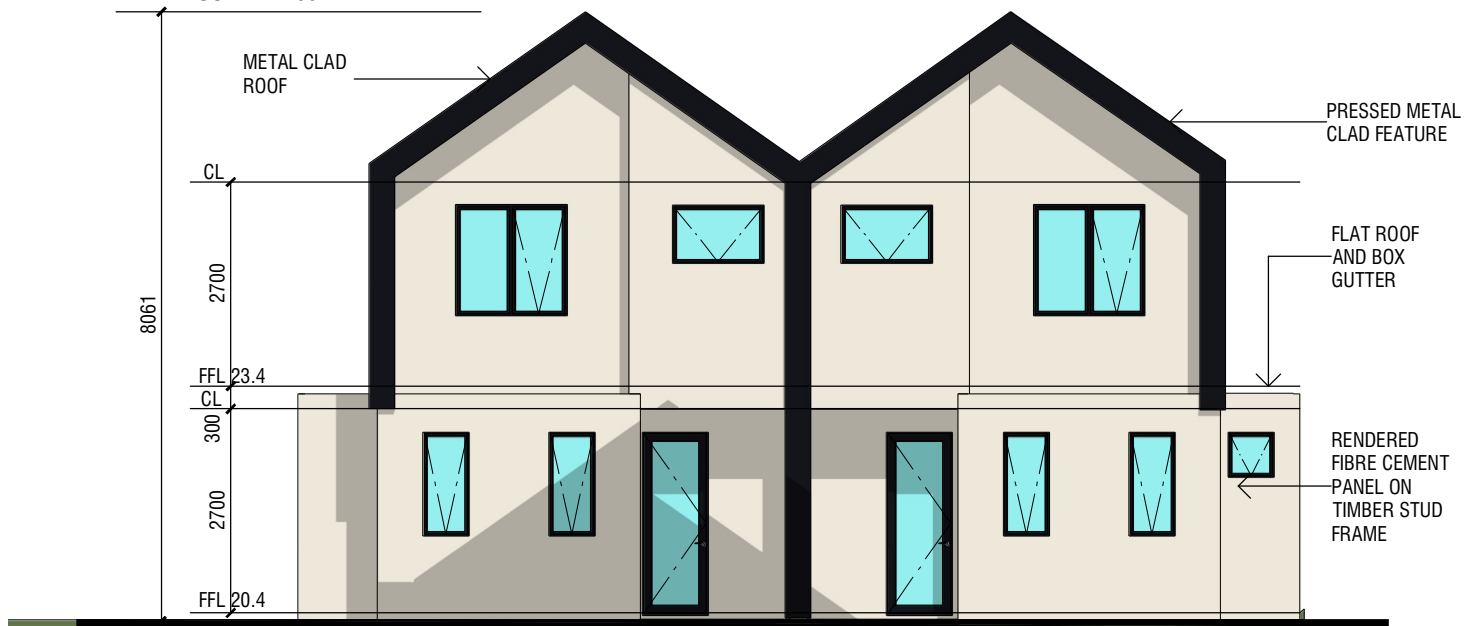
STREET ELEVATION 01
SCALE 1:100



ELEVATION 03 (rear units 5,6)
SCALE 1:100



ELEVATION 05 (front of unit 3)
SCALE 1:100



ELEVATION 06 (front of unit 5,6)
SCALE 1:100

STAGE	REV.	DESCRIPTION	DATE
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	2	U4 LOT ALLOCATION CHECK (> 100M2)	04-05-23
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		RFI AMENDMENT 'TIMBER' CLADDING FRONT U1/2	

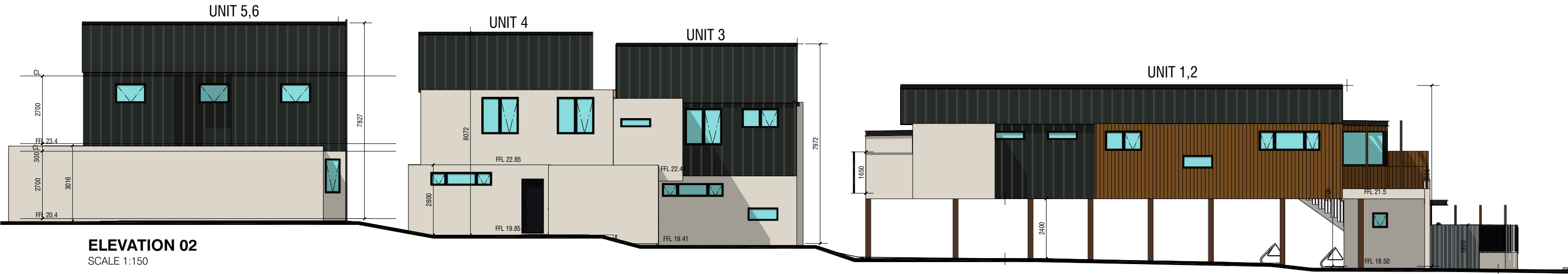


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TEAM A2 PTY LTD
33 SMITH ST HIGHGATE
ELEVATIONS 01,03,05,06

DESIGNED	CHECKED	DWG N°	REV
DS	DS	A 3.0	4
SHEET SIZE	DATE		
A3	20/06/2023		

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ELEVATION 02
SCALE 1:150

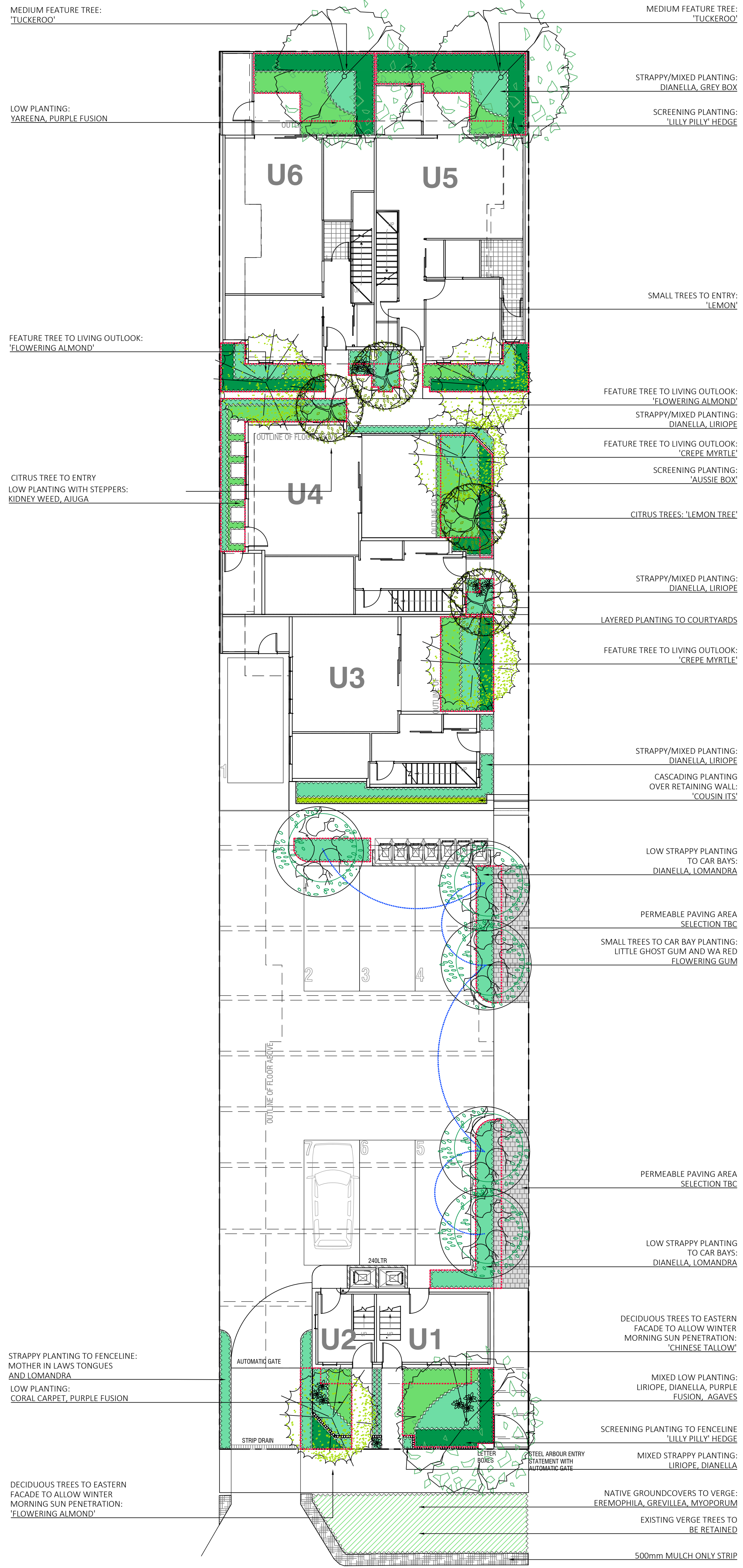


ELEVATION 04
SCALE 1:150

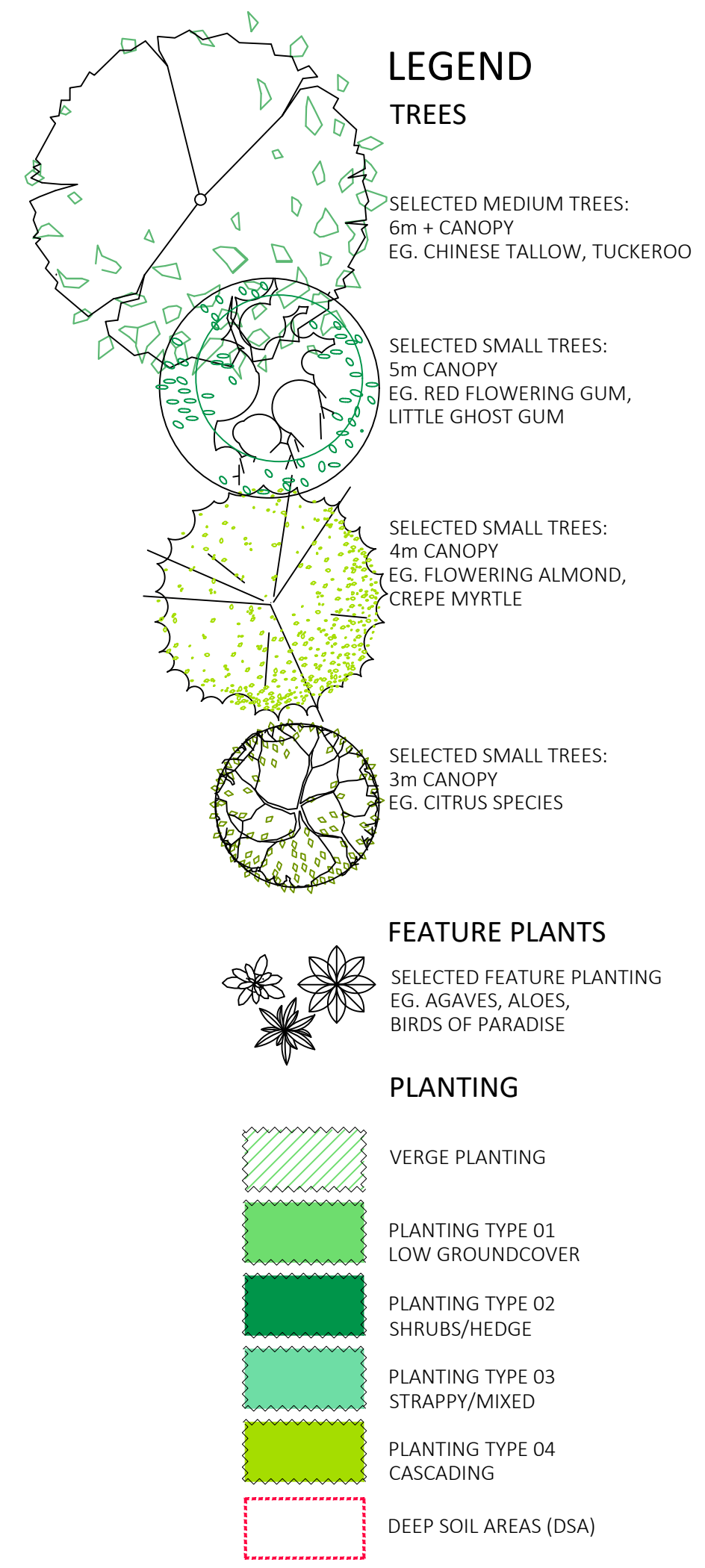
PROJECT NO		DESIGNED		CHECKED		DWG N°	
DS		DS		DS		A 3.1	
SHEET SIZE		DATE		REV		4	
A3		20/06/2023					
<p>TEAM A2 PTY LTD 33 SMITH ST HIGHGATE ELEVATIONS 02,04</p>							

STAGE	REV.	DESCRIPTION	DATE
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GENERAL NOTES:
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 3. ALL MEASUREMENTS TO BE CHECKED PRIOR TO CONSTRUCTION.



REV	DATE	DWN	APP	DESCRIPTION
A	10.12.21	KD	KD	LANDSCAPE CONCEPT PLAN - GROUND FLOOR
B	14.12.21	KD	KD	UPDATED LANDSCAPE CONCEPT PLAN
C	18.12.21	KD	KD	ADDED PLANTING STRIP
D	28.10.22	AC	KD	REDESIGN TO NEW LAYOUT
E	04.06.23	KD	KD	REDESIGN TO NEW LAYOUT



PLANTING PALETTE

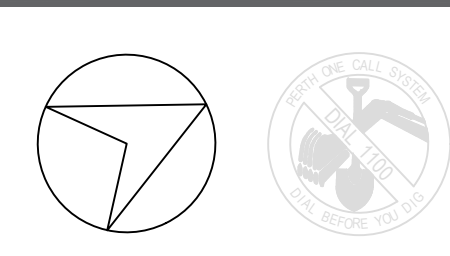
Symbol	Species	Common Name	Quantities	Size
Trees:				
ACofle	Agonis flexuosa 'Burgundy'	Burgundy Weeping Peppermint	As shown	100L
CIlat	Citrus latifolia	Dwarf Persian Lime	As shown	100L
CIlim	Citrus limon	Dwarf Eureka Lemon	As shown	100L
COFric	Corymbia ficifolia (grafted)	WA Red Flowering Gum	As shown	100L
CUFana	Cupaniopsis anacardioides	Tuckeroo	As shown	200L
EUCfor	Eucalyptus forrestiana	Fuchsia Gum	As shown	100L
EUCvic	Eucalyptus victrix	Little Ghost Gum	As shown	100L
LAGind	Lagerstroemia indica	White Crepe Myrtle	As shown	100L
PRJdul	Prunus dulcis	Flowering Almond	As shown	100L
SAPseb	Sapium sebifera	Chinese Tallow	As shown	200L
Shrubs and Groundcovers:				
ADCSun	Adenanthos cuneatus	Coral Carpet	2/m ²	140mm
AJurep	Ajuga reptans	Bungle weed	3/m ²	140mm
CASgla	Cassinia glauca	Cousin II	3/m ²	140mm
DIaem	Dianella tasmanica 'Emerald Arch'	Emerald Arch	3/m ²	140mm
DIAbia	Dianella tasmanica 'Blaze'	Blaze	3/m ²	140mm
DIAre	Dianella revoluta	Blue Flax Lily	3/m ²	140mm
DICsil	Dichondra silver falls	Silver Falls	3/m ²	140mm
ECHimb	Echeveria imbricata	Blue Rose	3/m ²	140mm
GREgin	Grevillea 'Gin Gin Gem'	Gin Gin Gem	2/m ²	140mm
HARwhi	Hardenbergia violaceae 'White Out'	White Native Wisteria	2/ lin.m	140mm
HEMpun	Hemidra pungens	Snake Bush	2/m ²	140mm
HIBsc	Hibbertia scandens	Snake Vine	2/m ²	140mm
LAIunob	Lauris nobilis	Bay Tree	2/ lin.m	140mm
LEUbro	Leucophyta brownii	Silver Cushion Bush	3/m ²	200mm
LOMtan	Lomandra 'Tanika'	Tanika	3/m ²	140mm
OLEaxi	Olearia axillaris	Coastal Daisy	3/m ²	200mm
PIMfer	Pimelea ferruginea	Rice Flower	3/m ²	200mm
PITmis	Pittosporum tobira 'Miss Muffet'	Miss Muffet	2/ lin.m	200mm
MYOpar	Myoporum parvifolium 'Yareena'	Yareena	2/m ²	140mm
RHAon	Rhapiolepis 'Oriental Pearl'	Dwarf Indian Hawthorn	2/ lin.m	200mm
SANtri	Sansevieria trifasciata laurentii	Mother-in-law's Tongue	3/m ²	200mm
SCAhum	Scaevola humilis 'Purple Fusion'	Fan Flower	2/m ²	140mm
SYZora	Syzygium australe 'Orange Twist'	Orange twist Lilly Pilly	2/ lin.m	200mm
TRAJas	Trachelospermum jasminoides	Star Jasmine	2/m ²	140mm
VIBdo	Viburnum odoratissimum	Dense Fence	2/ lin.m	200mm
VIBin	Viburnum tinus	Laurustinus	2/ lin.m	200mm
WESsus	Westringia 'Aussie Box'	Aussie Box	3/m ²	140mm
WESgre	Westringia 'Grey Box'	Grey Box	3/m ²	140mm
Feature Plants:				
AGAtt	Agave attenuata	Foxtail	As shown	12L
ALOTop	Aloe hybrid	Topaz	As shown	12L
STRreg	Streitizia reginea	Bird of Paradise	As shown	12L

LANDSCAPE AREA CALCULATIONS

LANDSCAPE AREAS
 Total Landscape areas (Ground floor + Level 01) = 146m² (18% of site)
DEEP SOIL AREAS (DSA)
 Ground Floor = 110m² (13.6% of site)
CANOPY COVER
 Proposed Medium Trees (6m canopy) x 3 = 85m²
 Proposed Small Trees (5m canopy) x 5 = 98m²
 Proposed Small Trees (4m canopy) x 5 = 63m²
 Proposed Small Trees (3m canopy) x 4 = 28m²
 Total Canopy Cover = 274m² (34% of site)

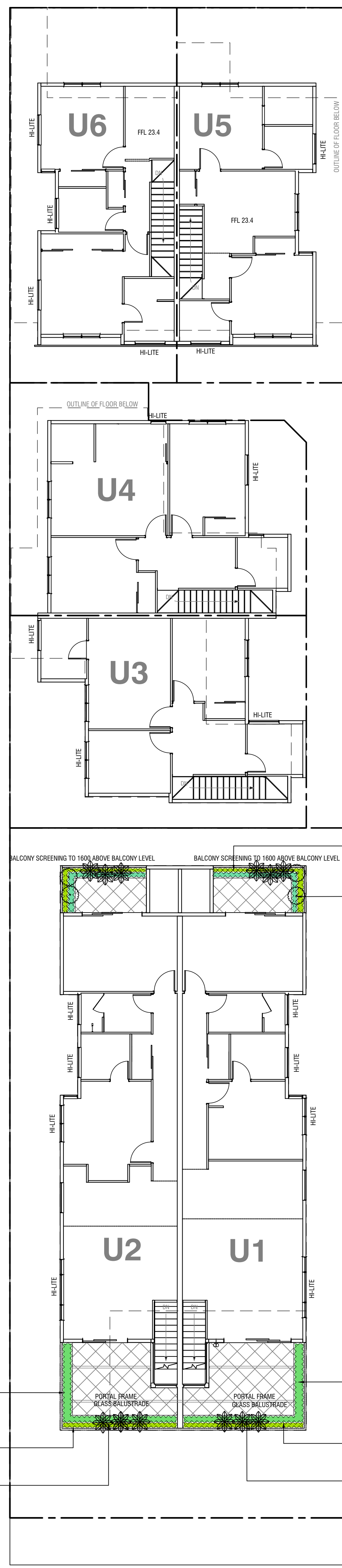
REFER PAGE 102 FOR PLANTING NOTES AND PLANTING IMAGES

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REV	DATE	DWN	APP	DESCRIPTION
A	10.12.21	KD	KD	LANDSCAPE CONCEPT PLAN - LEVEL 01
B	14.12.21	KD	KD	UPDATE LANDSCAPE CONCEPT PLAN
C	18.12.21	KD	KD	ADDED PLANTING STRIP
D	28.10.22	AC	KD	REDESIGN TO NEW LAYOUT
E	04.06.23	KD	KD	REDESIGN TO NEW LAYOUT



REFER PAGE 101 FOR LEGEND AND PLANTING PALETTE

LANDSCAPE AREA CALCULATIONS
LANDSCAPE AREAS
 Total Landscape areas (Ground floor + Level 01) = 146m² (18% of site)
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 Total Canopy Cover = 274m² (34% of site)

PLANTING IMAGES



NOTES

- GENERAL**
 - DRAINAGE FROM THE RAISED PLANTER AREAS AND POTS TO BE PROVIDED BY BUILDER
 - ALL SCALES ARE AS NOTED AND TO SUIT A1 PAPER SIZE
 - THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEDULES, REPORTS AND DRAWINGS AND PROJECT SPECIFICATIONS.
 - FOR ALL FINISHED LEVELS, PLANTER HEIGHTS, DRAINAGE DESIGN AND WATER CONNECTION POINTS REFER TO ASSOCIATED PROJECT DOCUMENTATION (BY OTHERS).
- SOIL PREPARATION**
 - ALL AREAS ARE TO BE FINE GRADED EVENLY TO CONFORM TO KERB LEVELS AND SURROUNDING FINISHES.
 - SURFACES SHALL BE FREE FROM DEPRESSIONS, IRREGULARITIES AND NOTICEABLE CHANGES IN GRADE. GENERALLY, GRADES SHALL DEViate IN LEVEL NO GREATER THAN 20mm IN ONE LINEAR METRE.
 - PLANTED AREAS SHALL BE SPREAD WITH MIN. 50mm OF APPROVED STANDARD SOIL CONDITIONER THAT SHALL BE RIPPED INTO EXISTING SOIL TO A MIN. DEPTH OF 200mm.
 - RAISED PLANTER AREAS AND POTS SHALL BE INSTALLED WITH APPROPRIATE DRAINAGE CELL, AGGREGATE AND GEOTEXTILE MEMBRANE BELOW SOIL.
 - FILL SOIL TO RAISED PLANTER AREAS AND POTS TO BE APPROVED LIGHTWEIGHT LANDSCAPE MIX.
 - PLANTING AREA SOIL PROFILES TO BE PREPARED AS SPECIFIED AND REVIEWED BY SUPERINTENDENT BEFORE PLANTING AND CONNECTING IRRIGATION.
 - ALL SITE AND IMPORTED SOILS, POTTING MIX, SOIL CONDITIONERS AND MULCHES TO BE IN ACCORDANCE TO RELEVANT AUSTRALIAN STANDARDS.
- PLANTING**
 - PLANTED AREAS SHALL BE MULCHED WITH AN ORGANIC MULCH UNLESS OTHERWISE STATED TO A MINIMUM DEPTH OF 75mm.
 - ADVANCED TREES SHALL BE STAKED W/ 50x50mm DIA HARDWOOD POSTS. POSTS SHALL BE PAINTED BLACK AND INSTALLED TO A MIN DEPTH OF 500mm. TREES SHALL BE SECURED TO POLES W/ RUBBER TIES IN FIGURE 8.
 - TREES PLANTED WITH IN 1000mm OF BOUNDARY WALLS AND/OR PARKING AREAS SHALL BE INSTALLED WITHIN 600mm DEPTH NYLEX ROOT BARRIER MEMBRANE. MEMBRANE SHALL BE INSTALLED AS PER MANUFACTURERS RECOMMENDATIONS.
 - REFER TO PLANTING PALETTE FOR SUGGESTED SPECIES. FINAL PLANTING PLAN SELECTED FROM THIS LIST.
 - PLANTS TO BE SET OUT IN EVEN SPACING TO FILL THE DESIGNATED AREAS.
 - IN AREAS OF MIXED PLANTING, SPECIES TO BE SPREAD OUT AT RANDOM, IN GROUPINGS OF 2 OR 3.
 - PLANTS SHALL BE SUPPLIED FROM AN INDUSTRY ACCREDITED WHOLESALE NURSERY. PLANTS SHALL BE IN APPROPRIATE SIZE FOR THE LISTED POT SIZE AND IN GOOD HEALTH.
 - IF SPECIES ARE UNAVAILABLE (OR IN SIZES SPECIFIED), SUBSTITUTES MUST BE APPROVED BY SUPERINTENDENT BEFORE DELIVERY AND INSTALLATION.
 - SUPERINTENDENT TO REVIEW SAMPLES OF ALL TREE SPECIES AND PLANTS AT SOURCE OR BY PHOTOGRAPH PRIOR TO DELIVERY AND INSTALLATION.
- IRRIGATION**
 - PLANTING TO GROUND LEVEL TO BE IRRIGATED VIA A FULLY AUTOMATIC SYSTEM FROM MAINS.
 - WATER PRESSURE TO HAVE A MINIMUM FLOW RATE OF 30l/pm AT 300kPa FROM THE WATER CONNECTION POINT (OR AS STIPULATED).
 - PLANTING TO PRIVATE COURTYARDS TO BE IRRIGATED VIA DIGITAL TAP TIMER (INDIVIDUAL CONNECTION POINTS TO BE PROVIDED).
 - PLANTING ON ALL UPPER LEVELS TO BE IRRIGATED VIA BATTERY OPERATED VALVE (CONNECTION POINTS TO BE PROVIDED TO EACH PLANTER).
 - CONTROLLER TO BE LOCATED IN BIN STORE (OR AS DIRECTED BY SUPERINTENDENT).
 - SLEEVES BENEATH PAVED SURFACES AND TO RAISED PLANTING AREAS TO BE PROVIDED BY OTHERS.
 - IRRIGATION TO GARDEN BEDS TO BE NETAFIM TECHLINE, SUB SURFACE IRRIGATION. INSTALLED TO MANUFACTURERS SPECIFICATION. IRRIGATION TO TURF TO BE POP UP SPRINKLERS; MP ROTATORS OR SIMILAR. IRRIGATION TO TREES TO BE BUBBLERS; TORO FLOOD BUBBLERS OR SIMILAR.
 - ASCON DRAWINGS, MANUALS AND 12 MONTH WARRANTY SHALL BE SUPPLIED BY THE IRRIGATION CONTRACTOR TO THE CLIENT UPON PRACTICAL COMPLETION.
 - PLEASE REFER TO IRRIGATION DRAWING SET FOR FINAL LAYOUT AND SCHEDULE (TO FUTURE DETAIL).

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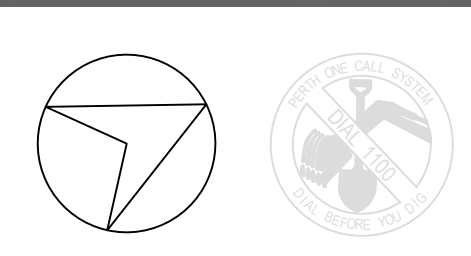
DEVELOPMENT APPROVAL

Innaloo WA 6018
 mob: 0450 965 569
 email: kelsie@kdla.com.au

JOB No. 0180 PAGE 102 REV E



SCALE 1:100 @A1



**SMITH STREET TOWNHOUSES
 LANDSCAPE CONCEPT PLAN_LEVEL 01**

**DONFAM INVESTMENTS A2 UNIT TRUST
 33 SMITH STREET, HIGHGATE**





Development Application – Urban Design Study

As part of the accompanying material for an application for development approval pursuant to Schedule 2, Part 8, Clause 63 of the Planning and Development (Local Planning Schemes) Regulations 2015, an urban design study is required for all developments visible from the public realm.

The urban design study is to be provided as drawings, 3D studies, and diagrams that interpret the development site's context into opportunities and constraints to generate early design parameters. The elements of the urban design study are based on Appendix 1 – Design Principles of the Built Form Policy.

Applicant Details

Name:	GARRETH MORRIS (ON BEHALF OF DOWFAM A2 UNIT TRUST)		
Address:	6 SCARP VIEW		
Suburb:	SWAN VIEW	Postcode:	6056
Email Address:	garreth@designsynergy.com.au		
Phone Number:	0439 111 969		
Applicant Signature			

Prepared by

Name:	GARRETH MORRIS		
Address:	6 SCARP VIEW		
Suburb:	SWAN VIEW	Postcode:	6056
Email Address:	garreth@designsynergy.com.au		
Phone Number:	0439 111 969		
Applicant Signature			

Property Details

Lot Number	73		
Address:	33 SMITH ST		
Suburb:	HIGHGATE	Postcode:	6003

Urban Design Study:

Please outline how each of the following elements have been addressed and attach any relevant or supporting photos, images, diagrams or drawings where applicable.

Description	Applicant comment
<p>Context & Character <i>Good design responds to and enhances the distinctive characteristics of a local area, contributing to a sense of place.</i></p>	
<p>Demonstrate how you have reviewed the natural environment including topography, local flora and fauna.</p>	<p>The surrounding area of Highgate is a relatively established tree lined suburb. The main street tree is the box and the flora is primarily introduced. We have ensured the design of the development is lush and green with a focus on the individual micro-climates of the planting zones.</p>
<p>Demonstrate consideration of the site's streetscape character.</p>	
<p>Demonstrate review of the built and natural environment of the local context to a radius of 400m – 1000m.</p>	
<p>Demonstrate how the site's context and character influenced the development.</p> <p>Consider the following:</p> <ul style="list-style-type: none"> • History of the local area; • Heritage listed buildings in the area; • High quality contemporary buildings in the area; • Materials, textures, patterns from high quality heritage / character as well as contemporary buildings in the area; and • Movement patterns / laneways. 	
<p>Landscape quality <i>Good design recognises that together landscape and buildings operate as an integrated and sustainable system, within a broader ecological context.</i></p>	
<p>Demonstrate review of the existing landscaping of the site and the street including mature trees, species and natural features</p>	
<p>Demonstrate how the landscape quality of the streetscape and surrounding context has been incorporated into the building and landscape design.</p>	

Description	Applicant comment
<p>Built Form & Scale <i>Good design provides development with massing and height that is appropriate to its setting and successfully negotiates between existing built form and the intended future character of the local area.</i></p>	
<p>What is the building massing and height of the streetscape? How has this been incorporated into the design?</p>	
<p>How does the development respond and contribute to the built form and scale of the streetscape?</p>	
<p>Demonstrate how the development encourages an activated and vibrant streetscape environment.</p>	
<p>Functionality & Build Quality <i>Good design meets the needs of users efficiently and effectively, balancing functional requirements to deliver optimum benefit and performing well over the full life-cycle.</i></p>	
<p>Demonstrate how the proposed design complements the use of the building.</p>	
<p>Sustainability <i>Good design optimises the sustainability of the built environment, delivering positive environmental, social and economic outcomes.</i></p>	
<p>Demonstrate how the building performance has been optimised using suitable orientation and layout of internal spaces.</p>	
<p>Amenity <i>Good design optimises internal and external amenity for occupants, visitors and neighbours, contributing to living and working environments that are comfortable and productive.</i></p>	
<p>Demonstrate how the development optimises amenity for occupants, adjoining neighbours and onlookers</p>	
<p>Legibility <i>Good design results in buildings and places that are legible, with clear connections and memorable elements to help people find their way around.</i></p>	
<p>Demonstrate how the design allow users and visitors to navigate through the development.</p>	
<p>Safety <i>Good design optimises safety and security, minimising the risk of personal harm and supporting safe behaviour and use.</i></p>	
<p>Demonstrate how the layout of buildings on site provides safe and high level of amenity for residents.</p>	

Description	Applicant comment
<p>Community <i>Good design responds to local community needs as well as the wider social context, providing buildings and spaces that support a diverse range of people and facilitate social interaction.</i></p> <p>Demonstrate how the development contributes to a sense of community, encouraging social engagement and enabling stronger communities.</p>	
<p>Aesthetics <i>Good design is the product of a skilled, judicious design process that results in attractive and inviting buildings and places that engage the senses.</i></p> <p>Demonstrate how the surrounding context and character has been incorporated into the design of the development.</p>	

Please complete all sections of this application and send to mail@vincent.wa.gov.au along with all relevant attachments. Alternatively, you can submit your application in person at our **Administration Centre (244 Vincent Street, Leederville)** or post to **PO Box 82, Leederville, 6902**.

Compliance Checklist

Performance Summary



Global Warming Potential, GWP (Life Cycle)



65% Saving against a target of 50%



Net use of fresh water, FW (Life Cycle)



50% Saving against a target of 50%

Performance Detail

	Initial Material & Construction	Use Stage Materials & Construction	Integrated Energy Use	Plug Load Energy Use	Water Supply & Treatment	End of Life	Recycling & Energy Export	Total
Global Warming Potential, GWP (kg CO ₂ eq / occupant / year)								
Benchmark	838.2	505.5	939.5	822	120.6	119.4	-75.82	3269
Proposed Design	274.1	410.5	6.781	793.2	105.9	117.4	-558.2	1149
Difference	564	95	932.8	28.83	14.71	1.984	482.4	2119
Life Cycle Savings	17%	3%	29%	1%	0%	0%	15%	65%
Net use of fresh water, FW (kg / occupant / year)								
Benchmark	3721	1747	1202	1757	93693	592.8	-286	102430
Proposed Design	1637	1616	14.49	1696	47512	186	-1527	51135
Difference	2084	130.8	1188	61.64	46181	406.8	1241	51294
Life Cycle Savings	2%	0%	1%	0%	45%	0%	1%	50%

Building Attributes

Highlighted information denotes that changes were made from the "baseline design" and should be an area of focus for compliance checks.

33a Smith St, Highgate, WA

Dwellings:	2
Bedrooms:	5
Bathrooms:	5
Car parks:	2
Floors:	2
Type of carpark:	Car Port
Ceiling Height:	2.6
Gross Floor Area:	237
Occupancy Date:	01/10/2023

Energy Supply and Efficiency Attributes

Electricity Supply:	Mains Connected
Thermal Rating:	NatHERS 6.0 Star
Energy Monitoring:	No Energy Monitoring
Natural Lighting:	Normal

Water Supply and Efficiency Attributes

Water Supply:	Mains Supply
Water Treatment:	Mains Connected
Shower Heads:	3 Star (greater than 6.0 and less than or equal to 7.5 L/m)
Toilets:	5 star (4.7L/flush, 3.2/half flush, 3.0L/average flush)
Tapware:	4 Star (greater than 6.0 and less than or equal to 7.5 L/m)
Washing Machine:	4.5 star (9.5L/kg clothing washed)
Dishwasher:	5.0 star (8.57L/wash for 10 place setting dishwasher)
Garden Type:	Dripper garden bed and no lawn
Rainwater Pump Type:	Medium or high pressure and flow with pressure vessel

Building Components

Highlighted information denotes that changes were made from the “baseline design” component type, or changes were made to the default quantities and should be an area of focus for compliance checks.

Integrated Services

Component Type	Quantity
Cooking Appliances	
Cooking, Res Electric Oven Induction Stove	2 Households cooking energy
Hot Water System	
Standard Heat Pump (HWS_App)	2 240L Electric heat pump h...
Indoor Lighting Fitout	
LED Residential Lighting (Standard Efficiency)	2 Household
Cooling System	
Split System Air Source Heat Pump for Cooling, Average Efficiency (COP/EER 3.65), R32 Refrigerant	3 heat pump(s) 5kW
Heating System	
Split System Air Source Heat Pump for Heating, Average Efficiency (COP/EER 3.65), R32 Refrigerant	3 heat pump(s) 5kW

Plug Loads

Component Type	Quantity
Refrigeration	
Refrigeration, Residential Well Ventilated Fridge Recess	2 Refrigeration Energy Use
Dwellings	
Appliances Residential Average (AUS)	2 eTool: Average Household ...

Outdoor Services

Component Type	Quantity
Renewable Generation	
Solar PV System Residential - Zone 3 (Perth Sydney etc)	5 kW
Outdoor Lighting Fitout	
LED Outdoor Lighting (Residential - Standard Efficiency), m2	129.53 m2 of outdoor lit area
Swimming Pool Temperature Control	
Swimming Pool Seasonal Temperature Control - No Pool Cover - Gas	0 Pool Surface Area
Swimming Pool Filtering	
Swimming Pool - Pumps and Filters Ultra Efficient	0 m2 surface area
Swimming Pool Structure	
Pool Structure - Concrete	0 m2 pool surface area

Structure

Component Type	Quantity
Ground Floor Area	
Concrete Floor - 100mm slab on ground 30MPa 3.8% reo (Portland Cement)	129.9 eTool: m2 of floor slab - ...
Upper Floor Area	
Elevated Floor, Timber Frame 300mm Bearers and Joists, <6m Span, particle board sheeting, insulated	223 m2 of elevated floor
Stairs	
Staircase, Timber frame and timber treads	2 2.4m Rise
External Wall Area	
Wall External Type 1, Masonry, double brick 110-50-110 insulated with foundations and finishes	70.6
Glazed Area	
Windows Residential Aluminium Single Glaze fly screen	46.4
Roof Area	
Roof - TimberTruss/SteelSheeting/25degreePitch	149.39
Entry Doors	
Door - Glazed Timber Frame Timber Jamb	4 Door (1.93m2)
Internal Doors	
Door - HollowCoreTimber/WoodenJam/painted	12 x 1.68m2 Door
External Wall Area	
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, coloured steel sheet cladding external	19.8
Internal Wall Area	
Wall, Internal, Framed, Timber Stud Plasterboard and paint finish	91.75
Internal Wall Area	
Wall, Internal, Framed, Timber Stud Plasterboard and paint finish	75.08
External Wall Area	
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, fibre cement clad (9mm)	108.5

Finishes

Component Type	Quantity
Living Areas	
Floor Covering - Vinyl (PVC) or Synthetic Linoleum	66.74
Kitchens Dining Areas	
Floor Covering - Vinyl (PVC) or Synthetic Linoleum	81.75
Wet Areas	
Floor Covering - Tiles (ceramic/5mm)	18.34 eTool: m2 of internal flo...
Bedroom Areas	
Floor Covering - Carpet (glue down/Nylon)	62.23 eTool: m2 of internal flo...

Compliance Checklist

Performance Summary



Global Warming Potential, GWP (Life Cycle)



67% Saving against a target of 50%



Net use of fresh water, FW (Life Cycle)



52% Saving against a target of 50%

Performance Detail

	Initial Material & Construction	Use Stage Materials & Construction	Integrated Energy Use	Plug Load Energy Use	Water Supply & Treatment	End of Life	Recycling & Energy Export	Total
Global Warming Potential, GWP (kg CO ₂ eq / occupant / year)								
Benchmark	838.2	505.5	939.5	822	120.6	119.4	-75.82	3269
Proposed Design	223.3	342.3	29.05	751.8	102.4	93.29	-477.8	1064
Difference	614.9	163.1	910.5	70.22	18.15	26.11	402	2205
Life Cycle Savings	19%	5%	28%	2%	1%	1%	12%	67%
Net use of fresh water, FW (kg / occupant / year)								
Benchmark	3721	1747	1202	1757	93693	592.8	-286	102430
Proposed Design	1402	1362	62.11	1607	46135	146.5	-1307	49408
Difference	2319	385.6	1140	150.1	47558	446.3	1021	53021
Life Cycle Savings	2%	0%	1%	0%	46%	0%	1%	52%

Building Attributes

Highlighted information denotes that changes were made from the "baseline design" and should be an area of focus for compliance checks.

33b Smith St, Highgate, WA

Dwellings:	4
Bedrooms:	12
Bathrooms:	10.5
Car parks:	5
Floors:	2
Type of carpark:	Car Port
Ceiling Height:	2.6
Gross Floor Area:	489
Occupancy Date:	01/10/2023

Energy Supply and Efficiency Attributes

Electricity Supply:	Mains Connected
Thermal Rating:	NatHERS 6.0 Star
Energy Monitoring:	No Energy Monitoring
Natural Lighting:	Normal

Water Supply and Efficiency Attributes

Water Supply:	Mains Supply
Water Treatment:	Mains Connected
Shower Heads:	3 Star (greater than 6.0 and less than or equal to 7.5 L/m)
Toilets:	5 star (4.7L/flush, 3.2/half flush, 3.0L/average flush)
Tapware:	4 Star (greater than 6.0 and less than or equal to 7.5 L/m)
Washing Machine:	4.5 star (9.5L/kg clothing washed)
Dishwasher:	5.0 star (8.57L/wash for 10 place setting dishwasher)
Garden Type:	Dripper garden bed and no lawn
Rainwater Pump Type:	Medium or high pressure and flow with pressure vessel

Building Components

Highlighted information denotes that changes were made from the “baseline design” component type, or changes were made to the default quantities and should be an area of focus for compliance checks.

Integrated Services

Component Type	Quantity
Cooking Appliances	
Cooking, Res Electric Oven Induction Stove	4 Households cooking energy
Hot Water System	
Standard Heat Pump (HWS_App)	4 240L Electric heat pump h...
Indoor Lighting Fitout	
LED Residential Lighting (Standard Efficiency)	4 Household
Cooling System	
Split System Air Source Heat Pump for Cooling, Average Efficiency (COP/EER 3.65), R32 Refrigerant	7 heat pump(s) 5kW
Heating System	
Split System Air Source Heat Pump for Heating, Average Efficiency (COP/EER 3.65), R32 Refrigerant	7 heat pump(s) 5kW

Plug Loads

Component Type	Quantity
Refrigeration	
Refrigeration, Residential Well Ventilated Fridge Recess	4 Refrigeration Energy Use
Dwellings	
Appliances Residential Average (AUS)	4 eTool: Average Household ...

Outdoor Services

Component Type	Quantity
Renewable Generation	
Solar PV System Residential - Zone 3 (Perth Sydney etc)	10 kW
Outdoor Lighting Fitout	
LED Outdoor Lighting (Residential - Standard Efficiency), m2	229.21 m2 of outdoor lit area
Swimming Pool Temperature Control	
Swimming Pool Seasonal Temperature Control - No Pool Cover - Gas	0 Pool Surface Area
Swimming Pool Filtering	
Swimming Pool - Pumps and Filters Ultra Efficient	0 m2 surface area
Swimming Pool Structure	
Pool Structure - Concrete	0 m2 pool surface area

Structure

Component Type	Quantity
Ground Floor Area	
Concrete Floor - 100mm slab on ground 30MPa 3.8% reo (Portland Cement)	313 eTool: m2 of floor slab -...
Upper Floor Area	
Elevated Floor, Timber Frame 300mm Bearers and Joists, <6m Span, particle board sheeting, insulated	225 m2 of elevated floor
Stairs	
Staircase, Timber frame and timber treads	4 2.4m Rise
External Wall Area	
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, fibre cement clad (9mm)	329
Glazed Area	
Windows Residential Aluminium Single Glaze fly screen	95.73
Roof Area	
Roof - TimberTruss/SteelSheeting/25degreePitch	300.08
Entry Doors	
Door - SolidCoreTimber/WoodenJam/Painted	8 Door (1.68m2)
Internal Doors	
Door - SolidCoreTimber/WoodenJam/Painted	24.5 Door (1.68m2)
External Wall Area	
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, coloured steel sheet cladding external	178.9
Internal Wall Area	
Wall, Internal, Framed, Timber Stud Plasterboard and paint finish	189.3
Internal Wall Area	
Wall, Internal, Framed, Timber Stud Plasterboard and paint finish	154.91
External Wall Area	
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, fibre cement clad (9mm)	67.8

Finishes

Component Type	Quantity
Living Areas	
Floor Covering - Vinyl (PVC) or Synthetic Linoleum	123.03
Kitchens Dining Areas	
Floor Covering - Vinyl (PVC) or Synthetic Linoleum	150.71
Wet Areas	
Floor Covering - Tiles (ceramic/5mm)	33.8 eTool: m2 of internal flo...
Bedroom Areas	
Floor Covering - Carpet (glue down/Nylon)	144 eTool: m2 of internal flo...



Life Cycle Assessment

33a Smith St, Highgate, WA

City of Vincent

Date : 25 October 2022

Authors : Robin Campbell (Lead)

Phone : 0411 141 246

Address : 99 Loftus St, Leederville

Email : info@email.com

Report Id : 30450





eToolLCD Software Disclaimer

The LCA predictions of embodied and operational impacts (including costs) conducted in eToolLCD software, by their very nature, cannot be exact. It is not possible to track all the impacts associated with a product or service back through history, let alone do this accurately. eToolLCD software has been built and tested to enable informed decisions when comparing design options. Generic cost and environmental impact coefficients do not necessarily correspond to those of individual brands of the same product or service due to differences within industries in the way these products and services are delivered.

This LCA study has not been reviewed and as such does not meet the relevant section of the ISO14044 requirements. Caution should be taken when interpreting the LCA study report.

eTool PTY LTD cannot make assurances regarding the accuracy of these reports for the above reasons.

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Executive Summary

This Life Cycle Assessment has been completed for a number of design scenarios for the Low Density Dwelling, located at 33a Smith St, Highgate, WA. The Author of the study is Robin Campbell of eTool and no critical review has been conducted.

The goal of this study is to profile and improve the environmental performance of the construction works at 33a Smith St, Highgate, WA. The life cycle performance of the project is compared to other designs. The study has been conducted in accordance with ISO 14044 and EN15978.

Characterised Impacts Per Occupant Per Year		Benchmark Design	Improved Design	Improved Design Savings Against Benchmark Design
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	3.31e+3	1.15e+3	65%
Ozone Depletion Potential, ODP	kg CFC-11 eq	1.24e-4	2.29e-4	-85%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	8.92e+0	5.14e+0	42%
Eutrophication potential, EP	kg PO ₄ eq	2.95e+0	2.32e+0	21%
Photochemical Ozone Creation Potential, POCP	kg ethylene	5.92e-1	3.96e-1	33%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	1.07e-1	8.52e-2	20%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	44873	15518	65%

Table 1: Summary of Results

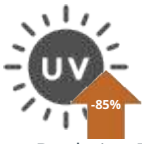
The Improved Design shows an expected performance improvement against Business as Usual for 6 of the 7 environmental indicators.



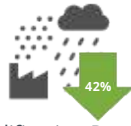
Improved Design Performance against Benchmark



Global Warming Potential, GWP



Ozone Depletion Potential, ODP



Acidification Potential for Soil and Water, AP



Eutrophication potential, EP



Photochemical Ozone Creation Potential, POCP



Abiotic Depletion Potential - Elements, ADPE



Abiotic Depletion Potential - Fossil Fuels, ADPF

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1 Introduction

Managing the environmental impacts that arise from the construction and operation of Building is of key importance in mitigating the damage caused directly and indirectly on the biosphere. Life Cycle Assessment (LCA) is the leading industry standard in clearly identifying optimum strategies for reducing environmental impacts. This report presents the results of the LCA completed for the Improved Design, City of Vincent Project located at 33a Smith St, Highgate, WA. eToolLCD software has been used to model the infrastructure's environmental impacts.

The study has been conducted in accordance with the following standards:

- International Standards 14040 and 14044.
- European Standard EN 15978: *Sustainability of Construction Works – Assessment of Environmental Performance of Buildings – Calculation Method*

The Author of the study is Robin Campbell of eTool and no critical review has been conducted.

2 Goal of the study

The goal of this study is to provide profile and improve the environmental performance of the construction works at 33a Smith St, Highgate, WA. The life cycle performance of the project is compared to other designs and as such this is a comparative study. The results of the study are intended to be made public.

3 Scope of the study

The LCA study has been conducted in accordance with the EN 15978 standard to assess the direct and indirect potential environmental impacts associated with the construction works at 33a Smith St, Highgate, WA as part of the City of Vincent project.

3.1 Functional Unit

The function of the Building must reflect the core purpose of the asset such that it can be compared accurately to different designs. In this case, the functional focus is the Residence and the chosen functional unit is the provision of this function for one Occupant over one year.

The estimated design life of the design is 55 years which has been adopted for the LCA study period. This takes into consideration the structural service life limit (150 years), as well as redevelopment pressure on the asset such as surrounding density, asset ownership structures, and the architectural design quality.

Note that products with expected service lives of less than the life span of the project are assumed to be replaced at increments reflecting their service life.

3.2 System Boundary

The system boundary, shown in Figure 1, follows guidance given in EN15978.



System Boundary

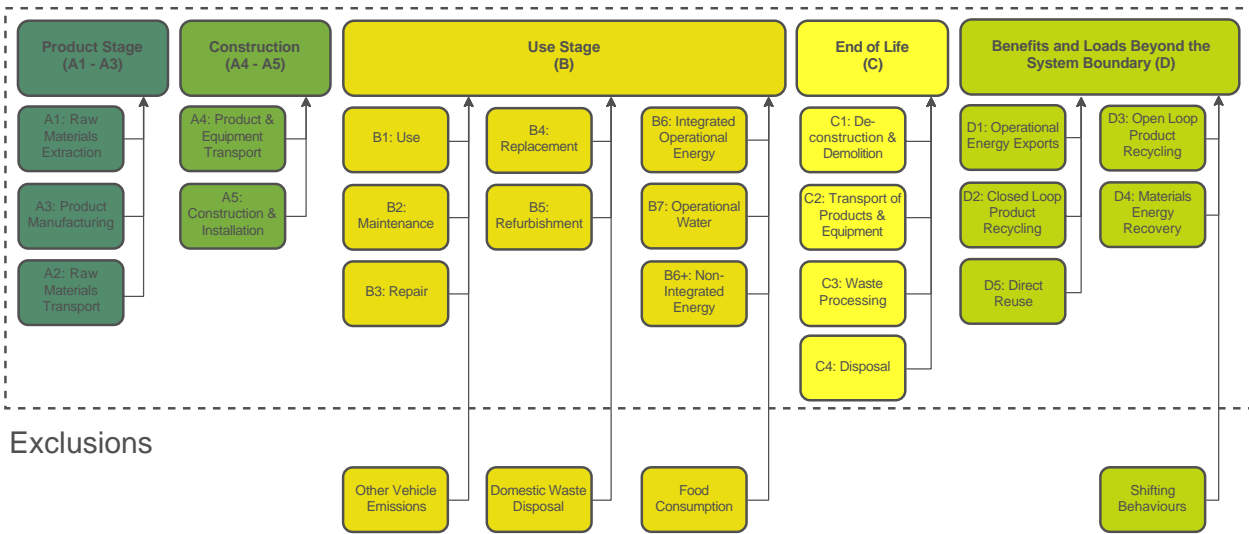


Figure 1: System Boundary Diagram

3.3 Environmental Indicators

The environmental indicators have been included in the study are detailed in Table 2. For further information regarding the environmental indicators please refer to Appendix A.

Environmental Indicator	Unit	Abbreviation	Characterisation Method
Environmental Impacts			
🌍 Global Warming Potential, GWP	kg CO ₂ eq	GWP	CML-IA baseline V4.5
☀️ Ozone Depletion Potential, ODP	kg CFC-11 eq	ODP	CML-IA baseline V4.5
🌿 Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	AP	CML-IA baseline V4.5
🚰 Eutrophication potential, EP	kg PO ₄ eq	EP	CML-IA baseline V4.5
🏠 Photochemical Ozone Creation Potential, POCP	kg ethylene	POCP	Institute of Environmental Sciences (CML)
🔧 Abiotic Depletion Potential - Elements, ADPE	kg antimony	ADPE	CML-IA baseline V4.5
🏠 Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	ADPF	CML-IA baseline V4.5

Table 2: Environmental Indicators Included in LCA study.

3.4 System Description

The object of the assessment is the Low Density Dwelling, located at 33a Smith St, Highgate, WA. The assessment includes all the upstream and downstream processes needed to provide the primary function of the structure from construction, maintenance, operation, and finally demolition and disposal associated with the low density dwelling. The inventory includes the extraction of raw materials or energy and the release of substances back to the environment or to the point where inventory items exit the system



boundary either during or at the end of the project life cycle.

The area of the project is the City of Vincent local government in Western Australia. This local government authority covers an area of approximately 10.4 square kilometres in metropolitan Perth, the capital of Western Australia, and lies about 3 km from the Perth CBD. It includes the suburbs of Highgate, Leederville, Mount Hawthorn, North Perth, as well as parts of Coolbinia, East Perth, Mount Lawley, Osborne Park, Perth and West Perth. The City of Vincent maintains 139 km of roads and 104 ha of parks and gardens.

New developments in the area must comply with the city's [built form policy released in 2020](#).

The project location is shown in figures 2 and 3.

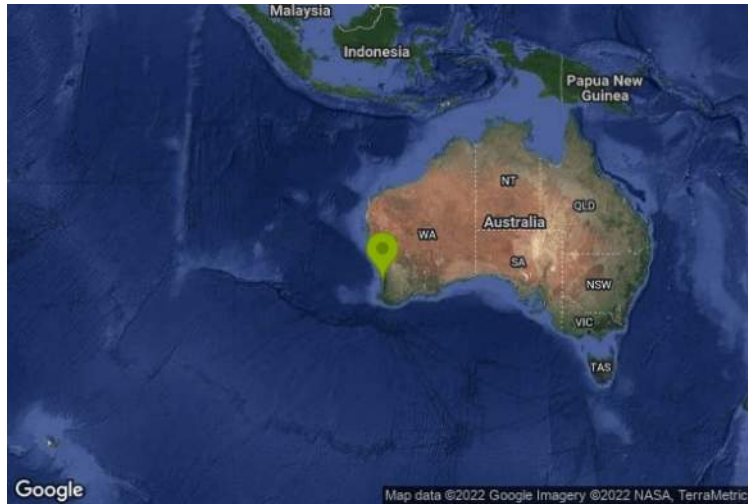


Figure 2: Location of the project - Global View.

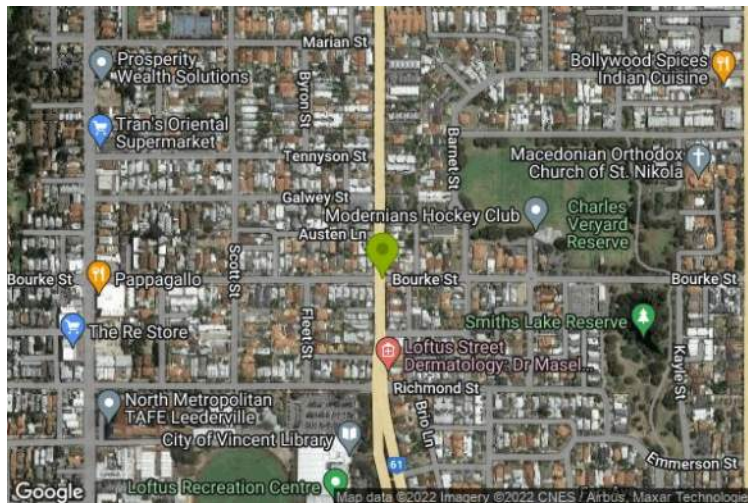


Figure 3: Location of the project - Locality View.

2 Townhouses. U1 is 3br, 2 bath plus powder room. U2 is 2br, 2 bath plus powder room. Parking on the ground level (7 bays in total for the whole site, which includes 4 more townhouses).

Table 3 below shows the key characteristics of the design.

	Business as Usual	Improved Design
Design Details		
Design Name	AU WA Res Ave Code Compl CZ 5 (10 dwellings)	33a Smith St, Highgate, WA



	Business as Usual	Improved Design
Stories (#)	2	2
Functional Focus	Single Family Residence	Residence
Structural Service Life Limit	100	150
Predicted Design Life	54	55
Functional Characteristics		
Dwellings	10	2
Bedrooms	30	5
Occupants	24	4
Vehicle Spaces	0	2
Total Floor Areas		
Usable Floor Area	2,140	201
Net Lettable Area	0	0
Fully Enclosed Covered Area	3,010	201
Unenclosed Covered Area	0	36
Gross Floor Area	3,010	237
Usable and Lettable Yield	71 %	85 %

Table 3: Design Characteristics Compared

Table 4 and 5 show the scope (structural and operational) of the inventory collection for the LCA. For further details on structure scope please refer to Appendix B.

Summary Structure Scope Diagram

Key: ✓ In Scope ✓ Partial ✗ Out of Scope

Category Name	Benchmark Design	Improved Design
Substructure	✓	✗
Superstructure	✓	✗
Internal finishes	✓	✗
Fittings, furnishings and equipment	✓	✗
Services equipment	✓	✗
Prefabricated buildings and building units	✗	✗
Work to existing building	✗	✗
External works	✓	✗
Facilitating works	✓	✗
Project/design team	✓	✗
Undefined	✗	✗

Table 4: Structural scope of LCI collection

Operational Scope diagram

Key: ✓ In Scope ✗ Out of Scope

Category Name	Benchmark Design	Improved Design
Appliances Dishwashers	✓	✗
Appliances Entertainment	✓	✗
Appliances Laundry Appliances	✓	✗
Appliances Office Workstations	✓	✗
Communications	✓	✗
Cooking and Food Preparation	✓	✗
Domestic Water Heating	✓	✗
Electrical Parasitic Loads	✓	✗
Fire Protection	✗	✗
HVAC	✓	✗
Industrial & Manufacturing Equipment	✗	✗
Lifts, Elevators and Conveying	✗	✗
Lighting	✓	✗
Miscellaneous	✗	✗
Monitoring, Control and Automation	✓	✗
Power Generation and Storage	✓	✗
Refrigeration	✓	✗



Category Name	Benchmark Design	Improved Design
Safety and Security	✓	✗
Swimming Pools	✓	✗
Water Pumping	✓	✗
Water Removal and Treatment	✓	✗
Water Supply	✓	✗
Workshops, Garage & Misc	✓	✗

Table 5: Operational scope of LCI collection

3.5 Cut off Criteria

The EN15978 cut-off criteria were used to ensure that all relevant potential environmental impacts were appropriately represented:

- Mass – if a flow is less than 1% of the mass at either a product-level or individual-process level, then it has been excluded, provided its environmental relevance is not of concern.
- Energy – if a flow is less than 1% of the energy at either a product-level or individual-process level, then it has been excluded, provided its environmental relevance is not a concern.
- The total of neglected input flows per module, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5% of energy usage and mass.
- Environmental relevance – if a flow meets the above criteria for exclusion, but is considered to potentially have a significant environmental impact, it has been included. All material flows which leave the system (emissions) and whose environmental impact is higher than 1% of an impact category, have been included.

The Operational Guidance for Life Cycle Assessment Studies (Wittstock et al. 2012) states:

The apparent paradox is that one must know the final result of the LCA (so one can show that the omission of a certain process is insignificant for the overall results) to be able to know which processes, elementary flows etc. can be left out.

The approach taken in this study is to continue modelling smaller inputs until confidence is gained that the criteria is safely met.

3.6 Allocation

Allocation rules follow those of EN15804 as given below:

- Allocation will respect the main purpose of the studied processes. If the main purpose of combined processes cannot be defined (e.g. combined mining and extraction of nickel and precious metals), economic allocation may be used to divide resources and emissions between the products.
- The principle of modularity is maintained. Where processes influence the product's environmental performance during its life cycle, they will be assigned to the module where they occur.
- The sum of the allocated inputs and outputs of a unit process are equal to the inputs and outputs of the unit process before allocation. This means no double counting of inputs or outputs is permissible.

3.7 Independent Review

No independent review has been conducted of this study.

4 Inventory Analysis

The design has been modelled using the available eToolLCD elements, templates and EPDs as shown in Table 6.

eToolLCD Item Type	Count in Design	
	Benchmark	Improved Design
Design Templates	24	134
Equipment and People Elements	495	195
Material Elements	841	344
Energy Elements	38	30
Water Elements	12	13
EPDs	0	0

Table 6: Count of elements, templates and EPDs in the design

The eToolLCD library templates are customisable and users may submit templates for validation. The template validation process is undertaken by experienced LCA practitioners and is a process of checking the user inputs and ensuring the assumptions are adequately referenced. Table 7 shows the extent to which validated templates were used in the model.

eToolLCD Item Type	Validated (%)	
	Benchmark	Improved Design
Total Design Templates	8.33	53.73
Equipment and People Elements	1.01	56.92
Material Elements	.48	40.41
Energy Elements	0	0
Water Elements	0	0

Table 7: Use of validated templates

4.1 Templates Comparison

The eToolLCD templates found in each design are provided in Table 8.

Parent Template Name	Units	Quantity
		Improved Design
Fittings, furnishings and equipment		
Appliances Residential Average (AUS)	#	2
Cooking, Res Electric Oven Induction Stove	#	2
Kitchen Medium sized (incl Equipment)	#	2
Refrigeration, Residential Well Ventilated Fridge Recess	#	2
Standard 1st Bathroom - WC/Shower-bath/Basin/WallTiles	#	5
Substructure		
Concrete Floor - 100mm slab on ground 30MPa 3.8% reo (Portland Cement)	m2	129.902
Staircase, Timber frame and timber treads	Other	2
Facilitating works		
Demolition - Residential (End-of-Life)	#	2
Superstructure		
Door - Glazed Timber Frame Timber Jamb	#	4
Door - HollowCoreTimber/WoodenJam/painted	#	12
Elevated Floor, Timber Frame 300mm Bearers and Joists, <6m Span, particle board sheeting, insulated	m2	223
Roof - TimberTruss/SteelSheeting/25degreePitch	m2	149.3873
Wall External Type 1, Masonry, double brick 110-50-110 insulated with foundations and finishes	m2	70.6
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, coloured steel sheet cladding external	m2	19.8
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, fibre cement clad (9mm)	m2	108.5
Wall, Internal, Framed, Timber Stud Plasterboard and paint finish	m2	166.83
Windows Residential Aluminium Single Glaze fly screen	m2	46.3960030684931
Services equipment		
Electrical Fittings - sockets power points wiring embodied only (m2)	m2	372
LED Outdoor Lighting (Residential - Standard Efficiency), m2	m2	129.533946065403
LED Residential Lighting (Standard Efficiency)	#	2



Parent Template Name	Units	Quantity
		Improved Design
Solar PV System Residential - Zone 3 (Perth Sydney etc)	Other	5
Split System Air Source Heat Pump for Cooling, Average Efficiency (COP/EER 3.65), R32 Refrigerant	#	3
Split System Air Source Heat Pump for Heating, Average Efficiency (COP/EER 3.65), R32 Refrigerant	#	3
Standard Heat Pump (HWS_App)	#	2
Swimming Pool - Pumps and Filters Ultra Efficient	m2	0.001
Utilities Connection to Site Residential	#	2
Water tank - steel (embodied)	Other	7E-06
Water Use and Treatment (eTool Turbo)	#	2
Internal finishes		
Floor Covering - Carpet (glue down/Nylon)	m2	62.2285714285714
Floor Covering - Tiles (ceramic/5mm)	m2	18.335449385052
Floor Covering - Vinyl (PVC) or Synthetic Linoleum	m2	148.49
External works		
Pool Structure - Concrete	m2	0.001
Swimming Pool Seasonal Temperature Control - No Pool Cover - Gas	m2	0.001

Table 8: Templates Comparison (showing master templates only)

4.2 eToolLCD software

eToolLCD software was used to model life cycle impacts of the project. eToolLCD uses third party background processes aggregated as mid-point indicators and stored in a number of libraries within the software which are coupled with algorithms and user inputs to output the environmental impact assessment. A map of user inputs, data sources and algorithms (outputs) is given in Figure 4.

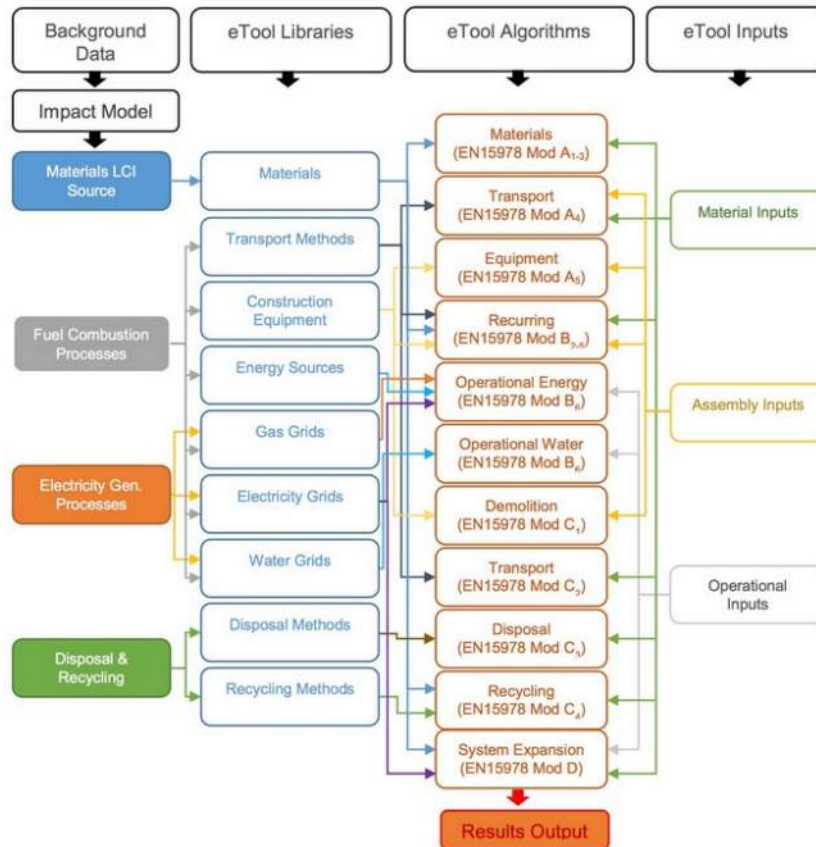


Figure 4: Relationship between LCI background data, eToolLCD software library, inputs and algorithms.

4.3 Data Quality



The data quality requirements for the background data are detailed in Table 9. Each of the criteria has been assessed for compliance and results presented below.

Criteria	Background Data Requirement	Compliance	
		Benchmark	Improved Design
Temporal Relevancy	For annually fluctuating processes like Grid electricity fuel mixes the datasets must have been updated within the last 2 years. More static processes like materials production must have been updated within the last 10 years. Product specific EPDs must have been updated in the last 5 years.	Failed Grid Passed Materials	Failed Grid Passed Materials
Geographical Relevancy	The background data should be specifically compiled for the same country (preferable) or continent as the project location.	Passed (Same Continent)	Passed (Same Country)
Precision	No requirement specified however a qualitative review undertaken to ensure no erroneous values	Passed	Passed
Completeness	Qualitative assessment of the process to ensure no obvious exclusions	Passed	Passed
Technological Relevancy	Ensure that technology assumptions are representative for the product or product group.	Passed	Passed
Consistency	The study methodology holds for the background data.	Passed	Passed
Reproducibility	The information available about the methodology and the data values reported should allow an independent practitioner to reproduce the results reported in the study.	Passed	Passed

Table 9: Summary of data quality requirements for the study.

Criteria	Inventory Collection Requirement (eToolLCD User Inputs)	Compliance	
		Benchmark	Improved Design
Temporal Relevancy	All inputs into eToolLCD to be reflective of the project being assessed and if assumptions are made these are to be based on industry practices that are consistent with the project commissioning date.	Passed 0/5 Checks	Passed 0/1 Checks
Geographical Relevancy	All inputs into eToolLCD must be reflective of the project being assessed and if assumptions are made these are based on the current practices employed in the project country.	Passed 0/5 Checks	Passed 0/2 Checks
Precision	To avoid aggregated errors a high level of precision is expected inputs into eToolLCD software, being either to 3 significant figures or: <ul style="list-style-type: none"> Two significant figures or nearest 10 hours for equipment run time Two significant figures or nearest 10kg for material quantities Two significant figures or nearest 100MJ / annum for operational energy Two significant figures or nearest 100kL / annum for operational water use 	Passed 0/4 Checks	Passed 0/1 Checks
Completeness	Inputs to cover all life cycle phases and elements identified in the system boundary. The link between background data, eToolLCD algorithms and subsequent LCA results is not to introduce significant gaps in the data.	Passed 0/9 Checks	Passed 0/2 Checks
Technological Relevancy	All inputs into eToolLCD must be reflective of the project being assessed and if assumptions are made these must be drawn from appropriate examples of like technology.	Passed 0/5 Checks	Passed 0/1 Checks
Consistency	All inputs into eToolLCD must be reflective of the project being assessed and if assumptions are made these are drawn from the same reference library.	Passed 0/9 Checks	Passed 0/0 Checks
Reproducibility	The information available about the methodology and the data values reported should allow an independent practitioner to reproduce the results reported in the study.	Passed 0/9 Checks	Passed 0/1 Checks

Table 10: Summary of data quality requirements for the study.

4.4 Completeness

The study aims to follow EN15804 procedures for exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process shall be included in the calculation, for which data are available.
- Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices shall be documented.
- In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % renewable and non-renewable primary energy usage and 1 % of the total mass input of that unit process.
- The total of neglected input flows per module, e.g. per module shall be a maximum of 5 % of energy usage and mass.
- Conservative assumptions in combination with plausibility considerations and expert judgement can be used to demonstrate compliance with these criteria.





- Particular care should be taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators.

Two major tests were run to determine the compliance with the above cut-off rules.

4.3.1 Inventory Mass Quantities

The cumulative mass of inventory entries is shown in Figure 5. Given that 192 material elements within the LCA base design make up the last 1% of mass inventory entries a high level of confidence exists that the cut off rules have been upheld.



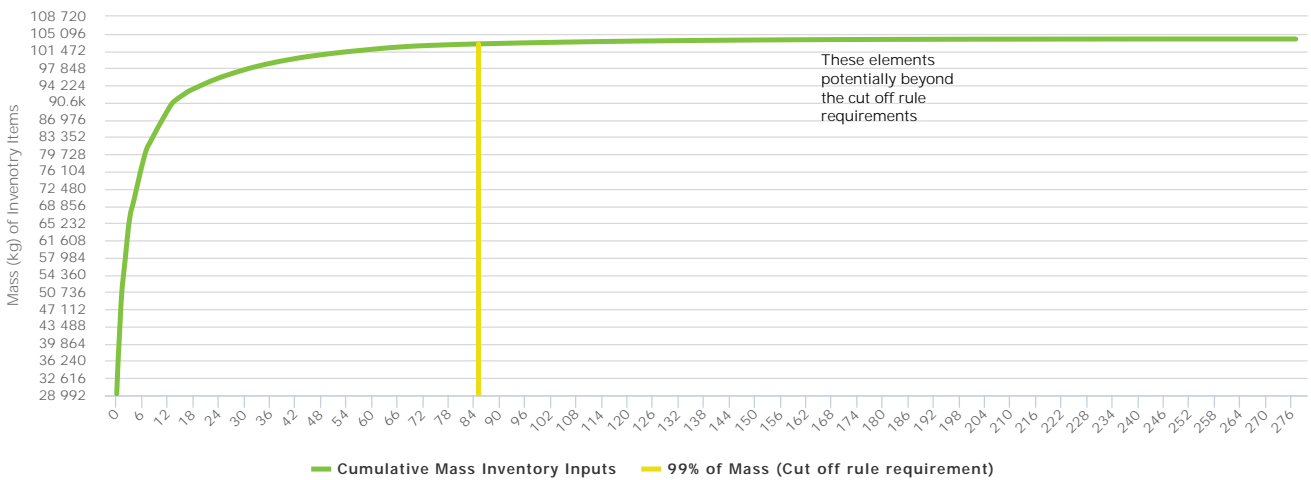


Figure 5: Cumulative Mass Inventory Entries. In this case 69.06% make up the last 5% of mass inventory entries.

4.3.2 Inventory Energy Analysis

The cumulative embodied energy of inventory entries is shown in Figure 6. Given that 329 elements within the LCA base design make up the last 1% of embodied energy inventory entries a high level of confidence exists that the cut off rules have been upheld.

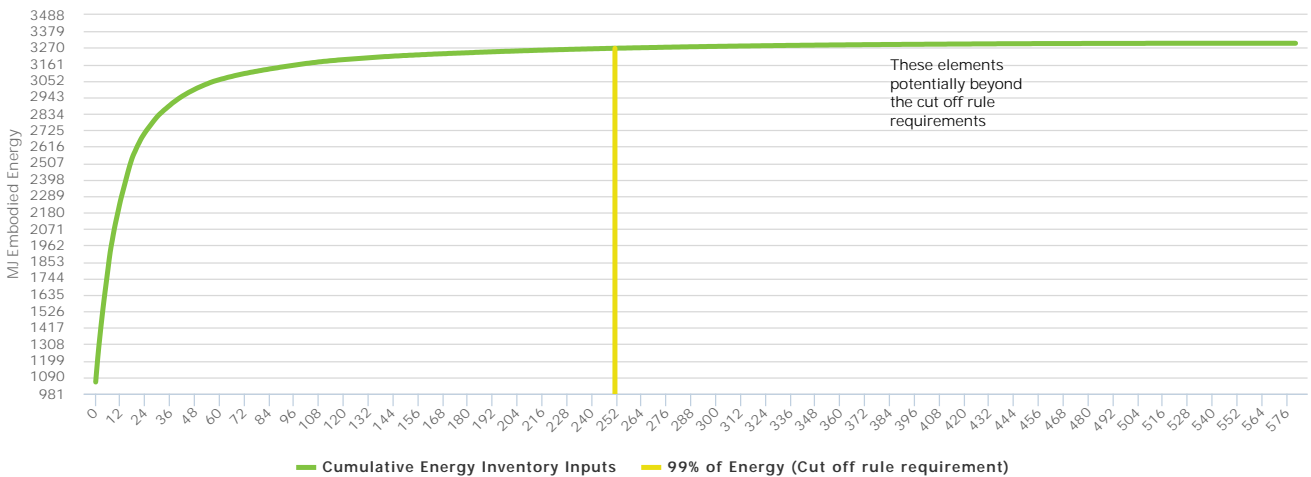


Figure 6: Cumulative Energy Inventory Entries. In this case 56.63% make up the last 5% of energy inventory entries.

5 Life Cycle Impact Assessment

The Life Cycle Impact Assessment (LCIA) results are provided in Table 11 and subsequent tables in the EN15978 reporting format. The heat map highlights the highest impacts for each indicators assessed and conversely in the comparison tables the highest savings observed. For further details on the LCIA please refer to interpretation.



5.1 Improved Design Environmental Impacts Indicators

Characterised Impacts Per Occupant Per Year		Materials and Construction			Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundary	Total	
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B6+	B7	C1	C2	C3	C4		D
Benchmark																		
GWP	kg CO ₂ eq	6.18e+2	1.24e+2	95.742	0	0	MNA	5.06e+2	0	9.40e+2	8.22e+2	1.66e+2	0	50.083	0	69.335	-75.873	3.31e+3
ODP	kg CFC-11 eq	3.00e-5	1.91e-5	1.47e-5	0	0	MNA	3.44e-5	0	4.88e-6	6.59e-6	3.61e-6	0	7.97e-6	0	4.61e-6	-2.26e-6	1.24e-4
AP	kg SO ₂ eq.	3.5093	0.3927	0.2682	0	0	MNA	2.4678	0	1.1599	1.5239	0.3678	0	0.1555	0	0.0906	-1.0128	8.9228
EP	kg PO ₄ eq	1.28e+0	9.64e-2	4.67e-2	0	0	MNA	8.26e-1	0	3.81e-1	5.09e-1	2.43e-1	0	3.47e-2	0	1.94e-2	-4.85e-1	2.95e+0
POCP	kg ethylene	2.24e-1	2.51e-2	3.61e-2	0	0	MNA	1.67e-1	0	8.29e-2	4.24e-2	2.40e-2	0	1.03e-2	0	1.40e-2	-3.41e-2	5.92e-1
ADPE	kg antimony	5.86e-2	3.61e-3	2.61e-4	0	0	MNA	4.79e-2	0	4.21e-3	6.09e-3	2.88e-3	0	2.02e-3	0	1.11e-4	-1.88e-2	1.07e-1
ADPF	MJ	7674.4	1899.3	1298.7	0	0	MNA	7168.8	0	1.38e+4	1.06e+4	2002.3	0	779.5	0	464	-826.2	44873
Improved Design																		
GWP	kg CO ₂ eq	193.02	53.535	29.832	-0.421	4.543	MNA	4.08e+2	0	6.782	7.93e+2	1.06e+2	11.326	13.298	2.14	90.659	-5.58e+2	1.15e+3
ODP	kg CFC-11 eq	4.71e-5	8.18e-6	2.96e-6	0	5.54e-7	MNA	1.59e-4	0	5.43e-8	6.36e-6	2.44e-6	1.96e-6	2.12e-6	4.30e-7	1.06e-6	-2.78e-6	2.29e-4
AP	kg SO ₂ eq.	2.52e+0	1.74e-1	0.0637	0	1.60e-2	MNA	2.14e+0	0	1.26e-2	1.47e+0	2.40e-1	3.30e-2	4.10e-2	5.17e-3	2.21e-2	-1.59e+0	5.14e+0
EP	kg PO ₄ eq	1.29e+0	4.64e-2	9.64e-3	0	0.0049	MNA	9.12e-1	0	0.0042	4.91e-1	1.78e-1	0.0067	0.0091	1.13e-3	4.78e-3	-6.32e-1	2.32e+0
POCP	kg ethylene	1.79e-1	1.10e-2	1.40e-2	0	1.04e-3	MNA	1.66e-1	0	3.50e-4	4.09e-2	1.56e-2	2.55e-3	2.72e-3	1.95e-4	1.37e-2	-5.06e-2	3.96e-1
ADPE	kg antimony	3.64e-2	1.44e-3	6.14e-5	0	1.88e-4	MNA	4.93e-2	0	5.02e-5	5.88e-3	2.04e-3	8.76e-5	4.96e-4	1.85e-5	2.47e-5	-1.08e-2	8.52e-2
ADPF	MJ	3956	813.4	275.6	0	65.5	MNA	5286.7	0	87.6	1.03e+4	1263.3	170.2	206	27.3	104.8	-6988.8	15518
Savings (Improved Design Compared to Benchmark)																		
GWP	kg CO ₂ eq	4.25e+2	70.476	65.911	0.421	-4.543	MNA	97.81	0	9.33e+2	28.832	59.665	-11.326	36.785	-2.14	-21.323	4.82e+2	65.2%
ODP	kg CFC-11 eq	-1.71e-5	1.10e-5	1.18e-5	0	-5.54e-7	MNA	-1.24e-4	0	4.82e-6	2.31e-7	1.17e-6	-1.96e-6	5.85e-6	-4.30e-7	3.56e-6	5.20e-7	-85.22%
AP	kg SO ₂ eq.	9.94e-1	2.19e-1	2.04e-1	0	-1.60e-2	MNA	3.31e-1	0	1.15e+0	5.34e-2	1.28e-1	-3.30e-2	1.14e-1	-5.17e-3	0.0685	5.77e-1	42.39%
EP	kg PO ₄ eq	-5.43e-3	5.00e-2	3.70e-2	0	-0.0049	MNA	-8.61e-2	0	3.77e-1	1.79e-2	6.57e-2	-0.0067	2.55e-2	-1.13e-3	1.47e-2	1.47e-1	21.35%
POCP	kg ethylene	4.53e-2	1.41e-2	2.21e-2	0	-1.04e-3	MNA	1.73e-3	0	8.26e-2	1.49e-3	8.43e-3	-2.55e-3	7.58e-3	-1.95e-4	2.94e-4	1.65e-2	33.13%
ADPE	kg antimony	2.22e-2	2.16e-3	2.00e-4	0	-1.88e-4	MNA	-1.41e-3	0	4.16e-3	2.14e-4	8.36e-4	-8.76e-5	1.53e-3	-1.85e-5	8.64e-5	-8.02e-3	20.28%
ADPF	MJ	3718.4	1085.9	1023.1	0	-65.5	MNA	1882.1	0	1.37e+4	372.6	739	-170.2	573.5	-27.3	359.2	6162.5	65.42%

Table 11: Environmental Impacts Impact of Each Life Cycle Phase.

INA: Indicator Not Assessed. MNA: Module Not Assessed.

Impact Key: Top 10% Top 20% Top 30%

Savings Key: Top 10% Top 20% Top 30%



6 Life Cycle Interpretation

The following sections provide more detailed results of the life cycle impact assessment for each environmental indicator with the aim of identifying the largest areas of impact. A one page profile for each indicator is provided on the subsequent pages giving detailed information about the indicator. Each chart provided is explained below.

Impact Time Series Chart:

A chart displaying when impacts occur during the life of a design. This enables users to gain insights such the “environmental payback period” of a design compared to alternatives, or when there are jumps in an impact value during the life of the project (for example, relating to a large replacement item).

Top Five Charts

Each top 5 chart categorises the buildings and expresses the environmental impacts by these categories. This enables a detailed understanding of what is responsible for the greatest environmental burdens and also compares these burdens between designs. The pie chart associated with each bar chart shows the proportion of the building that is represented in the bar chart. A brief description of the categories is provided below:

- **LC Module Impacts:** The EN15978 Life Cycle Modules. Generally 100% building impacts will be included in the bar chart.
- **Construction Category:** The breakdown of the impacts by construction category. The bar chart will generally only part of the total building impacts.
- **Operational Demand:** The building end use demands that are driving environmental impacts.
- **Energy Supply:** The supply of fuels to the building, in effect the upstream fuel sources supplying energy for on site use during construction, operational and demolition.
- **Materials:** The materials (grouped into common categories) that are driving the environmental impacts.
- **Equipment and People:** The equipment and people required during construction, maintenance and demolition and all associated transport trips that are driving the environmental impacts

All impact figures are quoted per the functional unit selected for the study.

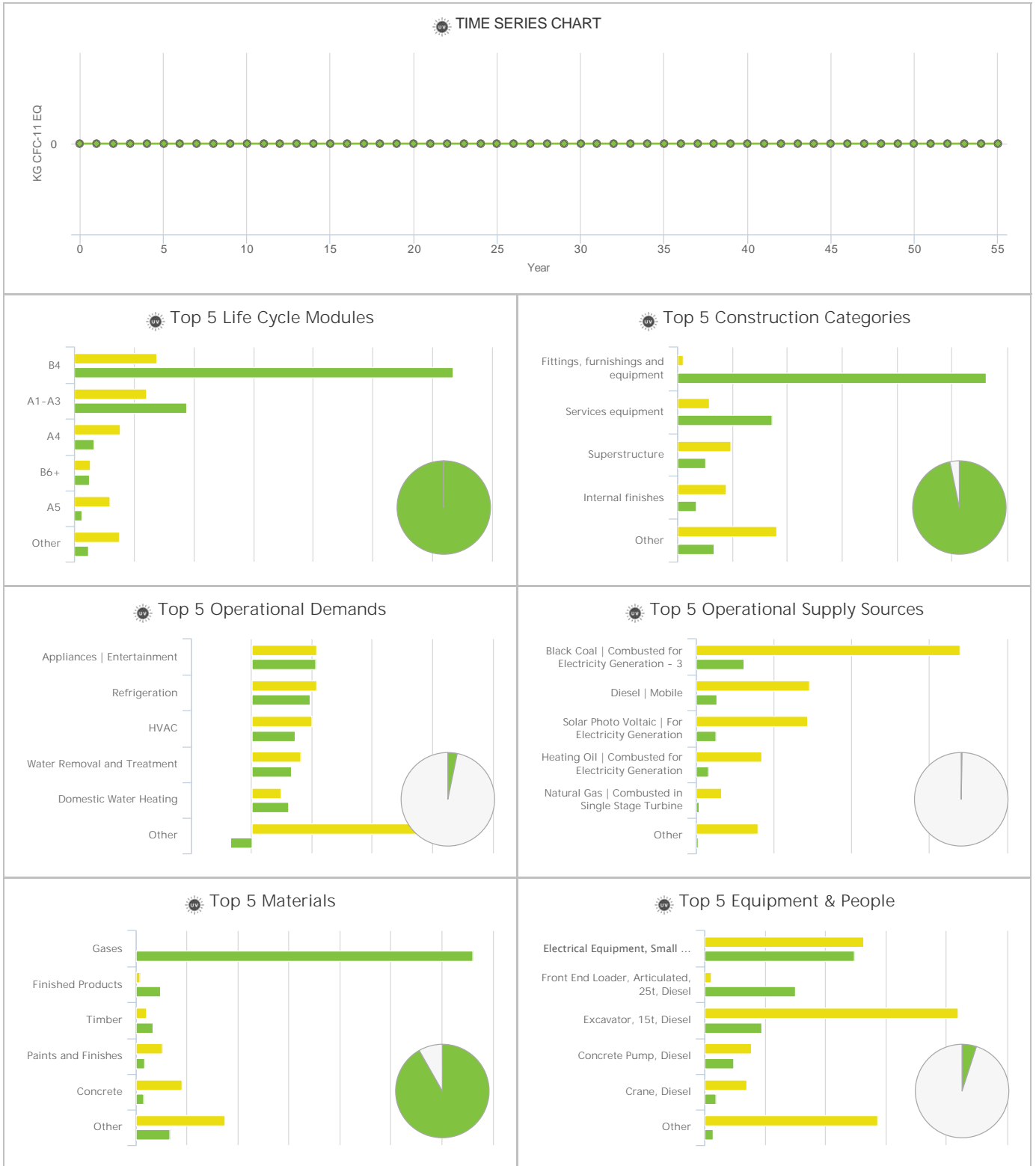
6.1 Global Warming Potential, GWP Profile

Business as Usual Improved Design



6.2 Ozone Depletion Potential, ODP Profile

☀ Business as Usual ☀ Improved Design



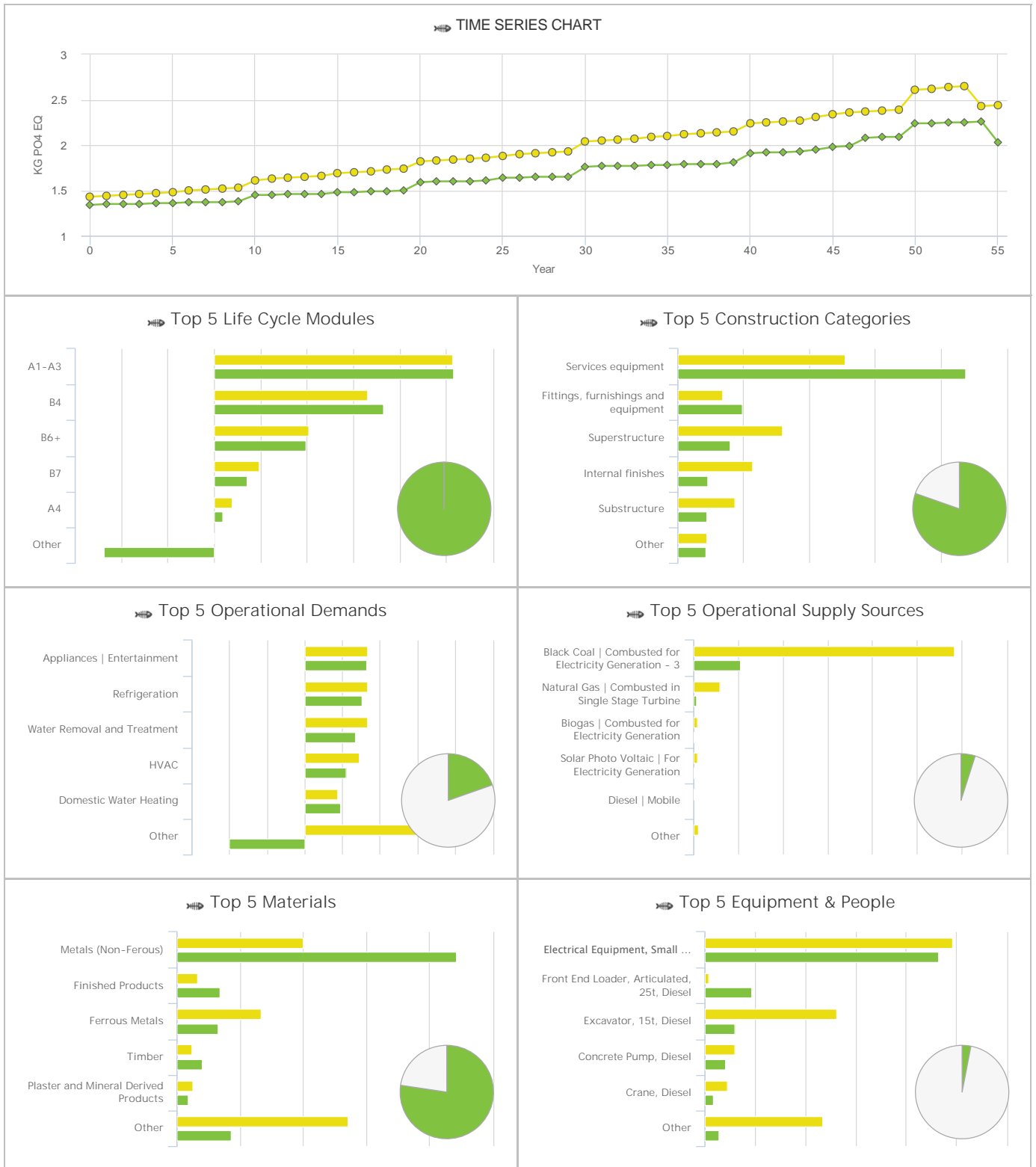
6.3 Acidification Potential for Soil and Water, AP Profile

Business as Usual Improved Design



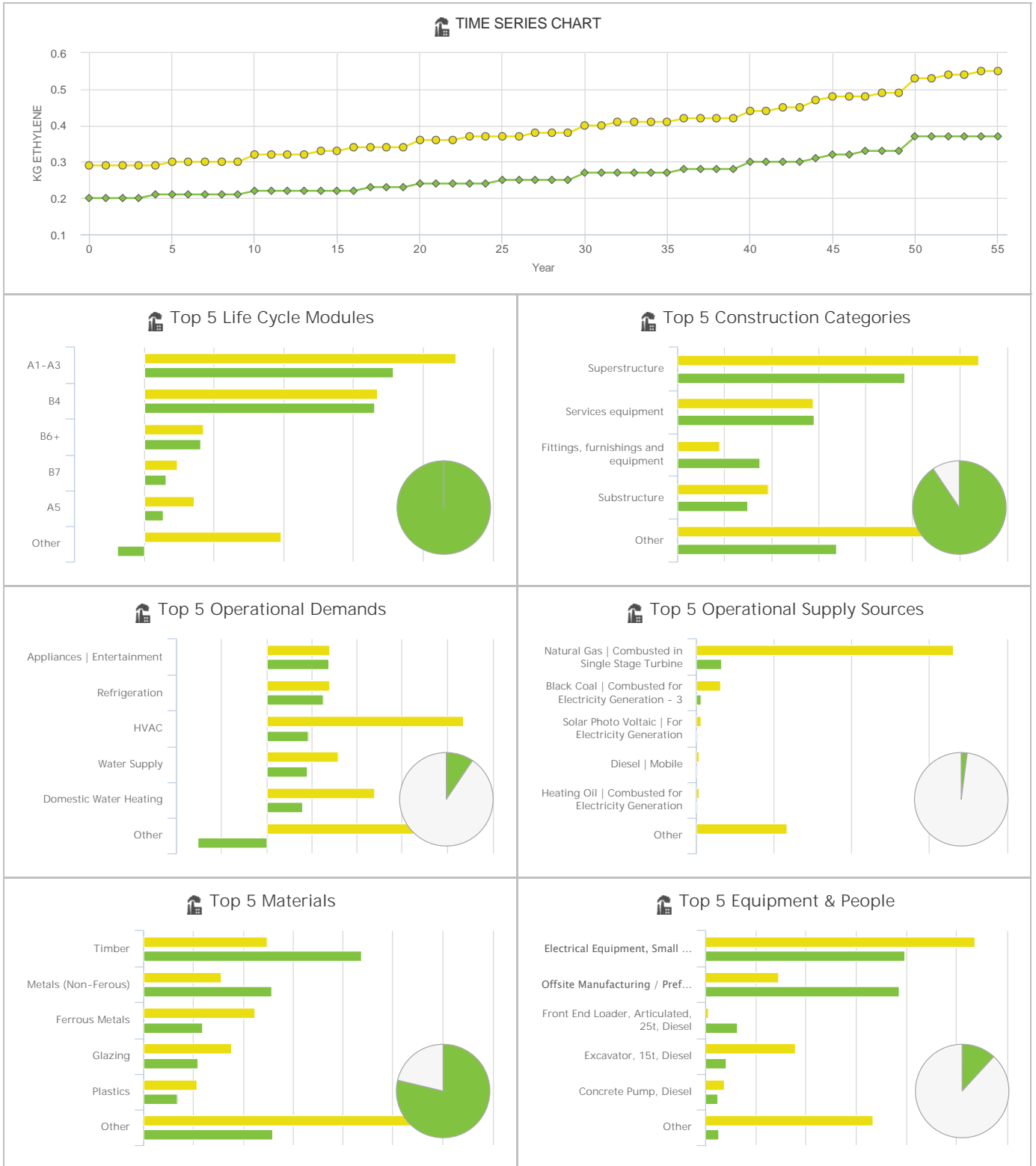
6.4 Eutrophication potential, EP Profile

Business as Usual Improved Design



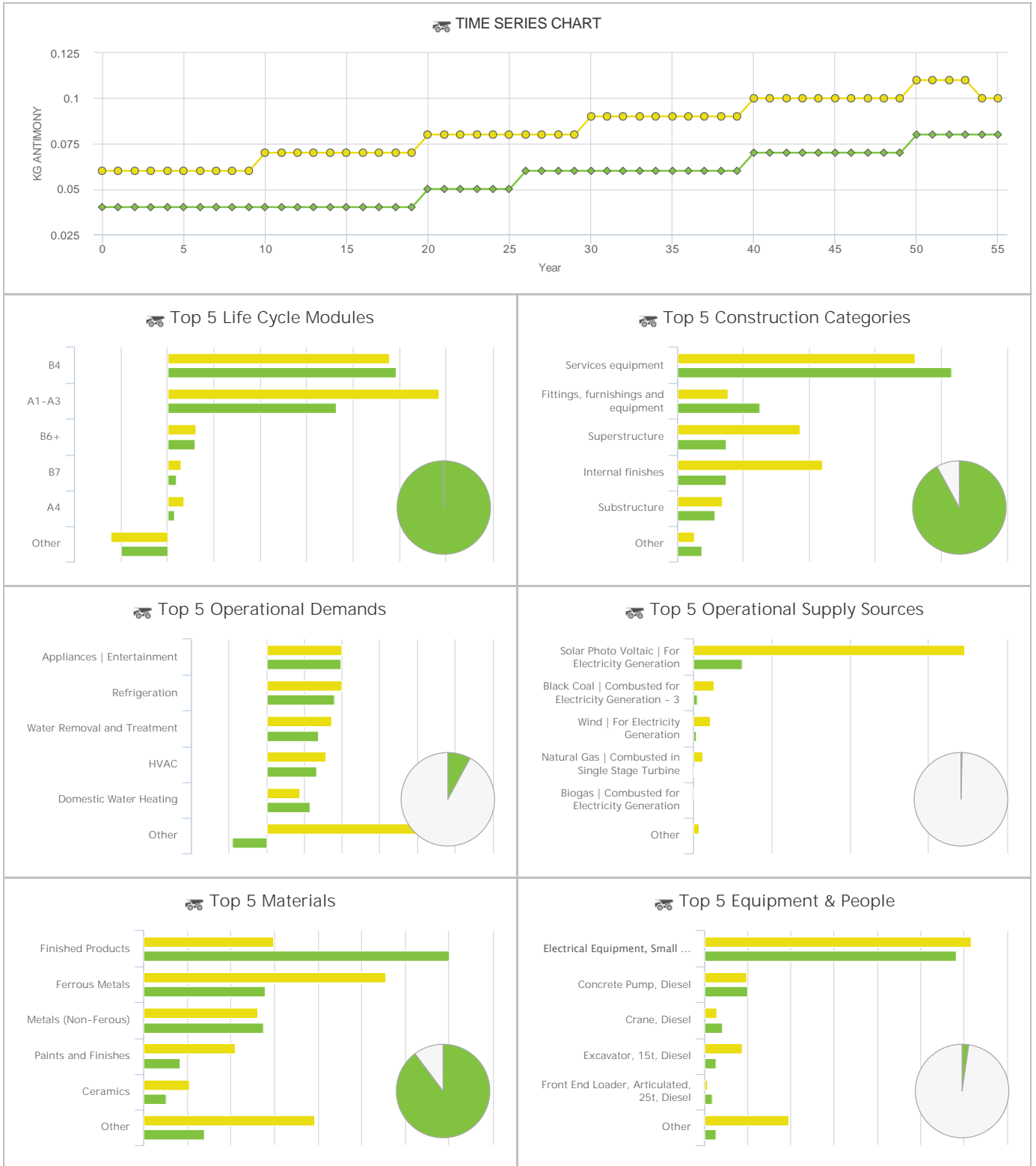
6.5 Photochemical Ozone Creation Potential, POCP Profile

Business as Usual Improved Design



6.6 Abiotic Depletion Potential - Elements, ADPE Profile

Business as Usual Improved Design



6.7 Abiotic Depletion Potential - Fossil Fuels, ADFP Profile

Business as Usual Improved Design



7 Low Impact Strategies

The following potential low impact design strategies were modelled in the LCA study to determine the relative benefits and aid the design decision making process.

For each design strategy, the relative savings for all indicators is provided and given in context to the other strategies. A basic description of the strategy is also provided.



8 Conclusions

The Improved Design shows an expected performance improvement against Business as Usual for 6 of the 7 environmental indicators.



9 References

9.1 Background LCI Data

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9.2 Inventory - Design Documentation

No design documents were recorded.

9.3 Inventory - Assumptions

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9.4 Environmental Product Declarations

No EPD references were recorded.



Appendix A: Environmental Indicators Description

Global Warming Potential, GWP

Anthropogenic global warming is caused by an increase of greenhouse gasses (GHG) in the earth's atmosphere. These gasses reflect some of the heat radiated from the earth's surface that would normally escape into space back to the surface of the earth. Overtime this warms the earth. Common GHGs include CO₂, N₂O, CH₄ and volatile organic compounds (VOCs). Global Warming Potential (GWP) is expressed in equivalent GHGs released, usually in kgCO₂e.

Ozone Depletion Potential, ODP

Ozone is formed and depleted naturally in the earth's stratosphere (between 15-40 km above the earth's surface). Halocarbon compounds are persistent synthetic halogen containing organic molecules that can reach the stratosphere leading to more rapid depletion of the ozone. As the ozone in the stratosphere is reduced more of the ultraviolet rays in sunlight can reach the earth's surface where they can cause skin cancer and reduced crop yields. Ozone Depletion Potential (ODP) is expressed in equivalent ozone depleting gasses (normally kgCFC11e).

Acidification Potential for Soil and Water, AP

Acidification is a consequence of acids (and other compounds which can be transformed into acids) being emitted to the atmosphere and subsequently deposited in surface soils and water. Increased acidity can result in negative consequences for flora and fauna in addition to increased corrosion of manmade structures (buildings vehicles etc.). Acidification Potential (AP) is an indicator of such damage and is usually measured in kgSO₂e

Eutrophication potential, EP

Over enrichment of aquatic ecosystems with nutrients leading to increased production of plankton, algae and higher aquatic plants leading to a deterioration of the water quality and a reduction in the value and/or the utilisation of the aquatic ecosystem. Eutrophication is primarily caused by surplus nitrogen and phosphorus. Sources of nutrients include agriculture (fertilisers and manure), aquaculture, municipal wastewater, and nitrogen oxide emissions from fossil fuel combustion.

Photochemical Ozone Creation Potential, POCP

Photochemical Ozone Creation Potential (POCP), commonly known as smog, is toxic to humans in high concentration. Although ozone is protective in the stratosphere at low levels it is problematic from both a health and nuisance perspective. Plant growth is also effected through damaged leaf surfaces and reduced photosynthesis. POCP is formed when sunlight and heat react with Volatile Organic Compounds (VOCs).

Abiotic Depletion Potential - Elements, ADPE

Abiotic Resource Depletion of energy (ADPE) is a measure of the extraction and consumption of primary resources from the earth. Such exploitation reduces resources available to future generations and as such must be managed.

Abiotic Depletion Potential - Fossil Fuels, ADPF

Abiotic Resource Depletion of energy (ARDE) is a measure of the extraction and consumption of non-renewable energy sources (primarily fossil fuels, but also inclusive of other energy sources such as uranium). Primary energy content of non-renewable energy sources including the embodied energy to extract, process and deliver the non renewable fuels, or manufacture, transport and install the renewable generator. Hence there is usually and non-renewable energy content associated with renewable fuels also.

Appendix B: Detailed Structure Scope Diagram

Key: ✓ In Scope, In Design ✓ In Scope, Not In Design ✓ Partial ✗ Out of Scope

Parent Name	Sub Category Name	Benchmark Design	Improved Design
Substructure	Substructure	✓	✗
	Standard foundations	✓	✗
	Specialist foundations	✓	✗
	Lowest floor construction	✓	✗
	Insulation	✓	✗
	Basement excavation	✓	✗
	Basement retaining walls	✓	✗
Superstructure	Frame	✓	✗
	Frame	✓	✗
	Upper floors	✓	✗
	Floors	✓	✗
	Insulation	✓	✗
	Balconies	✓	✗
	Drainage to balconies	✓	✗
	Roof	✓	✗
	Insulation	✓	✗
	Roof structure	✓	✗
	Roof coverings	✓	✗
	Specialist roof systems	✓	✗
	Roof drainage	✓	✗
	Rooflights, skylights and openings	✓	✗
	Roof features	✗	✗
	Stairs and ramps	✓	✗
	Stair/ramp structures	✓	✗
	Stair/ramp finishes	✓	✗
	Stair/ramp balustrades and handrails	✓	✗
	Ladders/chutes/slides	✓	✗
	External walls	✓	✗
	External Paint, Textures and Renders	✓	✗
	External enclosing walls above ground level	✓	✗
	Insulation	✓	✗
	External enclosing walls below ground level	✓	✗
	Solar/rain screening	✓	✗
	External soffits	✓	✗
	Subsidiary walls, balustrades and proprietary balconies	✓	✗
	Façade access/cleaning systems	✓	✗
	Windows and external doors	✓	✗
	External windows	✓	✗
	Security and Fly Screens	✓	✗
	External doors	✓	✗
	Internal walls and partitions	✓	✗
	Walls and partitions	✓	✗
	Insulation	✓	✗
	Balustrades and handrails	✓	✗
	Moveable room dividers	✓	✗
	Cubicles	✓	✗
	Internal doors	✓	✗
Internal doors	✓	✗	
Internal finishes	Wall finishes	✓	✗
	Wall finishes	✓	✗
	Cornices & Shadowlines	✓	✗
	Paint - Walls	✓	✗
	Wet Area Walls	✓	✗
	Floor finishes	✓	✗
	Finishes to floors	✓	✗
Wet Area Floors	✓	✗	
Raised access floors	✓	✗	



Parent Name	Sub Category Name	Benchmark Design	Improved Design
	Ceiling finishes	✓	✗
	Finishes to ceilings	✓	✗
	False ceilings	✓	✗
	Demountable suspended ceilings	✓	✗
Fittings, furnishings and equipment	Fittings, furnishings and equipment	✓	✗
	General fittings, furnishings and equipment	✓	✗
	Domestic kitchen fittings and equipment	✓	✗
	Special purpose fittings, furnishings and equipment	✗	✗
	Signs/notices	✗	✗
	Works of art	✗	✗
	Non-mechanical and non-electrical equipment	✗	✗
	Internal planting	✗	✗
	Bird and vermin control	✗	✗
	Services equipment	Sanitary installations	✓
Sanitary appliances		✓	✗
Sanitary ancillaries		✓	✗
Services equipment		✓	✗
Services equipment		✓	✗
Disposal installations		✓	✗
Foul drainage above ground		✓	✗
Chemical, toxic and industrial liquid waste disposal		✗	✗
Refuse disposal		✓	✗
Water installations		✓	✗
Mains water supply		✓	✗
Cold water distribution		✓	✗
Hot water distribution		✓	✗
Local hot water distribution		✓	✗
Steam and condensate distribution		✗	✗
Heat source		✓	✗
Heat source		✓	✗
Space heating and air conditioning		✓	✗
Central heating		✓	✗
Local heating		✓	✗
Central cooling		✓	✗
Local cooling		✓	✗
Central heating and cooling		✓	✗
Local heating and cooling		✓	✗
Central air conditioning		✓	✗
Local air conditioning		✓	✗
Ventilation systems		✓	✗
Central ventilation		✓	✗
Local and special ventilation		✓	✗
Smoke extract/control		✓	✗
Electrical installations		✓	✗
Electric mains and sub-mains distribution		✓	✗
Power installations		✓	✗
Lighting installations		✓	✗
Specialist lighting installations		✓	✗
Local electricity generation systems		✓	✗
Earthing and bonding systems		✓	✗
Fuel installations		✗	✗
Fuel storage		✗	✗
Fuel distribution systems		✗	✗
Lift and conveyor installations		✓	✗
Lifts and enclosed hoists		✓	✗
Escalators		✓	✗
Moving pavements		✓	✗
Powered stairlifts		✗	✗
Conveyors		✗	✗
Dock levellers and scissor lifts		✗	✗



Parent Name	Sub Category Name	Benchmark Design	Improved Design
	Cranes and unenclosed hoists	X	X
	Car lifts, car stacking systems, turntables and the like	X	X
	Document handling systems	✓	X
	Other lift and conveyor installations	✓	X
	Fire and lightning protection	X	X
	Fire-fighting systems	X	X
	Fire suppression systems	X	X
	Lightning protection	X	X
	Communication, security and control systems	✓	X
	Communication systems	✓	X
	Security systems	✓	X
	Central control/building management systems	✓	X
	Specialist installations	✓	X
	Specialist piped supply installations	X	X
	Specialist refrigeration systems	X	X
	Specialist mechanical installations	X	X
	Specialist electrical/electronic installations	X	X
	Water features	X	X
	Civil Engineering Structure	✓	X
	Builder's Work in Connection (BWIC) with Services	X	X
	BWIC with services	X	X
Prefabricated buildings and building units	Prefabricated buildings and building units	X	X
	Complete buildings	X	X
	Building units	X	X
	Pods	X	X
Work to existing building	Minor demolitions and alterations	X	X
	Minor Demolitions and Alterations	X	X
	Repairs to existing services	X	X
	Repairs to existing services	X	X
	Damp proof course/fungus and beetle eradication	X	X
	Damp Proof Course/Fungus and Beetle Eradication	X	X
	Façade Retention	X	X
	Façade Retention	X	X
	Cleaning Existing Surfaces	X	X
	Cleaning Existing Surfaces	X	X
	Renovation work	X	X
	Renovation Work	X	X
External works	Site preparation works	✓	X
	Site clearance	✓	X
	Preparatory groundworks	✓	X
	Roads, paths and pavings	✓	X
	Roads, paths and pavings	✓	X
	Special surfacings and pavings	✓	X
	Soft landscaping, planting and irrigation systems	✓	X
	Seeding and turfing	✓	X
	External planting	✓	X
	Irrigation systems	✓	X
	Fencing, railings and walls	✓	X
	Fencing and railings	✓	X
	Walls and screens	✓	X
	Retaining walls	✓	X
	Barriers and guardrails	✓	X
	External fixtures	X	X
	Site/street furniture and equipment	X	X
	Ornamental features	X	X
	External drainage	✓	X
	Surface water and foul water drainage	X	X
	Ancillary drainage systems	X	X
	External chemical, toxic and industrial liquid waste drainage	X	X
	Land drainage	✓	X



Parent Name	Sub Category Name	Benchmark Design	Improved Design
	External services	✓	✗
	Water mains supply	✓	✗
	Electricity mains supply	✓	✗
	External transformation devices	✓	✗
	Electricity distribution to external plant and equipment	✓	✗
	Gas mains supply	✓	✗
	Telecommunications and other communication system connections	✓	✗
	External fuel storage and piped distribution systems	✓	✗
	External security systems	✓	✗
	External/street lighting systems	✓	✗
	Local/district heating installations	✓	✗
	BWIC with external services	✓	✗
	Minor building works and ancillary buildings	✗	✗
	Minor building works	✗	✗
Ancillary buildings and structures	✗	✗	
Underpinning to external site boundary walls	✗	✗	
Facilitating works	Toxic/hazardous/contaminated material treatment	✗	✗
	Toxic/hazardous material removal	✗	✗
	Contaminated land	✗	✗
	Eradication of plant growth	✗	✗
	Major demolition works	✓	✗
	Demolition works	✓	✗
	Soft strip works	✓	✗
	Temporary support to adjacent structures	✗	✗
	Temporary support to adjacent structures	✗	✗
	Specialist groundworks	✗	✗
	Site dewatering and pumping	✗	✗
	Soil stabilisation measures	✗	✗
	Ground gas venting measures	✗	✗
	Temporary diversion works	✗	✗
	Temporary diversion works	✗	✗
	Extraordinary site investigation	✗	✗
Archaeological investigation	✗	✗	
Reptile/wildlife mitigation measures	✗	✗	
Other extraordinary site investigation	✗	✗	
Project/design team	Consultants	✓	✗
	Planning & Approvals	✓	✗
	Main contractor's pre-construction design	✓	✗
	Project Management	✓	✗
	Main contractor's design	✓	✗
	Sales and Marketing	✓	✗
Undefined			





Life Cycle Assessment

33b Smith St, Highgate, WA

City of Vincent

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eToolLCD Software Disclaimer

The LCA predictions of embodied and operational impacts (including costs) conducted in eToolLCD software, by their very nature, cannot be exact. It is not possible to track all the impacts associated with a product or service back through history, let alone do this accurately. eToolLCD software has been built and tested to enable informed decisions when comparing design options. Generic cost and environmental impact coefficients do not necessarily correspond to those of individual brands of the same product or service due to differences within industries in the way these products and services are delivered.

This LCA study has not been reviewed and as such does not meet the relevant section of the ISO14044 requirements. Caution should be taken when interpreting the LCA study report.

eTool PTY LTD cannot make assurances regarding the accuracy of these reports for the above reasons.

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Executive Summary

This Life Cycle Assessment has been completed for a number of design scenarios for the Low Density Dwelling, located at 33b Smith St, Highgate, WA. The Author of the study is Robin Campbell of eTool and no critical review has been conducted.

The goal of this study is to profile and improve the environmental performance of the construction works at 33b Smith St, Highgate, WA. The life cycle performance of the project is compared to other designs. The study has been conducted in accordance with ISO 14044 and EN15978.

Characterised Impacts Per Occupant Per Year		Benchmark Design	Improved Design	Improved Design Savings Against Benchmark Design
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	3.31e+3	1.07e+3	68%
Ozone Depletion Potential, ODP	kg CFC-11 eq	1.24e-4	1.94e-4	-57%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	8.92e+0	4.50e+0	50%
Eutrophication potential, EP	kg PO ₄ eq	2.95e+0	2.06e+0	30%
Photochemical Ozone Creation Potential, POCP	kg ethylene	5.92e-1	3.35e-1	43%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	1.07e-1	7.47e-2	30%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	44873	14169	68%

Table 1: Summary of Results

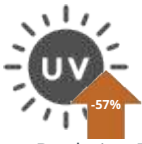
The Improved Design shows an expected performance improvement against Business as Usual for 6 of the 7 environmental indicators.



Improved Design Performance against Benchmark



Global Warming Potential, GWP



Ozone Depletion Potential, ODP



Acidification Potential for Soil and Water, AP



Eutrophication potential, EP



Photochemical Ozone Creation Potential, POCP



Abiotic Depletion Potential - Elements, ADPE



Abiotic Depletion Potential - Fossil Fuels, ADPF

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1 Introduction

Managing the environmental impacts that arise from the construction and operation of Building is of key importance in mitigating the damage caused directly and indirectly on the biosphere. Life Cycle Assessment (LCA) is the leading industry standard in clearly identifying optimum strategies for reducing environmental impacts. This report presents the results of the LCA completed for the Improved Design, City of Vincent Project located at 33b Smith St, Highgate, WA. eToolLCD software has been used to model the infrastructure's environmental impacts.

The study has been conducted in accordance with the following standards:

- International Standards 14040 and 14044.
- European Standard EN 15978: *Sustainability of Construction Works – Assessment of Environmental Performance of Buildings – Calculation Method*

The Author of the study is Robin Campbell of eTool and no critical review has been conducted.

2 Goal of the study

The goal of this study is to provide profile and improve the environmental performance of the construction works at 33b Smith St, Highgate, WA. The life cycle performance of the project is compared to other designs and as such this is a comparative study. The results of the study are intended to be made public.

3 Scope of the study

The LCA study has been conducted in accordance with the EN 15978 standard to assess the direct and indirect potential environmental impacts associated with the construction works at 33b Smith St, Highgate, WA as part of the City of Vincent project.

3.1 Functional Unit

The function of the Building must reflect the core purpose of the asset such that it can be compared accurately to different designs. In this case, the functional focus is the Residence and the chosen functional unit is the provision of this function for one Occupant over one year.

The estimated design life of the design is 55 years which has been adopted for the LCA study period. This takes into consideration the structural service life limit (150 years), as well as redevelopment pressure on the asset such as surrounding density, asset ownership structures, and the architectural design quality.

Note that products with expected service lives of less than the life span of the project are assumed to be replaced at increments reflecting their service life.

3.2 System Boundary

The system boundary, shown in Figure 1, follows guidance given in EN15978.



System Boundary

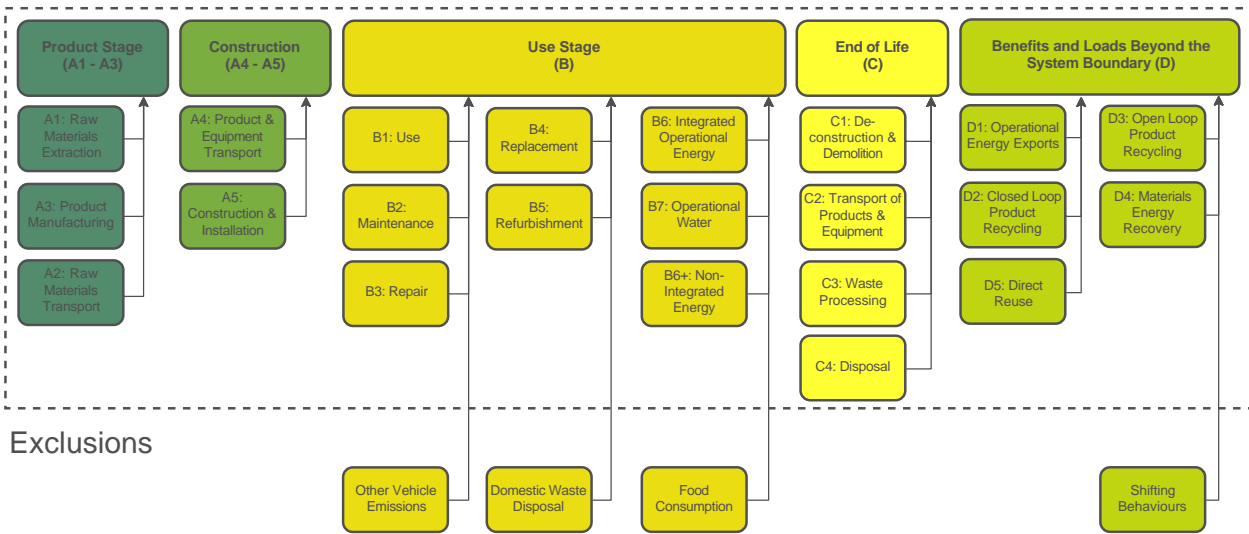


Figure 1: System Boundary Diagram

3.3 Environmental Indicators

The environmental indicators have been included in the study are detailed in Table 2. For further information regarding the environmental indicators please refer to Appendix A.

Environmental Indicator	Unit	Abbreviation	Characterisation Method
Global Warming Potential, GWP	kg CO ₂ eq	GWP	CML-IA baseline V4.5
Ozone Depletion Potential, ODP	kg CFC-11 eq	ODP	CML-IA baseline V4.5
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	AP	CML-IA baseline V4.5
Eutrophication potential, EP	kg PO ₄ eq	EP	CML-IA baseline V4.5
Photochemical Ozone Creation Potential, POCP	kg ethylene	POCP	Institute of Environmental Sciences (CML)
Abiotic Depletion Potential - Elements, ADPE	kg antimony	ADPE	CML-IA baseline V4.5
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	ADPF	CML-IA baseline V4.5

Table 2: Environmental Indicators Included in LCA study.

3.4 System Description

The object of the assessment is the Low Density Dwelling, located at 33b Smith St, Highgate, WA. The assessment includes all the upstream and downstream processes needed to provide the primary function of the structure from construction, maintenance, operation, and finally demolition and disposal associated with the low density dwelling. The inventory includes the extraction of raw materials or energy and the release of substances back to the environment or to the point where inventory items exit the system



boundary either during or at the end of the project life cycle.

The area of the project is the City of Vincent local government in Western Australia. This local government authority covers an area of approximately 10.4 square kilometres in metropolitan Perth, the capital of Western Australia, and lies about 3 km from the Perth CBD. It includes the suburbs of Highgate, Leederville, Mount Hawthorn, North Perth, as well as parts of Coolbinia, East Perth, Mount Lawley, Osborne Park, Perth and West Perth. The City of Vincent maintains 139 km of roads and 104 ha of parks and gardens.

New developments in the area must comply with the city's [built form policy released in 2020](#).

The project location is shown in figures 2 and 3.



Figure 2: Location of the project - Global View.

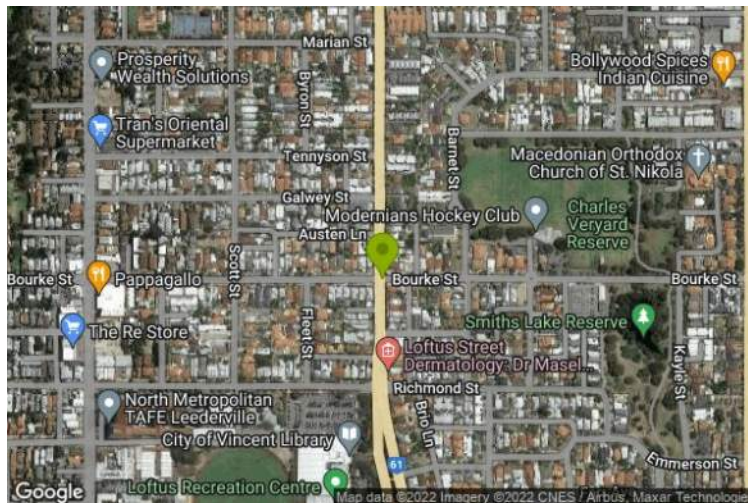


Figure 3: Location of the project - Locality View.

4 Townhouses. U3 is 3br, 2.5 bath. U4 is 3br, 2.5 bath. U5 is 3br, 3 bath. U6 is 3br, 2.5 bath. Each unit has a carport space on the ground level and there is 1 extra shared parking space for visitors.

Table 3 below shows the key characteristics of the design.

	Business as Usual	Improved Design
Design Details		
Design Name	AU WA Res Ave Code Compl CZ 5 (10 dwellings)	33b Smith St, Highgate, WA



	Business as Usual	Improved Design
Stories (#)	2	2
Functional Focus	Single Family Residence	Residence
Structural Service Life Limit	100	150
Predicted Design Life	54	55
Functional Characteristics		
Dwellings	10	4
Bedrooms	30	12
Occupants	24	10
Vehicle Spaces	0	5
Total Floor Areas		
Usable Floor Area	2,140	399
Net Lettable Area	0	0
Fully Enclosed Covered Area	3,010	399
Unenclosed Covered Area	0	90
Gross Floor Area	3,010	489
Usable and Lettable Yield	71 %	82 %

Table 3: Design Characteristics Compared

Table 4 and 5 show the scope (structural and operational) of the inventory collection for the LCA. For further details on structure scope please refer to Appendix B.

Summary Structure Scope Diagram

Key: ✓ In Scope ✓ Partial ✗ Out of Scope

Category Name	Benchmark Design	Improved Design
Substructure	✓	✗
Superstructure	✓	✗
Internal finishes	✓	✗
Fittings, furnishings and equipment	✓	✗
Services equipment	✓	✗
Prefabricated buildings and building units	✗	✗
Work to existing building	✗	✗
External works	✓	✗
Facilitating works	✓	✗
Project/design team	✓	✗
Undefined	✗	✗

Table 4: Structural scope of LCI collection

Operational Scope diagram

Key: ✓ In Scope ✗ Out of Scope

Category Name	Benchmark Design	Improved Design
Appliances Dishwashers	✓	✗
Appliances Entertainment	✓	✗
Appliances Laundry Appliances	✓	✗
Appliances Office Workstations	✓	✗
Communications	✓	✗
Cooking and Food Preparation	✓	✗
Domestic Water Heating	✓	✗
Electrical Parasitic Loads	✓	✗
Fire Protection	✗	✗
HVAC	✓	✗
Industrial & Manufacturing Equipment	✗	✗
Lifts, Elevators and Conveying	✗	✗
Lighting	✓	✗
Miscellaneous	✗	✗
Monitoring, Control and Automation	✓	✗
Power Generation and Storage	✓	✗
Refrigeration	✓	✗



Category Name	Benchmark Design	Improved Design
Safety and Security	✓	✗
Swimming Pools	✓	✗
Water Pumping	✓	✗
Water Removal and Treatment	✓	✗
Water Supply	✓	✗
Workshops, Garage & Misc	✓	✗

Table 5: Operational scope of LCI collection

3.5 Cut off Criteria

The EN15978 cut-off criteria were used to ensure that all relevant potential environmental impacts were appropriately represented:

- Mass – if a flow is less than 1% of the mass at either a product-level or individual-process level, then it has been excluded, provided its environmental relevance is not of concern.
- Energy – if a flow is less than 1% of the energy at either a product-level or individual-process level, then it has been excluded, provided its environmental relevance is not a concern.
- The total of neglected input flows per module, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5% of energy usage and mass.
- Environmental relevance – if a flow meets the above criteria for exclusion, but is considered to potentially have a significant environmental impact, it has been included. All material flows which leave the system (emissions) and whose environmental impact is higher than 1% of an impact category, have been included.

The Operational Guidance for Life Cycle Assessment Studies (Wittstock et al. 2012) states:

The apparent paradox is that one must know the final result of the LCA (so one can show that the omission of a certain process is insignificant for the overall results) to be able to know which processes, elementary flows etc. can be left out.

The approach taken in this study is to continue modelling smaller inputs until confidence is gained that the criteria is safely met.

3.6 Allocation

Allocation rules follow those of EN15804 as given below:

- Allocation will respect the main purpose of the studied processes. If the main purpose of combined processes cannot be defined (e.g. combined mining and extraction of nickel and precious metals), economic allocation may be used to divide resources and emissions between the products.
- The principle of modularity is maintained. Where processes influence the product's environmental performance during its life cycle, they will be assigned to the module where they occur.
- The sum of the allocated inputs and outputs of a unit process are equal to the inputs and outputs of the unit process before allocation. This means no double counting of inputs or outputs is permissible.

3.7 Independent Review

No independent review has been conducted of this study.

4 Inventory Analysis

The design has been modelled using the available eToolLCD elements, templates and EPDs as shown in Table 6.

eToolLCD Item Type	Count in Design	
	Benchmark	Improved Design
Design Templates	24	129
Equipment and People Elements	495	192
Material Elements	841	341
Energy Elements	38	30
Water Elements	12	13
EPDs	0	0

Table 6: Count of elements, templates and EPDs in the design

The eToolLCD library templates are customisable and users may submit templates for validation. The template validation process is undertaken by experienced LCA practitioners and is a process of checking the user inputs and ensuring the assumptions are adequately referenced. Table 7 shows the extent to which validated templates were used in the model.

eToolLCD Item Type	Validated (%)	
	Benchmark	Improved Design
Total Design Templates	8.33	50.39
Equipment and People Elements	1.01	53.12
Material Elements	.48	37.83
Energy Elements	0	0
Water Elements	0	0

Table 7: Use of validated templates

4.1 Templates Comparison

The eToolLCD templates found in each design are provided in Table 8.

Parent Template Name	Units	Quantity
		Improved Design
Fittings, furnishings and equipment		
Appliances Residential Average (AUS)	#	4
Cooking, Res Electric Oven Induction Stove	#	4
Kitchen Medium sized (incl Equipment)	#	4
Refrigeration, Residential Well Ventilated Fridge Recess	#	4
Standard 1st Bathroom - WC/Shower-bath/Basin/WallTiles	#	10
Substructure		
Concrete Floor - 100mm slab on ground 30MPa 3.8% reo (Portland Cement)	m2	313
Staircase, Timber frame and timber treads	Other	4
Facilitating works		
Demolition - Residential (End-of-Life)	#	4
Superstructure		
Door - SolidCoreTimber/WoodenJam/Painted	#	32.5
Elevated Floor, Timber Frame 300mm Bearers and Joists, <6m Span, particle board sheeting, insulated	m2	225
Roof - TimberTruss/SteelSheeting/25degreePitch	m2	300.0833
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, coloured steel sheet cladding external	m2	178.9
Wall, External, Framed, Timber 140mm studs with battens, insulation, plasterboard and paint internal finish, fibre cement clad (9mm)	m2	396.8
Wall, Internal, Framed, Timber Stud Plasterboard and paint finish	m2	344.21
Windows Residential Aluminium Single Glaze fly screen	m2	95.7284620273972
Services equipment		
Electrical Fittings - sockets power points wiring embodied only (m2)	m2	744
LED Outdoor Lighting (Residential - Standard Efficiency), m2	m2	229.209443772257
LED Residential Lighting (Standard Efficiency)	#	4
Solar PV System Residential - Zone 3 (Perth Sydney etc)	Other	10
Split System Air Source Heat Pump for Cooling, Average Efficiency (COP/EER 3.65), R32 Refrigerant	#	7



Parent Template Name	Units	Quantity
		Improved Design
Split System Air Source Heat Pump for Heating, Average Efficiency (COP/EER 3.65), R32 Refrigerant	#	7
Standard Heat Pump (HWS_App)	#	4
Swimming Pool - Pumps and Filters Ultra Efficient	m2	0.001
Utilities Connection to Site Residential	#	4
Water tank - steel (embodied)	Other	1.6E-05
Water Use and Treatment (eTool Turbo)	#	4
Internal finishes		
Floor Covering - Carpet (glue down/Nylon)	m2	144
Floor Covering - Tiles (ceramic/5mm)	m2	33.7998675496689
Floor Covering - Vinyl (PVC) or Synthetic Linoleum	m2	273.74
External works		
Pool Structure - Concrete	m2	0.001
Swimming Pool Seasonal Temperature Control - No Pool Cover - Gas	m2	0.001

Table 8: Templates Comparison (showing master templates only)

4.2 eToolLCD software

eToolLCD software was used to model life cycle impacts of the project. eToolLCD uses third party background processes aggregated as mid-point indicators and stored in a number of libraries within the software which are coupled with algorithms and user inputs to output the environmental impact assessment. A map of user inputs, data sources and algorithms (outputs) is given in Figure 4.

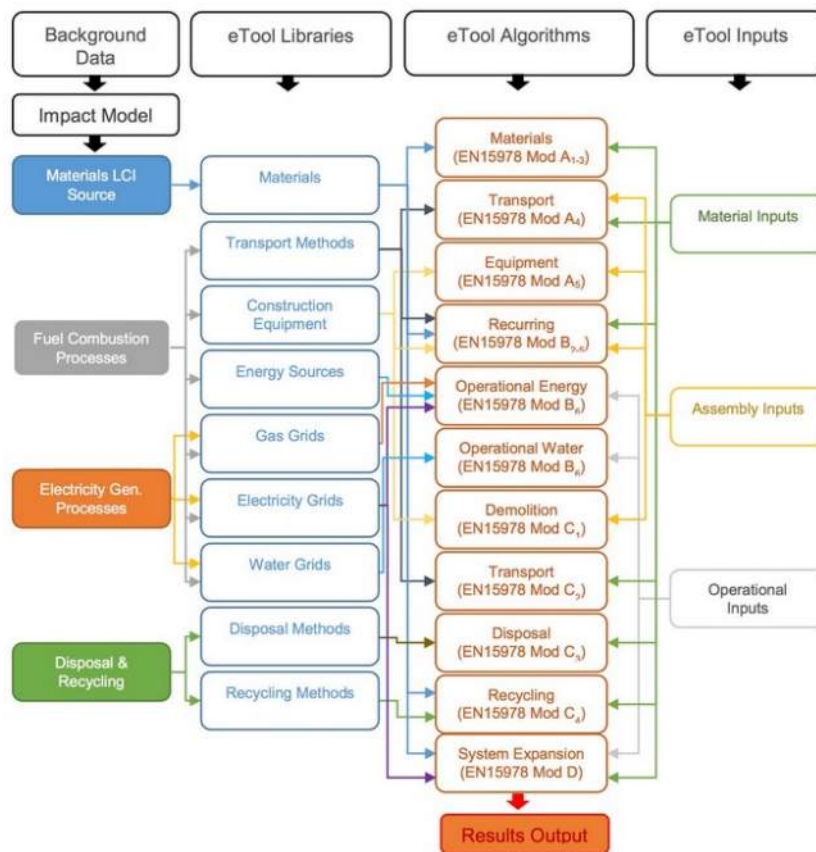


Figure 4: Relationship between LCI background data, eToolLCD software library, inputs and algorithms.

4.3 Data Quality

The data quality requirements for the background data are detailed in Table 9. Each of the criteria has been assessed for compliance and



results presented below.

Criteria	Background Data Requirement	Compliance	
		Benchmark	Improved Design
Temporal Relevancy	For annually fluctuating processes like Grid electricity fuel mixes the datasets must have been updated within the last 2 years. More static processes like materials production must have been updated within the last 10 years. Product specific EPDs must have been updated in the last 5 years.	Failed Grid Passed Materials	Failed Grid Passed Materials
Geographical Relevancy	The background data should be specifically compiled for the same country (preferable) or continent as the project location.	Passed (Same Continent)	Passed (Same Country)
Precision	No requirement specified however a qualitative review undertaken to ensure no erroneous values	Passed	Passed
Completeness	Qualitative assessment of the process to ensure no obvious exclusions	Passed	Passed
Technological Relevancy	Ensure that technology assumptions are representative for the product or product group.	Passed	Passed
Consistency	The study methodology holds for the background data.	Passed	Passed
Reproducibility	The information available about the methodology and the data values reported should allow an independent practitioner to reproduce the results reported in the study.	Passed	Passed

Table 9: Summary of data quality requirements for the study.

Criteria	Inventory Collection Requirement (eToolLCD User Inputs)	Compliance	
		Benchmark	Improved Design
Temporal Relevancy	All inputs into eToolLCD to be reflective of the project being assessed and if assumptions are made these are to be based on industry practices that are consistent with the project commissioning date.	Passed 0/5 Checks	Passed 0/1 Checks
Geographical Relevancy	All inputs into eToolLCD must be reflective of the project being assessed and if assumptions are made these are based on the current practices employed in the project country.	Passed 0/5 Checks	Passed 0/2 Checks
Precision	To avoid aggregated errors a high level of precision is expected inputs into eToolLCD software, being either to 3 significant figures or: <ul style="list-style-type: none"> Two significant figures or nearest 10 hours for equipment run time Two significant figures or nearest 10kg for material quantities Two significant figures or nearest 100MJ / annum for operational energy Two significant figures or nearest 100kL / annum for operational water use 	Passed 0/4 Checks	Passed 0/1 Checks
Completeness	Inputs to cover all life cycle phases and elements identified in the system boundary. The link between background data, eToolLCD algorithms and subsequent LCA results is not to introduce significant gaps in the data.	Passed 0/9 Checks	Passed 0/2 Checks
Technological Relevancy	All inputs into eToolLCD must be reflective of the project being assessed and if assumptions are made these must be drawn from appropriate examples of like technology.	Passed 0/5 Checks	Passed 0/1 Checks
Consistency	All inputs into eToolLCD must be reflective of the project being assessed and if assumptions are made these are drawn from the same reference library.	Passed 0/9 Checks	Passed 0/0 Checks
Reproducibility	The information available about the methodology and the data values reported should allow an independent practitioner to reproduce the results reported in the study.	Passed 0/9 Checks	Passed 0/1 Checks

Table 10: Summary of data quality requirements for the study.

4.4 Completeness

The study aims to follow EN15804 procedures for exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process shall be included in the calculation, for which data are available.
- Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices shall be documented.
- In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % renewable and non-renewable primary energy usage and 1 % of the total mass input of that unit process.
- The total of neglected input flows per module, e.g. per module shall be a maximum of 5 % of energy usage and mass.
- Conservative assumptions in combination with plausibility considerations and expert judgement can be used to demonstrate compliance with these criteria.
- Particular care should be taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators.



Two major tests were run to determine the compliance with the above cut-off rules.

4.3.1 Inventory Mass Quantities

The cumulative mass of inventory entries is shown in Figure 5. Given that 184 material elements within the LCA base design make up the last 1% of mass inventory entries a high level of confidence exists that the cut off rules have been upheld.



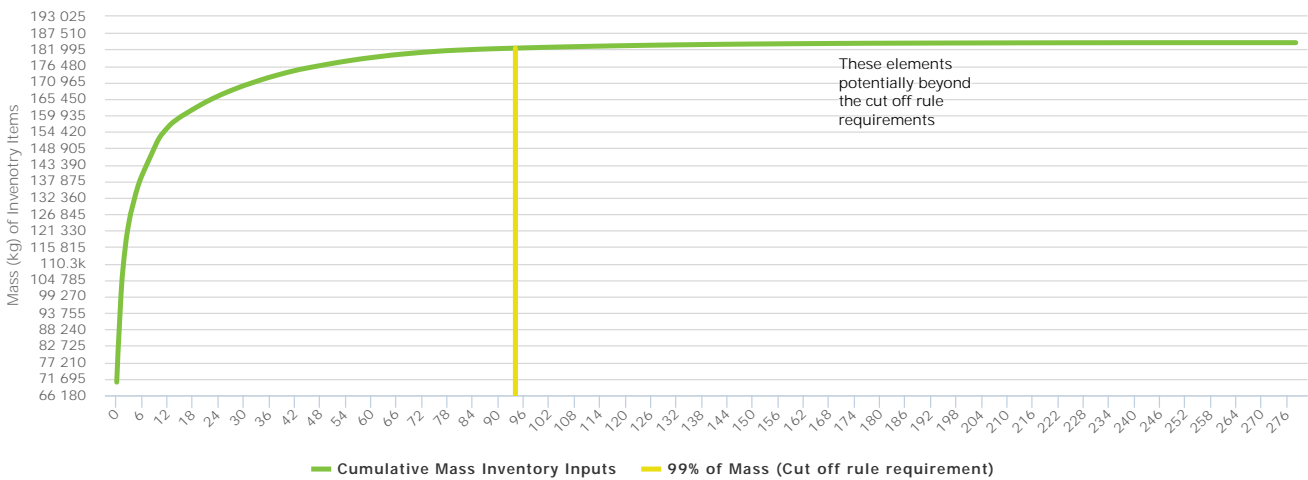


Figure 5: Cumulative Mass Inventory Entries. In this case 65.95% make up the last 5% of mass inventory entries.

4.3.2 Inventory Energy Analysis

The cumulative embodied energy of inventory entries is shown in Figure 6. Given that 337 elements within the LCA base design make up the last 1% of embodied energy inventory entries a high level of confidence exists that the cut off rules have been upheld.

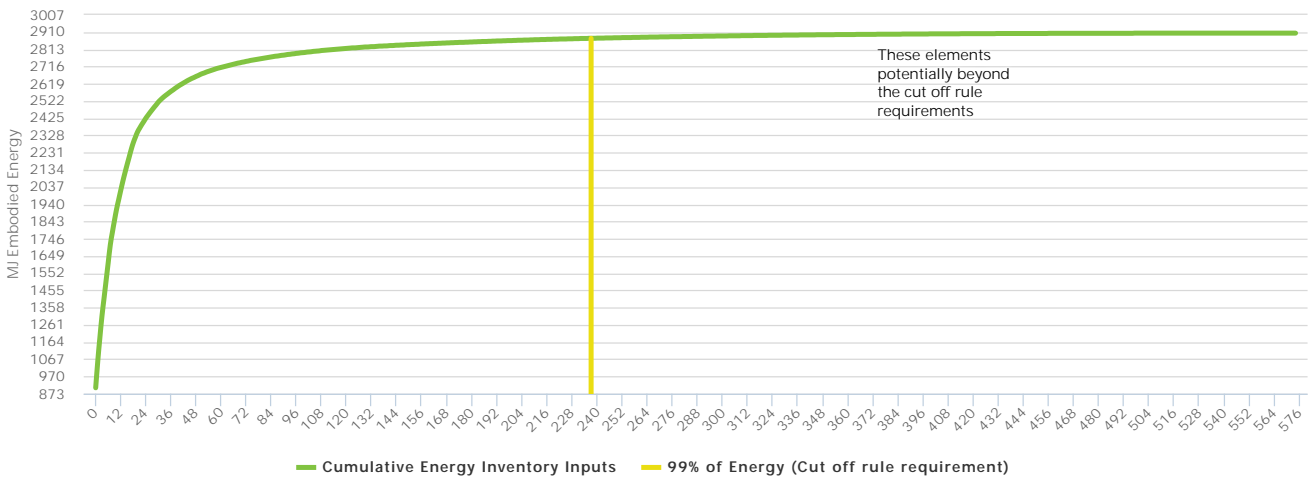


Figure 6: Cumulative Energy Inventory Entries. In this case 58.61% make up the last 5% of energy inventory entries.

5 Life Cycle Impact Assessment

The Life Cycle Impact Assessment (LCIA) results are provided in Table 11 and subsequent tables in the EN15978 reporting format. The heat map highlights the highest impacts for each indicators assessed and conversely in the comparison tables the highest savings observed. For further details on the LCIA please refer to interpretation.



5.1 Improved Design Environmental Impacts Indicators

Characterised Impacts Per Occupant Per Year		Materials and Construction			Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundary	Total		
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B6+	B7	C1	C2	C3	C4		D	
Benchmark																			
	GWP	kg CO ₂ eq	6.18e+2	1.24e+2	95.742	0	0	MNA	5.06e+2	0	9.40e+3	8.22e+2	1.66e+2	0	50.083	0	69.335	-75.873	3.31e+3
	ODP	kg CFC-11 eq	3.00e-5	1.91e-5	1.47e-5	0	0	MNA	3.44e-5	0	4.88e-6	6.59e-6	3.61e-6	0	7.97e-6	0	4.61e-6	-2.26e-6	1.24e-4
	AP	kg SO ₂ eq.	3.5093	0.3927	0.2682	0	0	MNA	2.4678	0	1.1599	1.5239	0.3678	0	0.1555	0	0.0906	-1.0128	8.9228
	EP	kg PO ₄ eq	1.28e+0	9.64e-2	4.67e-2	0	0	MNA	8.26e-1	0	3.81e-1	5.09e-1	2.43e-1	0	3.47e-2	0	1.94e-2	-4.85e-1	2.95e+0
	POCP	kg ethylene	2.24e-1	2.51e-2	3.61e-2	0	0	MNA	1.67e-1	0	8.29e-2	4.24e-2	2.40e-2	0	1.03e-2	0	1.40e-2	-3.41e-2	5.92e-1
	ADPE	kg antimony	5.86e-2	3.61e-3	2.61e-4	0	0	MNA	4.79e-2	0	4.21e-3	6.09e-3	2.88e-3	0	2.02e-3	0	1.11e-4	-1.88e-2	1.07e-1
	ADPF	MJ	7674.4	1899.3	1298.7	0	0	MNA	7168.8	0	1.38e+4	1.06e+4	2002.3	0	779.5	0	464	-826.2	44873
Improved Design																			
	GWP	kg CO ₂ eq	161.66	37.76	24.868	-0.435	2.064	MNA	3.41e+2	0	29.053	751.82	1.02e+2	9.684	10.448	1.832	71.327	-477.83	1.07e+3
	ODP	kg CFC-11 eq	3.98e-5	5.80e-6	2.54e-6	0	2.61e-7	MNA	1.35e-4	0	2.33e-7	6.03e-6	2.36e-6	1.67e-6	1.66e-6	3.68e-7	7.98e-7	-2.38e-6	1.94e-4
	AP	kg SO ₂ eq.	2.11e+0	1.23e-1	5.49e-2	0	7.52e-3	MNA	1.80e+0	0	5.39e-2	1.39e+0	2.32e-1	2.82e-2	3.21e-2	4.43e-3	1.67e-2	-1.36e+0	4.50e+0
	EP	kg PO ₄ eq	1.11e+0	0.0333	8.27e-3	0	2.18e-3	MNA	7.77e-1	0	1.80e-2	4.65e-1	1.71e-1	5.73e-3	7.13e-3	9.63e-4	3.61e-3	-5.42e-1	2.06e+0
	POCP	kg ethylene	1.50e-1	7.87e-3	1.20e-2	0	5.78e-4	MNA	1.37e-1	0	1.50e-3	3.88e-2	1.51e-2	2.18e-3	2.13e-3	1.67e-4	1.05e-2	-4.30e-2	3.35e-1
	ADPE	kg antimony	3.23e-2	9.85e-4	5.14e-5	0	1.02e-4	MNA	4.23e-2	0	2.15e-4	5.57e-3	1.97e-3	7.46e-5	3.78e-4	1.58e-5	1.86e-5	-9.17e-3	7.47e-2
	ADPF	MJ	3231.7	573	236.8	0	29.5	MNA	4371.9	0	375.4	9715.4	1222.8	145.5	161.5	23.4	79.1	-5997	14169
Savings (Improved Design Compared to Benchmark)																			
	GWP	kg CO ₂ eq	4.56e+2	86.251	70.874	0.435	-2.064	MNA	1.64e+2	0	9.11e+2	70.229	63.105	-9.684	39.635	-1.832	-1.991	4.02e+2	67.83%
	ODP	kg CFC-11 eq	-9.77e-6	1.33e-5	1.22e-5	0	-2.61e-7	MNA	-1.01e-4	0	4.64e-6	5.63e-7	1.25e-6	-1.67e-6	6.31e-6	-3.68e-7	3.82e-6	1.17e-7	-57.12%
	AP	kg SO ₂ eq.	1.40e+0	2.69e-1	2.13e-1	0	-7.52e-3	MNA	6.70e-1	0	1.11e+0	1.30e-1	1.36e-1	-2.82e-2	1.23e-1	-4.43e-3	7.39e-2	3.44e-1	49.56%
	EP	kg PO ₄ eq	1.70e-1	6.31e-2	3.84e-2	0	-2.18e-3	MNA	4.87e-2	0	3.63e-1	4.35e-2	7.21e-2	-5.73e-3	2.75e-2	-9.63e-4	1.58e-2	5.62e-2	30.11%
	POCP	kg ethylene	7.42e-2	1.73e-2	2.41e-2	0	-5.78e-4	MNA	3.03e-2	0	8.14e-2	3.62e-3	8.94e-3	-2.18e-3	8.16e-3	-1.67e-4	3.47e-3	8.91e-3	43.45%
	ADPE	kg antimony	2.63e-2	2.62e-3	2.10e-4	0	-1.02e-4	MNA	5.58e-3	0	3.99e-3	5.20e-4	9.08e-4	-7.46e-5	1.64e-3	-1.58e-5	9.24e-5	-9.61e-3	30.04%
	ADPF	MJ	4442.8	1326.3	1061.9	0	-29.5	MNA	2796.9	0	1.34e+4	907.5	779.5	-145.5	617.9	-23.4	384.9	5170.8	68.42%

Table 11: Environmental Impacts Impact of Each Life Cycle Phase.

INA: Indicator Not Assessed. MNA: Module Not Assessed.

Impact Key: Top 10% Top 20% Top 30%

Savings Key: Top 10% Top 20% Top 30%

6 Life Cycle Interpretation

The following sections provide more detailed results of the life cycle impact assessment for each environmental indicator with the aim of identifying the largest areas of impact. A one page profile for each indicator is provided on the subsequent pages giving detailed information about the indicator. Each chart provided is explained below.

Impact Time Series Chart:

A chart displaying when impacts occur during the life of a design. This enables users to gain insights such the “environmental payback period” of a design compared to alternatives, or when there are jumps in an impact value during the life of the project (for example, relating to a large replacement item).

Top Five Charts

Each top 5 chart categorises the buildings and expresses the environmental impacts by these categories. This enables a detailed understanding of what is responsible for the greatest environmental burdens and also compares these burdens between designs. The pie chart associated with each bar chart shows the proportion of the building that is represented in the bar chart. A brief description of the categories is provided below:

- **LC Module Impacts:** The EN15978 Life Cycle Modules. Generally 100% building impacts will be included in the bar chart.
- **Construction Category:** The breakdown of the impacts by construction category. The bar chart will generally only part of the total building impacts.
- **Operational Demand:** The building end use demands that are driving environmental impacts.
- **Energy Supply:** The supply of fuels to the building, in effect the upstream fuel sources supplying energy for on site use during construction, operational and demolition.
- **Materials:** The materials (grouped into common categories) that are driving the environmental impacts.
- **Equipment and People:** The equipment and people required during construction, maintenance and demolition and all associated transport trips that are driving the environmental impacts

All impact figures are quoted per the functional unit selected for the study.

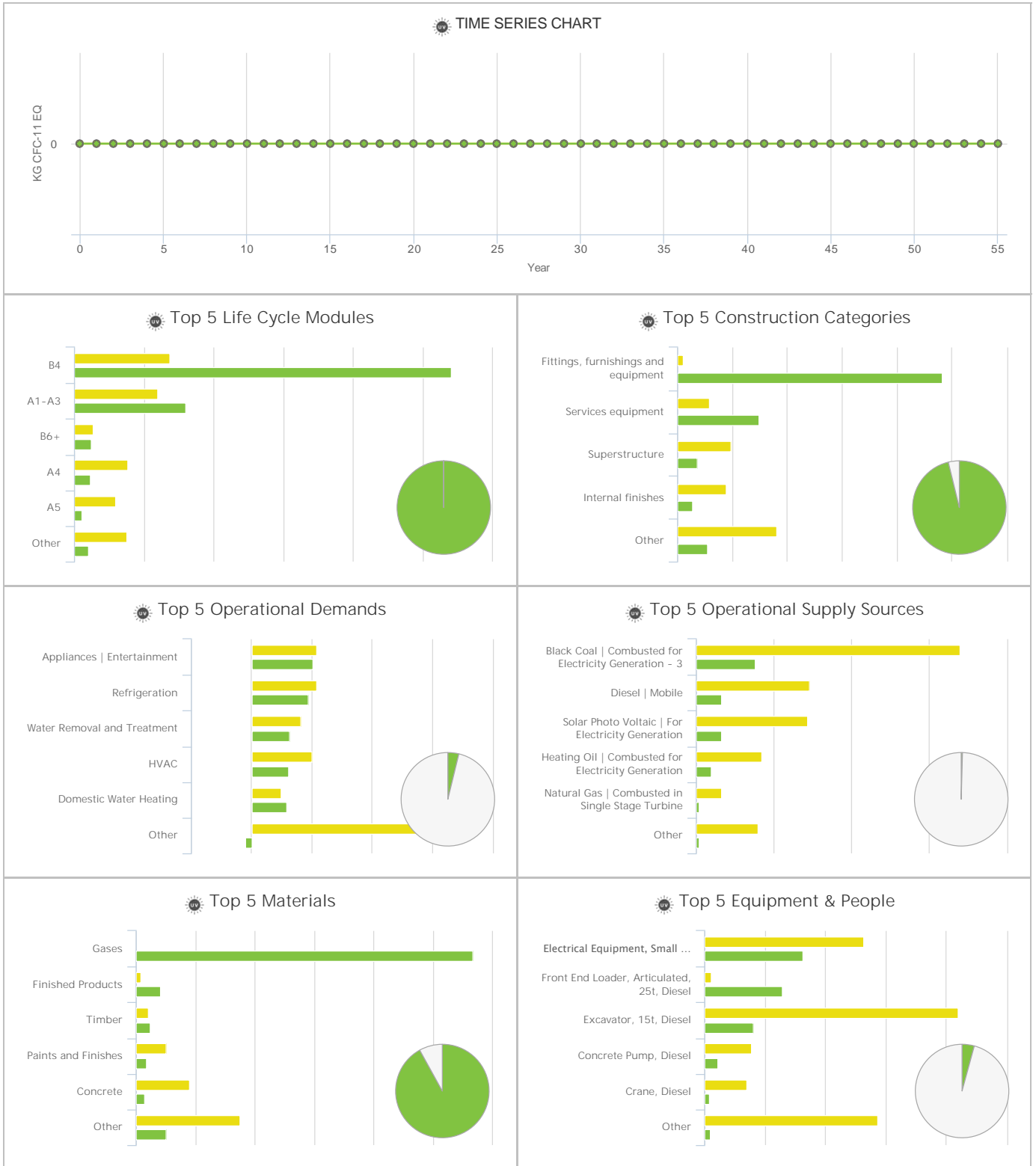
6.1 Global Warming Potential, GWP Profile

Business as Usual Improved Design



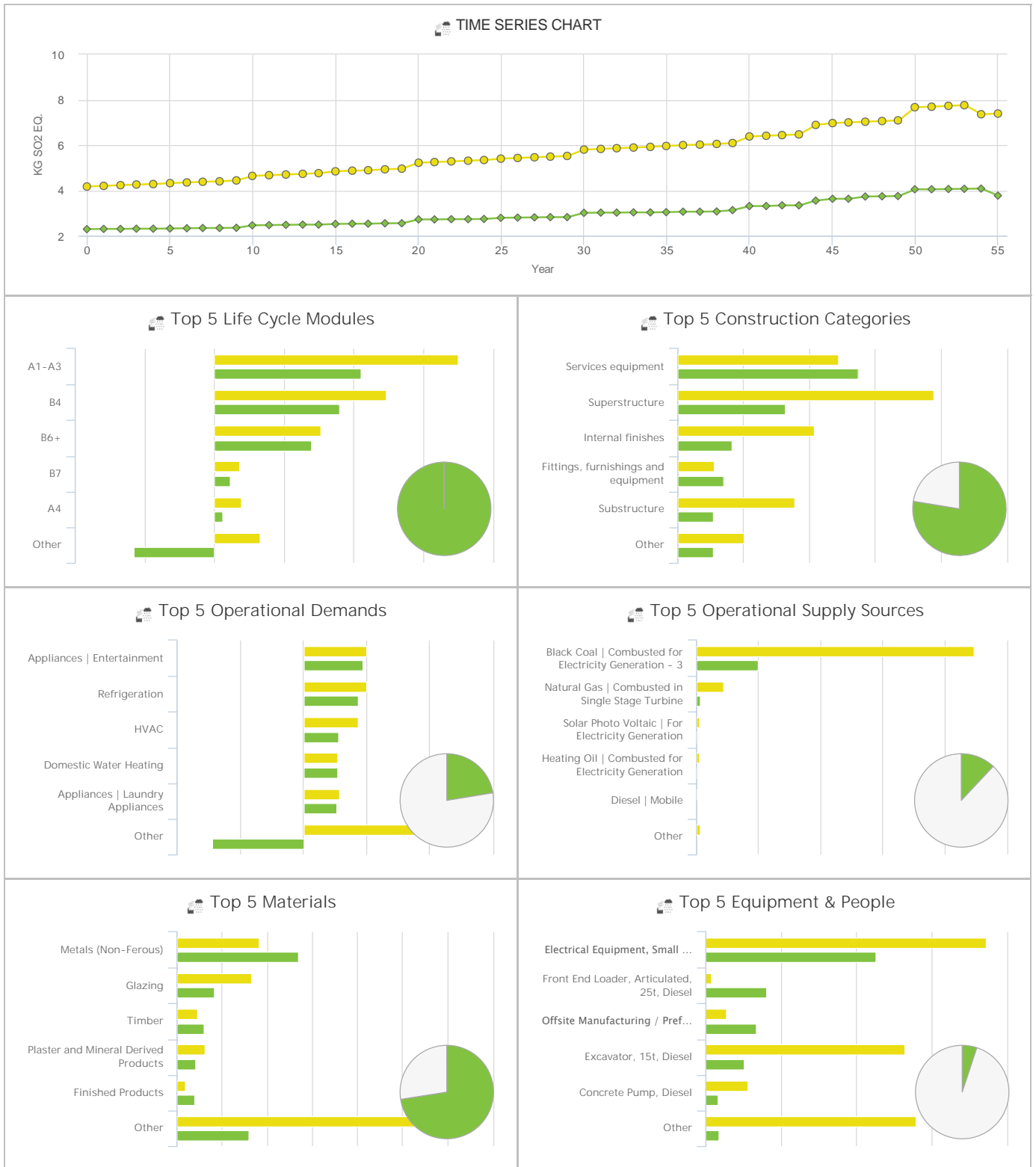
6.2 Ozone Depletion Potential, ODP Profile

☞ Business as Usual ☜ Improved Design



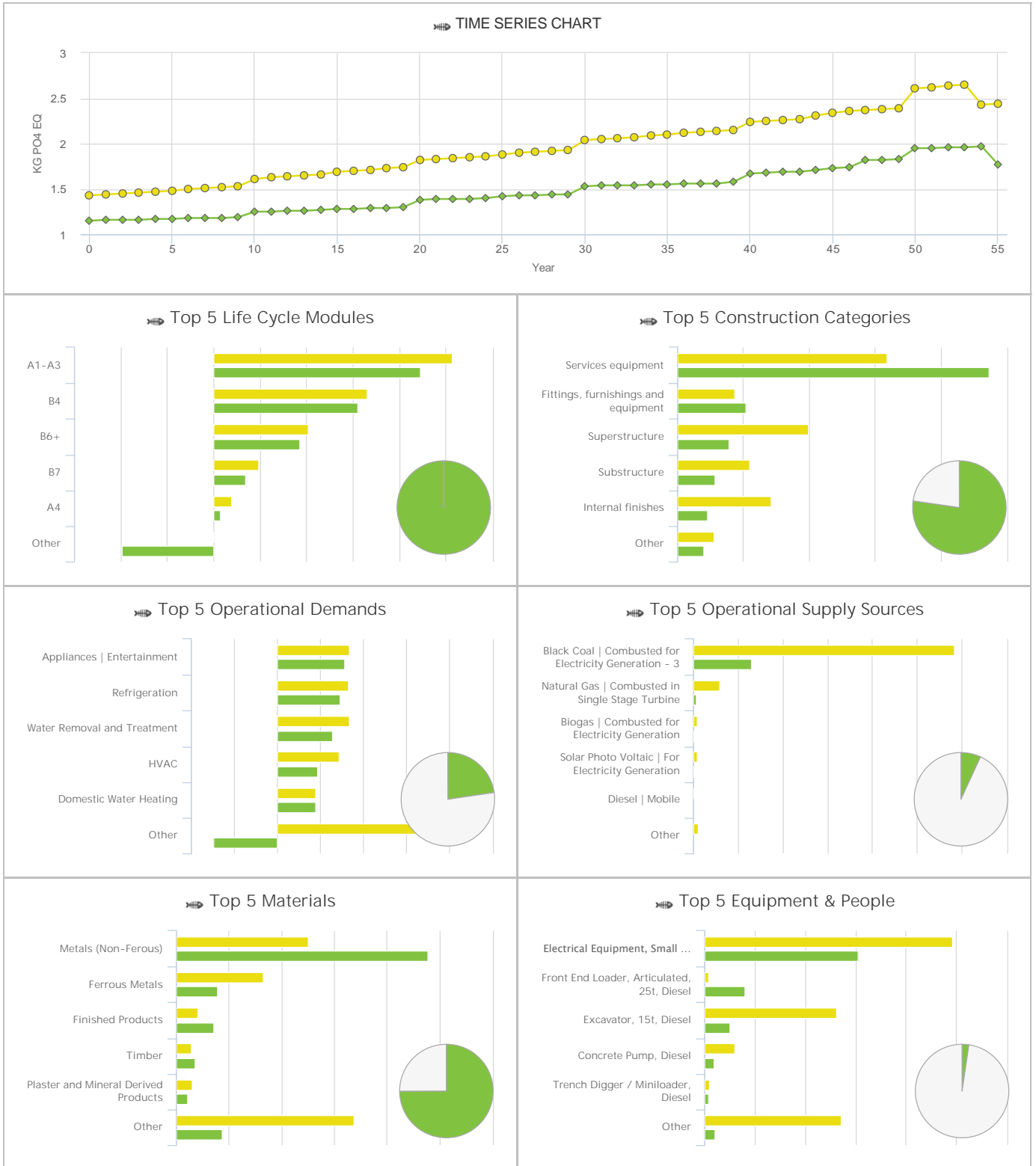
6.3 Acidification Potential for Soil and Water, AP Profile

Business as Usual Improved Design



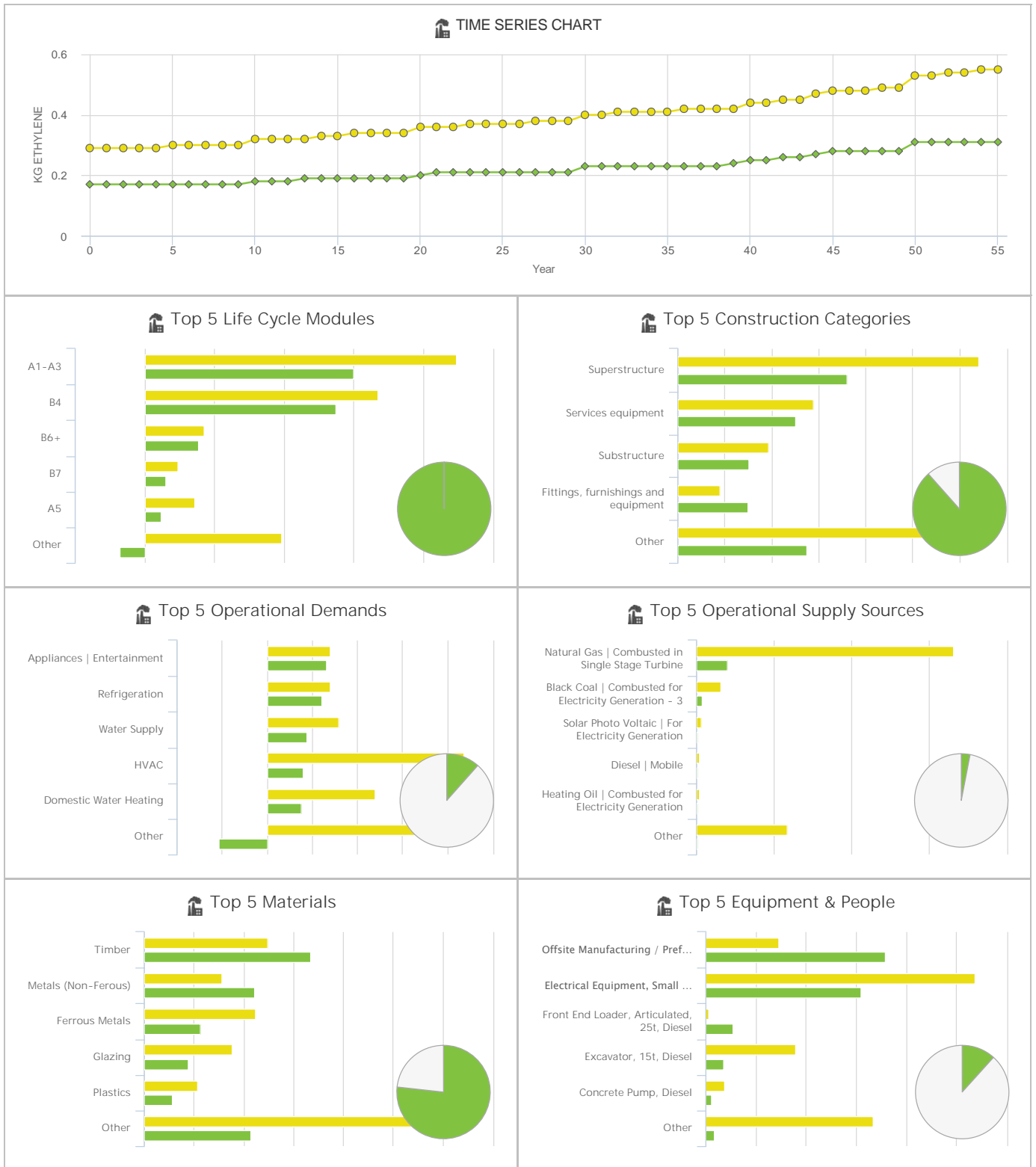
6.4 Eutrophication potential, EP Profile

Business as Usual Improved Design



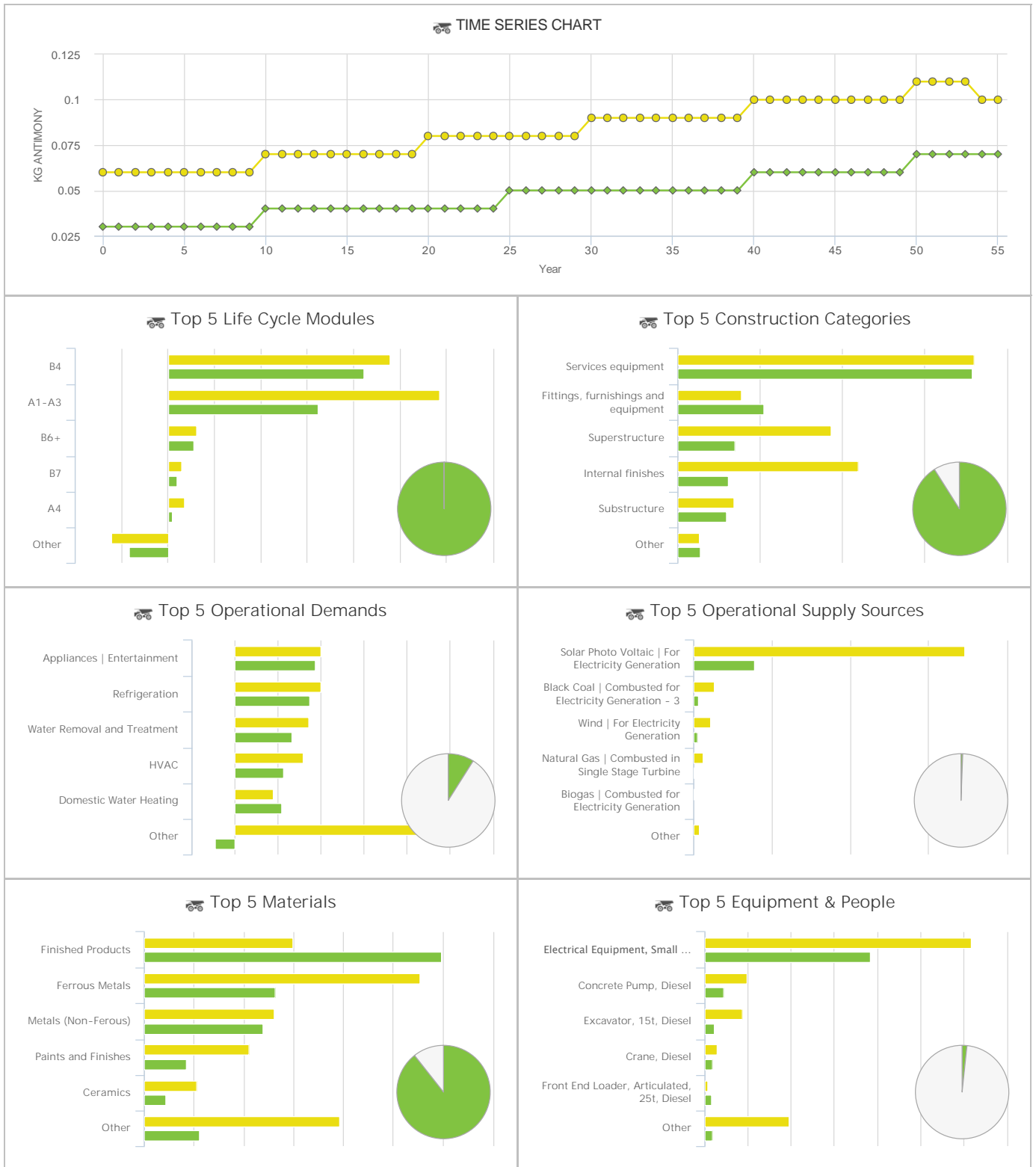
6.5 Photochemical Ozone Creation Potential, POCP Profile

Business as Usual Improved Design



6.6 Abiotic Depletion Potential - Elements, ADPE Profile

Business as Usual Improved Design



6.7 Abiotic Depletion Potential - Fossil Fuels, ADFP Profile

⚙️ Business as Usual 🏗️ Improved Design



7 Low Impact Strategies

The following potential low impact design strategies were modelled in the LCA study to determine the relative benefits and aid the design decision making process.

For each design strategy, the relative savings for all indicators is provided and given in context to the other strategies. A basic description of the strategy is also provided.



8 Conclusions

The Improved Design shows an expected performance improvement against Business as Usual for 6 of the 7 environmental indicators.



9 References

9.1 Background LCI Data

Life Cycle Strategies, 2015, Australasian LCI - V15 - Life Cycle Strategies (BETA)

9.2 Inventory - Design Documentation

No design documents were recorded.

9.3 Inventory - Assumptions

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9.4 Environmental Product Declarations

No EPD references were recorded.



Appendix A: Environmental Indicators Description

Global Warming Potential, GWP

Anthropogenic global warming is caused by an increase of greenhouse gasses (GHG) in the earth's atmosphere. These gasses reflect some of the heat radiated from the earth's surface that would normally escape into space back to the surface of the earth. Overtime this warms the earth. Common GHGs include CO₂, N₂O, CH₄ and volatile organic compounds (VOCs). Global Warming Potential (GWP) is expressed in equivalent GHGs released, usually in kgCO₂e.

Ozone Depletion Potential, ODP

Ozone is formed and depleted naturally in the earth's stratosphere (between 15-40 km above the earth's surface). Halocarbon compounds are persistent synthetic halogen containing organic molecules that can reach the stratosphere leading to more rapid depletion of the ozone. As the ozone in the stratosphere is reduced more of the ultraviolet rays in sunlight can reach the earth's surface where they can cause skin cancer and reduced crop yields. Ozone Depletion Potential (ODP) is expressed in equivalent ozone depleting gasses (normally kgCFC11e).

Acidification Potential for Soil and Water, AP

Acidification is a consequence of acids (and other compounds which can be transformed into acids) being emitted to the atmosphere and subsequently deposited in surface soils and water. Increased acidity can result in negative consequences for flora and fauna in addition to increased corrosion of manmade structures (buildings vehicles etc.). Acidification Potential (AP) is an indicator of such damage and is usually measured in kgSO₂e

Eutrophication potential, EP

Over enrichment of aquatic ecosystems with nutrients leading to increased production of plankton, algae and higher aquatic plants leading to a deterioration of the water quality and a reduction in the value and/or the utilisation of the aquatic ecosystem. Eutrophication is primarily caused by surplus nitrogen and phosphorus. Sources of nutrients include agriculture (fertilisers and manure), aquaculture, municipal wastewater, and nitrogen oxide emissions from fossil fuel combustion.

Photochemical Ozone Creation Potential, POCP

Photochemical Ozone Creation Potential (POCP), commonly known as smog, is toxic to humans in high concentration. Although ozone is protective in the stratosphere at low levels it is problematic from both a health and nuisance perspective. Plant growth is also effected through damaged leaf surfaces and reduced photosynthesis. POCP is formed when sunlight and heat react with Volatile Organic Compounds (VOCs).

Abiotic Depletion Potential - Elements, ADPE

Abiotic Resource Depletion of energy (ADPE) is a measure of the extraction and consumption of primary resources from the earth. Such exploitation reduces resources available to future generations and as such must be managed.

Abiotic Depletion Potential - Fossil Fuels, ADPF

Abiotic Resource Depletion of energy (ARDE) is a measure of the extraction and consumption of non-renewable energy sources (primarily fossil fuels, but also inclusive of other energy sources such as uranium). Primary energy content of non-renewable energy sources including the embodied energy to extract, process and deliver the non renewable fuels, or manufacture, transport and install the renewable generator. Hence there is usually and non-renewable energy content associated with renewable fuels also.

Appendix B: Detailed Structure Scope Diagram

Key: ✓ In Scope, In Design ✓ In Scope, Not In Design ✓ Partial ✗ Out of Scope

Parent Name	Sub Category Name	Benchmark Design	Improved Design
Substructure	Substructure	✓	✗
	Standard foundations	✓	✗
	Specialist foundations	✓	✗
	Lowest floor construction	✓	✗
	Insulation	✓	✗
	Basement excavation	✓	✗
	Basement retaining walls	✓	✗
Superstructure	Frame	✓	✗
	Frame	✓	✗
	Upper floors	✓	✗
	Floors	✓	✗
	Insulation	✓	✗
	Balconies	✓	✗
	Drainage to balconies	✓	✗
	Roof	✓	✗
	Insulation	✓	✗
	Roof structure	✓	✗
	Roof coverings	✓	✗
	Specialist roof systems	✓	✗
	Roof drainage	✓	✗
	Rooflights, skylights and openings	✓	✗
	Roof features	✗	✗
	Stairs and ramps	✓	✗
	Stair/ramp structures	✓	✗
	Stair/ramp finishes	✓	✗
	Stair/ramp balustrades and handrails	✓	✗
	Ladders/chutes/slides	✓	✗
	External walls	✓	✗
	External Paint, Textures and Renders	✓	✗
	External enclosing walls above ground level	✓	✗
	Insulation	✓	✗
	External enclosing walls below ground level	✓	✗
	Solar/rain screening	✓	✗
	External soffits	✓	✗
	Subsidiary walls, balustrades and proprietary balconies	✓	✗
	Façade access/cleaning systems	✓	✗
	Windows and external doors	✓	✗
	External windows	✓	✗
	Security and Fly Screens	✓	✗
	External doors	✓	✗
	Internal walls and partitions	✓	✗
	Walls and partitions	✓	✗
	Insulation	✓	✗
	Balustrades and handrails	✓	✗
	Moveable room dividers	✓	✗
	Cubicles	✓	✗
	Internal doors	✓	✗
	Internal doors	✓	✗
Internal finishes	Wall finishes	✓	✗
	Wall finishes	✓	✗
	Cornices & Shadowlines	✓	✗
	Paint - Walls	✓	✗
	Wet Area Walls	✓	✗
	Floor finishes	✓	✗
	Finishes to floors	✓	✗
Wet Area Floors	✓	✗	
Raised access floors	✓	✗	



Parent Name	Sub Category Name	Benchmark Design	Improved Design
	Ceiling finishes	✓	✗
	Finishes to ceilings	✓	✗
	False ceilings	✓	✗
	Demountable suspended ceilings	✓	✗
Fittings, furnishings and equipment	Fittings, furnishings and equipment	✓	✗
	General fittings, furnishings and equipment	✓	✗
	Domestic kitchen fittings and equipment	✓	✗
	Special purpose fittings, furnishings and equipment	✗	✗
	Signs/notices	✗	✗
	Works of art	✗	✗
	Non-mechanical and non-electrical equipment	✗	✗
	Internal planting	✗	✗
	Bird and vermin control	✗	✗
	Services equipment	Sanitary installations	✓
Sanitary appliances		✓	✗
Sanitary ancillaries		✓	✗
Services equipment		✓	✗
Services equipment		✓	✗
Disposal installations		✓	✗
Foul drainage above ground		✓	✗
Chemical, toxic and industrial liquid waste disposal		✗	✗
Refuse disposal		✓	✗
Water installations		✓	✗
Mains water supply		✓	✗
Cold water distribution		✓	✗
Hot water distribution		✓	✗
Local hot water distribution		✓	✗
Steam and condensate distribution		✗	✗
Heat source		✓	✗
Heat source		✓	✗
Space heating and air conditioning		✓	✗
Central heating		✓	✗
Local heating		✓	✗
Central cooling		✓	✗
Local cooling		✓	✗
Central heating and cooling		✓	✗
Local heating and cooling		✓	✗
Central air conditioning		✓	✗
Local air conditioning		✓	✗
Ventilation systems		✓	✗
Central ventilation		✓	✗
Local and special ventilation		✓	✗
Smoke extract/control		✓	✗
Electrical installations		✓	✗
Electric mains and sub-mains distribution		✓	✗
Power installations		✓	✗
Lighting installations		✓	✗
Specialist lighting installations		✓	✗
Local electricity generation systems		✓	✗
Earthing and bonding systems		✓	✗
Fuel installations		✗	✗
Fuel storage		✗	✗
Fuel distribution systems		✗	✗
Lift and conveyor installations		✓	✗
Lifts and enclosed hoists		✓	✗
Escalators		✓	✗
Moving pavements		✓	✗
Powered stairlifts		✗	✗
Conveyors		✗	✗
Dock levellers and scissor lifts		✗	✗



Parent Name	Sub Category Name	Benchmark Design	Improved Design
	Cranes and unenclosed hoists	X	X
	Car lifts, car stacking systems, turntables and the like	X	X
	Document handling systems	✓	X
	Other lift and conveyor installations	✓	X
	Fire and lightning protection	X	X
	Fire-fighting systems	X	X
	Fire suppression systems	X	X
	Lightning protection	X	X
	Communication, security and control systems	✓	X
	Communication systems	✓	X
	Security systems	✓	X
	Central control/building management systems	✓	X
	Specialist installations	✓	X
	Specialist piped supply installations	X	X
	Specialist refrigeration systems	X	X
	Specialist mechanical installations	X	X
	Specialist electrical/electronic installations	X	X
	Water features	X	X
	Civil Engineering Structure	✓	X
	Builder's Work in Connection (BWIC) with Services	X	X
	BWIC with services	X	X
Prefabricated buildings and building units	Prefabricated buildings and building units	X	X
	Complete buildings	X	X
	Building units	X	X
	Pods	X	X
Work to existing building	Minor demolitions and alterations	X	X
	Minor Demolitions and Alterations	X	X
	Repairs to existing services	X	X
	Repairs to existing services	X	X
	Damp proof course/fungus and beetle eradication	X	X
	Damp Proof Course/Fungus and Beetle Eradication	X	X
	Façade Retention	X	X
	Façade Retention	X	X
	Cleaning Existing Surfaces	X	X
	Cleaning Existing Surfaces	X	X
	Renovation work	X	X
	Renovation Work	X	X
External works	Site preparation works	✓	X
	Site clearance	✓	X
	Preparatory groundworks	✓	X
	Roads, paths and pavings	✓	X
	Roads, paths and pavings	✓	X
	Special surfacings and pavings	✓	X
	Soft landscaping, planting and irrigation systems	✓	X
	Seeding and turfing	✓	X
	External planting	✓	X
	Irrigation systems	✓	X
	Fencing, railings and walls	✓	X
	Fencing and railings	✓	X
	Walls and screens	✓	X
	Retaining walls	✓	X
	Barriers and guardrails	✓	X
	External fixtures	X	X
	Site/street furniture and equipment	X	X
	Ornamental features	X	X
	External drainage	✓	X
	Surface water and foul water drainage	X	X
	Ancillary drainage systems	X	X
	External chemical, toxic and industrial liquid waste drainage	X	X
	Land drainage	✓	X



Parent Name	Sub Category Name	Benchmark Design	Improved Design
	External services	✓	✗
	Water mains supply	✓	✗
	Electricity mains supply	✓	✗
	External transformation devices	✓	✗
	Electricity distribution to external plant and equipment	✓	✗
	Gas mains supply	✓	✗
	Telecommunications and other communication system connections	✓	✗
	External fuel storage and piped distribution systems	✓	✗
	External security systems	✓	✗
	External/street lighting systems	✓	✗
	Local/district heating installations	✓	✗
	BWIC with external services	✓	✗
	Minor building works and ancillary buildings	✗	✗
	Minor building works	✗	✗
Ancillary buildings and structures	✗	✗	
Underpinning to external site boundary walls	✗	✗	
Facilitating works	Toxic/hazardous/contaminated material treatment	✗	✗
	Toxic/hazardous material removal	✗	✗
	Contaminated land	✗	✗
	Eradication of plant growth	✗	✗
	Major demolition works	✓	✗
	Demolition works	✓	✗
	Soft strip works	✓	✗
	Temporary support to adjacent structures	✗	✗
	Temporary support to adjacent structures	✗	✗
	Specialist groundworks	✗	✗
	Site dewatering and pumping	✗	✗
	Soil stabilisation measures	✗	✗
	Ground gas venting measures	✗	✗
	Temporary diversion works	✗	✗
	Temporary diversion works	✗	✗
	Extraordinary site investigation	✗	✗
Archaeological investigation	✗	✗	
Reptile/wildlife mitigation measures	✗	✗	
Other extraordinary site investigation	✗	✗	
Project/design team	Consultants	✓	✗
	Planning & Approvals	✓	✗
	Main contractor's pre-construction design	✓	✗
	Project Management	✓	✗
	Main contractor's design	✓	✗
	Sales and Marketing	✓	✗
Undefined			



Summary of Submissions:

The tables below summarise the comments received during the advertising period of the proposal, together with Administration's response to each comment.

Comments Received in Support:	Administration Comment:
<p><u>Lot Boundary Setbacks</u></p> <p>Comments that the lot boundary setback variations are not an issue and are a by-product of how thin the lot is, including the additional boundary wall of the store room on the rear boundary.</p>	<p>Noted.</p>
Comments Received in Objection:	Administration Comment:
<p><u>Street Setbacks</u></p> <p>Concerns regarding the proposed street setback of the development and that the character of this portion of Smith Street is in part defined by the significant setbacks and planting areas on lots that allow for substantial vegetation to establish in these set back areas and other parts of the lots. This vegetation contributes significantly to the amenity of the street and neighbourhood by providing a visual buffer between the street and dwellings, habitat for local bird and insect life, shade to foot paths, and an overall contribution to a reduction in any heat island effect for the area.</p>	<ul style="list-style-type: none"> The street setback is sufficient to allow for landscaping to be provided in the street setback area for Units 1 and 2, including the planting of two trees and a number of other smaller plantings. The vegetation would soften the appearance of the proposed development from street and provide an acceptable visual buffer. Between the front of the dwellings and the street boundary, 23.9 square metres of soft landscaping area would be provided, equivalent to 51.2 percent of this setback area.
<p><u>Landscaping</u></p> <ul style="list-style-type: none"> Concerns regarding the trees indicated in the areas adjacent to the car parking and the likelihood of any real tree canopy establishing in these areas. Concerns regarding inconsistencies between the landscape concept plan and the site plan in relation to depiction of the existing verge trees. Concerns regarding the retention of the existing verge trees. Concerns that the lack of deep soil zones to Unit 2 would impact the establishment of any significant trees in the front setback area of the Unit. 	<ul style="list-style-type: none"> The trees located adjacent to the car parking area would assist in improving the internal amenity of this area and have not been included in the City's canopy coverage calculation. Sufficient tree canopy would be provided by the proposed trees on site. Permeable paving would be provided for the pedestrian path area to support the growth of the trees adjacent to the car parking area. No existing verge trees are proposed to be removed. A condition of approval is recommended requiring retention and protection of the verge trees with written approval from the City to be obtained by the applicant prior to the removal of any verge trees. The street setback area is sufficient to allow for a deep soil area to be provided in this location for Unit 2. The dimensions of the deep soil area are sufficient to not impede the ability for the tree proposed in this area to reach its maximum canopy spread.

Summary of Submissions:

Comments Received in Objection:	Administration Comment:
<ul style="list-style-type: none"> • Concerns that the proposed development will not provide sufficiently similar tree canopy to what present on the site prior to demolition of the dwelling on the property. • Concerns that the provision of site vegetation is not sufficient to maintain and enhance the tree canopy and local sense of place. • Concerns that only 3 medium trees are proposed for the entire site thus reducing the overall tree canopy provided on the site. • Concerns that the proposed development would set a precedent in the area for reduced planting zones, reduced tree canopy, and reduced setbacks, which will impact negatively on the current vegetation in the area and any opportunities for the future establishment of new vegetation. Further concerns that this present would result in reduced shade to footpaths in the area, reduced tree canopy for local fauna (birds and insects), increased potential for heat island effect in the neighbourhood, and a reduction of visual buffer between the street and dwellings. 	<ul style="list-style-type: none"> • A total of 17 trees of varying species and sizes, and a number of small plantings are proposed across the site including to the street setback area and lot boundaries. This landscaping would make an effective contribution to the landscaping outcome and canopy coverage on site. • The location of the landscaping proposed would provide improved amenity for future residents. The landscaping for Units 3 to 6 would be located adjacent to the lot boundaries and would assist with reducing the impact of the development on adjoining properties. • The tree planting and canopy cover is appropriate and would be commensurate with the nature of the proposal and the extent of development on site. • The proposed plantings and deep soil areas would be sufficient to contribute towards increased urban air quality, tree and vegetation coverage and a sense of open space between the subject site and adjoining properties. This would create a greater landscaping amenity for residents and would make an effective contribution to the City's green canopy to reduce the impact of the urban heat island effect.

Comments Received Expressing Concern:	Administration Comment
<p><u>Environmentally Sustainable Design</u></p> <p>Comments that the proposed black metal cladding for the upper floors and roof should be replaced with a material with reduced solar absorbance in order to reduce the urban heat island effect of the development.</p>	<ul style="list-style-type: none"> • The development is proposed to predominantly utilise timber framed construction method which would reduce the thermal mass of the development, reducing the potential to radiate heat to adjoining properties. • The development proposes a mix of colours and materials and the extent of the use of the 'Monument' colour is acceptable in considering the sustainability of the proposed development in its entirety, noting that the City's Built Form Policy in itself does not prohibit the use of this colour for cladding.

Note: Submissions are considered and assessed by issue rather than by individual submitter.

Summary of Submissions:

The tables below summarise the comments received during the advertising period of the proposal, together with the Applicant's response to each comment.

Comments Received in Support:	Applicant Comment:
<p><u>Lot Boundary Setbacks</u></p> <ul style="list-style-type: none"> Comments that the lot boundary setback variations are not an issue and are a by-product of how thin the lot is including the additional boundary wall of the store room on the rear boundary. 	<p>Agreed.</p>
Comments Received in Objection:	Applicant Comment:
<p><u>Street Setbacks</u></p> <ul style="list-style-type: none"> Concerns regarding the proposed street setback of the development and that the character of this portion of Smith Street is in part defined by the significant setbacks and planting areas on lots that allow for substantial vegetation to establish in these set back areas and other parts of the lots. This vegetation contributes significantly to the amenity of the street and neighbourhood by providing a visual buffer between the street and dwellings, habitat for local bird and insect life, shade to foot paths, and an overall contribution to a reduction in any heat island effect for the area. 	<p>The street setback has been increased to 3.5m (at ground level) with the upper level further setback. The 3.5m width is sufficient for growth of trees and for a landscaped courtyard.</p> <p>Whilst there is a variation, the setbacks exceeds the R-Codes requirements for an R80 coding. Given the highly variable and eclectic context of this portion of Smith Street, it is not necessary to replicate the setbacks of the adjoining properties.</p>
<p><u>Landscaping</u></p> <ul style="list-style-type: none"> Concerns that the provision of site vegetation is not sufficient to maintain and enhance the tree canopy and local sense of place. Concerns regarding inconsistencies between the landscape concept plan and the site plan in relation to depiction of the existing verge trees. Concerns regarding the retention of the existing verge trees. Concerns that the proposed development will not provide sufficiently similar tree canopy to what present on the site prior to demolition of the dwelling on the property. Concerns regarding the trees indicated in the areas adjacent to the car parking and the likelihood of any real tree canopy establishing in these areas. Concerns that the lack of deep soil zones to Unit 2 would impact the establishment of any significant trees in the front setback area of the Unit. Concerns that only 3 medium trees are proposed for the entire site thus 	<p>Across the site, the proposal incorporates 13.6% deep soil landscaping and 34% canopy coverage. This is consistent with the measures set out in the City's Built Form Policy.</p> <p>Refer also to street setback comments above.</p>

Summary of Submissions:

Comments Received in Objection:	Applicant Comment:
<p>reducing the overall tree canopy provided on the site.</p> <ul style="list-style-type: none">Concerns that the proposed development would set a precedent in the area for reduced planting zones, reduced tree canopy, and reduced setbacks, which will impact negatively on the current vegetation in the area and any opportunities for the future establishment of new vegetation. Further concerns that this precedent would result in reduced shade to footpaths in the area, reduced tree canopy for local fauna (birds and insects), increased potential for heat island effect in the neighbourhood, and a reduction of visual buffer between the street and dwellings.	

Comments Received Expressing Concern:	Applicant Comment
<p><u>Environmentally Sustainable Design</u></p> <ul style="list-style-type: none">Comments that the proposed black metal cladding for the upper floors and roof should be replaced with a material with reduced solar absorbance in order to reduce the urban heat island effect of the development.	<p>A sustainability report (Lifecycle Assessment) has been submitted to the City which demonstrates a potential life cycle saving of 65% (CO2 emissions). This exceeds the 50% target under the City's policy.</p> <p>Dark roofs can be overcome by appropriate materials and insulation and these are important for the architectural character.</p>

Note: Submissions are considered and assessed by issue rather than by individual submitter.

Determination Advice Notes:

1. This is a development approval issued under the City of Vincent Local Planning Scheme No. 2 and the Metropolitan Region Scheme only. It is not a building permit or an approval to commence or carry out development under any other law. It is the responsibility of the applicant/owner to obtain any other necessary approvals and to commence and carry out development in accordance with all other laws.
2. If the development the subject of this approval is not substantially commenced within a period of two years, or another period specified in the approval after the date of determination, the approval will lapse and be of no further effect.
3. Where an approval has so lapsed, no development must be carried out without the further approval of the local government having first been sought and obtained.
4. If an applicant or owner is aggrieved by this determination there is a right of review by the State Administrative Tribunal in accordance with the *Planning and Development Act 2005* Part 14. An application must be made within 28 days of the determination.
5. This approval is not an authority to ignore any constraint to development on the land, which may exist through statute, regulation, contract or on title, such as an easement or restrictive covenant. It is the responsibility of the applicant and not the City to investigate any such constraints before commencing development. This approval will not necessarily have regard to any such constraint to development, regardless of whether or not it has been drawn to the City's attention.
6. The applicant is responsible for ensuring that all lot boundaries as shown on the approved plans are correct.
7. NO verge trees shall be removed. The verge trees shall be RETAINED and PROTECTED from any damage including unauthorised pruning.
8. An Infrastructure Protection Bond together with a non-refundable inspection fee shall be lodged with the City by the applicant, prior to the commencement of works, and will be held until all building/development works have been completed and any disturbance of, or damage to the City's infrastructure, including verge trees, has been repaired/reinstated to the satisfaction of the City. An application for the refund of the bond shall be made in writing. The bond is non-transferable.
9. The movement of all path users, with or without disabilities, within the road reserve, shall not be impeded in any way during the course of the building works. This area shall be maintained in a safe and trafficable condition and a continuous path of travel (minimum width 1.5 metres) shall be maintained for all users at all times during construction works. Permits are required for placement of any material within the road reserve.
10. The owners of the subject land shall obtain the consent of the owners of relevant adjoining properties before entering those properties in order to make good the boundary walls.
11. The visual privacy requirements of Clause 5.4.1 C1.2 of the R Codes Volume 1 states that "screening devices such as obscure glazing, timber screens, external blinds, window hoods and shutters are to be at least 1.6m in height, at least 75 percent obscure, permanently fixed, made of durable material and restrict view in the direction of the overlooking into any adjoining property.
12. A 'clear sight line' means:
 - Continuous horizontal or vertical gaps that constitute a minimum of 50 percent of the total surface area;
 - A minimum gap size of 40mm;
 - If slats are orientated to be deeper than they are wide, the distance between the slats must be no less than two-times the depth of the slat;
 - Clear non-reflective glass.

Determination Advice Notes:

13. **Visually permeable is defined as “*in reference to a wall, gate, door or fence that the vertical surface has continuous vertical or horizontal gaps of 50mm or greater width occupying not less than one third of the total surface area; continuous vertical or horizontal gaps less than 50mm in width, occupying at least one half of the total surface area in aggregate; or a surface offering equal or lesser obstruction to view; as viewed directly from the street*”.**
14. **All new crossovers to lots are subject to a separate application to be approved by the City. All new crossovers shall be constructed in accordance with the City’s Standard Crossover Specifications, which specify that the portion of the existing footpath traversing the proposed crossover (subject to the Footpath being in good condition as determined by the Infrastructure and Environment Services Directorate), must be retained. The proposed crossover levels shall match into the existing footpath levels. Should the footpath not to be in satisfactory condition, it must be replaced with in-situ concrete panels in accordance with the City's specification for reinstatement of concrete paths.**
15. **All stormwater produced on the subject land shall be retained on site, by suitable means to the full satisfaction of the City. No further consideration shall be given to the disposal of stormwater ‘offsite’ without the submission of a geotechnical report from a qualified consultant. Should approval to dispose of stormwater ‘offsite’ be subsequently provided, detailed design drainage plans and associated calculations for the proposed stormwater disposal shall be lodged together with the building permit application working drawings.**
16. **The applicant and owner are advised that sufficient parking can be provided on the subject site and as such the City of Vincent will not issue a residential or visitor car parking permit to any owner or occupier of the residential dwellings. This information should be provided to all prospective purchasers, and it is recommended that a notice be placed on Sales Contracts to advise purchasers of this restriction.**