Norwest Marketown

Planning Proposal

Prepared by Finding Infinity

31/08/2023

Contents

finding
ínfinity

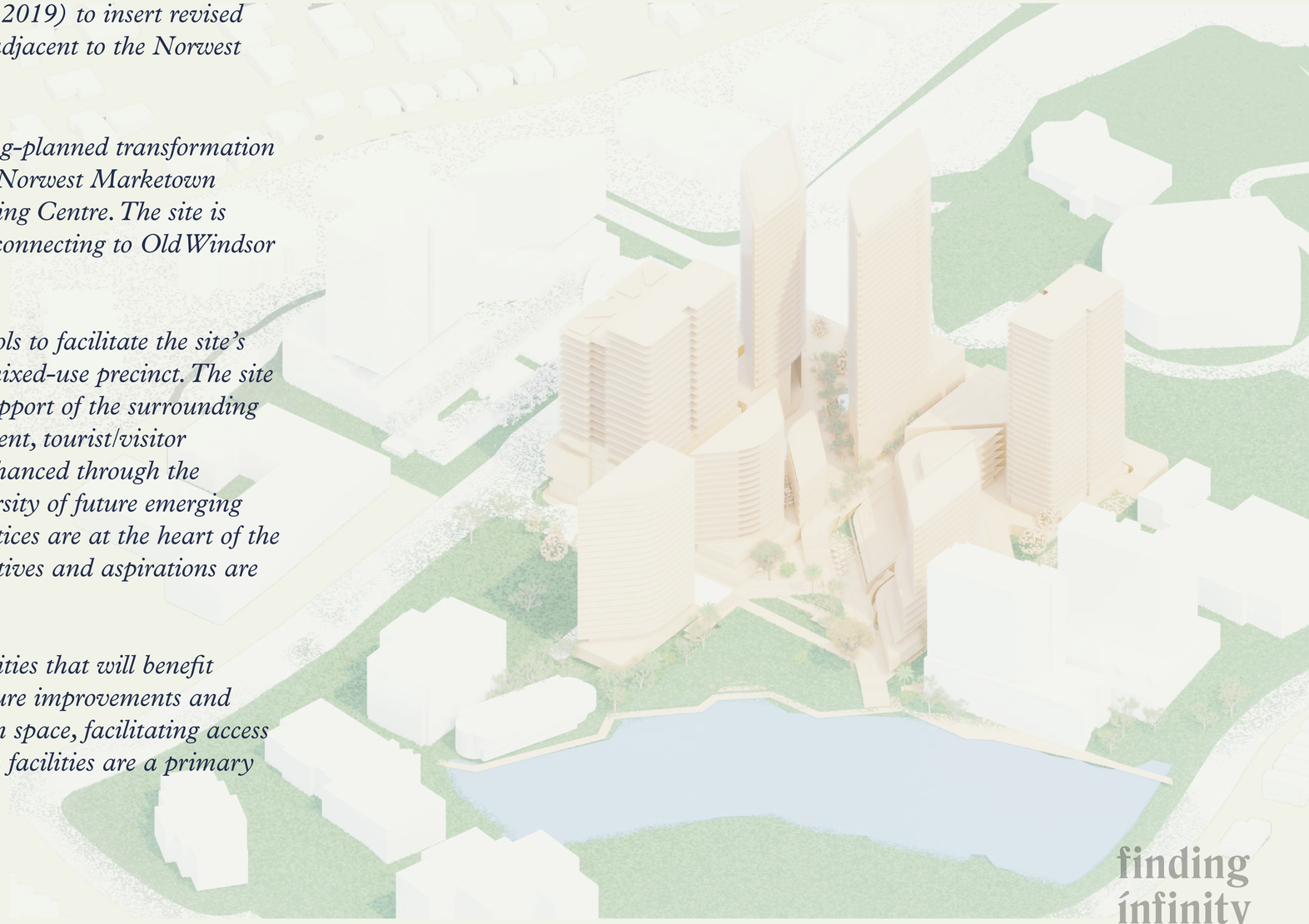
Introduction

This report has been prepared, on behalf of Norwest City Trust (Mulpha Norwest), to support the submission and assessment of the Norwest Marketown Planning Proposal. The proposal seeks to amend The Hills Local Environmental Plan 2019 (THLEP 2019) to insert revised planning controls for land situated at 4-6 Century Circuit, Norwest adjacent to the Norwest Metro Station and within the Norwest Strategic Centre.

The Norwest Marketown Planning Proposal aims to facilitate the long-planned transformation of 46,455m² of strategically important land presently containing the Norwest Marketown Shopping Centre and adjoining lands comprising the Carlile Swimming Centre. The site is situated along a major regional throughfare in Norwest Boulevarde, connecting to Old Windsor Road to the west.

This Planning Proposal will facilitate the appropriate planning controls to facilitate the site's future redevelopment for a contemporary transit-oriented and truly mixed-use precinct. The site has a capacity to deliver a range of employment generating uses in support of the surrounding Norwest Business Park, through commercial, retail, office, entertainment, tourist/visitor accommodation and community floorspace. These uses are further enhanced through the proposal's introduction of residential uses and the potential for a diversity of future emerging housing typologies. Mulpha's vision for sustainable development practices are at the heart of the concept for the site and a range of environmental sustainability initiatives and aspirations are sought, including renewable energy and building efficiencies.

Development planned for the site will be supported by a range of facilities that will benefit occupants of the site and the broader region, together with infrastructure improvements and upgrades and the delivery of generous plazas, public squares and open space, facilitating access to an enhanced Norwest Lake foreshore. Education and collaboration facilities are a primary focus of community life for Norwest Marketown.



finding infinity

Norwest Marketown Indicative Reference Scheme

Mulpha's vision for the site is a revitalised and vibrant mixed-use precinct that increases the productivity of employment generating land, provides essential services and increases the provision of housing close to transport. The precinct will provide essential services and a range of new community facilities and open space areas that will benefit the broader community. This will enable the creation of a vibrant and rejuvenated centre that fosters an attractive place to live, work and play.

The Norwest Marketown Indicative Reference Scheme, as prepared by FJC Studio, represents an optimised and refined reference scheme, to guide best practice design and the preparation of detailed planning controls to achieve an attractive transit-oriented development precinct with high amenity.

Key features of the Norwest Marketown Indicative Reference Scheme are:

- *A masterplanned urban design of new building blocks, public streets, squares and open spaces.*
- *A total development density of up to 232,375m² Gross Floor Area (GFA) comprising a Floor Space Ratio of 5.0:1. This includes the following components:*
  - *117,330m² of employment generating floorspace comprising commercial, retail and hotel accommodation;*
  - *102,523m² of residential floorspace comprising approximately 854 apartments; and*
  - *12,523m² of community, indoor recreation, civic, entertainment and education floorspace.*
- *Building heights above ground ranging from 5 storeys to 36 storeys.*
- *A Lower Ground level providing a direct connection to Norwest Metro through to Norwest Lake at grade with retail and food and beverage opportunities.*
- *Basement parking, loading and servicing across 5 subterranean levels, with spaces for some 2,600 cars, which are intended to be allocated by way of a parking management system.*
- *Substantial open space provisions including:*
  - *Lake Avenue – pedestrian linkage connecting Norwest Boulevarde to Norwest Lake*
  - *Garden Terrace – cascading open space, providing an enhanced Norwest Lake Foreshore*
  - *Norwest Public Square – local passive open space and alfresco dining.*
- *Community and civic buildings such as the Glass House.*
- *Significant enhancements to the existing Century Circuit, including intersections with Norwest Boulevarde, the provision of internalised local streets within a pedestrian priority environment and opportunity for a future connection to Fairway Drive.*
- *Complementary on and off-site infrastructure to be delivered by way of a future Planning Agreement.*

Norwest Marketown - Indicative Landscape Master Plan Source: Realm

finding infinity

Proposed Planning Controls

The Planning Proposal Justification Report, as prepared by Ethos Urban, details the intention to insert new planning provisions covering Norwest Marketown, through the amendment of the THLEP 2019. Specifically, the Planning Proposal will:

- *Seek a rezoning of the site from E1 Local Centre to MU1 Mixed Use.*
- *Seek an increase in overall height within the site from RL116 to RL216.*
- *Seek an increase to Floor Space Ratio from 1.49:1 to 5.0:1, comprising a minimum 'commercial premises' and 'entertainment facility' FSR of 2.5:1 and a maximum 'residential flat buildings', 'shop top housing' and 'boarding houses' FSR of 2.21:1 and 854 dwellings.*
- *Dwelling size and mix requirements consistent with THLEP 2019 and Council's strategic goals for housing.*
- *Car parking provisions in relation to dwellings, dwelling visitors, retail and commercial uses.*
- *Additional Permitted Uses (Schedule 1) to allow for the land uses of: recreation area, retail premises, recreation facility (outdoor), water recreation structure, waterbody (artificial) and wharf/boating facilities, within the land zoned SP2 Infrastructure within the site.*

Norwest Marketown, Indicative Built Form Vision – Source: FJC

Norwest Marketown, Indicative Lake Interface – Source: FJC

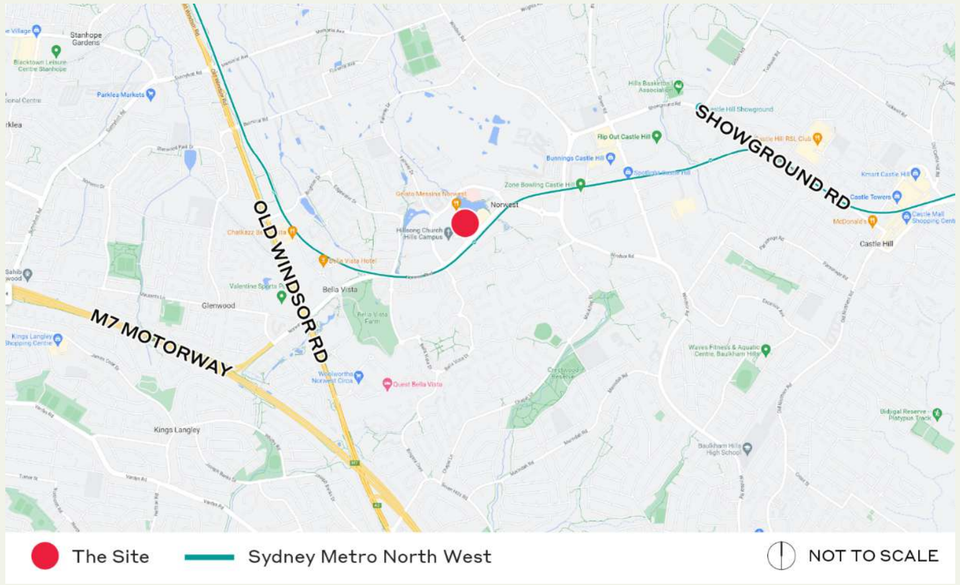
finding infinity

Proposed Planning Controls

Corresponding site-specific DCP which will address provisions such as:

- *Relationship to other Hills Shire DCP provisions*
- *Urban Context*
- *Desired Future Character and Principles*
- *Public Domain and Open Space*
- *Built Form*
- *Active Frontages*
- *Solar Access and Overshadowing*
- *Vehicular Access and Connectivity*
- *Landscape*
- *Design Excellence*
- *Sustainability*
- *Wind*
- *Staging and Implementation*

The proposal is in response to the Draft Norwest Precinct Plan which was on exhibition from 2 May 2023 until 31 July 2023. According to the Draft Plan, Norwest Marketown is identified within 'Focus Area 2' was earmarked as being subject to 'market driven' change and that changes to the planning framework would be driven by landowner-initiated planning proposals, along with associated amendments to the DCP, Public Domain Plan and appropriate infrastructure contribution mechanisms.



Location of the site in its surrounding context Source: Google Maps, edits by Ethos Urban

finding infinity

Site Location, Description and Context

The site is located at 4-6 Century Circuit, Norwest within The Hills LGA. Norwest is approximately 12km north of the Parramatta CBD, and 35km northwest of the Sydney CBD. The site is strategically located within the north eastern portion of Norwest Business Park. The Park accommodates an extensive amount of employment land such as office and business premises and contains a range of facilities and amenities, including childcare centres, medical facilities, supermarkets, and a range of smaller retail tenants. It also incorporates recreational areas as well as pedestrian and bicycle linkages.

The site is also directly adjacent to the Norwest Metro railway station. Following its opening in 2019, surrounding each Metro station is an identified precinct that contributes to the Sydney Norwest Urban Renewal Corridor. In the context of this corridor, the site is situated within the Norwest Precinct.

The worker population within Norwest Business Park includes around 30,000 workers, being one of Greater Sydney's major employment areas. The workforce includes a large portion of professionals and clerical/service workers. Health care and social assistance, retail trade, professional, scientific, and technical services are the largest employing industries in the locality.

The site is situated on the northern side of Norwest Boulevarde, between Brookhollow Avenue and Century Circuit. It comprises two allotments which are legally described as Lot 2 in DP 1213272 (4 Century Circuit) and Lot 5080 in DP1008602 (6 Century Circuit). Both allotments are owned by Mulpha. The site has a frontage of approximately 185m to Norwest Boulevard and incorporates Century Circuit which extends eastward within the southern portion of the site. This site was formerly part of the North Sydney Brick and Tile Company's Brick Works Holding and as noted previously now forms part of the Norwest Business Park. An aerial view of the site, the relevant allotments and the immediate locality is provided below.

Site aerial photograph, showing extent of the site. Source: Nearmap, edits by Ethos Urban

finding infinity

Sustainability Summary

Summary

The impact of the key environmental initiatives and opportunities under consideration to make Norwest Marketown the Healthiest Precinct in Australia include;

// ***74% reduction in grid electricity consumption***
- // *Highly energy efficient buildings*
- // *Maximised rooftop and facade PV*
- // *Generating energy from anaerobic digester*

// ***100% embodied carbon reduction***
- // *Timber construction (no concrete)*
- // *Low carbon materials and zero carbon construction machinery*

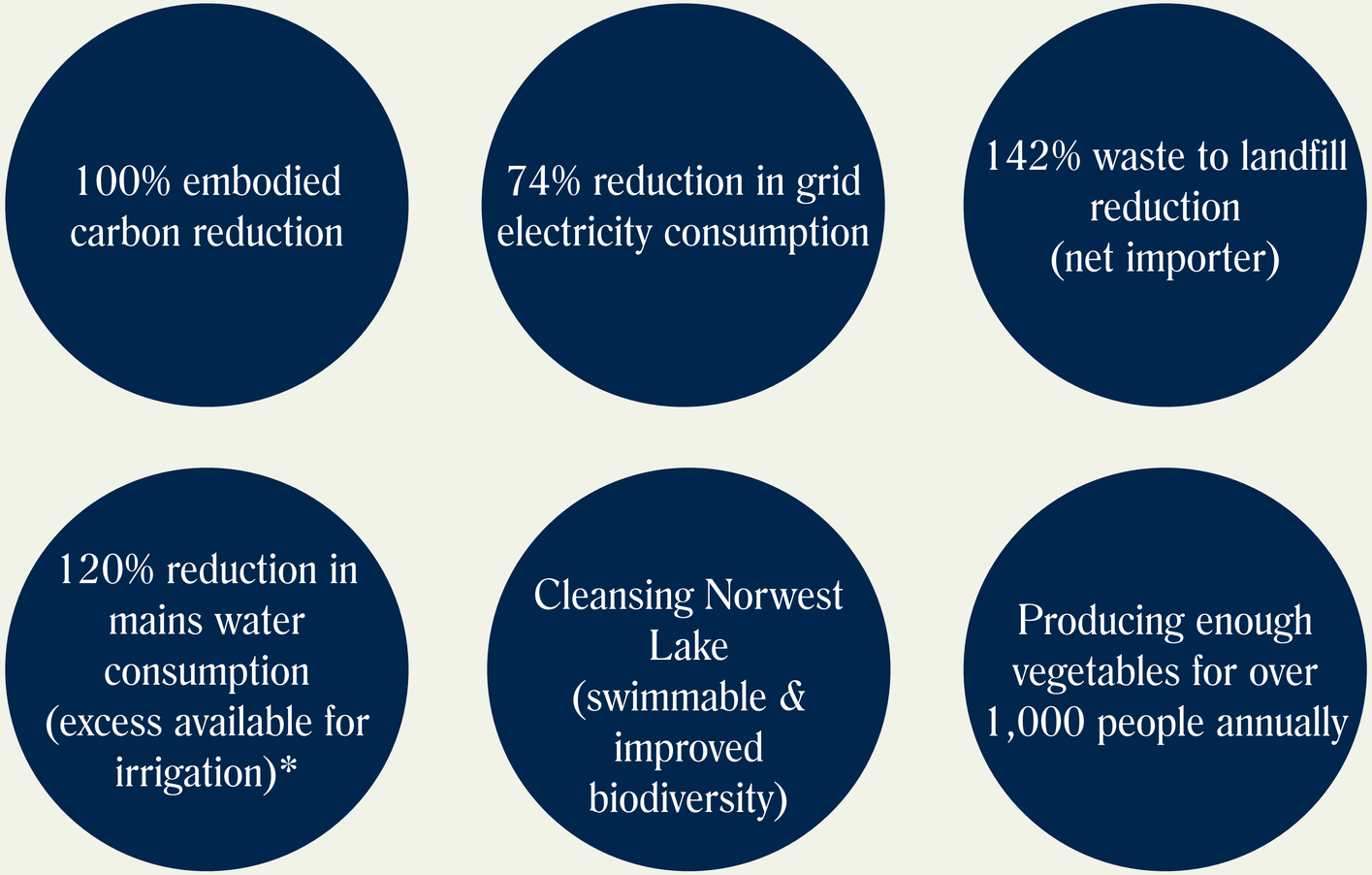
// ***100% reduction in mains water consumption***
- // *No Sewer Connection - Blackwater collection & treatment for irrigation **

// ***Net importer of waste***
- // *Zero waste precinct and importing food waste and other technical materials from local community*

// ***Cleaning, cleansing and rewilding of Norwest Lake***
- // *Swimmable and improved biodiversity*

// ***Maximise urban farming***
- // *Growing food on rooftops, indoor farming, aquaculture, converting car parks to indoor farms*

Impact of Potential Key Initiatives:



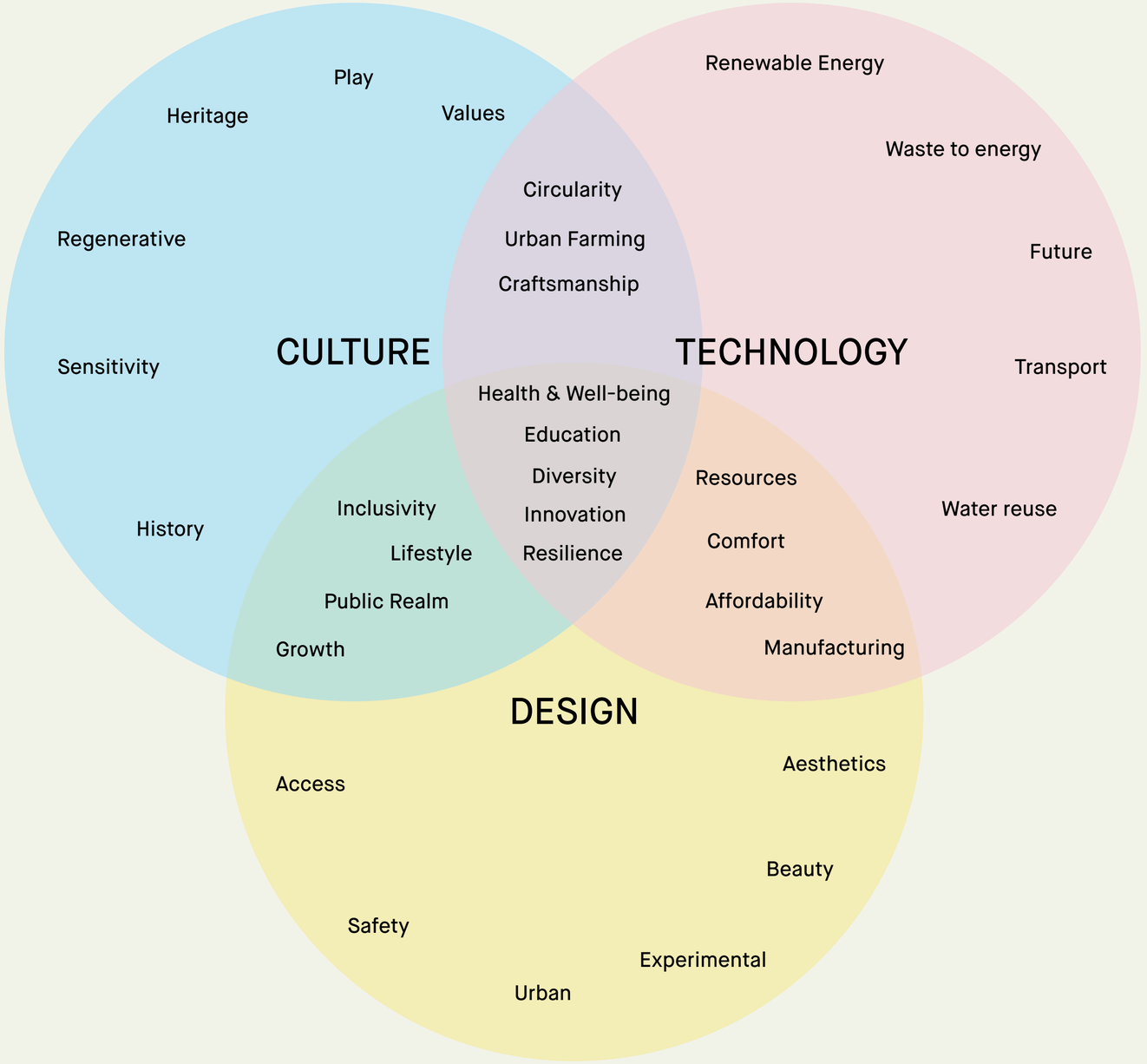
* Initiatives Requiring Further investigation

finding infinity

Vision Strategy

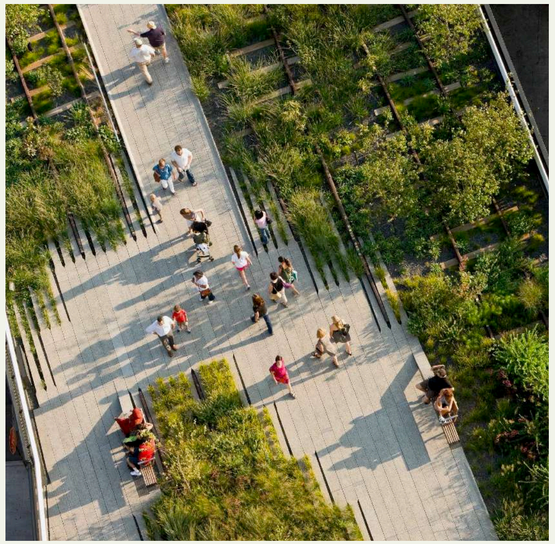
The Norwest Marketown development aims to combine technology, culture and design to create a holistic place to live, create, work and play.

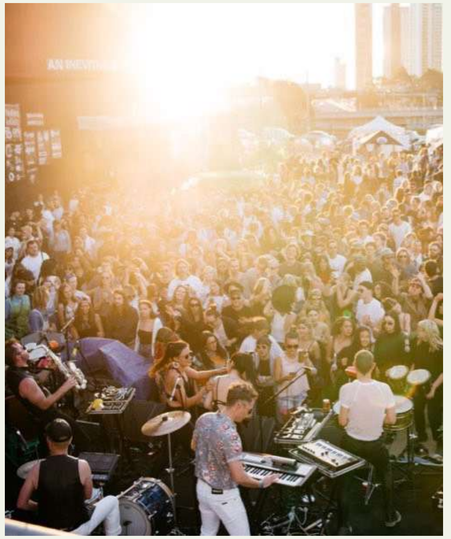
The vision for the site is formed through an integrated approach to architecture, infrastructure, culture, development and engineering. The strategy of combining future technology and infrastructure with the culture that enables communities to thrive creates a city that is vibrant, diverse, healthy and connected to its surrounding area.



finding infinity

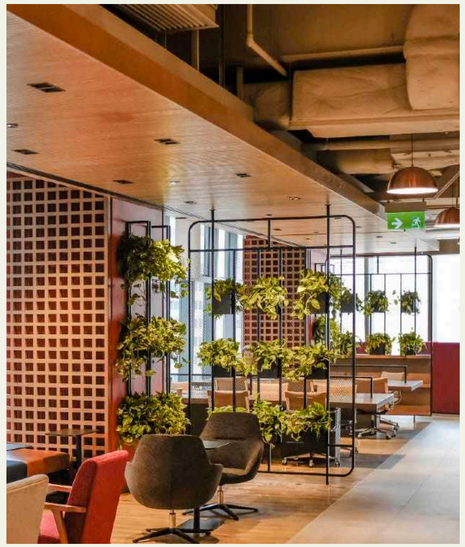
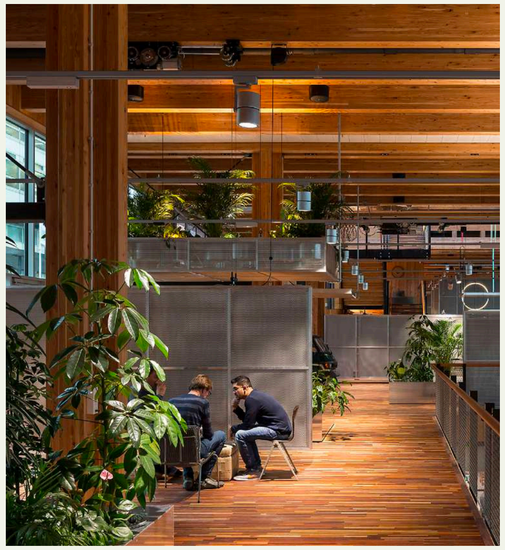
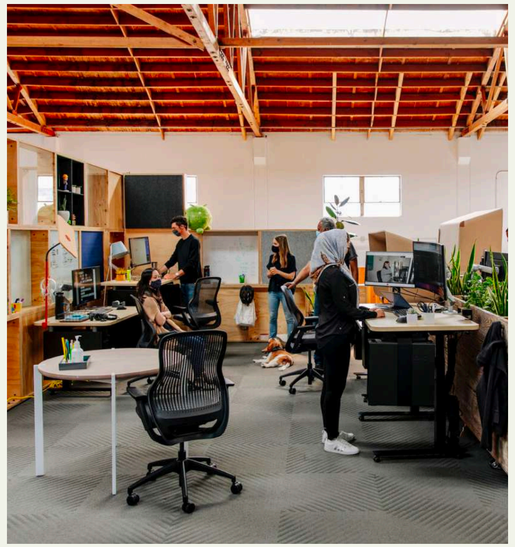
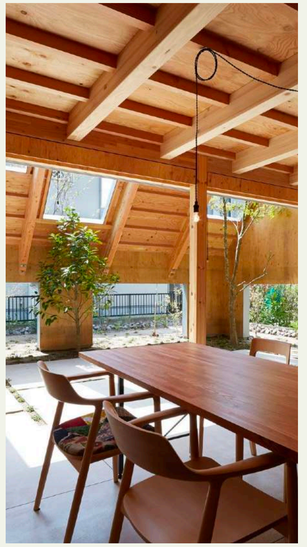
Bringing the entire neighbourhood together

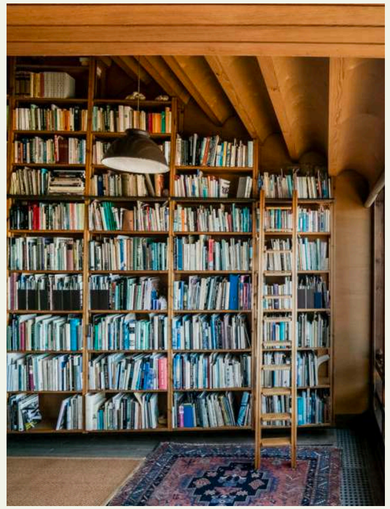


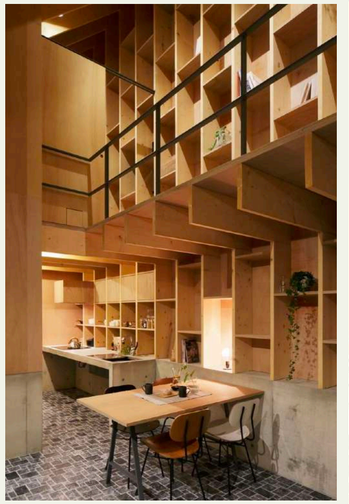
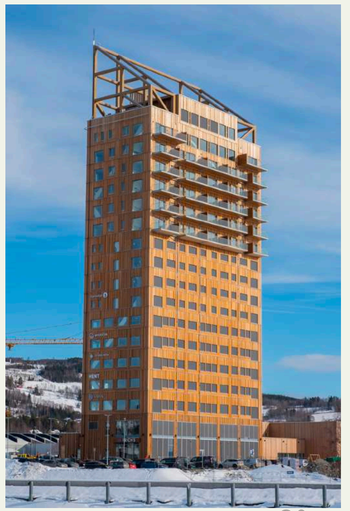


finding
infinity

Happy place to work

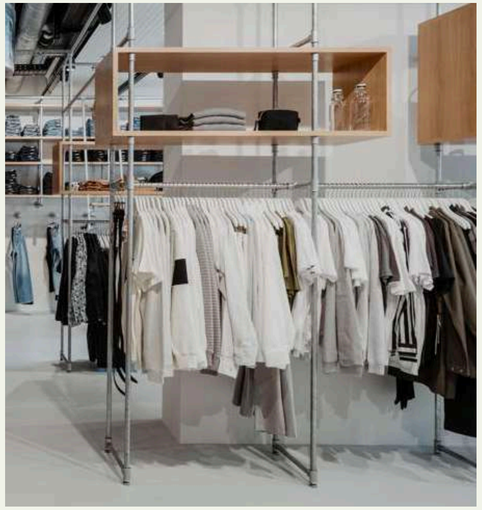








finding
infinity

Appealing place to shop

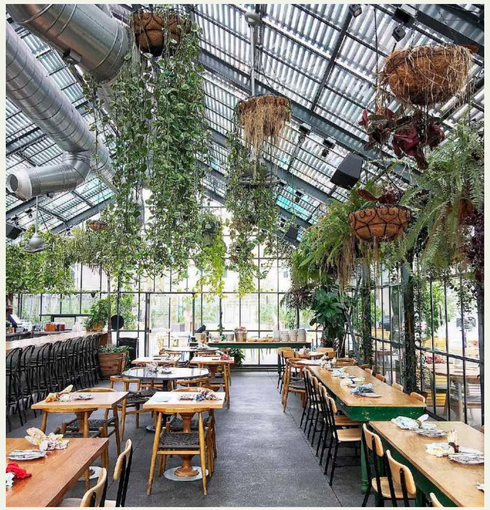


finding infinity

Zero waste future hospitality using food that's grown on site



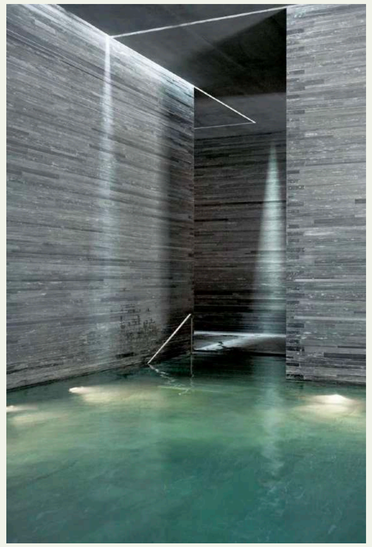
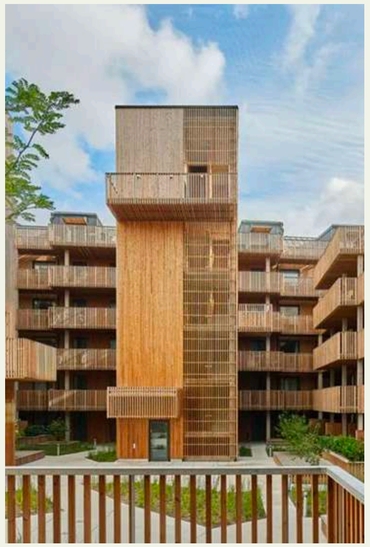


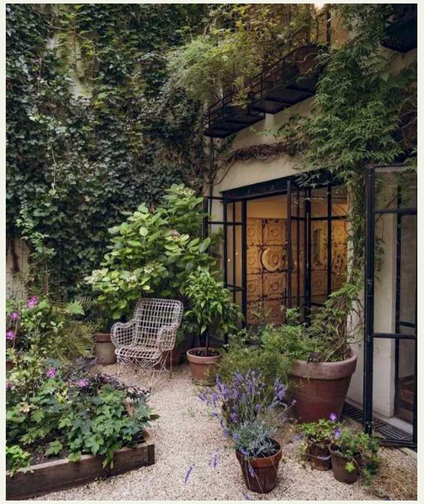


finding
ínfinity

Providing comfortable and affordable spaces allowing people to live with a positive environmental impact



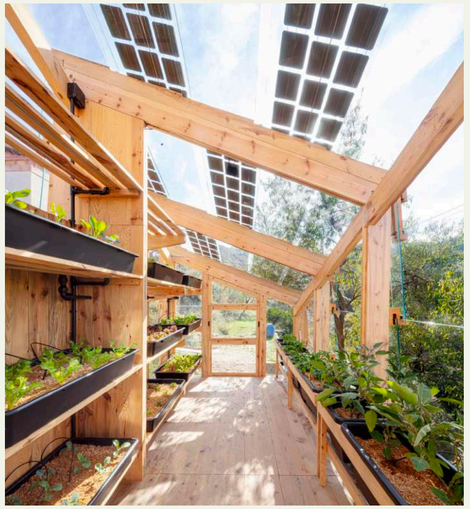



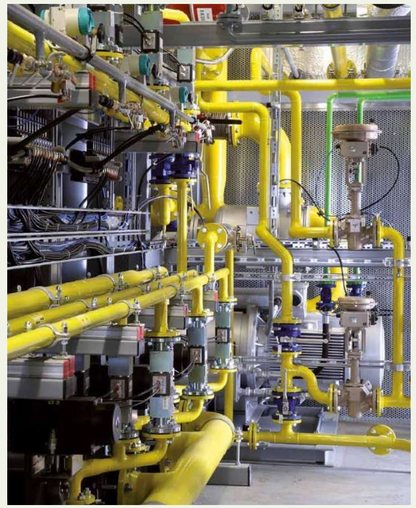

finding
infinity

A community that produces more than it consumes, giving back to the surrounding area and future generations



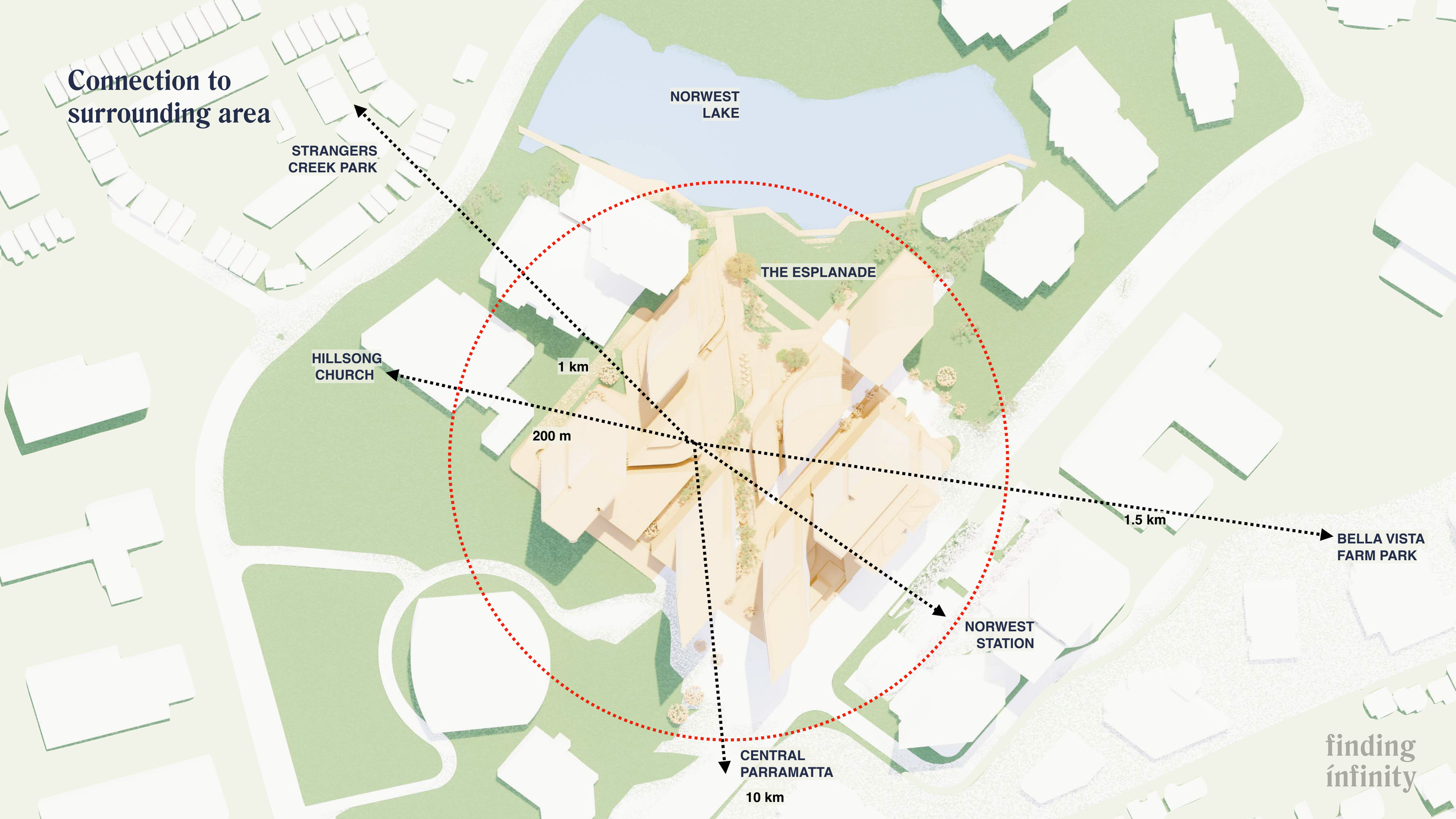





finding
infinity

Connection to surrounding area



finding infinity

Targets

The project is aspiring towards achieving the following goals;

Highly Energy Efficient

100 % Renewably Powered

Water Positive

Treats and exports more water than it consumes

Zero Waste

Treats more organic waste than it produces

Zero Waste Construction

Carbon Neutral Construction

Maximised urban farming

Growing more food on site than before

Healthiest community in Australia

finding infinity

Potential Key Initiatives and Opportunities

finding infinity

Summary Matrix

Potential Key Initiatives and Opportunities	Specifics	Targets	Pros	Cons
Zero carbon, zero waste & circular construction	Selection of building materials and construction company to align with goals	Zero embodied emissions in building materials. Zero waste on construction of the precinct	Healthier site and waterway during construction. Promotional potential for development	Increased construction cost
Electric Precincts	No gas connection to precinct	No gas connection	Health, reduced infrastructure requirements, opportunity for greater renewable energy usage	Can be spatially challenging. Careful equipment selection required for restaurants
Net Zero New Builds	Building fabric, passive design, efficient systems	High performance building fabric, Highly efficient systems, maximised solar, low to no embodied emissions	Thermal comfort, health, low energy / water demands, low operating costs	Can cost more if not integrated into architecture
Renewable Energy Generation & Storage	Solar PV Waste to energy plant	Facade PV & maximise rooftop areas Net Zero - low bills for residents Maximise waste to energy plant	Enable net-zero on-site, residents receive the financial benefits, raised solar systems enable rainwater collection	Competition for spatials
Wastewater Treatment & Reuse	Circular water systems	Rainwater catchment, treatment and reuse Greywater catchment, treatment and reuse Black & grey water to potable *	Robust & resilient water supply	Challenges with current regulation & financial performance. Public perception
Rainwater Capture, Treatment & Infiltration	Rainwater reuse & water sensitive urban design	100% of rooftop rainwater collection & no stormwater run-off - maximum permeable ground surfaces Fasade rainwater collection	Healthier waterways, reduce water bills, potential to refine stormwater requirements	Competition for rooftop area
Organic Waste to Energy	Anaerobic Digester	Large scale on-site anaerobic digester	Transforming the neighbours organic waste into energy, organic fertiliser whilst also generating income for residents. Allows the precinct to be net-positive.	Requires some spatials & organisation workflow to be worked through in design.
Circular Economy	Embodied carbon, design for disassembly, circular materials & avoid landfill	Zero embodied emission construction, all materials are designed for disassembly & circular building materials. No waste to landfill	High value of materials after life of a project	Hard to achieve in a cost effective manner, lack of products and technology currently available on the market
Safe and Comfortable Microclimates	Urban Heat Island Effect	Maximise tree street canopy Smart landscape design	Reduce urban heat island effect	Cost of maintenance
Community Resilience Through Public Realm	Urban Forests	Urban forest & biodiversity	Hyperlocal food production & community fostering	Allocating sufficient spatials, maintenance
Food production	Community Gardens	Community Gardens & Urban Farming	Locally produced, fresh food	Allocating sufficient spatials, maintenance

* **Initiatives Requiring Further investigation**

finding infinity

Masterplan/Infrastructure

finding infinity

Initiative Summary

Summary of potential environmental initiatives and opportunities under consideration for Norwest Marketown:

Anaerobic Digester
Converts food waste into biogas and organic fertiliser. The biogas can be used to generate electricity and heat for the site.

Wellness
Spa and sauna linked to digester

Rooftop Solar
Maximised

Heat Pumps for Heating, cooling & DHW

Facade Solar
Maximised

Zero Waste Supermarket

Solar Greenhouse & Urban Agriculture
Potential for growing food and productive gardens for restaurant and market use

Zero Waste Bar / Restaurant
Food supply grown on site

Public Art
Sustainable sculpture

Green Infrastructure

Moonlight Cinema about the future

Biodiversity Native Vegetation

Battery Storage

Electric Vehicles & Vehicle to Grid Charging
On-site electric vehicle service for guest transportation and residents.

Rainwater Collection and Reuse

Productive Beehives
Productive beehives enhancing pollination and providing honey for retail or residents.

Aquaculture

Natural Pool Lake Swimming

Water Biodiversity
Waterfront design to enhance aquatic biodiversity.

Forest Windbreaker
Trees and planting structures that mitigate wind and offer shading

Urban Food Forest

Fishing
Catch and eat fresh fish in hospitality venues

Art Gallery
Creating community through art

Share & Repair Centre

Zero Waste Fashion
Retail

Markets
Fresh Food & Produce Grown on site

Heat Recovery Ventilation

Native Greenery

Net Zero Buildings

Shading
Shading design is optimised with orientation preventing undesirable heat gain.

Efficient Water Fittings and Fixtures

Greywater Supply to laundries

Efficient Lighting and Appliances

100% Electric Buildings
No Gas

E-Water Systems
No harsh chemicals

High Performance Building Fabric
Reduce heating and cooling demands

Net Zero Construction

Zero Waste Construction

Cross Laminated Timber Construction (CLT)
CLT can be beneficial due to its ability to sequester carbon, as well as health and well-being impacts associated with timber.

Non-Toxic Materials
Interiors designed using only non-toxic materials, contributing to healthy indoor environmental quality.

Zero Carbon Materials
Investigate material options such as recycled and zero carbon bricks.

Initiatives Requiring Further investigation

Floating Solar PV

Grey & black water Treatment for Potable use

Vacuum toilets

Vacuum waste system Organics, recycling, waste

Energy Opportunities

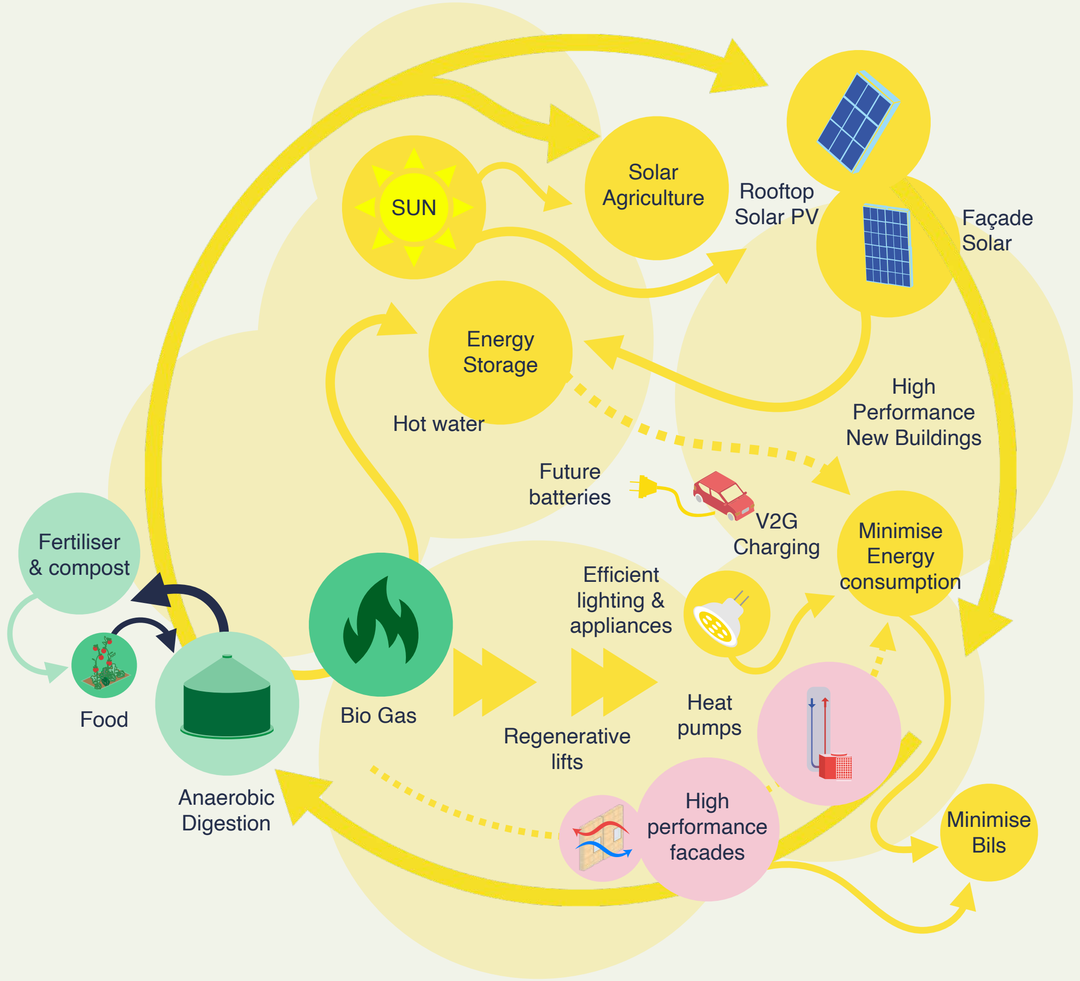
Potential Opportunities for reducing energy consumption and onsite energy generation:

Energy Efficiency

// *Efficient lighting & appliances*
// *Mixed mode ventilation*
// *Air cooled 5 pipe heat pump for cooling, heating and domestic hot water*
// *Heat recovery ventilation*
// *Regenerative Lifts*

Energy Generation and Storage

// *Waste to energy plant*
// *Rooftop solar*
// *Facade solar*
// *Alterations to building forms to for additional rooftop solar*
// *Pumped hydro energy storage from storm water*
// *Vehicle to grid charging (V2G)*
// *Floating Solar*

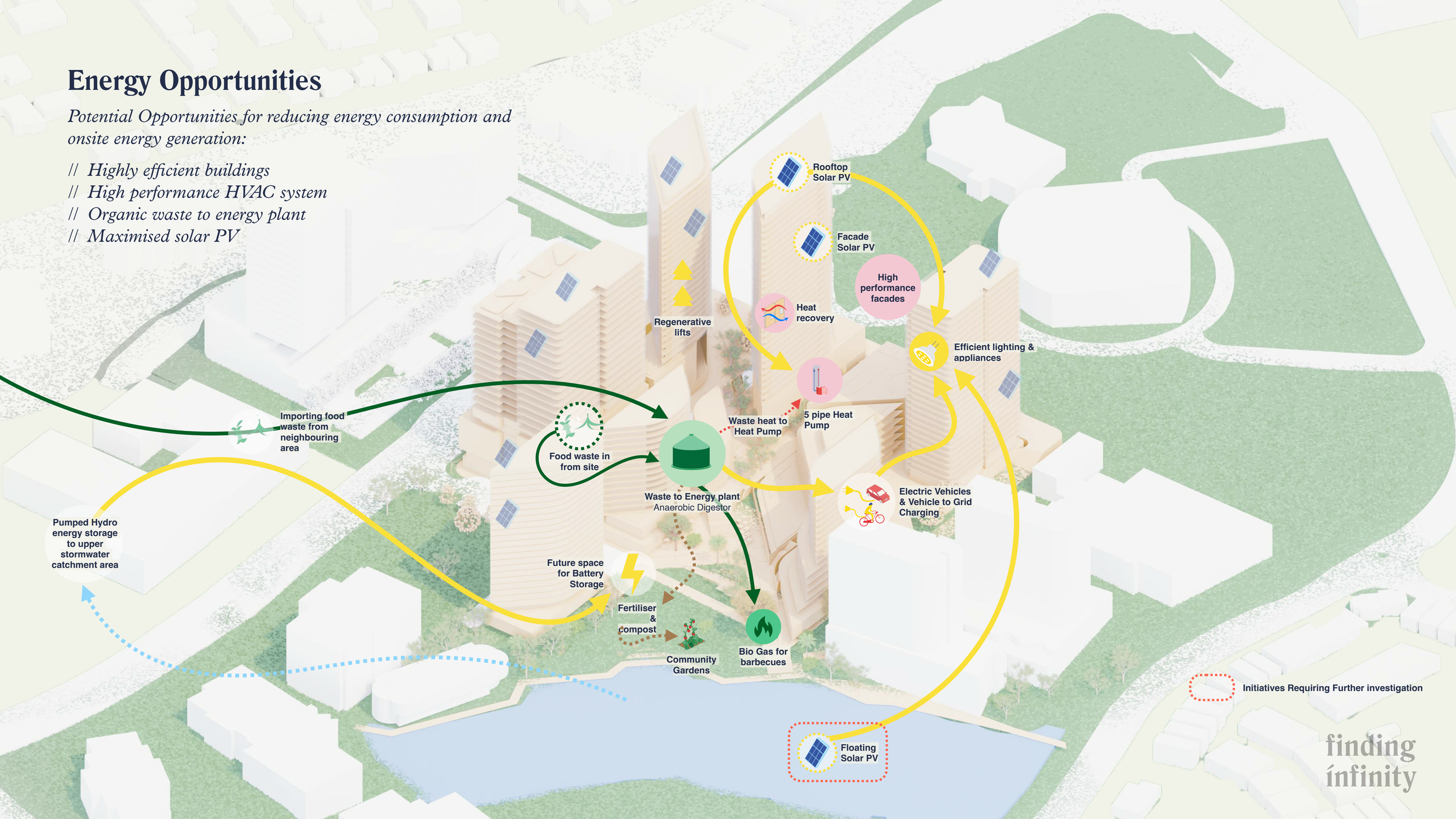


finding infinity

Energy Opportunities

Potential Opportunities for reducing energy consumption and onsite energy generation:

// *Highly efficient buildings*
// *High performance HVAC system*
// *Organic waste to energy plant*
// *Maximised solar PV*



finding infinity

Energy Opportunities

Building by building heat pumps

Spatial requirements:

// ~900 m² building by building heat pumps
// ~400 m² district waste to energy plant
// ~10,500 m² floating solar
// ~10,000 m² rooftop solar (80% of rooftops)
// ~7,000 m² facade solar (50% wall to window ratio)

Rooftop Solar PV
80% of roof area
(Combine rooftop solar, greenhouse and rainwater collection at the edge)

Facade Solar PV
~40% of North facing facade
Optimise layout while minimal overshadowing

Building 5 pipe Heat Pump plumbed to aerobic digester pumps
200 kW
Allow ~150 m²

*Indicative facade solar layout

Facade Solar

Waste to Energy plant
Anaerobic Digestor in carpark
25 tonne/day
Allow ~400 m²

Electric Vehicles & Vehicle to Grid Charging
Provide electric charging in all car spots

Future space for Battery Storage
Located in underground carpark

Potential to store energy via pumped hydro
Dam located up stream, pump water up in times of excess energy

Floating Solar PV
10,000 m²

Floating Solar
Further liaising and integrating with relevant land managers and stakeholders required for this opportunity

Initiatives Requiring Further investigation

finding infinity

Energy Opportunities

Centralised district heat pump

Spatial requirements:

// ~300 m² district heat pump
// ~400 m² district waste to energy plant
// ~10,500 m² floating solar
// ~10,000 m² rooftop solar (80% of rooftops)
// ~7,000 m² facade solar (50% wall to window ratio)

Rooftop Solar PV
80% of roof area
(Combine with rooftop solar greenhouse)

Facade Solar PV
~40% of North facing facade
Optimise layout while minimal overshadowing

*Indicative facade solar layout

District 5 pipe Heat Pump plumbed to aerobic digester pumps
1000 kW
Allow ~300 m2

Waste to Energy plant
Anaerobic Digestor in carpark
25 tonne/day
Allow ~400 m²

Future space for Battery Storage
Located in underground carpark

Electric Vehicles & Vehicle to Grid Charging
Provide electric charging in all car spots

Facade Solar

Floating Solar
Further liaising and integrating with relevant land managers and stakeholders required for this opportunity

Floating Solar PV
10,000 m²

Potential to store energy via pumped hydro
Dam located up stream, pump water up in times of excess energy

Initiatives Requiring Further investigation

finding infinity

Water Opportunities

Potential Opportunities for water consumption reduction and onsite water capture and treatment:

Efficiency:

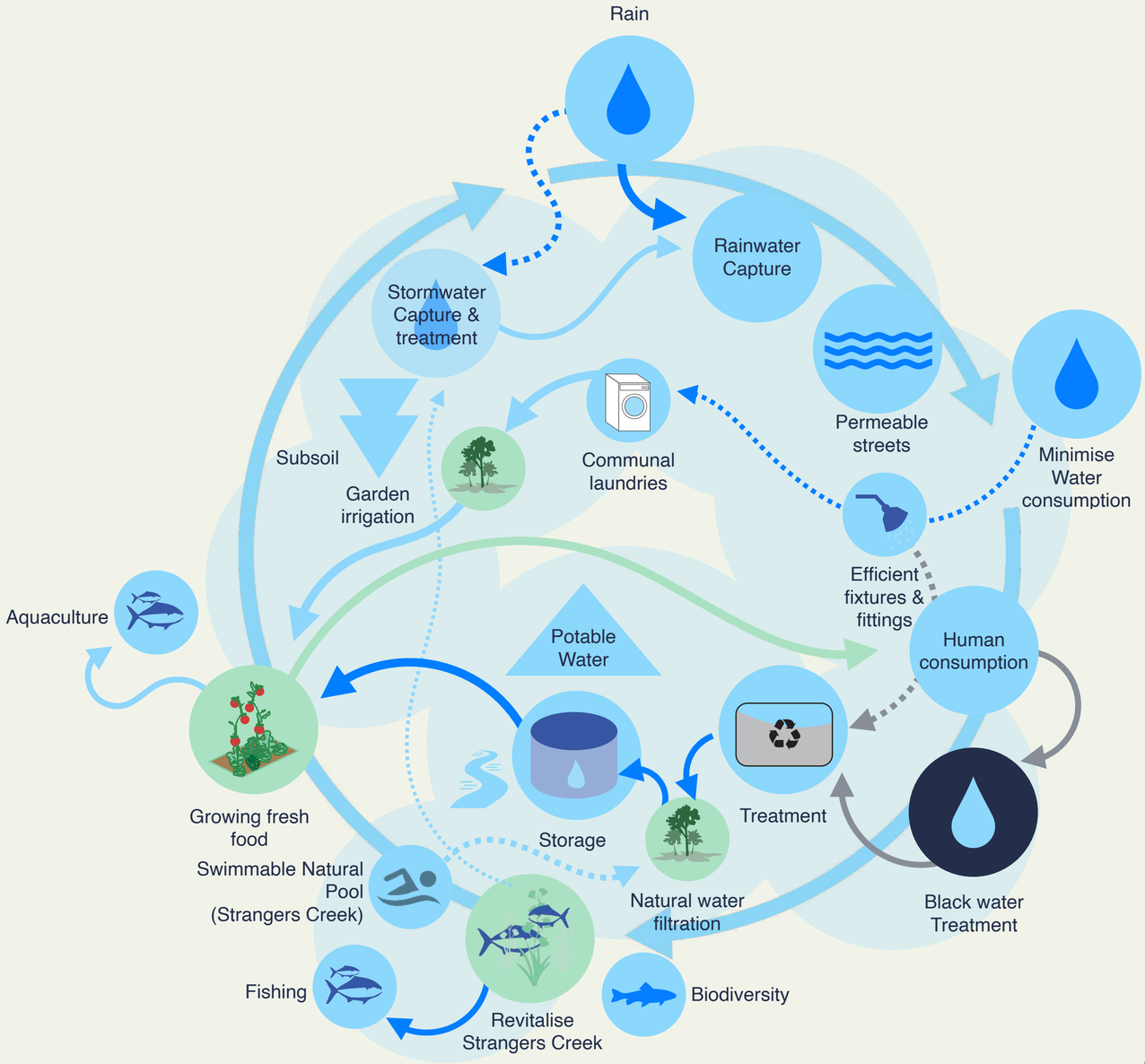
// *Efficient fixtures and fittings*
// *Vacuum toilets*

Supply

// *Rainwater collection and treatment*
// *Greywater collection and closed loop recycling*
// *Stormwater harvesting for subsoil irrigation*
// *Human waste composting for soil enrichment*

Lifestyle

// *Permeable streets to reduce harmful stormwater runoff*
// *Natural swimming pool (chemical free)*
// *Rewinding lake edge*



finding infinity

Water Opportunities

Conservative

// *Rainwater collection, treatment and reuse for potable*
// *Greywater collection and reuse for non-potable demands*
// *Blackwater to sewer*
// *Stormwater harvesting for subsoil irrigation*

-

Natural pool (chemical free)

Investigate mains Class A recycled water

Stormwater recirculation to water quality basins

Rain water rooftop collection

Grey water collection
Showers & basins

Grey water
Laundries, dishwashers

Greywater Treatment
For non-potable

Toilets
Supplied by grey water

Black water to sewer

Rain water facade collection

Rain water treatment & storage
For potable

Rain water supply
For potable

Planting

Rewilding

Natural pool (chemical free)

Stormwater havesting for sub-soil irrigation

Water Biodiversity
Waterfront design to enhance aquatic biodiversity.

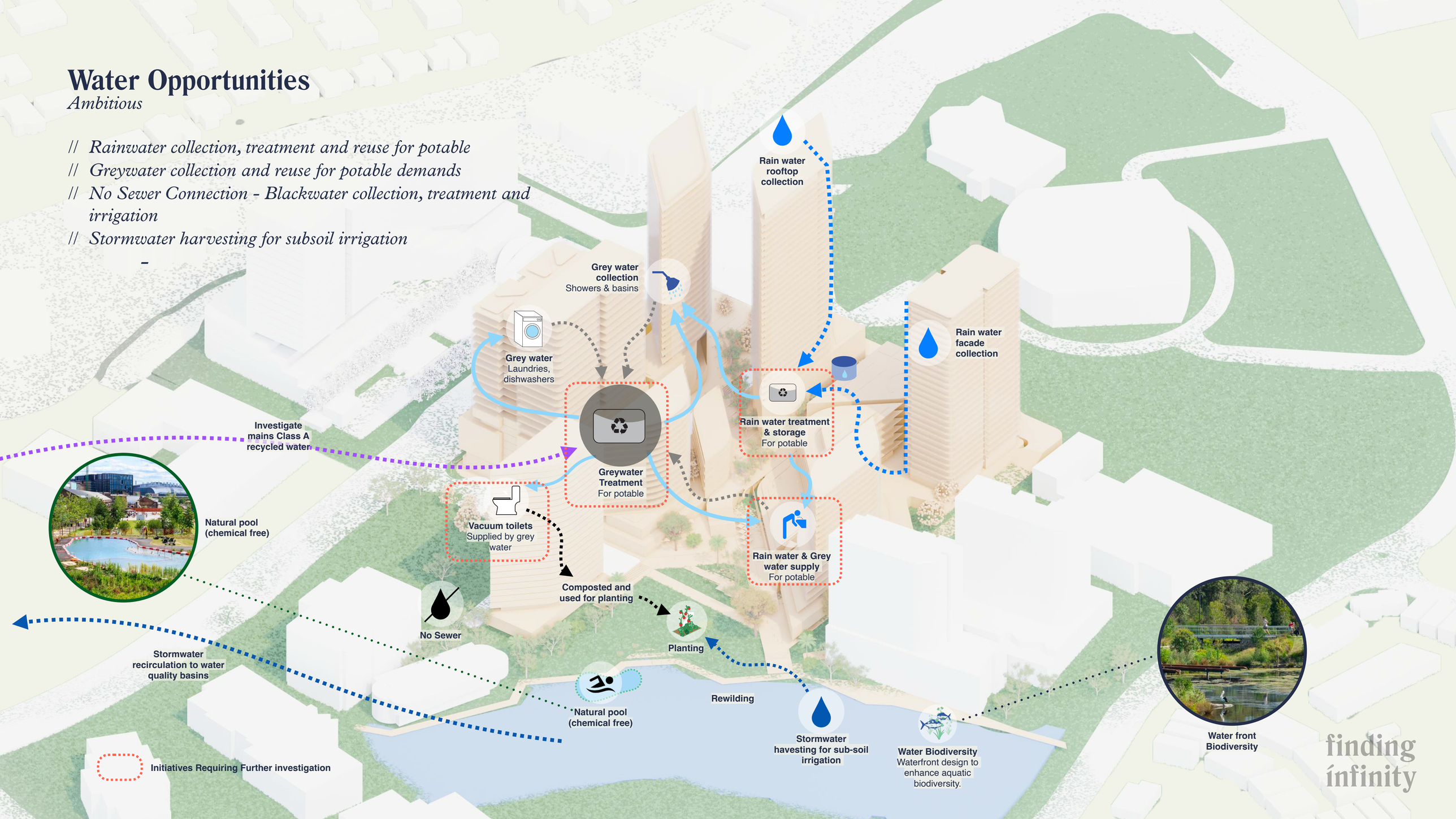
Water front Biodiversity

finding infinity

Water Opportunities

Ambitious

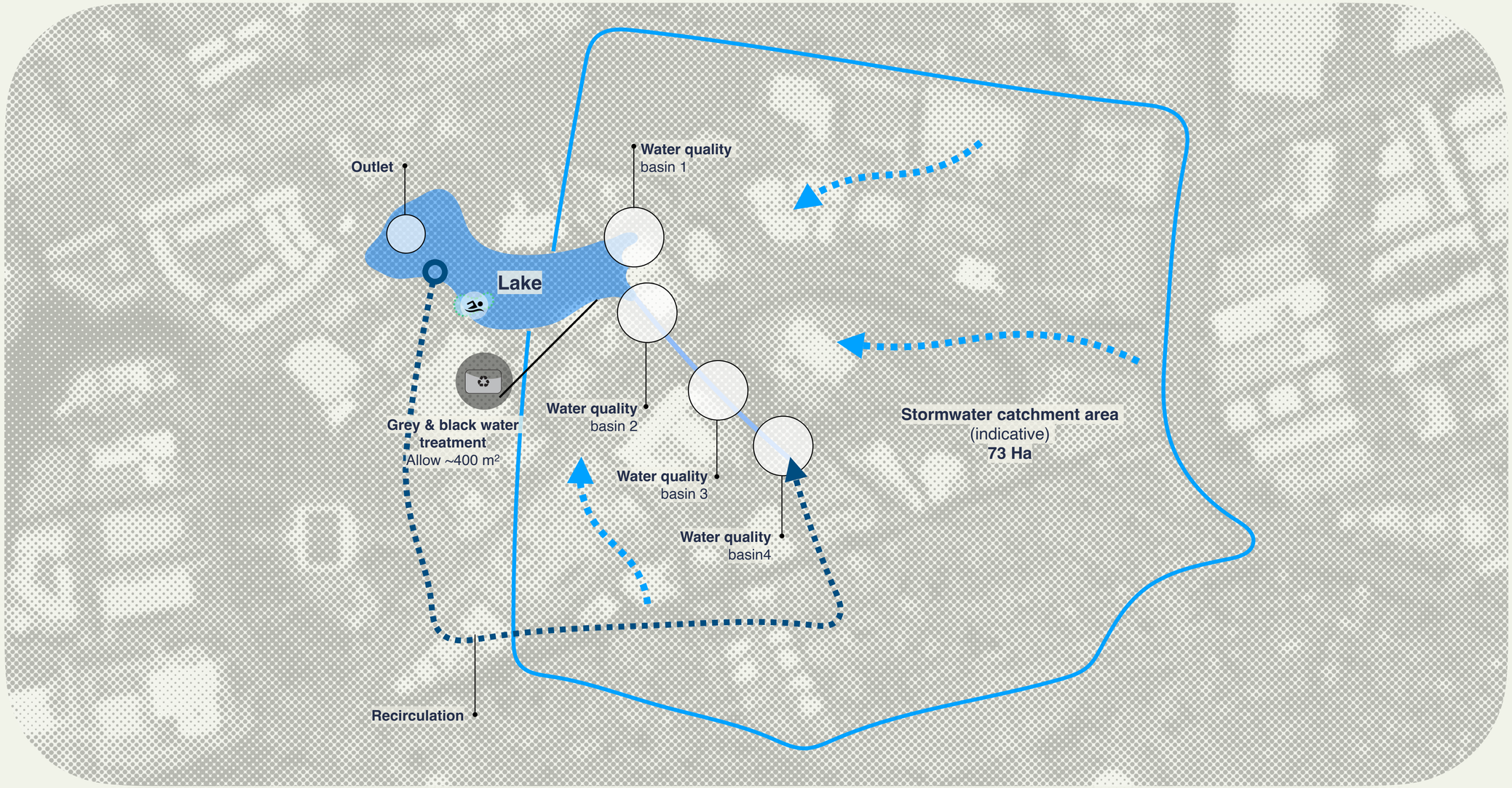
// *Rainwater collection, treatment and reuse for potable*
// *Greywater collection and reuse for potable demands*
// *No Sewer Connection - Blackwater collection, treatment and irrigation*
// *Stormwater harvesting for subsoil irrigation*



finding infinity

Water Opportunities

Spatials



finding
infinity

Waste Opportunities

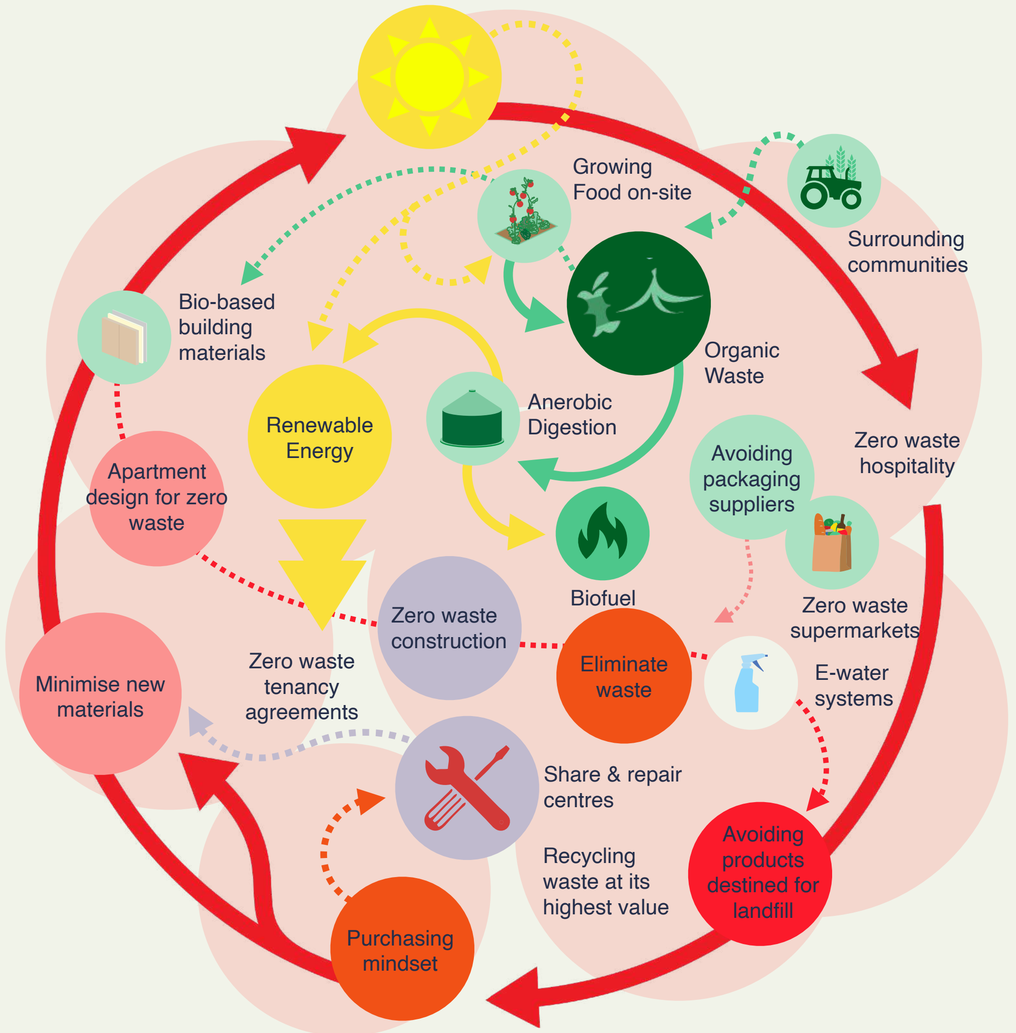
Potential Opportunities for waste reduction and onsite waste disposal:

Reduce:

// *Zero waste tenancy, hotel agreements*
// *Apartment designed for zero waste*
// *Share & repair centres*
// *E-Water systems*

Reuse:

// *Waste to energy plant*
// *Onsite generated compost for gardens*



finding infinity

Waste Opportunities

Potential Opportunities for waste reduction and onsite waste disposal

// *25 tonne per day organic waste to energy plant*
// *No waste to landfill*
// *Importer of waste*

NVAC
Site wide
vacuum system

Importing food waste from neighbouring areas

E-Water Systems
No harsh chemicals

Apartment design for zero waste

Renewable energy out

No waste to landfill

Zero waste hotels

Zero waste residences

Food waste from residents

Waste to Energy plant
Anaerobic Digestor

Organic
Vacuum system

Recycling
Vacuum system

Fertiliser for gardens

Zero Waste Bar / Restaurant

Zero Waste Supermarket

Community Gardens

Share & Repair Centre

Initiatives Requiring Further investigation

finding infinity

Materials Opportunities

Potential Opportunities to minimise embodied carbon and toxic substances in the materials used to build the development

Zero carbon construction

// *Hybrid structures*
// *Zero carbon interiors*
// *Zero carbon exteriors*
// *Cement replacement*
// *Timber structures*

Health

// *Non toxic materials*

Built for disassembly

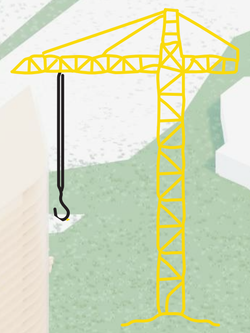
// *Material passport*
// *Built for disassembly*

finding infinity

Materials Opportunities

Potential Opportunities to minimise embodied carbon and toxic substances in the materials used to build the development

// *Timber construction (no concrete)*
// *Low carbon materials*
// *Zero carbon construction machinery*
// *Built for disassembly*



Built for disassembly

Material Passports

Zero Carbon Materials
Investigate material options such as recycled and zero carbon bricks.

Hybrid Structure

Tall Timber Towers

Zero carbon interiors & exteriors

Cross Laminated Timber (CLT)

Non-Toxic Materials
Interiors designed using only non-toxic materials, contributing to healthy indoor environmental quality.

Bio-based Materials

Zero Waste Construction

Share & Repair Centre

Renewably powered construction

Potentially powered by early onsite anaerobic digester & scaffolding solar PV

Non-toxic & Bio-based materials

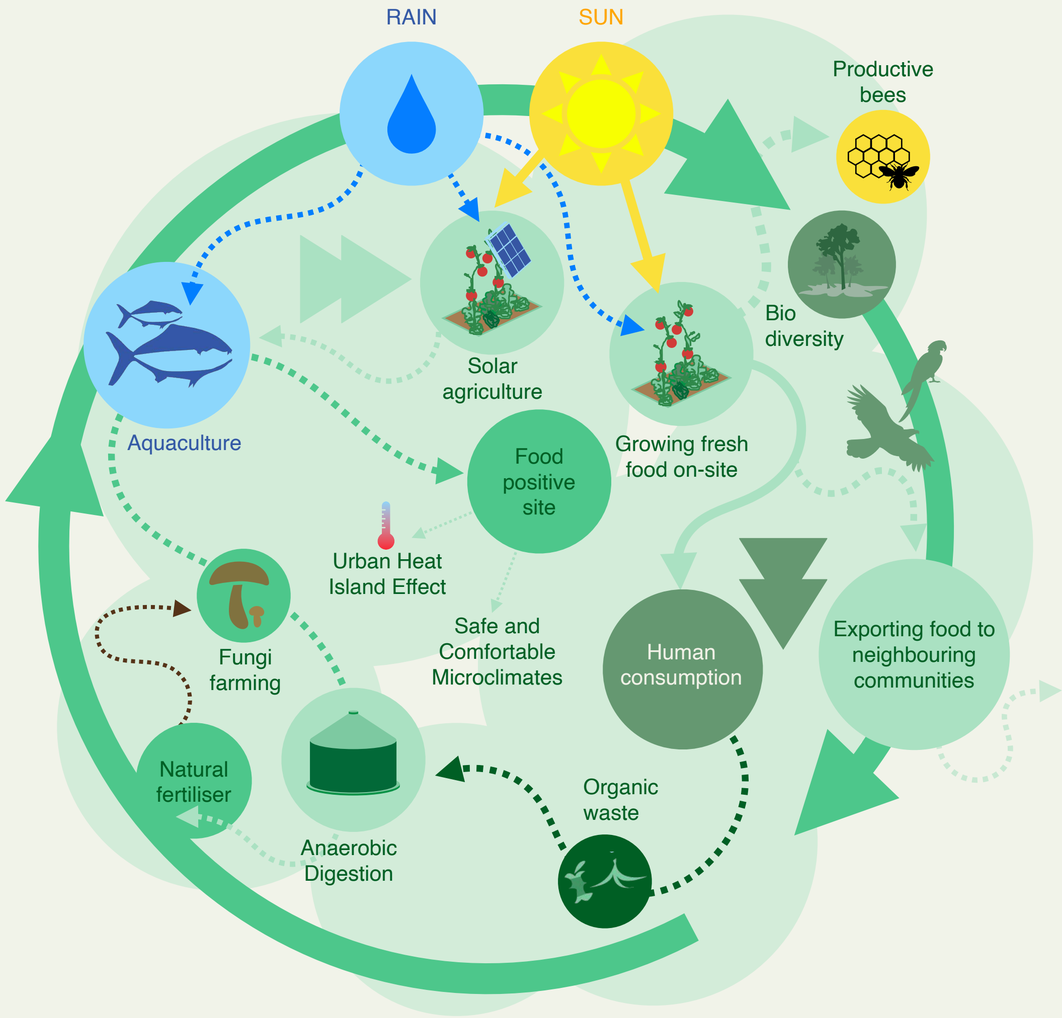
finding infinity

Food Opportunities

Potential Opportunities for onsite food production

Onsite food production

// *Community gardens*
// *Rooftop solar greenhouse*
// *Productive Beehives*
// *Future adaptable carpark to allow future indoor farming.*
// *Vertical Farming*
// *Aquaculture*



finding infinity

Food Opportunities

Potential Opportunities for onsite food production

Urban farming in Underground carpark (Flexible space)
Potential to grow vegetables for 1,000 people annually

Community Gardens

Green Infrastructure

Biodiversity Native Vegetation

Aquaculture

Rooftop Solar Greenhouse

Fungi farming

Farmers Markets

Community Gardens

Urban Food Forest

Aquaculture

Fishing
Catch and eat fresh fish in hospitality venues

Rooftop Greenhouse

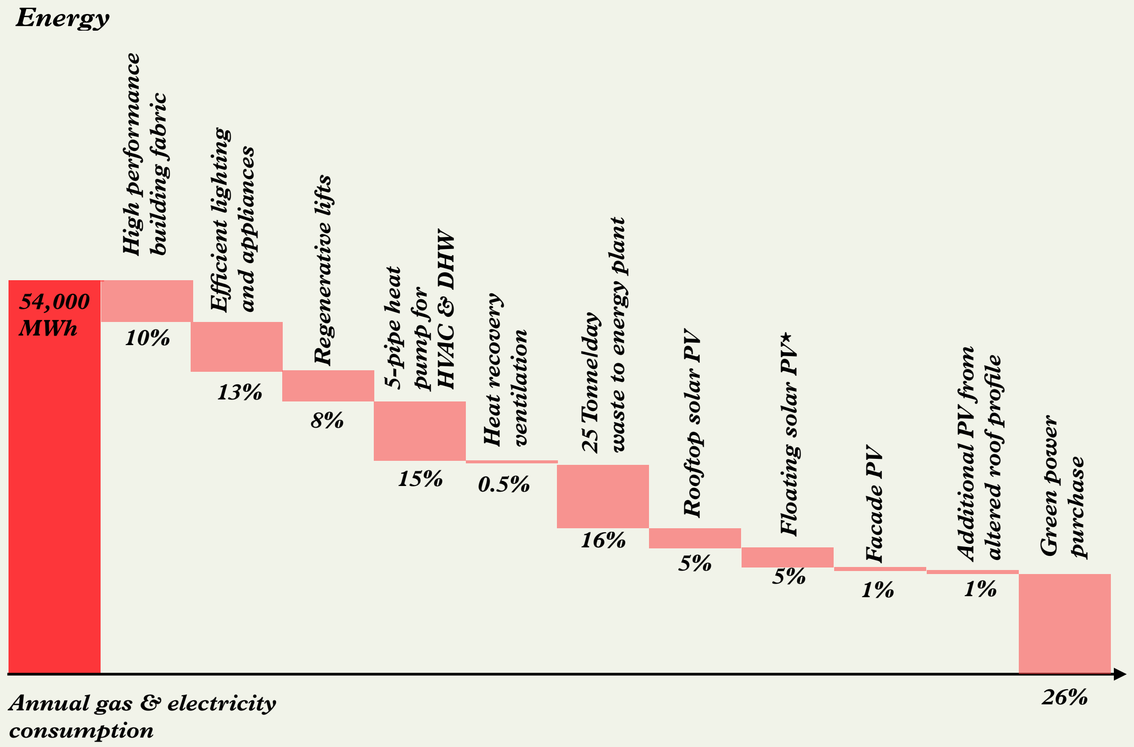
Productive Beehives
Productive beehives enhancing pollination and providing honey for retail & residents

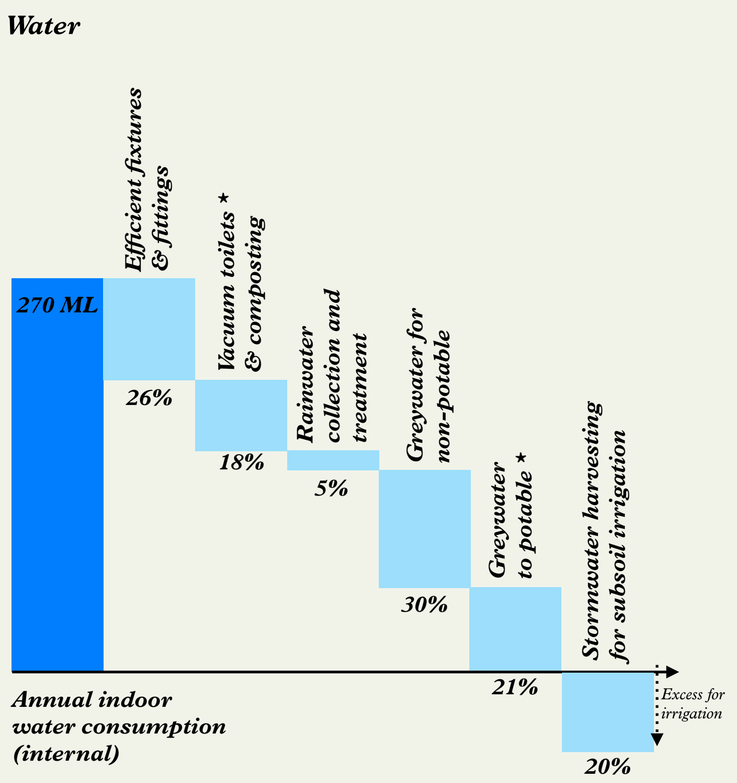
Vertical Farming

finding infinity

Potential Impact of Initiatives

Energy and Water





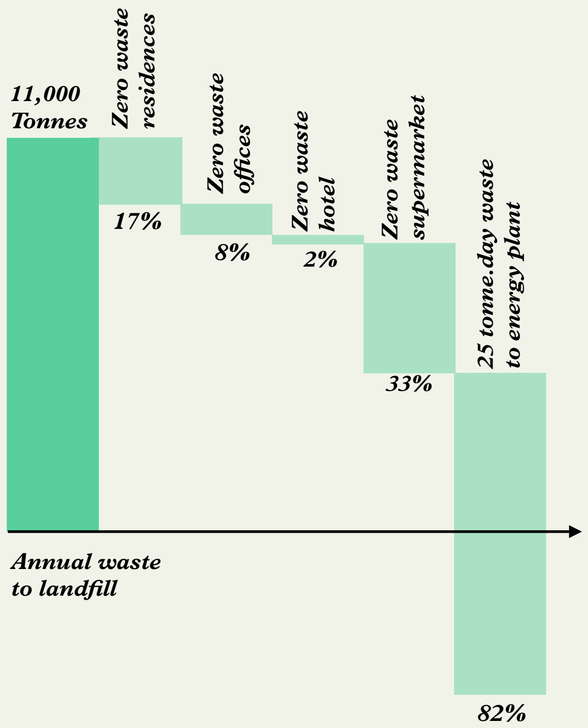
* Initiatives Requiring Further investigation

finding infinity

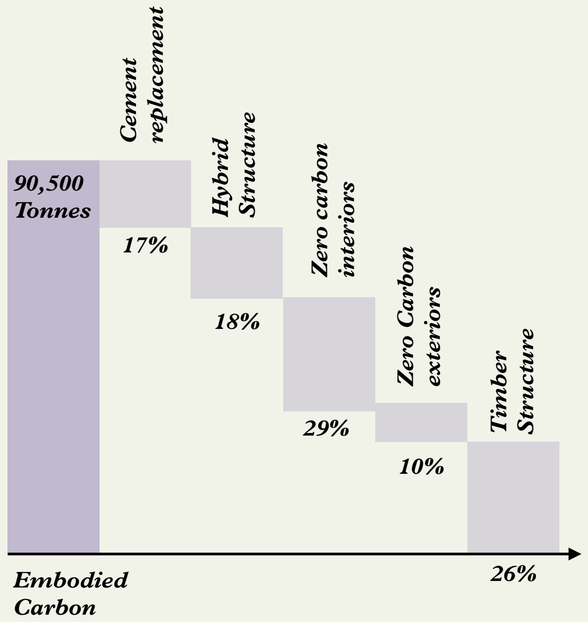
Potential Impact of Initiatives

Waste and Embodied Carbon

Waste



Embodied Carbon



finding infinity

Summary of Initiatives and Opportunities

The cost, environmental impact, financial return and spatial requirements of key initiatives are summarised in the table to the right.

These costs are scaled estimates based on previous projects and should all be considered indicative only.

Confirmed Initiatives	Capital Cost ($)	Environmental Impact (%)	Annual Return/Saving ($)	Simple Payback (years)	Spatial Requirements
High performance building fabric	Within budget	10% energy savings	$1,000,000	-	R4 insulation in walls 0.4 ACH
Efficient lighting and appliances	Within budget	13% energy savings	$1,100,000	-	No change
Regenerative lifts	Within budget	8% energy savings	$750,000	TBC	No change
5 pipe heat pump	$12,000,000	15% energy savings	$1,000,000	12	300 m^2 or 900 m^2
Heat recovery ventilation*	TBC	0.5% energy savings	$30,000	TBC	Additional ductwork
Rooftop solar PV	$3,100,000	5% energy savings	$400,000	8	~10,000 m^2
Facade solar PV	$1,000,000	1% energy savings	$90,000	5	3,500 m^2
Additional PV from tilted roof profile	$500,000*	1% energy savings	$120,000	4	12,000 m^2 (2,000 m^2 additional to standard rooftop)
25 tonne/day waste to energy plant	$7,000,000	16% energy savings 82% waste saving	$1,800,000	4	~400 m^2
Zero waste agreements - residences, hotels, offices, supermarkets	-	60% waste savings	-	-	No change
Greywater treatment & reuse for non-portable	$13,500,000	30% water savings	$200,000	65	150 m2 plus dual sewer mains and supplies
Fixtures & Fittings	$800,000	26% water savings	$300,000	3	No change
Stormwater harvesting for subsoil irrigation*	TBC	20% water savings	TBC	TBC	TBC
Initiatives requiring further investigation					
Floating solar PV	$5,000,000	5% energy savings	$400,000	12	10,500 m^1 on lake
Vacuum toilets and onsite solids composting*	TBC	18% water savings	$120,000	-	Reduced sewer riser dimension
Rainwater treatment & reuse for potable	$700,000	5% water savings	$30,000	23	15-20 kL per building
Greywater treatment for potable	$650,000**	21% water savings	$165,000	4 years	100m^2
Vacuum waste systems (Organic & recycling)	$2.3 - $3m*	-	TBC	TBC	13m x 18m collection station Site wide piping (~300mm)
Total	$44,000,000	74% energy savings 120% water savings 182% waste savings	$7,300,000	~6 years	

* *Costs and savings not included in summary figures*
** *Additional plant cost only*

Conclusion

Through the implementation of some or all of the initiatives and opportunities presented in this document, Norwest Marketown has the potential to be a low embodied carbon, low consumption development that gives back to the community through outcomes including;

- *74% reduction in grid electricity consumption*
- *100% embodied carbon reduction*
- *120% reduction in mains water consumption*
- *Net importer of waste*
- *Cleaning and cleansing of lake water*
- *Food producer*

A project that is ahead of its time; a leader for reducing environmental impacts in Australia.

Further due diligence is still required to ensure we deliver something that is robust and works seamlessly. As the project progresses we will continue to refine these initiatives and ensure they are technically and financially feasible.

As a team we will work together to integrate as many of the initiatives as possible.

Summary of the cost and financial return of key potential initiatives:

finding infinity

Modelling Parameters

Cost Parameters

Parameters used in the cost benefit analysis of initiatives are shown in the table to the right.

	Unit	Cost/unit
Electricity	$/kWh	0.175
Feed in tariff	$/kWh	0.1133
Gas	$/MJ	0.0204
Gas connection	$/day	0.743
Heat	$/kWh	0.05
DHW (if applicable)	$/kL	14.42
Water supply	$/kL	2.49
Sewerage	$/kL	0.83
Sewage connection	$/qtr	64.13
Landfill waste	$/tonne	215
Recycling	$/tonne	165
Imported organic waste income	$/tonne	107.5
Staff	$/hr	35
Fertiliser	$/20kg bag	6
Liquid fertiliser	$/tonne	100
Centralised heat pump DHW	/kL/day capacity	$13,405
Centralised gas boiler	/kL/day capacity	$4,034
PV	/kW installed	$1,650
Floating PV	/kW installed	$3,000
Saving from replacing façade material	/m2	$150
Rainwater potable treatment plant capital	/kL.day capacity	$1,780
Rainwater potable treatment operations	/kL	$0.53
Water tank	/kL	$135
Class A grey water treatment plant	/kl/day capacity	$2,375
Class A grey & blackwater treatment plant (100kL)	/plant	$420,000
Class A grey & blackwater treatment plant (200kL)	/plant	$510,000
Potable grey & blackwater treatmnet plant (100kL)	/plant	$500,000
Potable grey & blackwater treatmnet plant (200kL)	/plant	$630,000
Grey & blackwater treatment to class A	/kL	$0.70
Grey & blackwater treatment to potable	/kL	$1.00

Energy Modelling Parameters

Parameters used in the modelling of energy consumption are shown in the table to the right.

	Base Case	Actual
kWh/m2 rates taken from modelled outputs from similar apartment building in Sydney		
Wall insulation	R2.5 m2K/W total wall makeup	R4.0 m2K/W total wall makeup
Roof insulation	R2.5 m2K/W added insulation	R2.5 m2K/W added insulation
Floor insulation	R1.5 m2K/W added insulation	R1.5 m2K/W added insulation
Glazing performance	Building B, U3.5 W/m2K SHGC 0.64 Building C, U4.3 W/m2K, SHGC 0.47	Building B, U3.5 W/m2K SHGC 0.64 Building C, U4.3 W/m2K, SHGC 0.47
Airtightness	0.7ACH	0.4 ACH
Glazing ratio	As drawn	As drawn

finding infinity

Water Consumption Parameters

Parameters used in the modelling of water consumption are shown in the table to the right.

	Consumption (L/minute or L/use)		Uses per person per day		
	Base case	Efficient	Residential	Commercial	Retail
Showers	7.5 L/min	7.5 L/min	1 x 10 min	5% of people, 5 mins	0
Toilets	4 L/use	3.2 L/use	4	2.3	1
Urinals	0.5 L/use	0 L/use	0	2	1
Bathroom taps	9 L/min	4.5 L/min	7 x 0.15 min	2.5 x 0.15 min	2 x 0.15 min
Kitchen taps	7.5 L/min	4.5 L/min	4 x 0.5 min	2 x 0.5 min	5 x 0.5 min
Washing machines	80 L/use	68 L/use	2 washes per person per week	0	0
Dishwashers	11.5 L/use	9.2 L/use	25% of people, 1 use per day	10% of people, 1 use per day	1 use per 4 people per day
Bathtubs	150 L/use	150 L/use	5% of people, 1 use per day	0	0
Irrigation	1385 KL/yr	1385 KL/yr			

Waste Generation Parameters

Parameters used in the modelling of water consumption are shown in the table to the right. Updated based on feedback from elephant's foot.

	Residential	Hotel	Office	Supermarket
Unit	L / bedroom / day	L / room / day	L / 10m² floor area / day	L / 10m² floor area / day
Landfill	5	4	2.14	18
Recycling	4.29	4	2.14	20
Organic	2.86	1.5	0.35	18

finding infinity

Population Density Parameter

Parameters used in the modelling of expected populations in buildings are shown to the right

Use Type	NCC Building Class	Density (m2 per person)	Reference
Residential	2	4	NABERS
Office	5	10	NCC2019 D1.13
Retail	6	5	NCC2019 D1.13
Carpark	7a	30	NCC2019 D1.13
Public	9b	2	NCC2019 D1.13
Education	9b	4	NCC2019 D1.13
Hotel	3	15	NCC2019 D1.13

finding infinity

www.findinginfinity.com