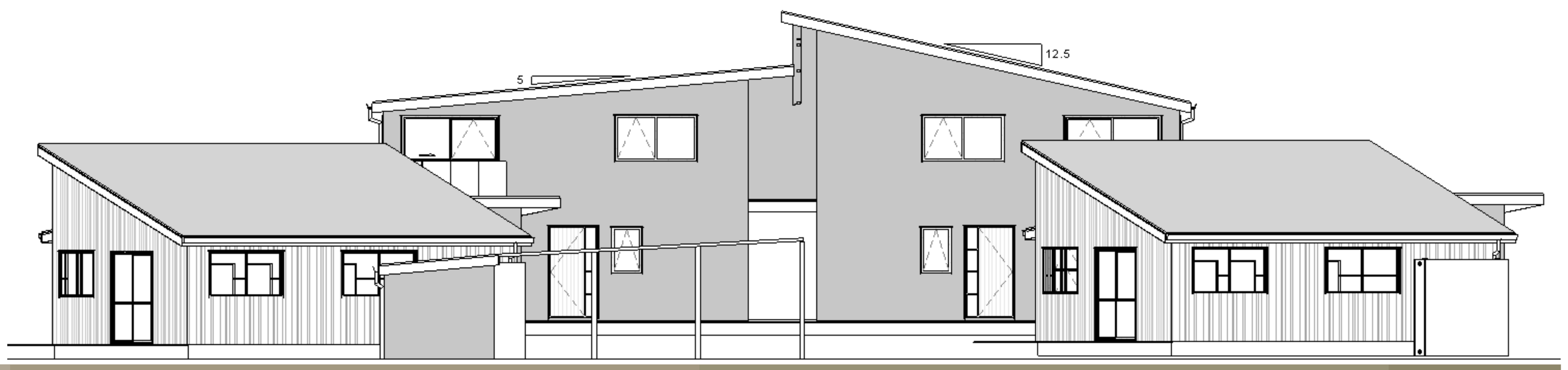
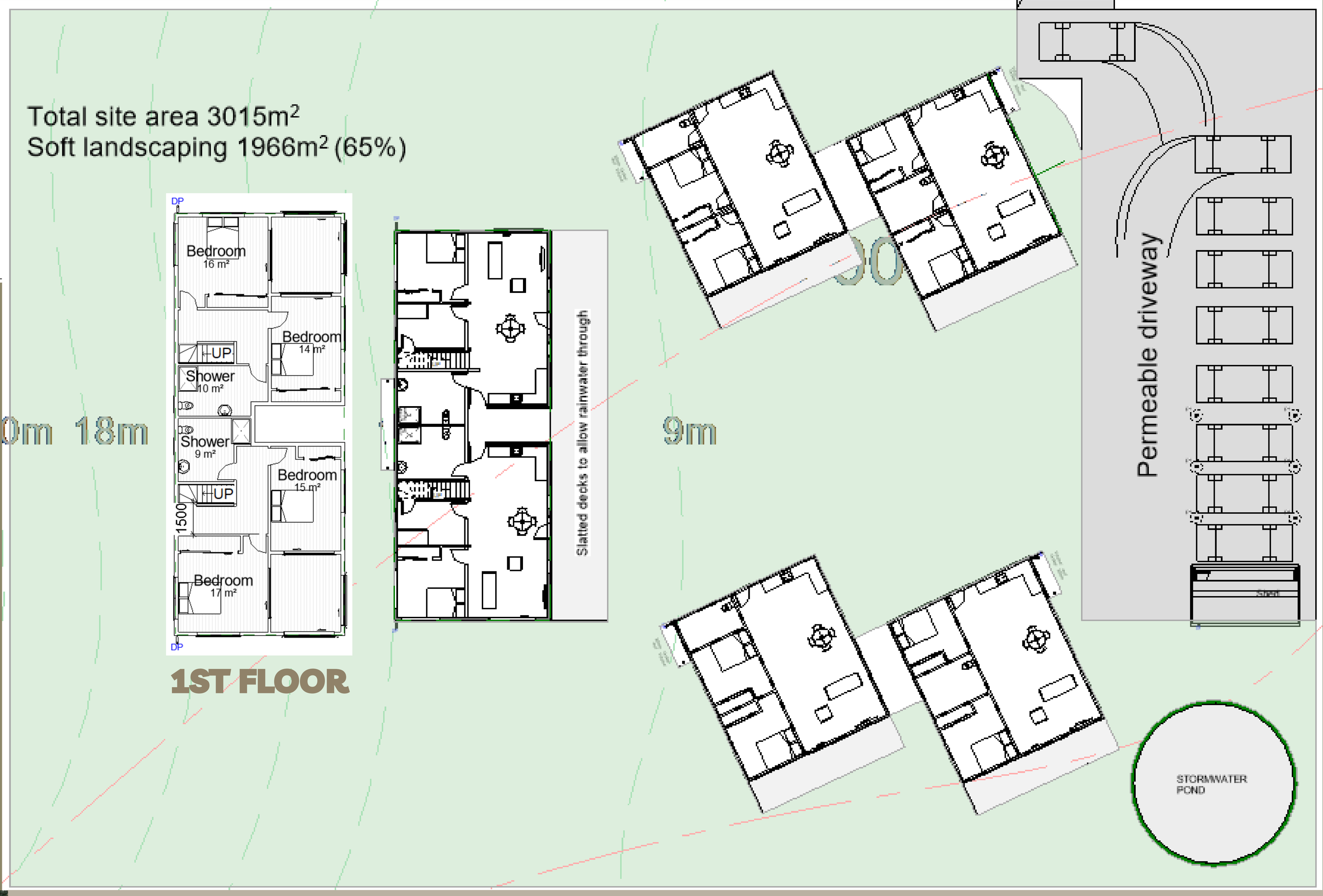
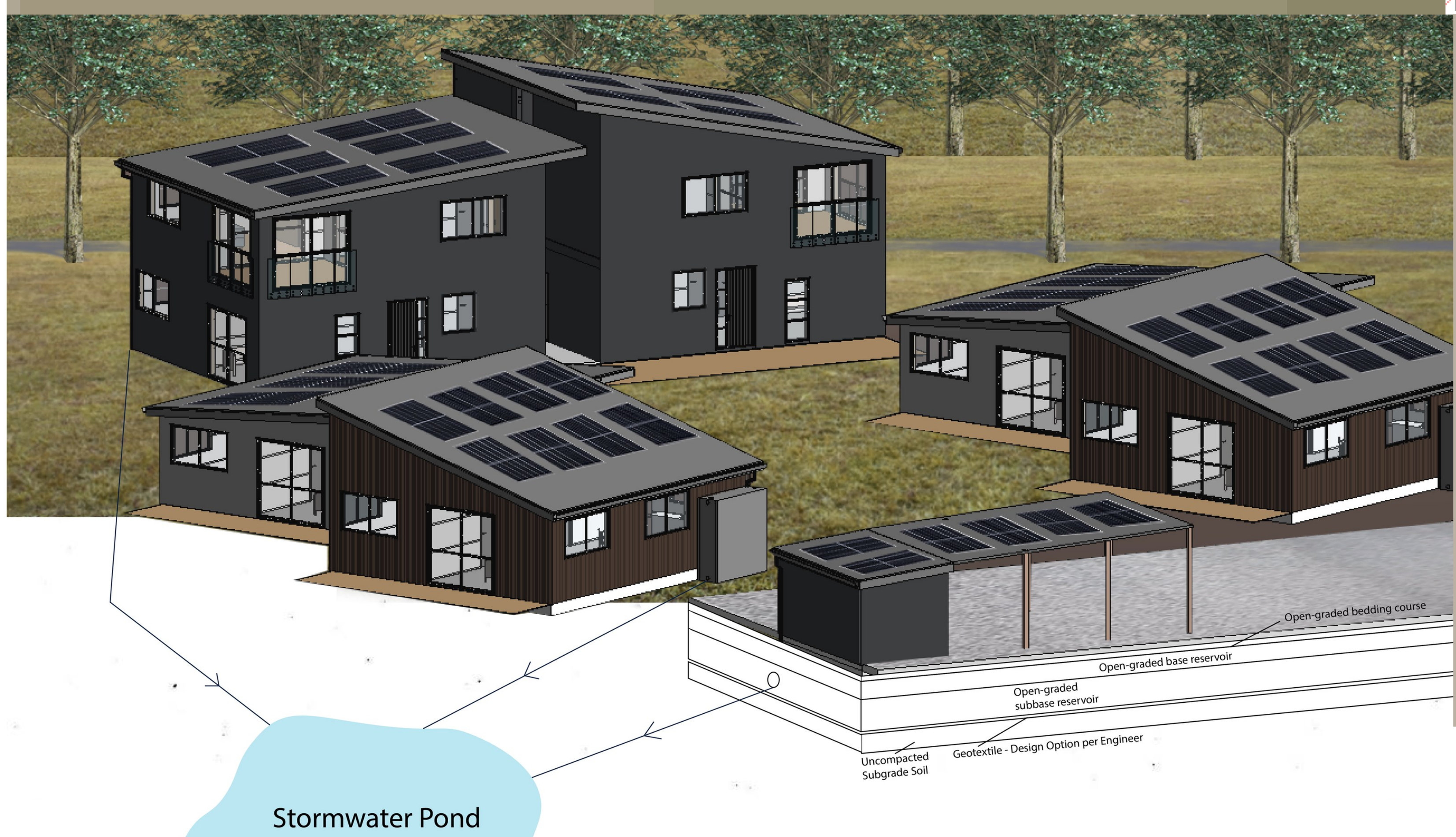


HAUMARU FUTURES

Be safe, be sheltered, be home

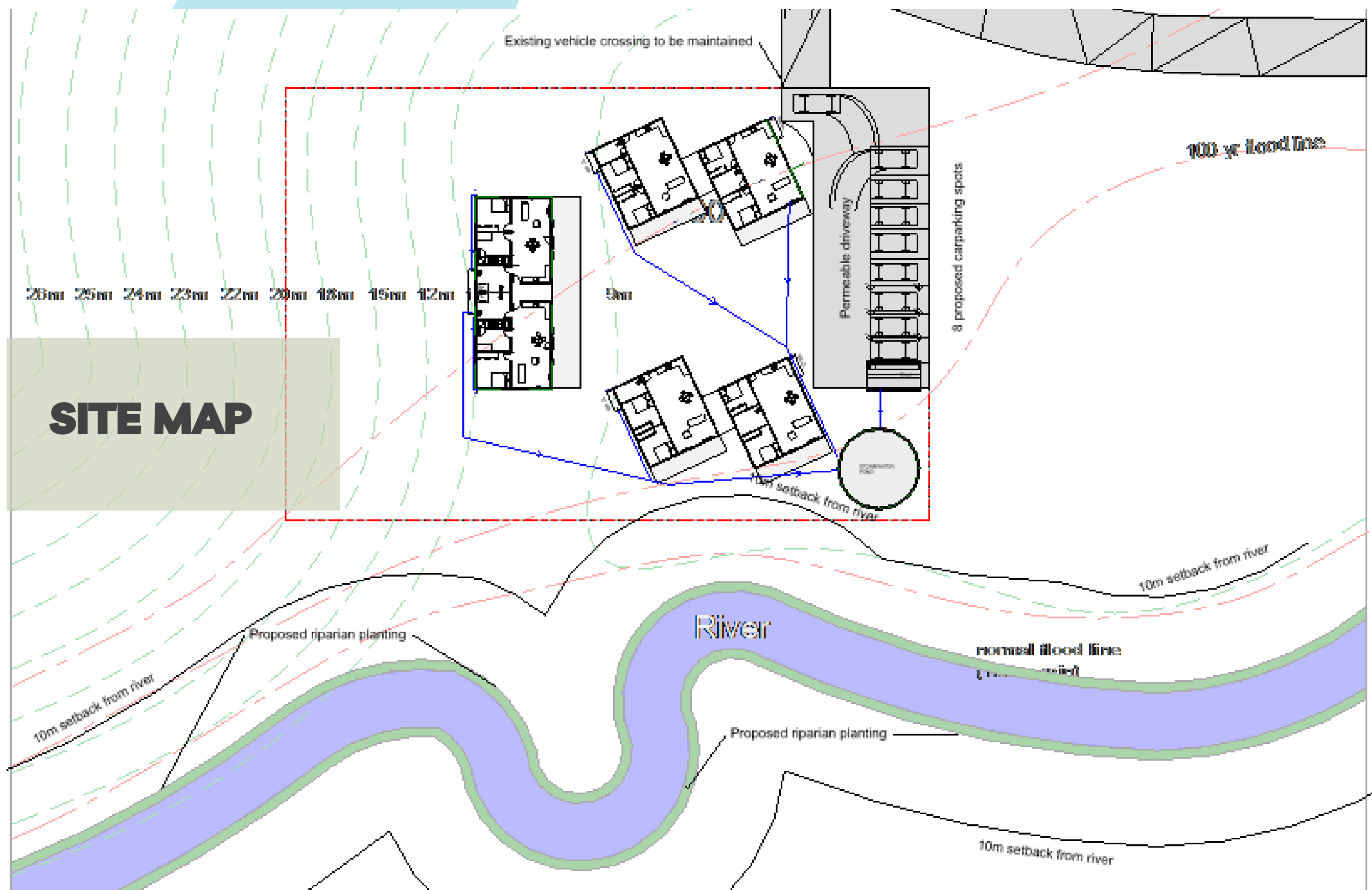




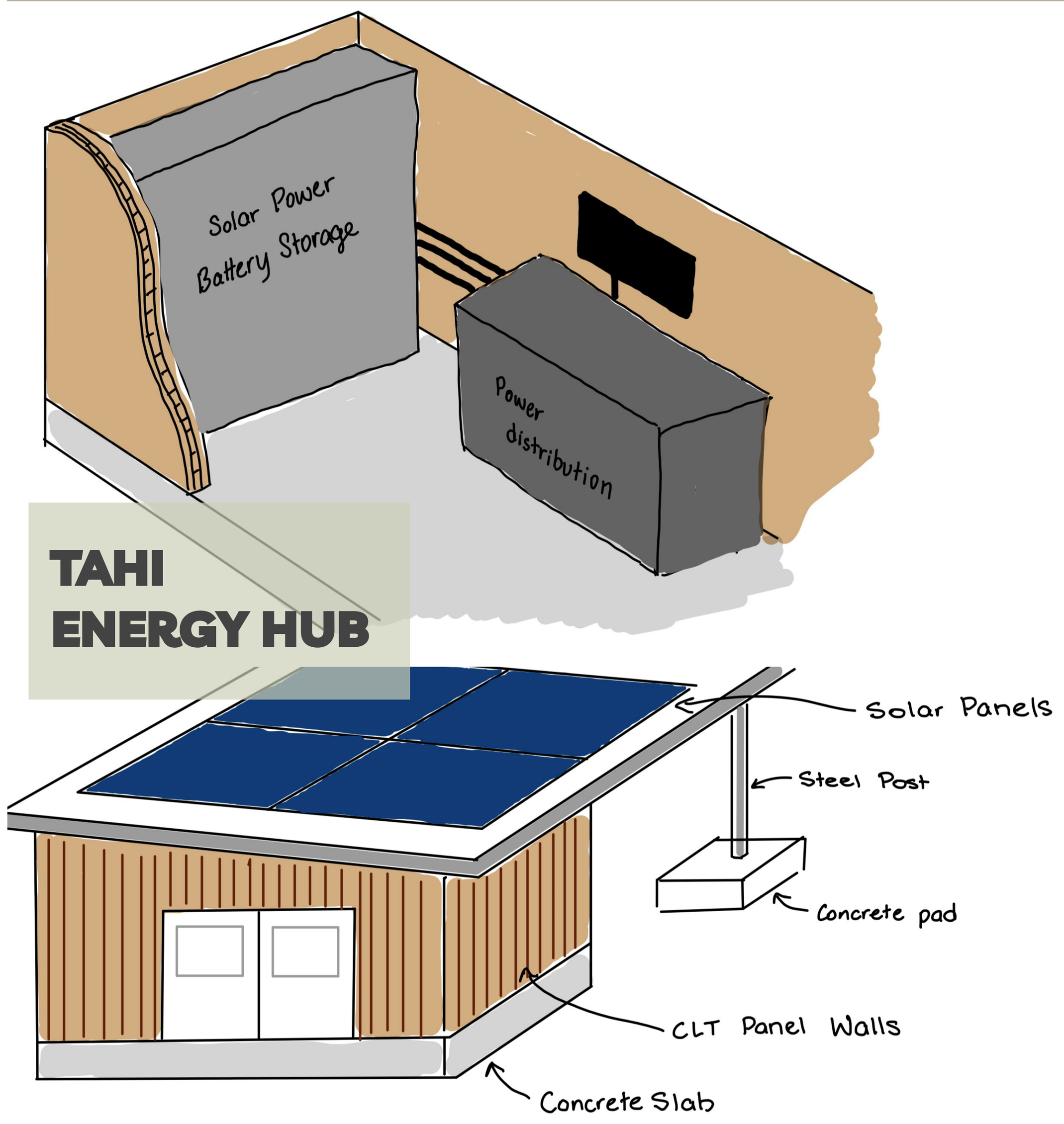
FAMILY NEEDS

Haumaru Futures has been crafted with a vision of community, resilience and sustainability. Bringing together the residents through inclusive unity. Our project caters to the diverse and evolving needs of multiple generational families, fluctuating in size. The design promotes mutual community support, and flexible living arrangements ensuring ongoing comfort and adaptability for the residents. The inclusion of vibrant shared spaces, and peaceful areas to retreat together, create a nurturing environment where our families can thrive for generations to come.

SITE MAP



TAHI ENERGY HUB



OUR TEAM

Architecture
Roseann Choy
University of Auckland

Engineering
Nicole Scott
University of Waikato

Construction Management
Boaz Boonzaaijer
Massey University

TEAM COLLABORATION

Our team united our various strength to produce a design project following the ArchEngBuild 2023 brief. We faced many challenges and changes along our journey but ultimately we were able to work together to solve all of the complications we encountered.

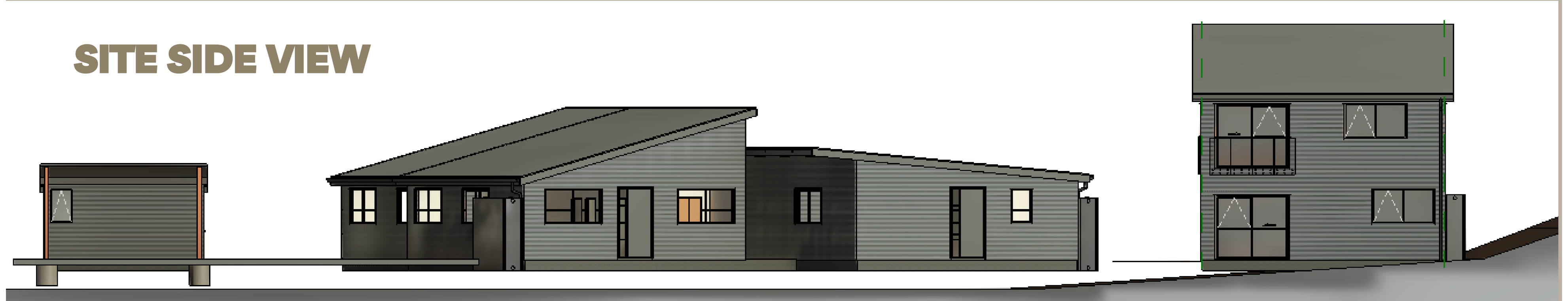
Our architect, Roseann, worked tirelessly bringing the evolving design to life, bringing her skills and expertise to execute the design and it's functional aspects. Nicole, our engineer ensured structural viability and contributed detailed hand-drawn cross-sections of structural reinforcement elements. Boaz, our construction manager orchestrated the implementation, providing oversight and input to practical sustainable living outcomes.

Frequent and effective communication, mutual respect, and working to our individual strengths resulted in a compatible workflow. Problem solving throughout the conceptual design challenges led us to a successfully complete project, which met the technical and functional criteria of the design brief.

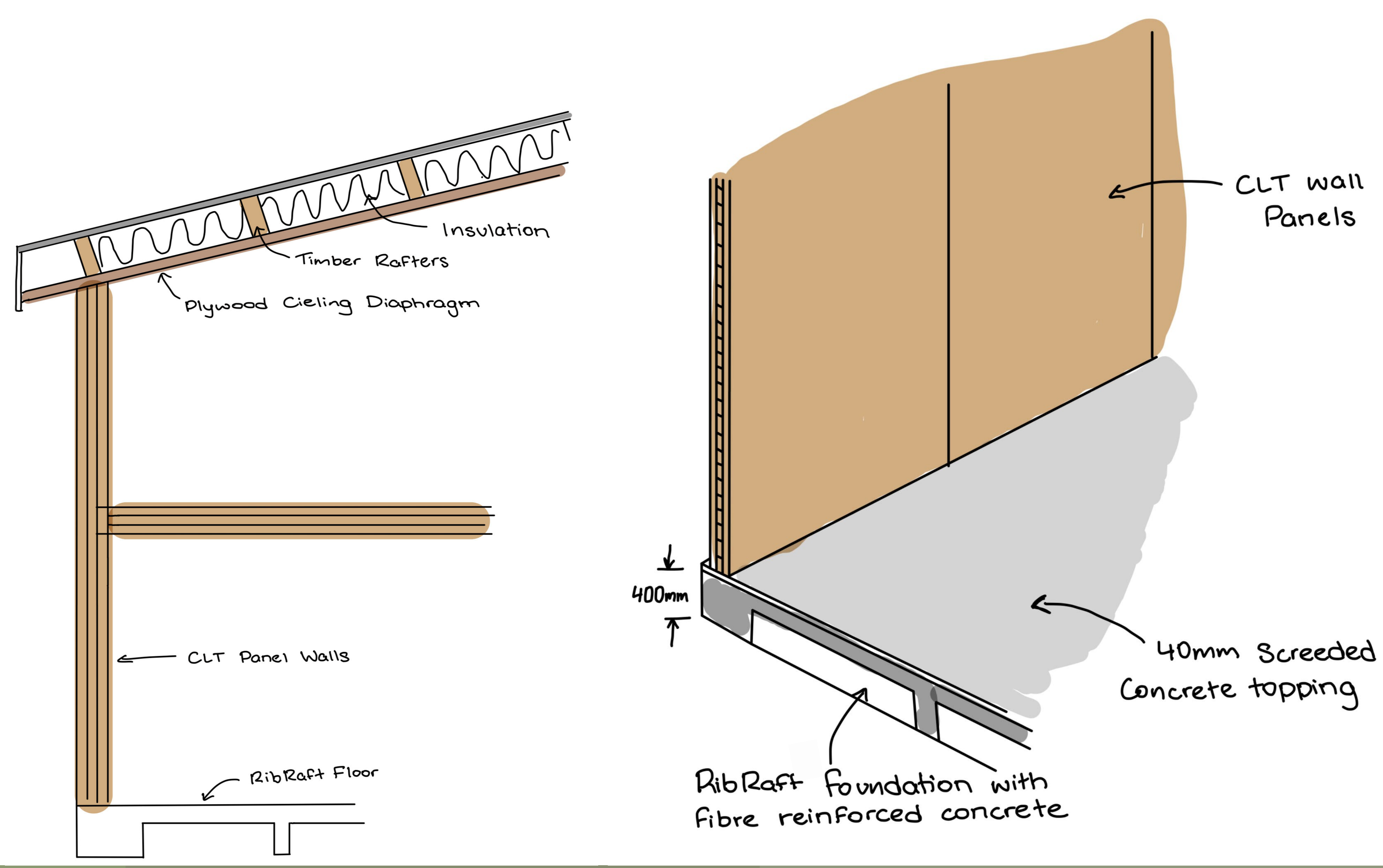
HAUMARU

To shelter; provide a safe haven, a caring environment that encapsulates the commitment we have to all of our tenants.

SITE SIDE VIEW



HOUSING STRUCTURE CROSS SECTIONS



Te Punga - The Anchor

Team 7 - Brayden Jennison, David Wu, Harry Falkiner

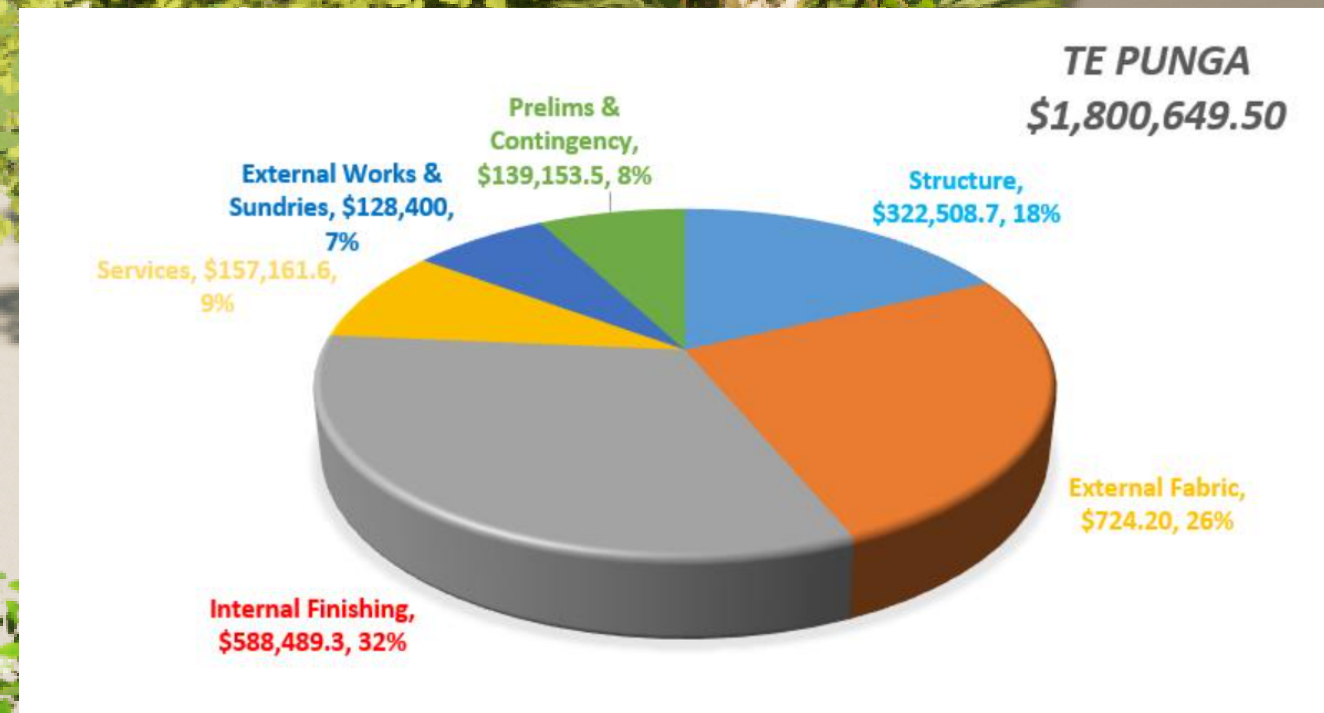
Te Punga. The Anchor. Anchoring 6 families into a community sitting on the bank of the Hutt River in Wellington, New Zealand.

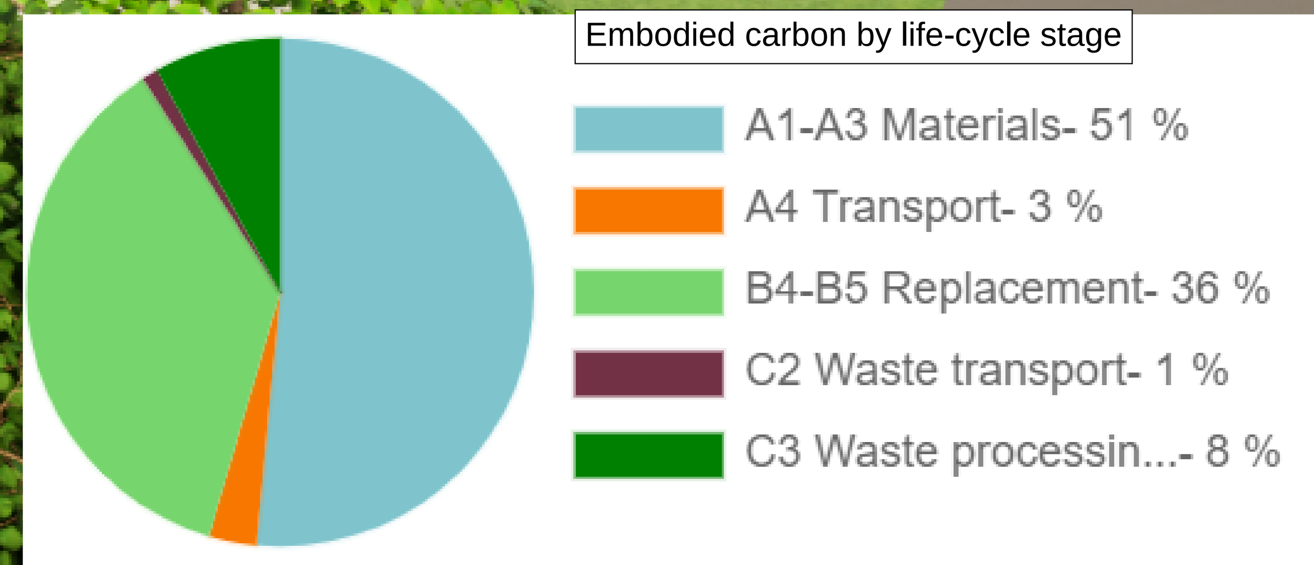
Te Punga is a proposed residential development for 6 families looking to create a community focused, shared living site in Lower Hutt, Wellington. Our proposed design includes 6 separate residential dwellings between 2.5 and 3 bedrooms, constructed with Structural Insulated Timber panels infilled with compressed straw, on a timber pile foundation.

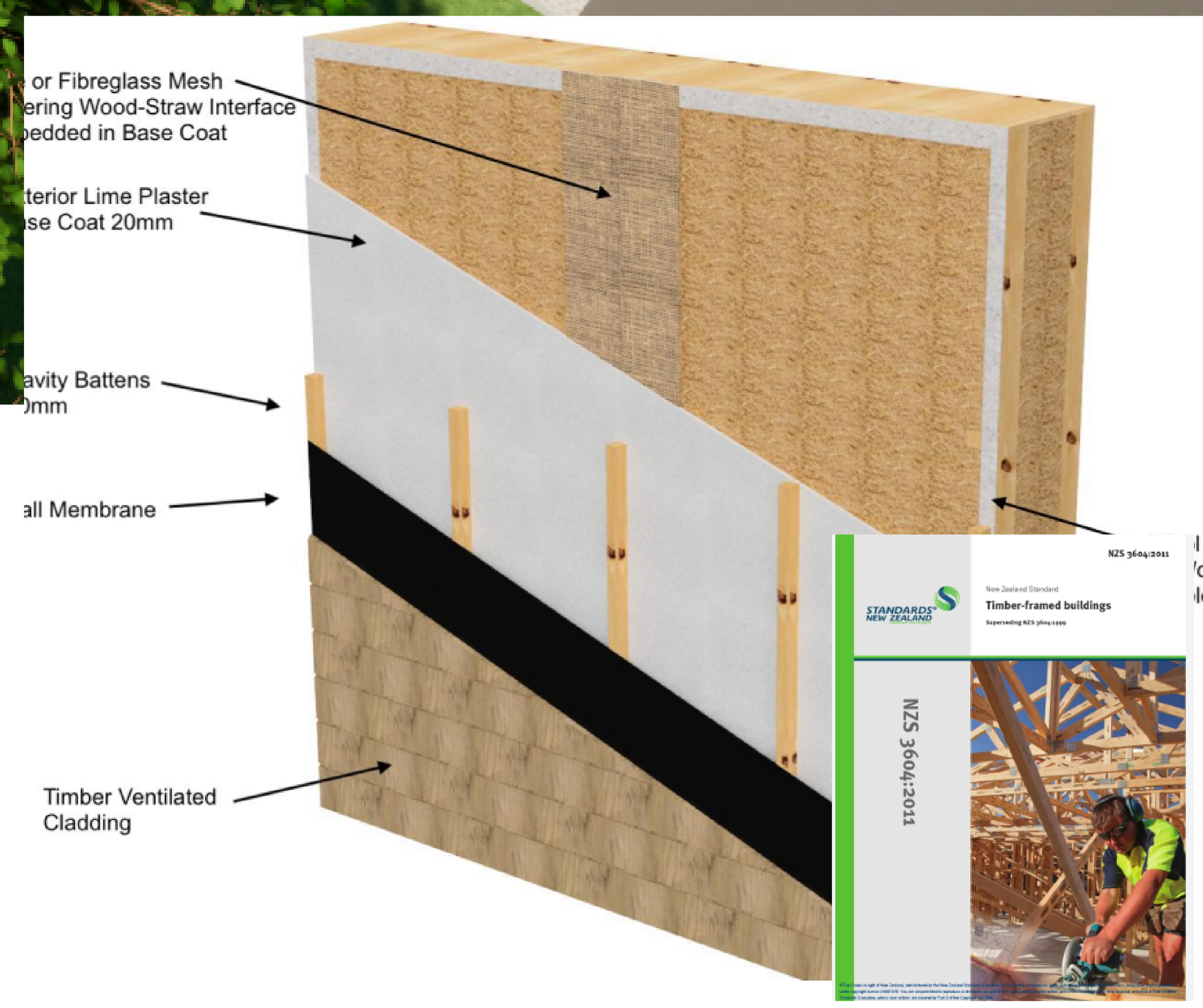
This conceptual design is the product of collaboration between Braydon (Architecture), David (Construction Management) & Harry (Structural Engineering).

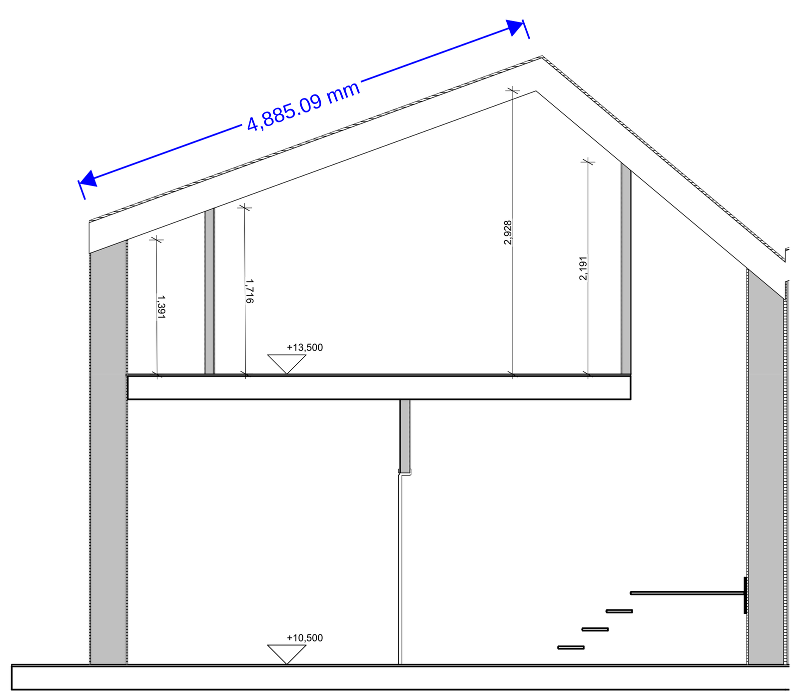
The project seeks to provide an accessible, adaptable and resilient community development concept. Central key values of accessibility, affordability and scalability have shaped our design process. We believe there is a responsibility in low-carbon residential projects to make the knowledge gained accessible for future projects in order to work towards meaningful industry change and carbon minimisation.

Following floor plans and building concepts produced by Brayden, David and Harry have sought to find ways to deliver the concept with minimal cost, low embodied energy and efficient structural design.









$L := 5\ m$
$Tribwidth := 0.6\ m$

Restrained along top edge continuously:

Critical load combination: 1.2G + 1.5Q (NZS 1170.0)

$G(roof) := 0.45\ kPa$
$Q := 0.25\ kPa$
$1.2\ G + 1.5\ Q = 0.825\ kPa$

$w := (1.2\ G + 1.5\ Q) \cdot Tribwidth = 0.495\ \frac{kN}{m}$

Assume bending governed, maximum moment at mid-span

Moment Demand:

$M := \frac{(w \cdot L^2)}{8}$ $\quad M = 1.547\ kN \cdot m$

Moment Capacity: Try a 240x45 LVL $\quad b := 45\ mm \quad d := 240\ mm$

$\phi := 0.8 \quad fb := 14\ MPa \quad Z := \frac{(b \cdot d^2)}{6} \quad k1 := 0.8 \quad k4 := 1.0 \quad k8 := 0.8$

$s := 400\ mm \quad k5 := 1 + (k4 - 1) \cdot \left(1 - 2\ \frac{s}{L}\right) \quad k5 = 1$

$\phi Mc := \phi \cdot k1 \cdot k4 \cdot k5 \cdot k8 \cdot fb \cdot Z$ NZS 3603

$\phi Mc = 3.097\ kN \cdot m \quad E := 13.2\ GPa \quad I := \frac{(b \cdot d^3)}{12}$

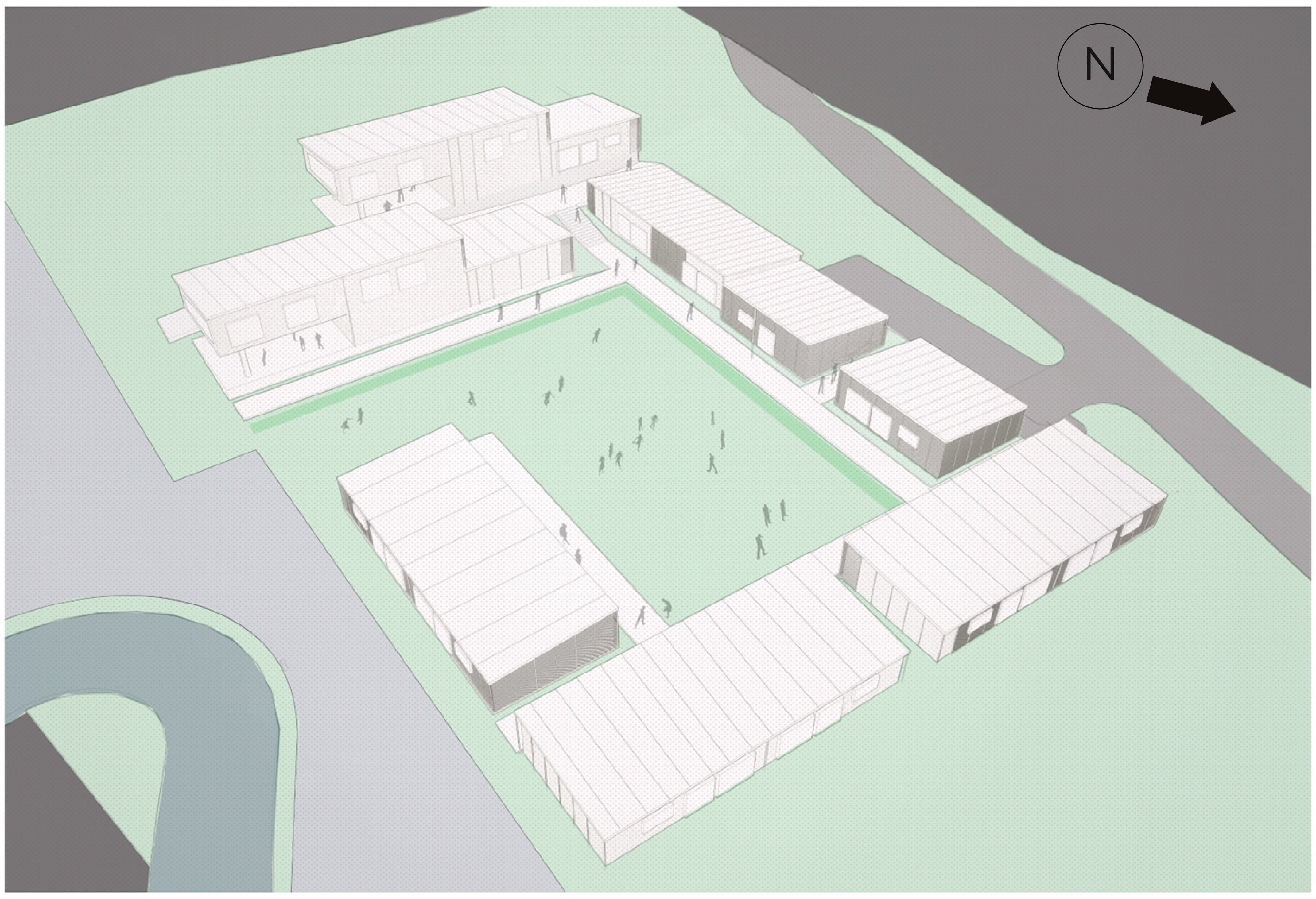
Check deflection: Maximum deflection at mid-span

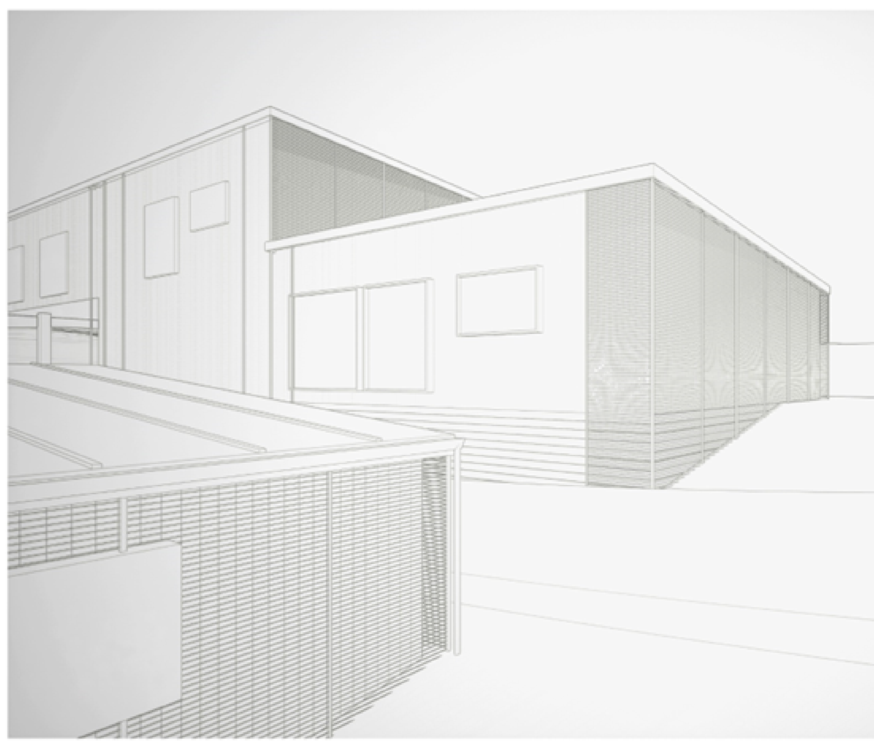
$\Delta := \frac{(5 \cdot w \cdot L^4)}{384 \cdot E \cdot I} \quad \Delta = 5.887\ mm$ Less than span/300 --> OK (1170.0)

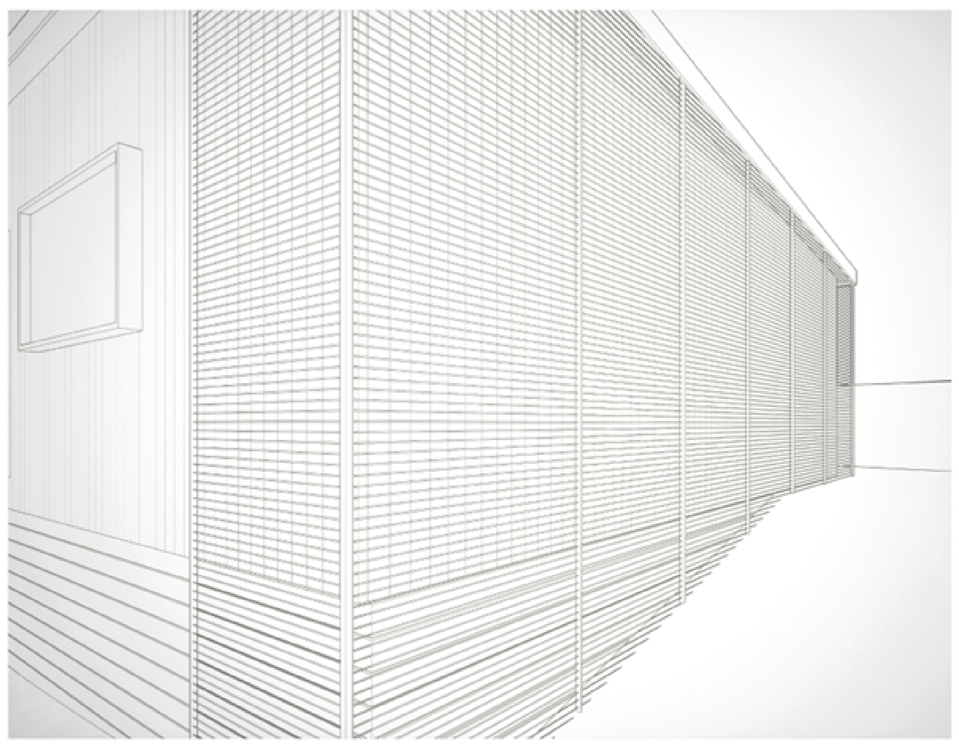
COHOUSE VILLA

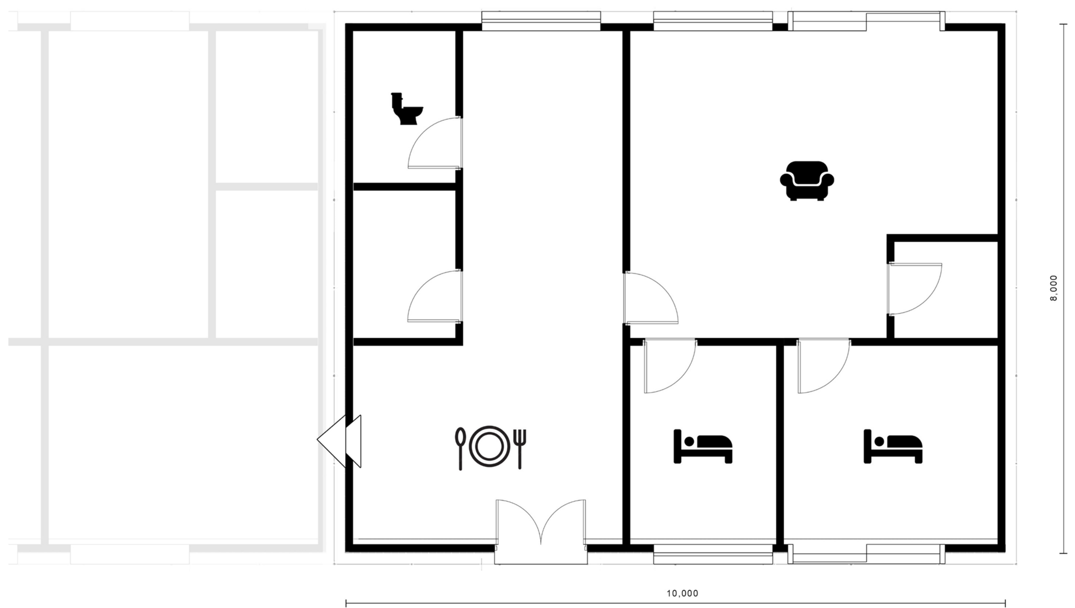
Nathania Cheung, Cass Scouller, Benny Hui

A residential village where private dwellings and shared communal spaces are integrated intentionally to foster social interaction and healthy spaces

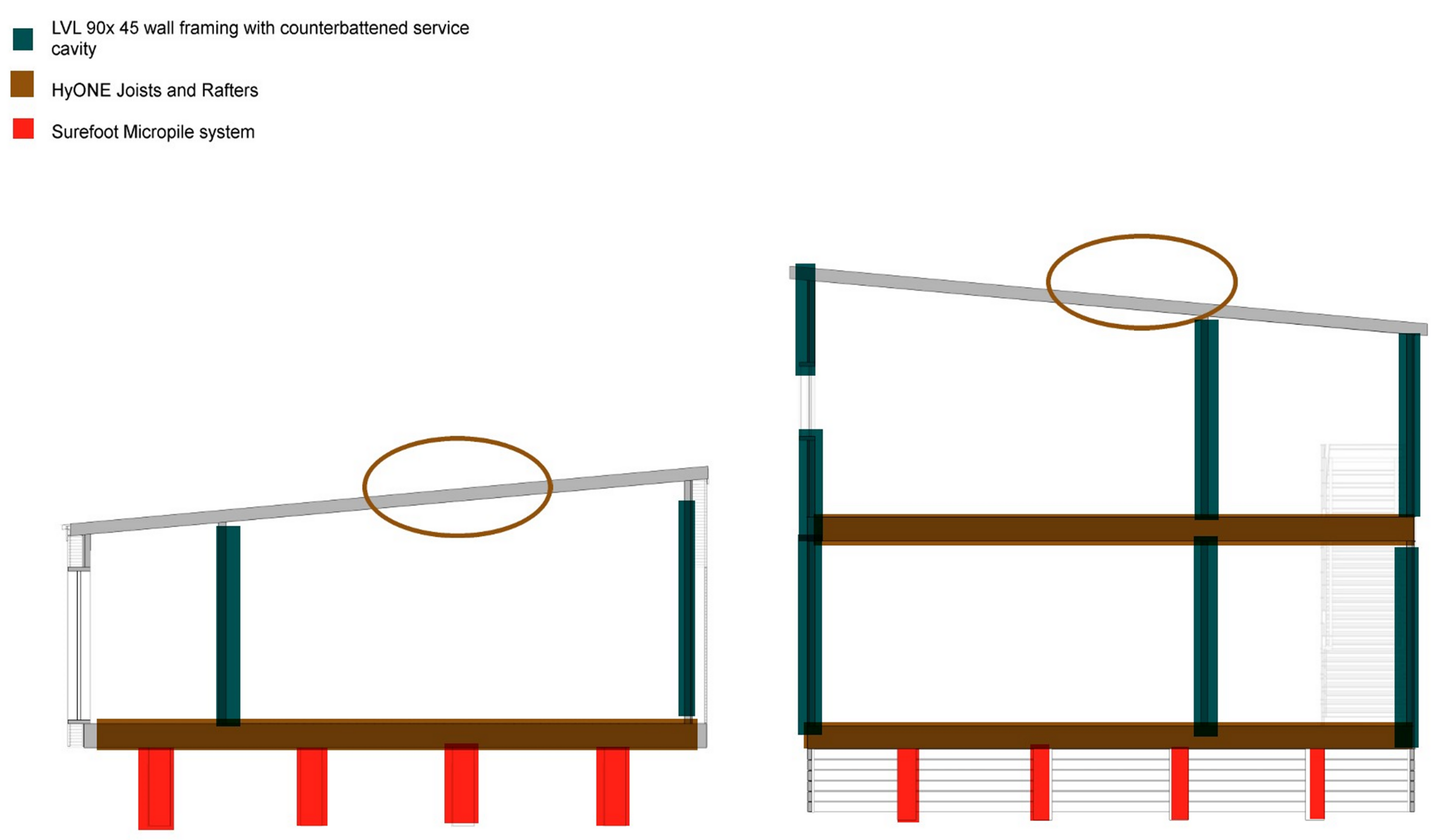








Cross-section



Meeting the needs of families

Usability	Shared communal areas & high social amenities But enough private space
Accessibility	Ramps to access houses 1 bathroom & 1 bedroom on the ground floor Wide doorways
Safety	Warm & healthy High thermal efficiency & passive solar design Ducted heatpumps, solar PV cells
Growth	Flexible design for the addition of further modules
Comfort	Modern Compact, but smart layout
Resilience & Adaptability	Elevated houses to decrease risk of flooding

Collaboration approach

Initially, we focused on creating a mind map to conceptualize our ideas, followed by leveraging our strengths to design. Despite facing challenges and late revisions, we collaborated to acquire new skills and formed new relationships to produce a design that aligns with project requirements and showcases our abilities.

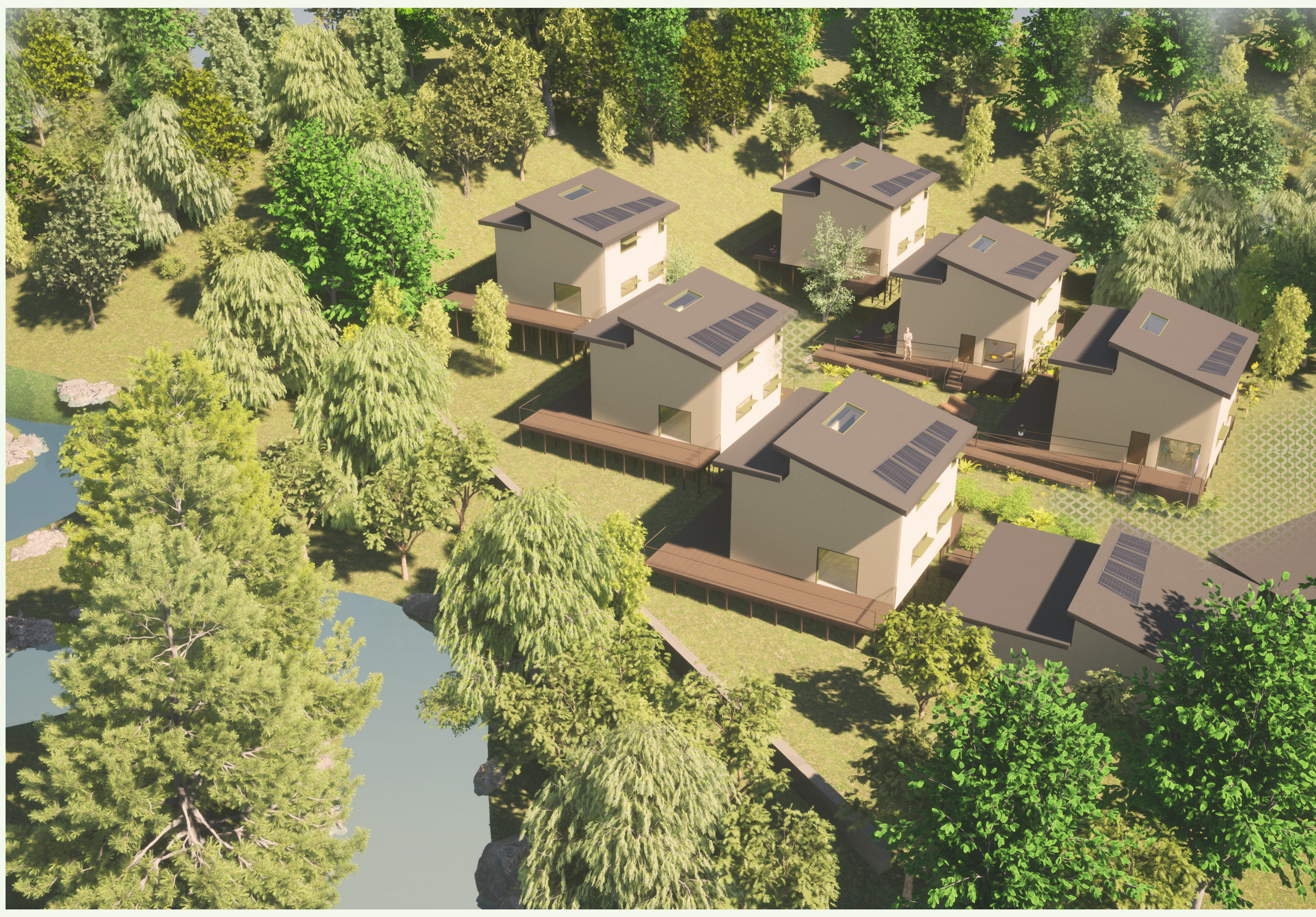
SUSTAINABLE COMMUNITY LIVING

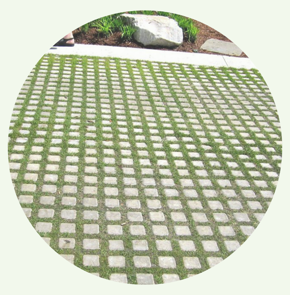
This development plans to support a small community of 6 families, each in their own detached two storey home. The community aims to reestablish the connection between people and land, while still maintaining a sense of strong community presence & sustainable practices that not only ensure low carbon output, but ensure that materials will be easily deconstructed and reused. This development will achieve this by not allowing cars into the housing area and laying permeable paving to and from the community building & local nature to ensure that residents maximise social interaction. A community facility is also included to encourage interaction and connection.

This development has also been meticulous in its material selection, ensuring to specify items that are not only sustainable, but affordable & have good deconstruction properties.

The unique systems that this development has also designed, ensure that we are not only preparing for climate changes in the future, but also meeting needs and conditions of the present.

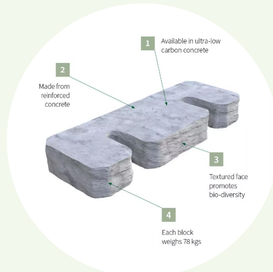
Lastly, we will be offering a unique shared ownership programme between the residents and developer, to keep entry to market costs low, affordable and non-predatory.

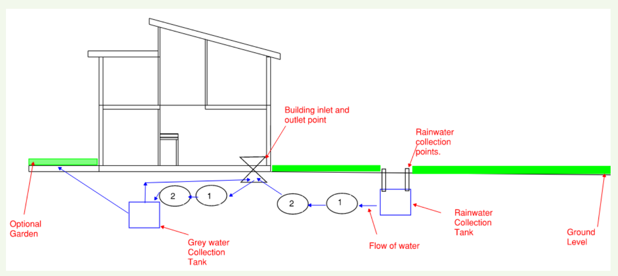



PERMEABLE PAVING


FLOODING WALL


BIOSWALES

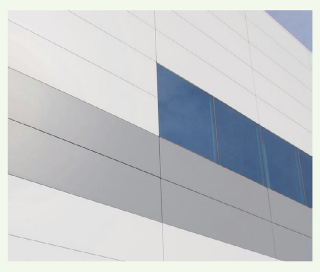

NATIVE VEGETATION


RAINWATER COLLECTION & GREYWATER REUSE SYSTEM

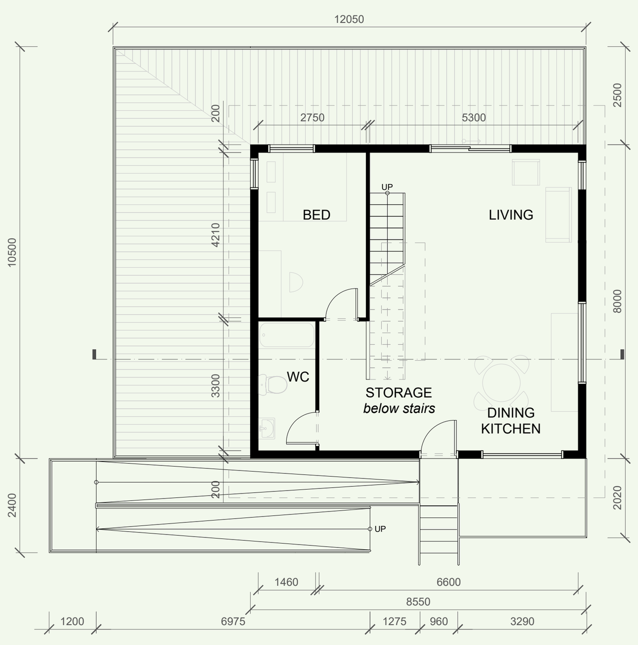

SOLAR PANELS & CHP


ORIENTED STRAND BOARD (OSB)

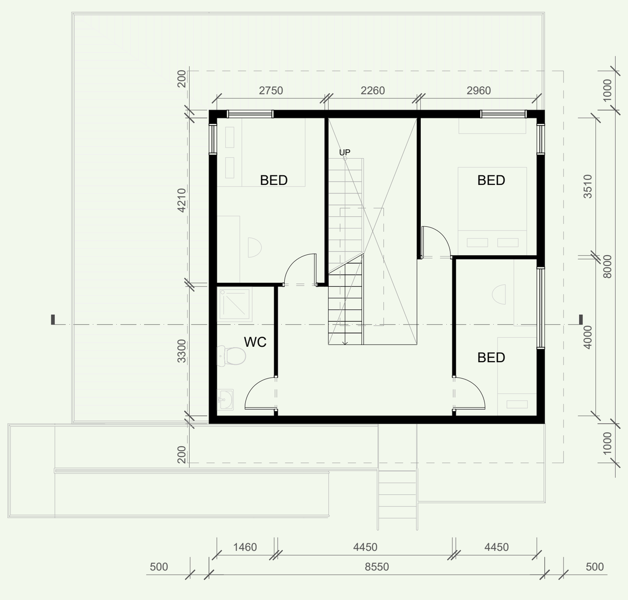
ECRETE CONCRETE


KINGSPAN INSULATED FACADE WALL PANELS

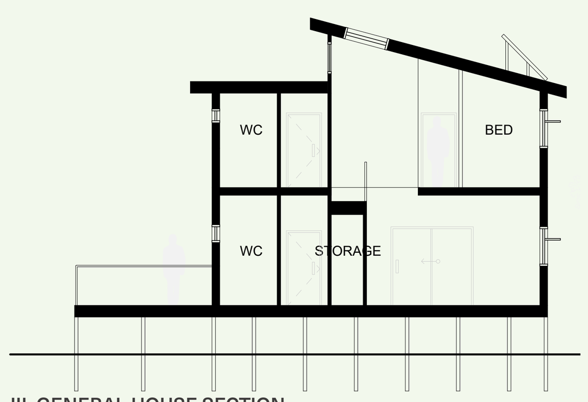

KINGSPAN ROOF PANELS



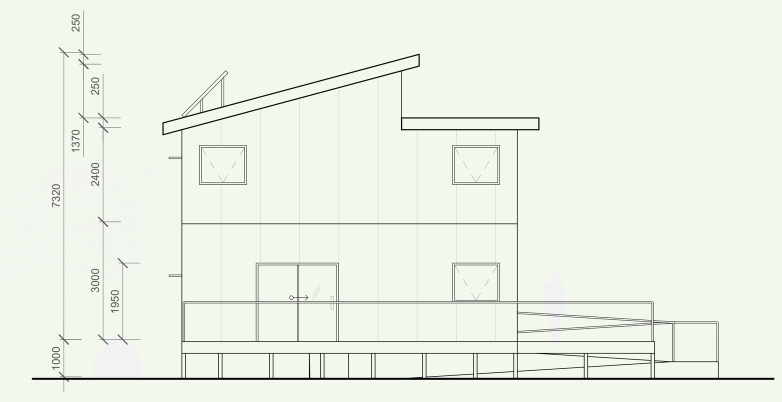
I. GENERAL HOUSE PLAN, GF

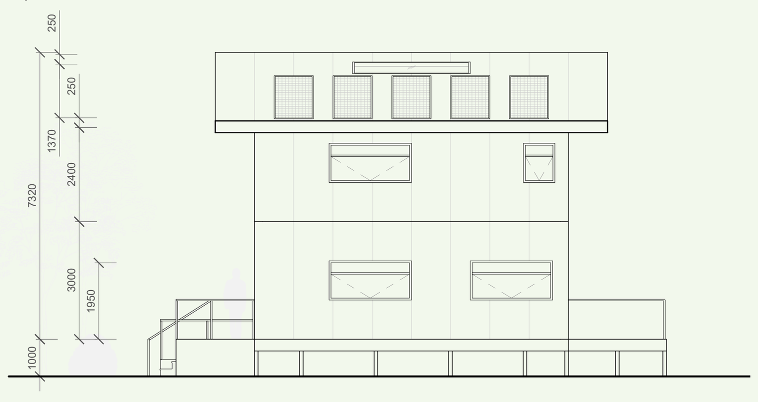


II. GENERAL HOUSE PLAN, 1F



III. GENERAL HOUSE SECTION


IV. HOUSE WEST ELEVATION


V. HOUSENORTH ELEVATION

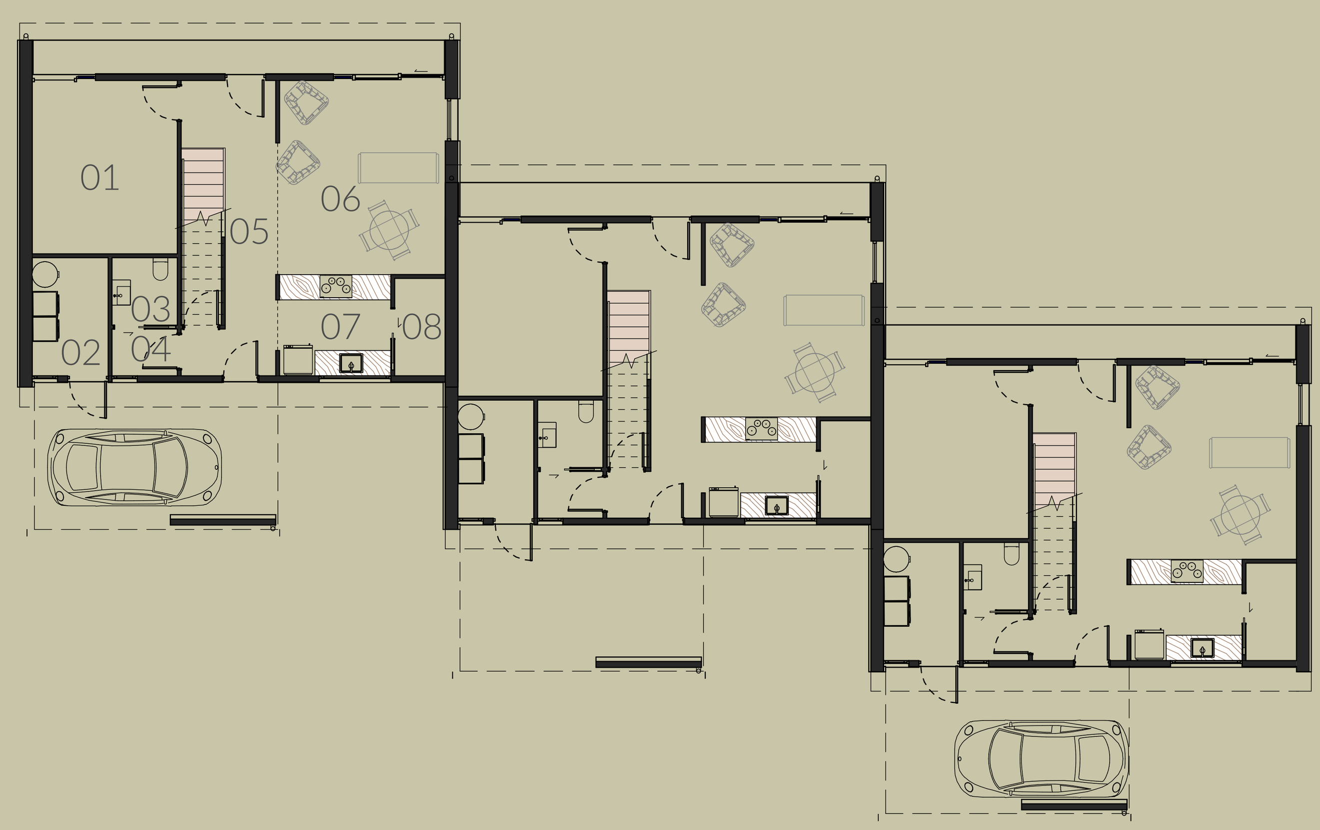
NTS

G.4 Danbie Bong, Cameron Hames, Makana 'O Maui Uele

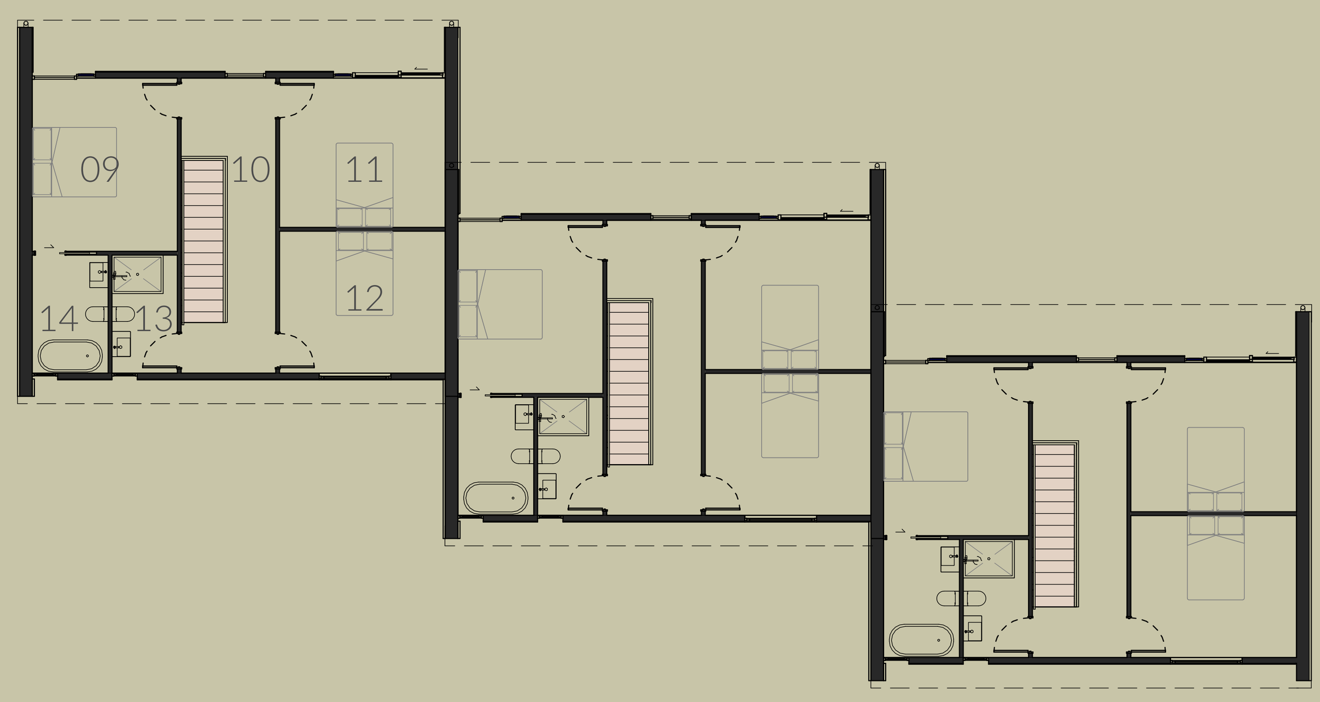
SIX RIVERS

AN ECO-SYSTEM OF PEOPLE IN COMMUNITY

GROUND FLOOR PLANS



FIRST FLOOR PLANS



PROJECT DESCRIPTION

SIX RIVERS is a community village collective of families who have come together to dwell in the Hutt Region of Wellington. The Intent of the project is to provide housing to these families which responds to the social, cultural, & ecological context in a holistic design outcome. The buildings utilise prefabricated mass timber & lightweight timber construction methodologies, increasing efficiency of construction through modularity & standardisation.

The material selection is lightweight, robust, & affordable palette of corrugated aluminium & thermally modified pinus radiata cladding.

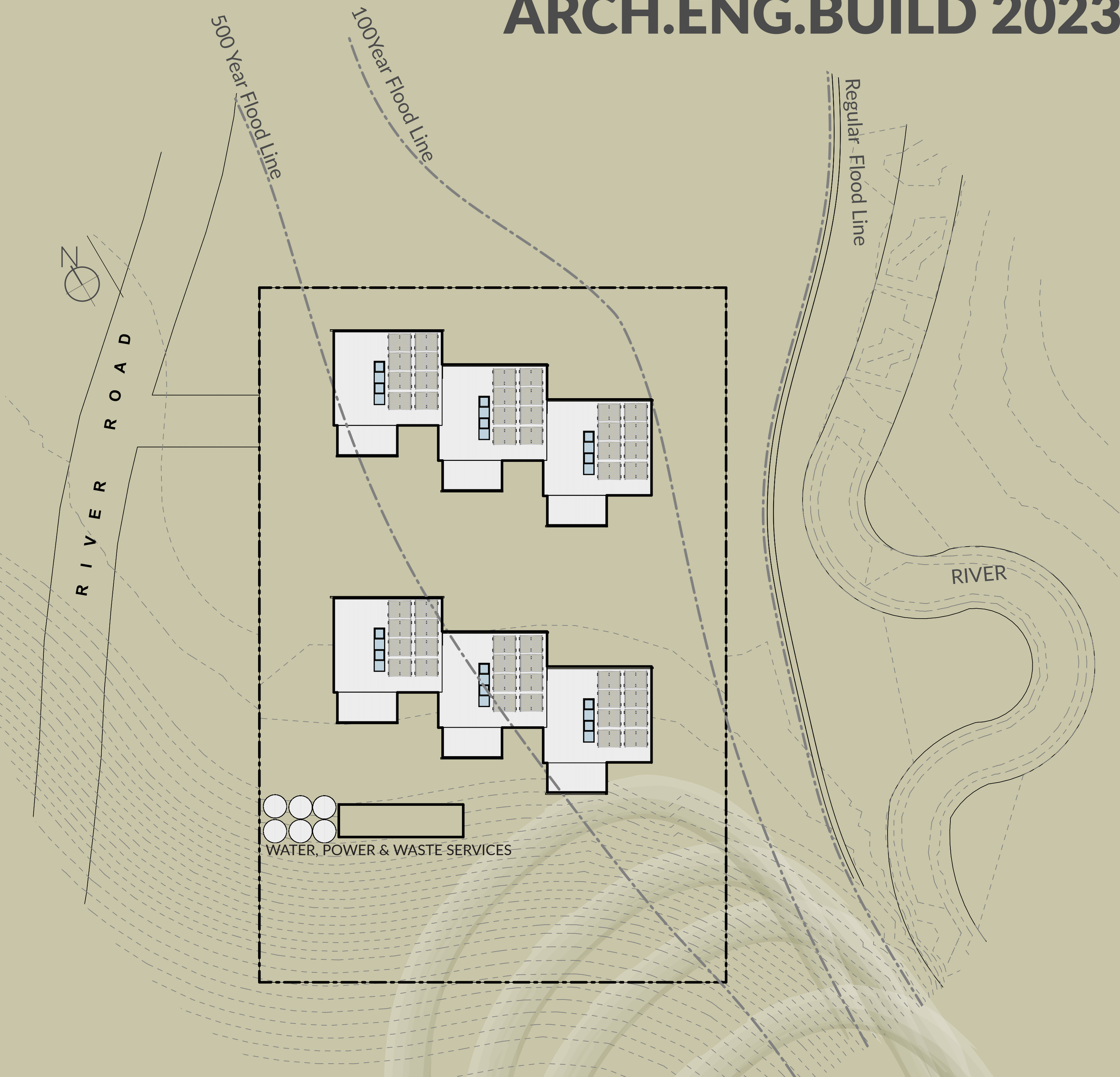
The thermal envelope is extremely high performing with wall build ups at R3, roof at R6.98, & Slab at 2.39. It is also intended that through passive hosue building practices the enevelpope will be airtight & employ a ducted HVAC system to ensure a temperate, dry interior environment. This will reduce operational heating & cooling cost for the families.

Site-wide systems for stormwarter retention, waste treatment, power generation & storage are also supplied meaning the community is self-sustainable.

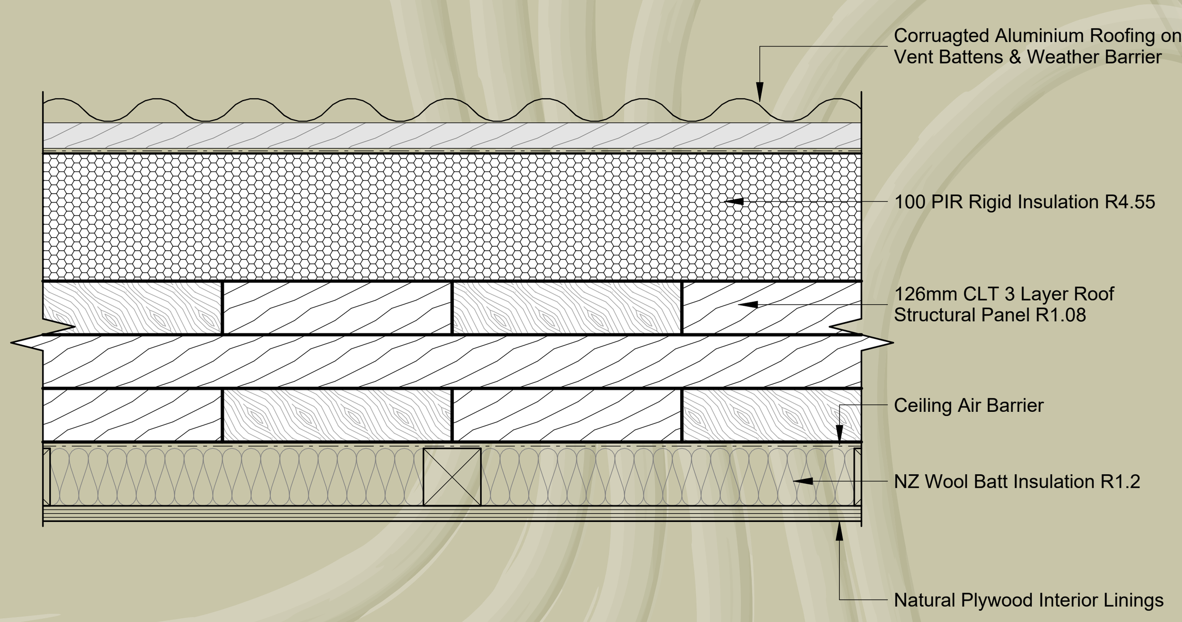
Aleksandr Bakharovskii
Andrea Tang
Mila Makasini

ACCOMMODATION SCHEDULE

#	SPACE	AREA
01	FLEXIBLE SPACE	14 m^2
02	PLANT + LAUNDRY	5 m^2
03	WC	2 m^2
04	LOBBY	2 m^2
05	STAIR & ENTRY	16 m^2
06	LIVING & DINING	18 m^2
07	KICTHEN	6 m^2
08	STORE	3 m^2
09	MASTER BED	14 m^2
10	STAIR & PASSAGE	16 m^2
11	BED 1	14 m^2
12	BED 2	13 m^2
13	BATHROOM	4 m^2
14	ENSUITE	5 m^2

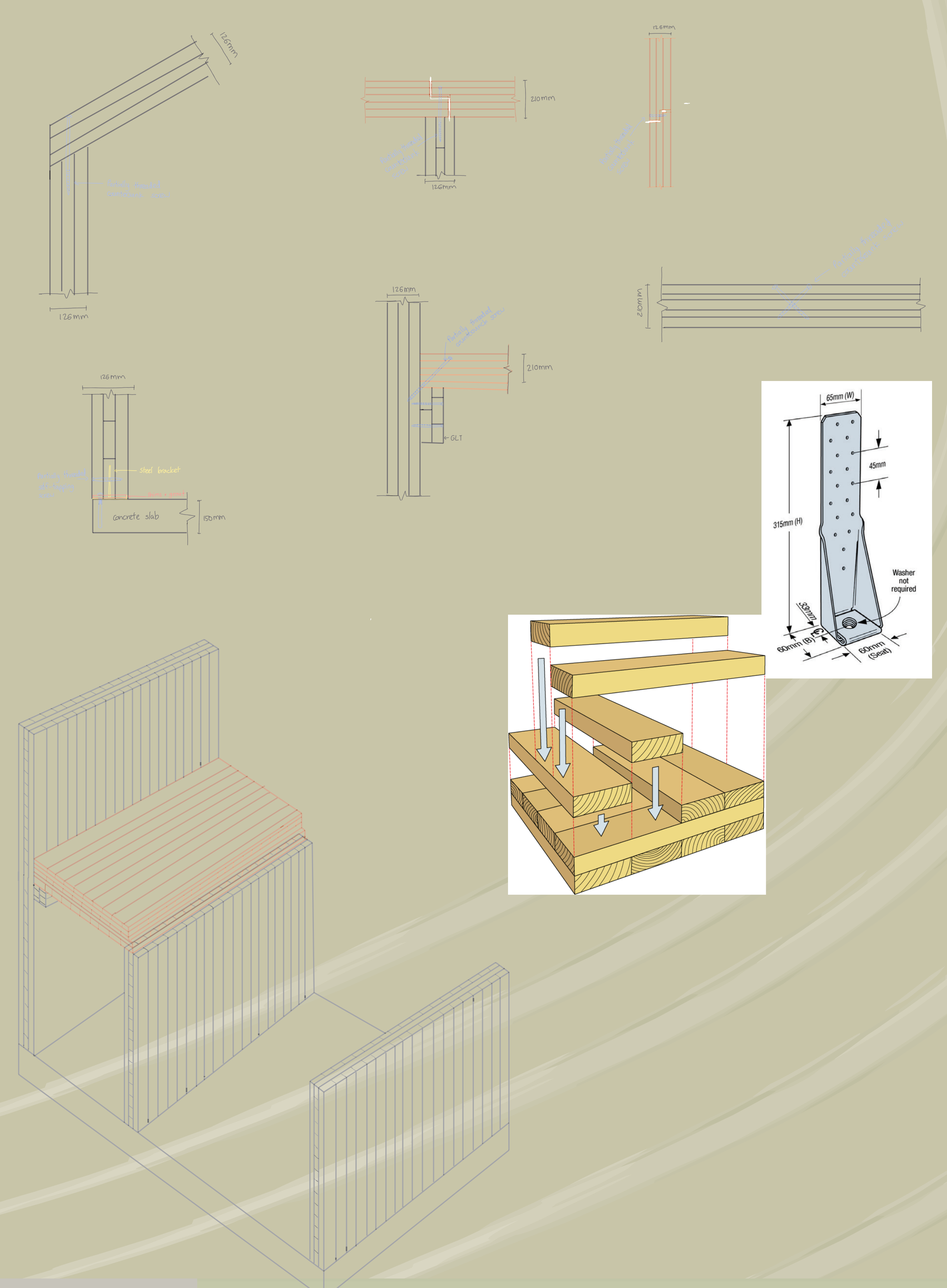


SITE PLAN

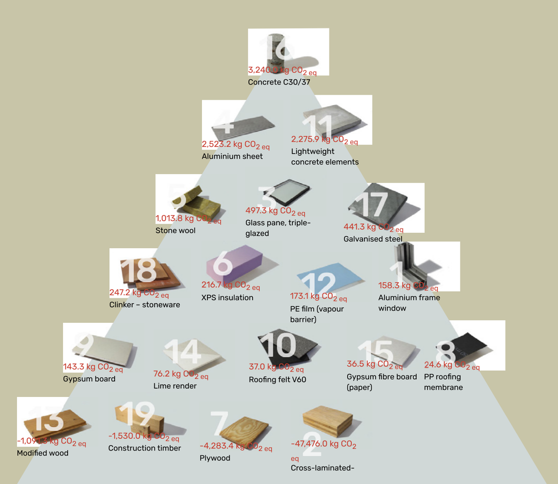


TYPICAL CONSTRUCTION DETAIL

STRUCTURAL DESIGN



EMBODIED ENERGY + CO_2



#	material	impact / m3	volume [m3]	area [m2]	thickness [mm]	result
1	Aluminium frame window	ter 1172.7 kg CO2eq/m3	0.14 m3	3 m2	45 mm	158.3 kg $CO_{2\,eq}$/m3
2	Cross-laminated-timber CLT	-664.0 kg CO2eq/m3	71.50 m3	286 m2	250 mm	-47,476.0 kg $CO_{2\,eq}$/m3
3	Glass pane, triple-glazed	ter 415.6 kg CO2eq/m3	1.20 m3	33.24 m2	36 mm	497.3 kg $CO_{2\,eq}$
4	Aluminium sheet	28242.0 kg CO2eq/m3	0.09 m3	162.44 m2	.55 mm	2,523.2 kg $CO_{2\,eq}$
5	Stone wool	70.4 kg CO2eq/m3	14.40 m3	160 m2	90 mm	1,013.8 kg $CO_{2\,eq}$
6	XPS insulation	96.3 kg CO2eq/m3	2.25 m3	75 m2	30 mm	216.7 kg $CO_{2\,eq}$
7	Plywood	-649.0 kg CO2eq/m3	6.60 m3	550 m2	12 mm	-4,283.4 kg $CO_{2\,eq}$
8	PP roofing membrane	271.5 kg CO2eq/m3	0.09 m3	90.77 m2	1 mm	24.6 kg $CO_{2\,eq}$
9	Gypsum board	169.6 kg CO2eq/m3	0.84 m3	65 m2	13 mm	143.3 kg $CO_{2\,eq}$
10	Roofing felt V60	407.8 kg CO2eq/m3	0.09 m3	90.77 m2	1 mm	37.0 kg $CO_{2\,eq}$
11	Lightweight concrete elements	202.3 kg CO2eq/m3	11.25 m3	75 m2	150 mm	2,275.9 kg $CO_{2\,eq}$
12	PE film (vapour barrier)	266.3 kg CO2eq/m3	0.65 m3	650 m2	1 mm	173.1 kg $CO_{2\,eq}$
13	Modified wood	-519.0 kg CO2eq/m3	2.10 m3	84.11 m2	25 mm	-1,091.3 kg $CO_{2\,eq}$
14	Lime render	190.6 kg CO2eq/m3	0.40 m3	40 m2	10 mm	76.2 kg $CO_{2\,eq}$
15	Gypsum fibre board (paper)	91.2 kg CO2eq/m3	0.40 m3	40 m2	10 mm	36.5 kg $CO_{2\,eq}$
16	Concrete C30/37	288.0 kg CO2eq/m3	11.25 m3	75 m2	150 mm	3,240.0 kg $CO_{2\,eq}$
17	Galvanised steel	22923.1 kg CO2eq/m3	0.02 m3	35 m2	.55 mm	441.3 kg $CO_{2\,eq}$
18	Clinker – stoneware	618.0 kg CO2eq/m3	0.40 m3	40 m2	10 mm	247.2 kg $CO_{2\,eq}$
19	Construction timber	-680.0 kg CO2eq/m3	2.25 m3	25 m2	90 mm	-1,530.0 kg $CO_{2\,eq}$
						-43,276.3 kg $CO_{2\,eq}$/m3

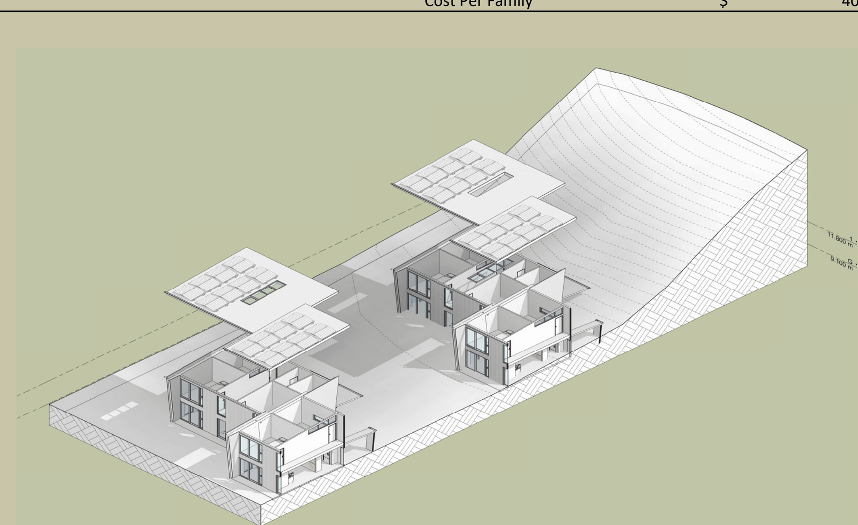
Bldg Element	Quantity (m2 or Kg)	Embodied Carbon kg CO2/qty	Carbon Value kg CO2
3100 - Concrete Slab	75.68	461.81	34,947.93
3300 - CLT Wall Panels	131.77	0.93	122.55
3300 - CLT Floor & Roof	155.32	0.93	144.45
4100 - Ply Rigid Barrier	281.00	0.86	241.66
4100 - Bldg Wrap	281.02	0.62	174.23
4200 - Aluminium Wall Cladding	71.67	33	2,365.11
4200 - Timber Cladding (Abodo)	84.11	0.53	44.58
4300 - Aluminium Roof Cladding	90.77	33	2,995.41
Carbon Per House	41,035.92 KG		437,647.57
Overall Carbon	**246,215.51 KG CO2**		**2,625,885.44**

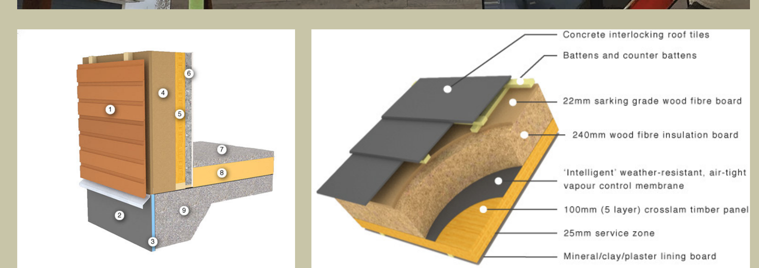
230Tonnes CO_2

Typical Embodied Carbon of an Average NZ House in 90 Life Span

CONSTRUCTION

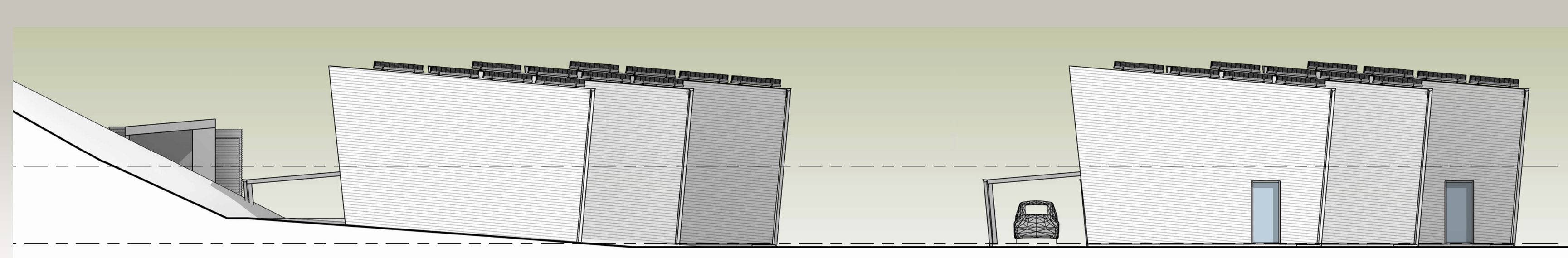
Element	Area/Qty	Cost	Overall Cost
Land Cost			$ 100,000.00
Build Per Home / Family	139	$ 2,600.00	$ 361,400.00
Landscpaing & Site	Prov. Allowance		$ 80,000.00
Solar & Water & Recycling	Prov. Allowance		$ 65,000.00
		Total Project Cost	$ 2,413,400.00
		Cost Per Family	$ 402,233.33

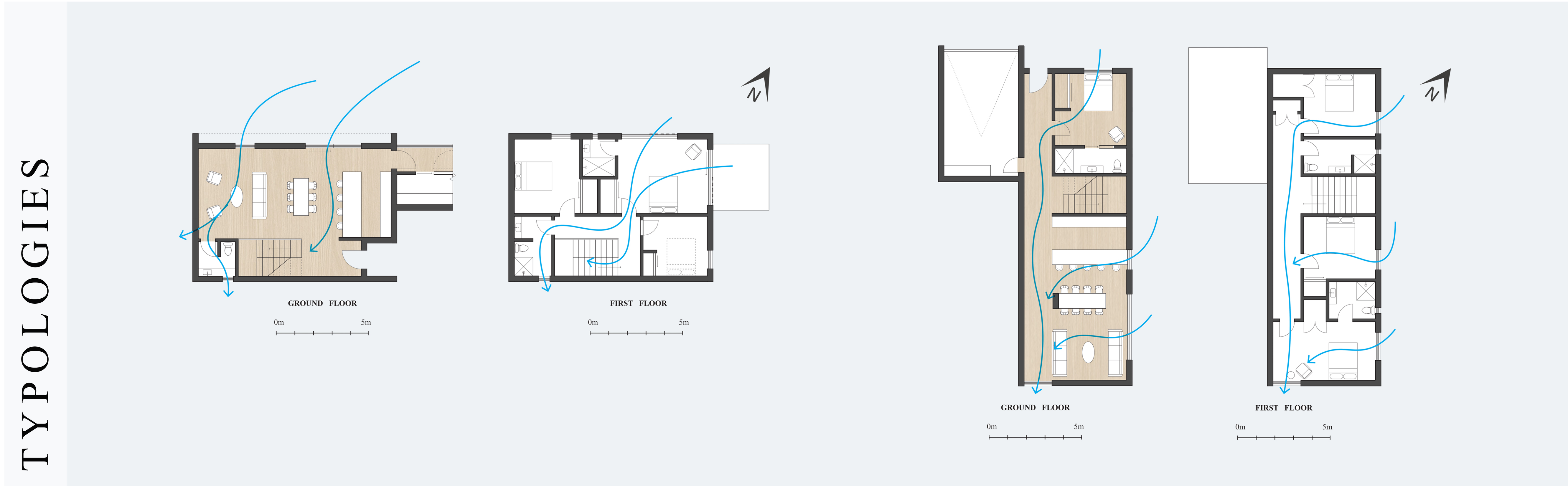


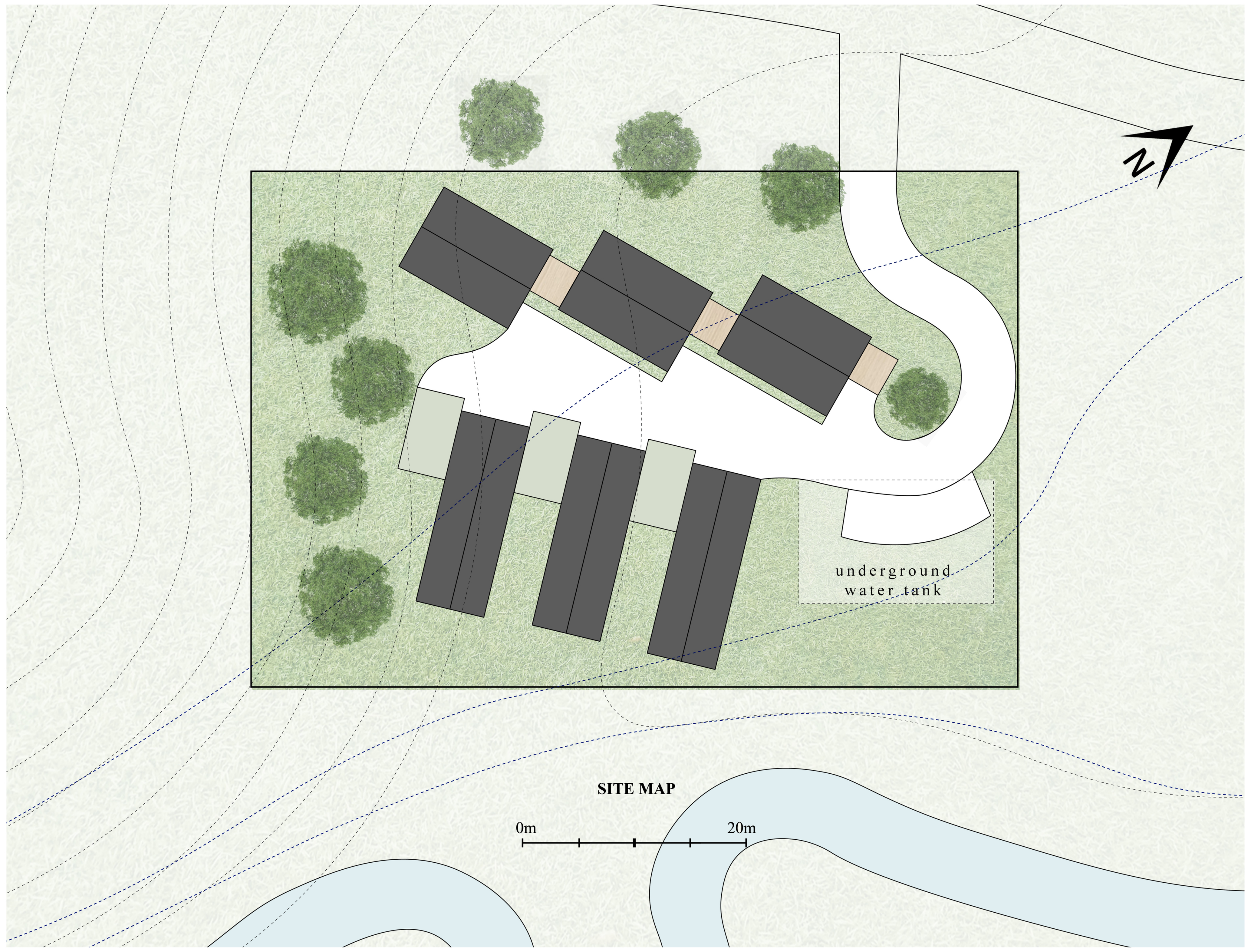


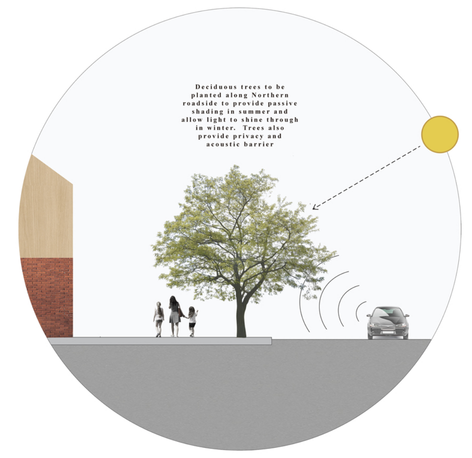
$402,233.33

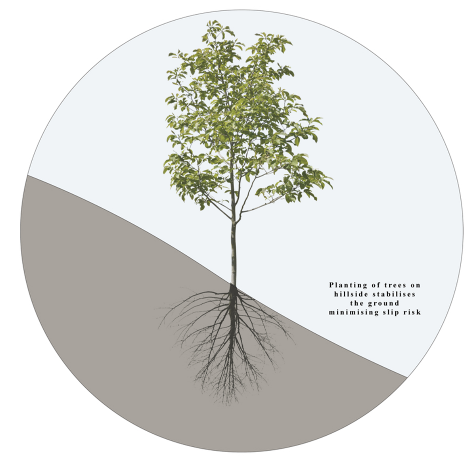
Approximate Build Cost per family.
Whole Project cost $2.43Million

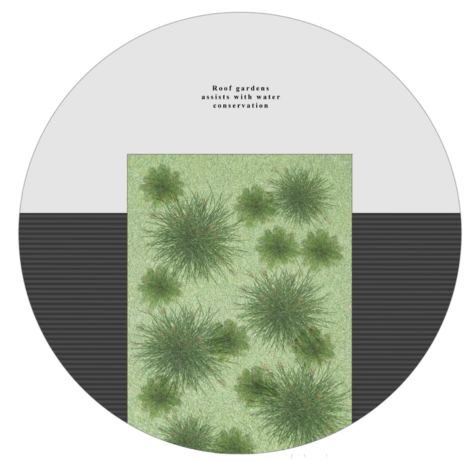






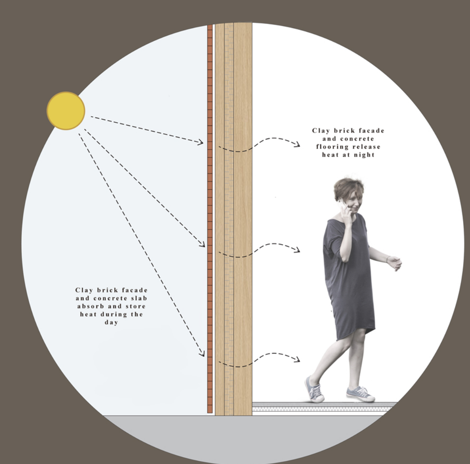


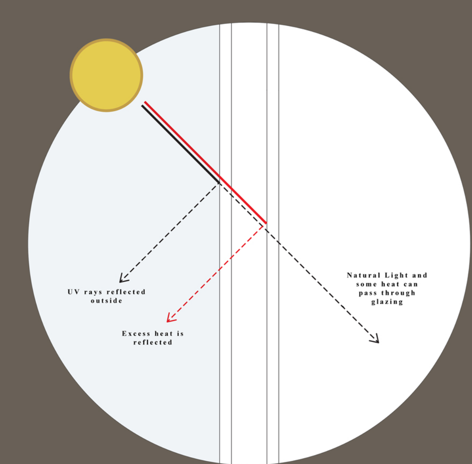


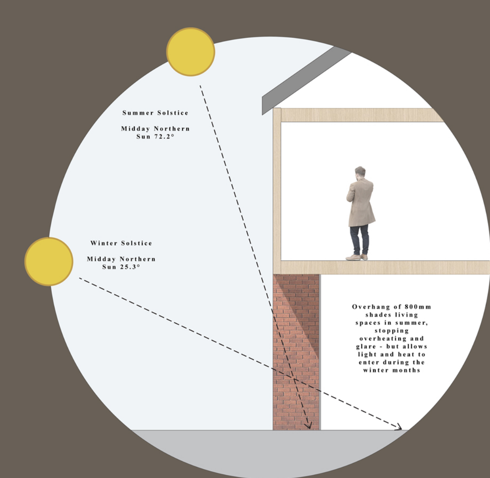


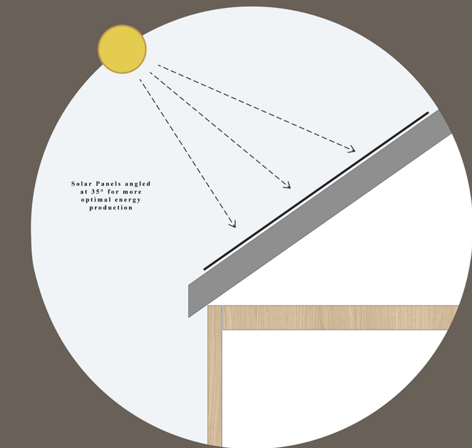
AT THE WATERS EDGE

'At the waters edge' is a medium density residential scheme focused on biophilic design, sustainability, and its community of residences. Taking into consideration the site's existing climate and environmental features, this project employs numerous passive design strategies such as optimal solar orientation, solar shading, passive ventilation, and thermal mass. However, deliberate sustainable efforts are also made through active design choices in the water overflow rain gardens, water collection tanks, and PVC solar panels. This can also be seen through the choice of cost effective, but durable materials suitable to Wellington's cooler climate as well as seismic activity. Whilst sustainability is of upmost importance, the scheme also has to be comfortable to live in, prompting biophilic design choices of roof gardens, courtyards, and view shafts of the river – addressing the needs of the diverse range of families that can live in this residential scheme.



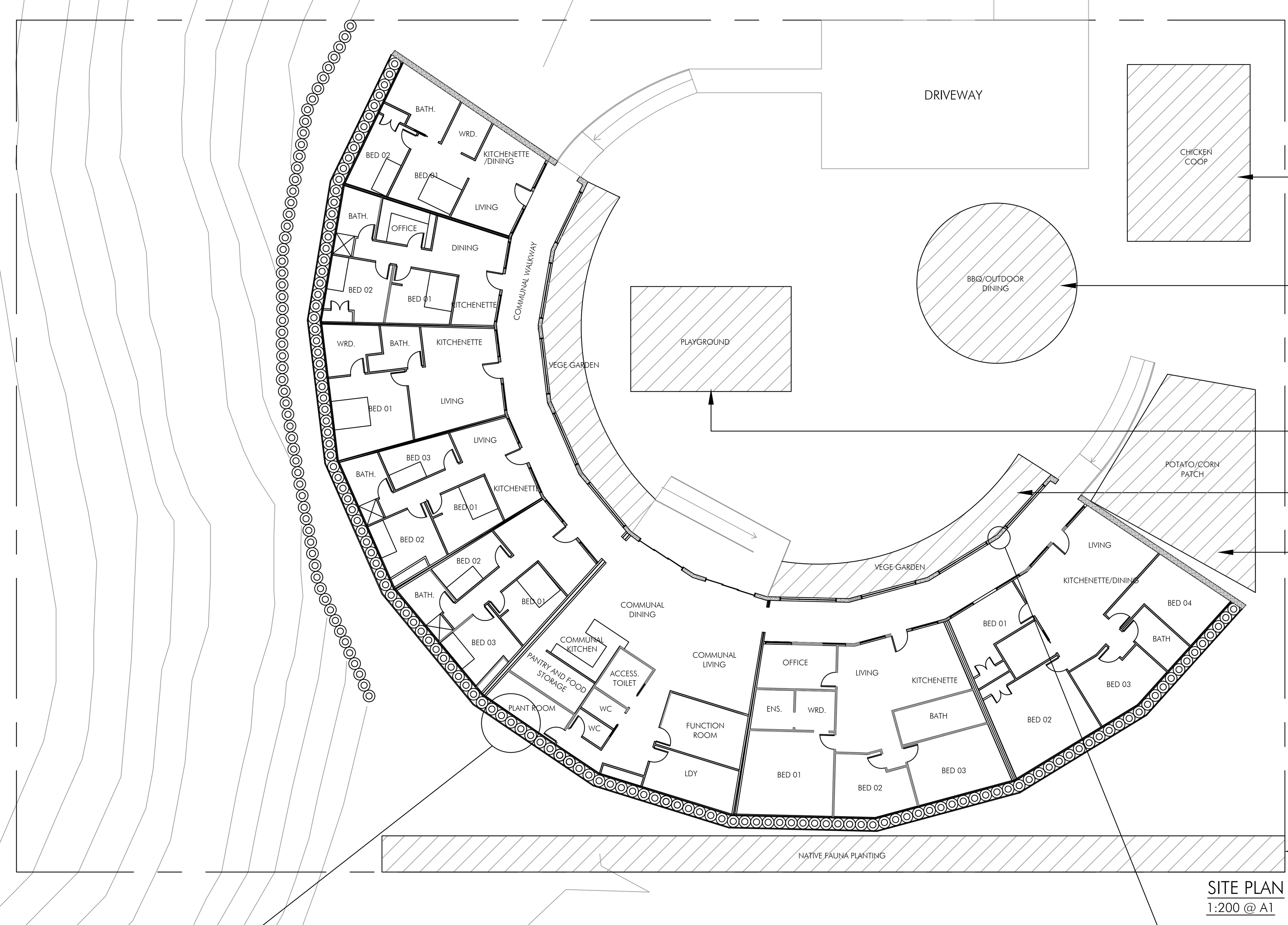




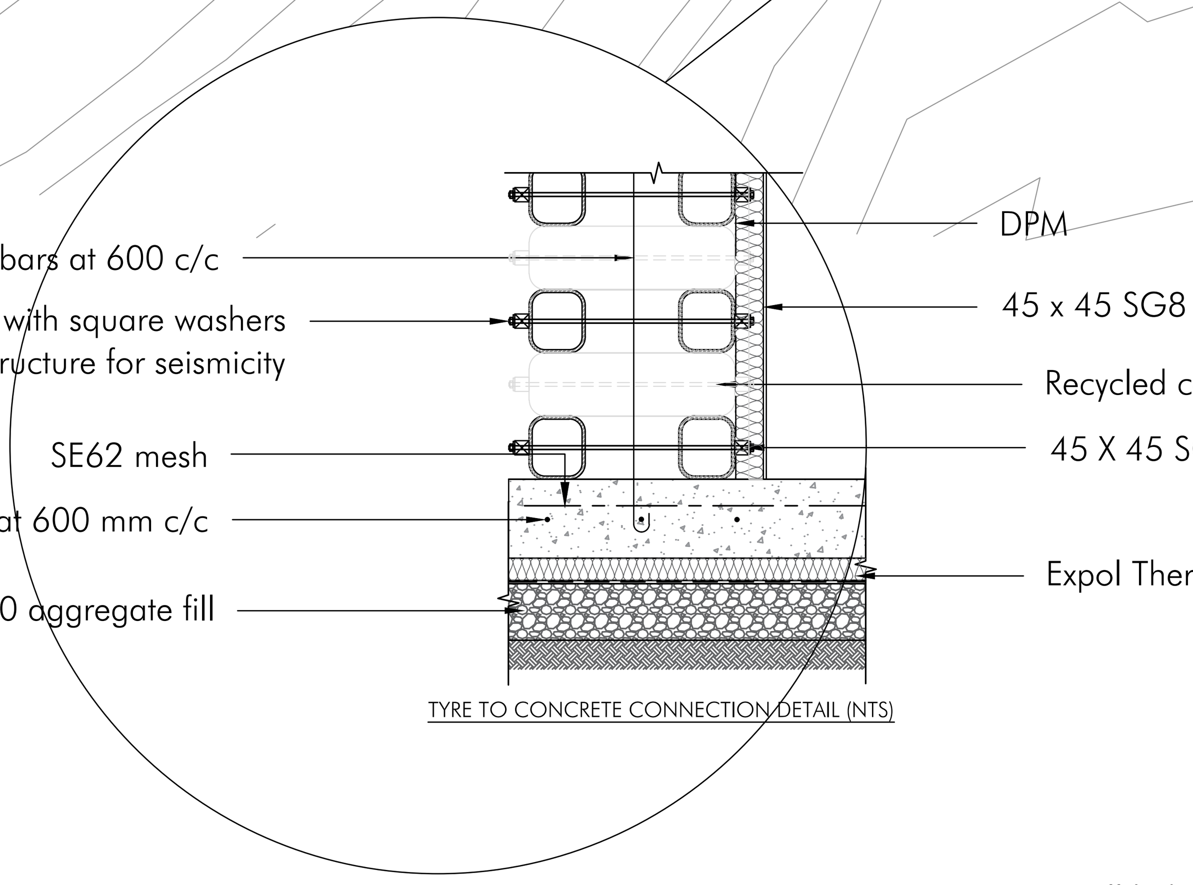


CIRCUITION:

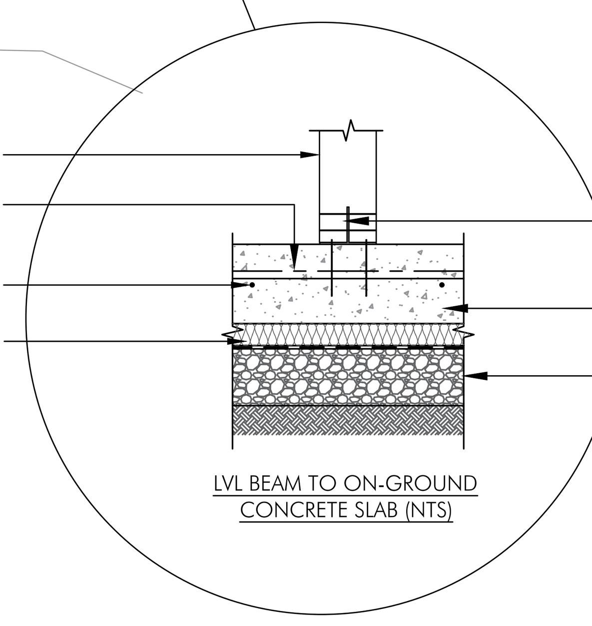
AN EXPLORATION OF RECYCLED ARCHITECTURE



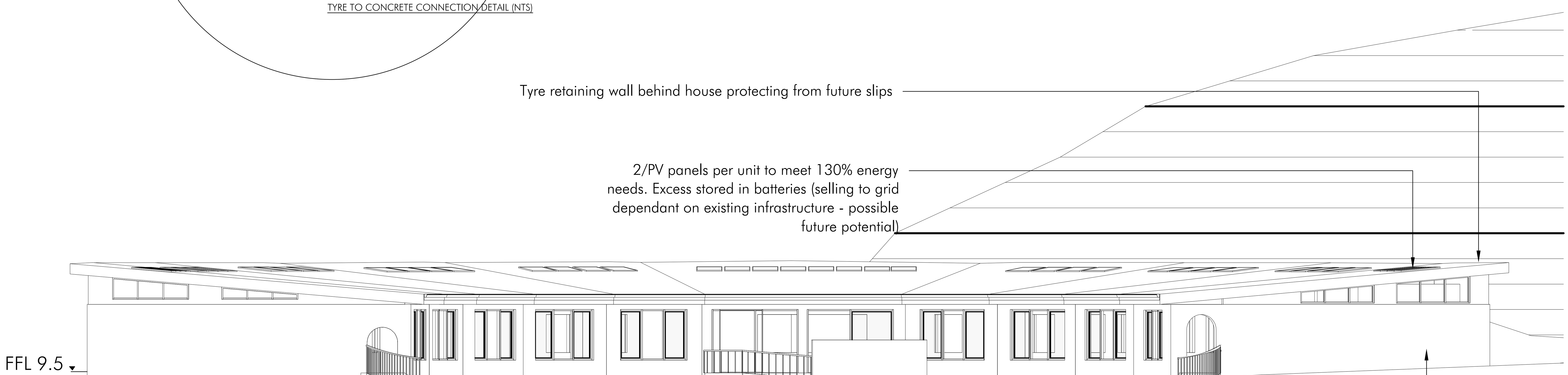
SITE PLAN
1:200 @ A1



TYRE TO CONCRETE CONNECTION DETAIL (NTS)



LVL BEAM TO ON-GROUND CONCRETE SLAB (NTS)



ELEVATION
1:400 @ A1

LIVING BUILDING CHALLENGE/HAUORA MAAORI

ADAPT AND RESILIENCE

- FLOOD BARRIERS: cost effective, removable, easy installation and can protect up to 700 mm of flooding. NZ suppliers available
- FLOOR LEVELS: Built to achieve 1/100 modelled flood levels from Hutt District Council. Note: modelling behaviour is unpredicatable and design has met prediction as best as possible. Elevated construction to reduce risk of flooding.
- GEOTECHNICAL DRAINAGE AND WATER MANAGEMENT SYSTEM: Geotechnical downpipes and water through site to onsite water storage and existing council infrastructure. Drainage to river allowed only by council consent.
- RESILIENT MATERIAL: Using materials that are dimensionally stable, perform well under heat.
- CERTIFIED PASSIVE HOUSE: This has been achieved through superior design, air tight construction, high performance windows, heat recovery ventilation, thermal bridge elimination energy efficient appliances and lighting, cool roofing that reflects the light and UV, finally passive solar design.

MINIMISE

1. SCM concrete

By using SCMs, you can decrease the amount of Portland cement needed in the mixture. Cement production is energy-intensive and generates a substantial amount of carbon dioxide (CO2) emissions. By using SCMs to partially replace cement, you lower the overall carbon footprint of the concrete. This process also reduces the heat of hydration and mitigate the Alkali-Silica Reaction (ASR)

2. Recycled aggregates by use of granular tyre and brown/green glass aggregates for concrete fill - this can replace up to 40% of virgin aggregate and has been shown to have structural integrity for use in foundation and retaining structures. It also has good dampening during seismic activity however this has not been quantified.
3. Carbon sequestration through plantation of native species - gold standard
4. Utilisation of timber as building material which is a carbon sink and
5. Utilisation of rammed earth for wall fill and thermal protection
6. Rescue and reuse tyres in wall fill and retaining structures from landfills as currently NZ do not have measures/facilities in place to recycle or reuse these.

HEALTH, HAPPINESS AND BEAUTY

- Circular form encourages community while also allowing for privacy
- Emphasis on greenery for health (aesthetic, thermal comfort and nutrition)
- Building position to take advantage of natural sunlight
- Internally, rooms that are not adjacent to external walls and windows are top lit via internal partition wall glazing.
- Playground/play area to encourage mental, physical and emotional development of children and allow opportunity for adults to engage in play

ENERGY

Based on peak sunshine hours and average energy consumption for the complex based on MBIE recommendation of electricity use 45 kWh/ m2 we require at 34,000 KWh of energy per year. This has been calculated to equate to a required array size of 505kW and two panels per module. However this has been increased to 4 panels per module which will be able to provide 130% of the energy requirements of the complex