





## PUNGGOL WATERFRONT HOUSING DESIGN \_ TERRACES ON THE WATER

PGH334E

### ACTIVITIES/FACILITIES ON THE PROMENADE

The canal walk along generates different facilities in order to create community spaces. Through the different common greens, the residents are invited along the waterway promenade. The "Water points" are round basin-fountain spread along the promenade as playground for kids. Those "water points" are the direct physical contact between people and water. The promenade will also be designed to allow soft circulation (cycling, rollerblading...)

### DWELLINGS IN A PARK

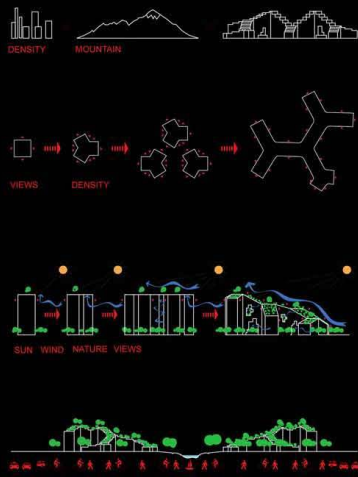
The new quarter of Punggol will be a vast green garden park. The ground floor is designed in multiple interconnected paths to ensure the visual and physical transparency over the entire area. The vegetation diversity of the park will be balanced by the canal and the water points. The car parks will provide a low rise landscaped podium and the latter will be in harmony with the landscape of the park.

### DIVERSITY AND FLEXIBILITY

The building's plot offers flexibility regarding the diversity in types of apartments. Thus, each developers will have the freedom to choose from 3 to 5 rooms flats based on demand and location. The "waterfall" construction gives a diversity of scale from 4 to 18 floors (from a small building to a small tower). Each apartments is designed as a "small world" which provide different spaces that can be used for different purposes (entrance hall, terrace, reading room).

### FREE CONNECTIONS

The residents will enjoy an easy access from any parts of the new quarter to public transportations such as bus and sky train. Each plot will provide the basic services such as cleaner. The plots area will provide more specific facilities such as fitness and kindergarten. Most public activities such as restaurants and bars will be on the promenade while the main commercial areas such as shops and supermarket will be located near the skytrain access. All these services and activities will be freely connected through the park and will generate social interaction from private to public.



BIRD VIEW



VIEW FROM THE RIVER



VIEW FROM THE CANAL



VIEW AT THE TERRACE GARDEN



VIEW AT THE SIDES OF THE CANAL

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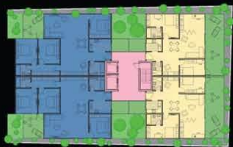
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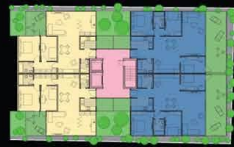
**TYPICAL BLOCK 1**  
F4.3(YELLOW)- F4.3(YELLOW)- F4.3(YELLOW)  
F4.3: FOUR-ROOM FLAT AT THE TRIAL CORNER: 87 SQUARE METER



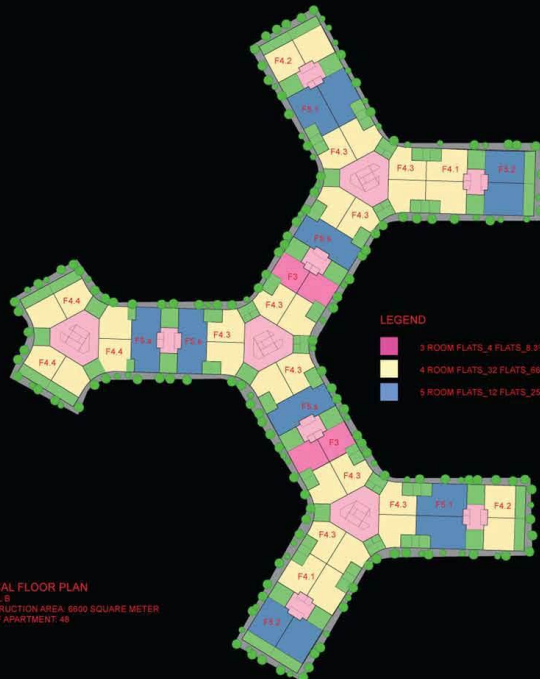
**TYPICAL BLOCK 2**  
F3(PINK)- F5.2(BLUE)  
F3: THREE-ROOM FLAT: 88 SQUARE METER  
F5.2: FIVE-ROOM FLAT WITH TERRACE: 132 SQUARE METER



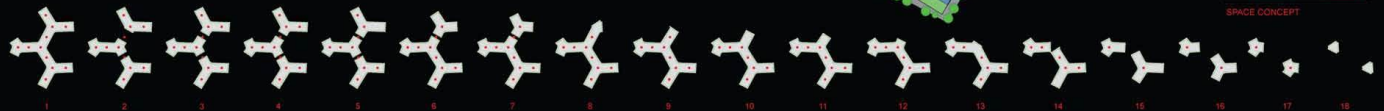
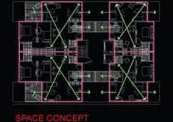
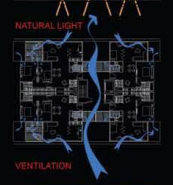
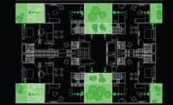
**TYPICAL BLOCK 3**  
F4.2(BLUE)- F4.2(YELLOW)  
F5.1: FIVE-ROOM FLAT: 126 SQUARE METER  
F4.2: FOUR-ROOM FLAT WITH TERRACE: 100 SQUARE METER



**TYPICAL BLOCK 4**  
F4.1(YELLOW)- F5.2(BLUE)  
F4.1: FOUR-ROOM FLAT: 96 SQUARE METER  
F5.2: FIVE-ROOM FLAT WITH TERRACE: 126 SQUARE METER



**LEGEND**  
 3 ROOM FLATS\_4 FLATS\_8.2%  
 4 ROOM FLATS\_30 FLATS\_66.7%  
 5 ROOM FLATS\_12 FLATS\_25.0%



**PRIVACY**  
Each level will contain a total from four to six flats and therefore, will provide a relative good privacy for residents. The angles (120°) avoid buildings to face each other frontally and therefore, increase the privacy for residents. Finally, the apartments interior will divide night time activities and day time activities in a private and respectful way for the comfort of the residents.



**NATURE IN THE APARTMENT**  
It is divided in three different types of nature. First, the domestic nature belonging on private terraces. The second one belongs to the vertical garden connecting all common circulation and the last one is the nature surrounding the plots. All three types of nature give the feeling of living among nature and soften the boundary between inside and outside and, nature and building.



**VENTILATION**  
All major living spaces and rooms within the dwelling unit will be designed with effective natural lighting and ventilation. All common areas such as staircases, lift lobbies and access corridors are naturally ventilated through the vertical gardens. The design of the external facade respect the space provided for the air conditioned units.

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RIVERFRONT VIEW



VIEW FROM THE INTERIOR PASSAGE OF A BUILDING



VIEW ALONG THE RIVER



SECTION AA, 1:1000



VIEW FROM A TERRACE



VIEW FROM A TERRACE ON THE TOP



SECTION BB, 1:2000

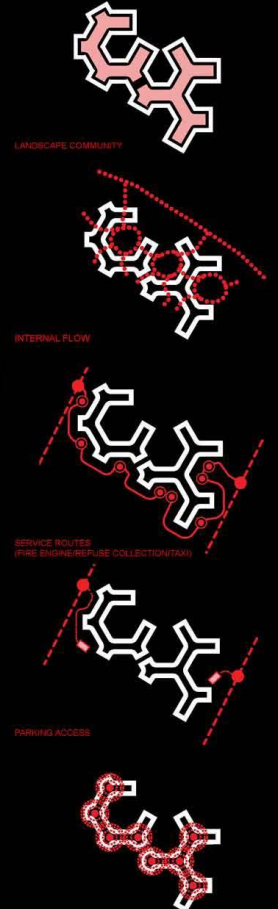
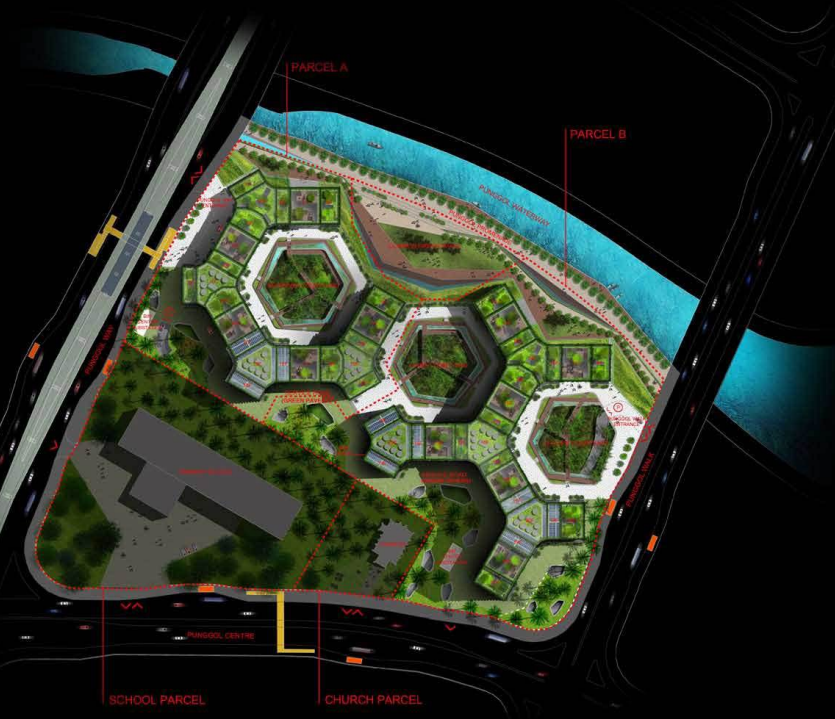
# PUNGGOL WATERFRONT HOUSING DESIGN\_TERRACES ON THE WATER

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**Create a Unique Punggol Town Center**  
**"CREATE TERRACES ON THE WATER"**  
 Our goal is to create a real *landmark community*, not only for the ex-  
 tance but also for the entire project. The landscape idea was truly  
 inspired by the asian *rice terraces stepping down the water*. This  
 unique identity gives to the project an iconic value which makes it  
 4. The *Plaza* and as an *unconventional example*, motivates the future  
 development of Punggol.



TERRACE



	UNIT	PARCEL A	PARCEL B	PARCEL A+B	SCHOOL	CHURCH	COMMON GREEN
NET FLOOR AREA (NFA)	sqm	40000	51014	100014	-	-	-
GROSS FLOOR AREA (GFA)	sqm	81214	81708	142022	14000	360	-
EFFICIENCY RATIO = NFA/GFA	-	0.73	0.73	0.747	-	-	-
SITE AREA	sqm	17000	27000	45210	17000	2000	4000
GROSS FLOOY RATIO	-	2.844	2.844	3.16	8	-	-
NET COVERAGE	%	23.54	23.20	26.3	74.5	12.8	-
TOTAL NO. OF DRILLING LAMPS	-	400	0.10	1024	-	-	-

- BUS STOP
- LRT STATION
- PEDESTRIAN BRIDGE
- - - FUTURE PROVISION OF CAR PARKING
- - - PARCEL LIMIT

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BIRD VIEW



VIEW



COURTYARD AFFECTATION

**TRAFFIC**  
**SITE ACCESS & INTERNAL TRAFFIC CIRCULATION**  
 The strategy for vehicular site access comprises the provision of **main** on both Punggol Way and Punggol Walk and also a one-way egress to Punggol Central. Within the site, the main internal driveway will comprise a two-way road linking between Punggol Way and Punggol Central, bordering the south side of the main development. To the south, there is vehicular egress direct to Punggol Central, thereby minimizing traffic loads at the **main**.

**DROP OFF & PICK-UP**  
 Drop-off / pick-up is proposed to be at the e-deck level, with vehicle drop-off facilities provided at the tower cores.

**PARKING**  
 The car parking strategy comprises the provision of parking below the e-deck. Accesses are located within the site, in proximity to the site's ingress/egress, with barrier provision.

**SERVICE ROUTES (Fire Engine/Refuse Collection)**  
 Refuse collection vehicles will access the site via both Punggol Way and Punggol Walk. The vehicles will access the centrally located bin centres then exit the site via the same. Fire access is via the **main**, together with hardstanding for those areas of the building not in close proximity to the internal driveway.

**PUBLIC TRANSPORT & PEDESTRIAN INTEGRATION**  
 The site is in close proximity to Punggol MRT Station, Suiyang LRT Station and also bus routes operating along Punggol Way, Punggol Central and Punggol Walk. The site planning has ensured **pedestrian connectivity** to these public transport networks. The development will connect the main pedestrian networks along Punggol Way, Punggol Central and Punggol Walk to the pedestrian walkway along Punggol Waterway.



VIEW FROM THE RIVER



VIEW AT THE PUNGGOL WALK ENTRANCE



VIEW AT THE CENTRAL COURTYARD



VIEW AT THE SKYLINE



TRAFFIC

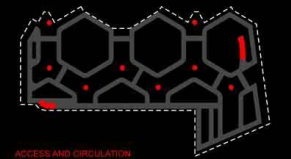




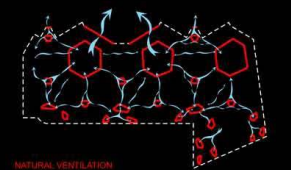
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**FOUNDATION**  
 The site is challenging for foundations systems. The soil report indicates that there is a 5 to 15m thick sand fill underlying the site and the waterway running at the northern boundary of the site contributes to potential ground instability. **Bored pile foundations systems** are therefore proposed, as they have the ability to resist both the vertical gravity load as well as horizontal load induced by the change in ground water table and the wind. During construction stage, installation of bored piles foundation will also **minimize vibration** transmitted to the LRT structures.



ACCESS AND CIRCULATION



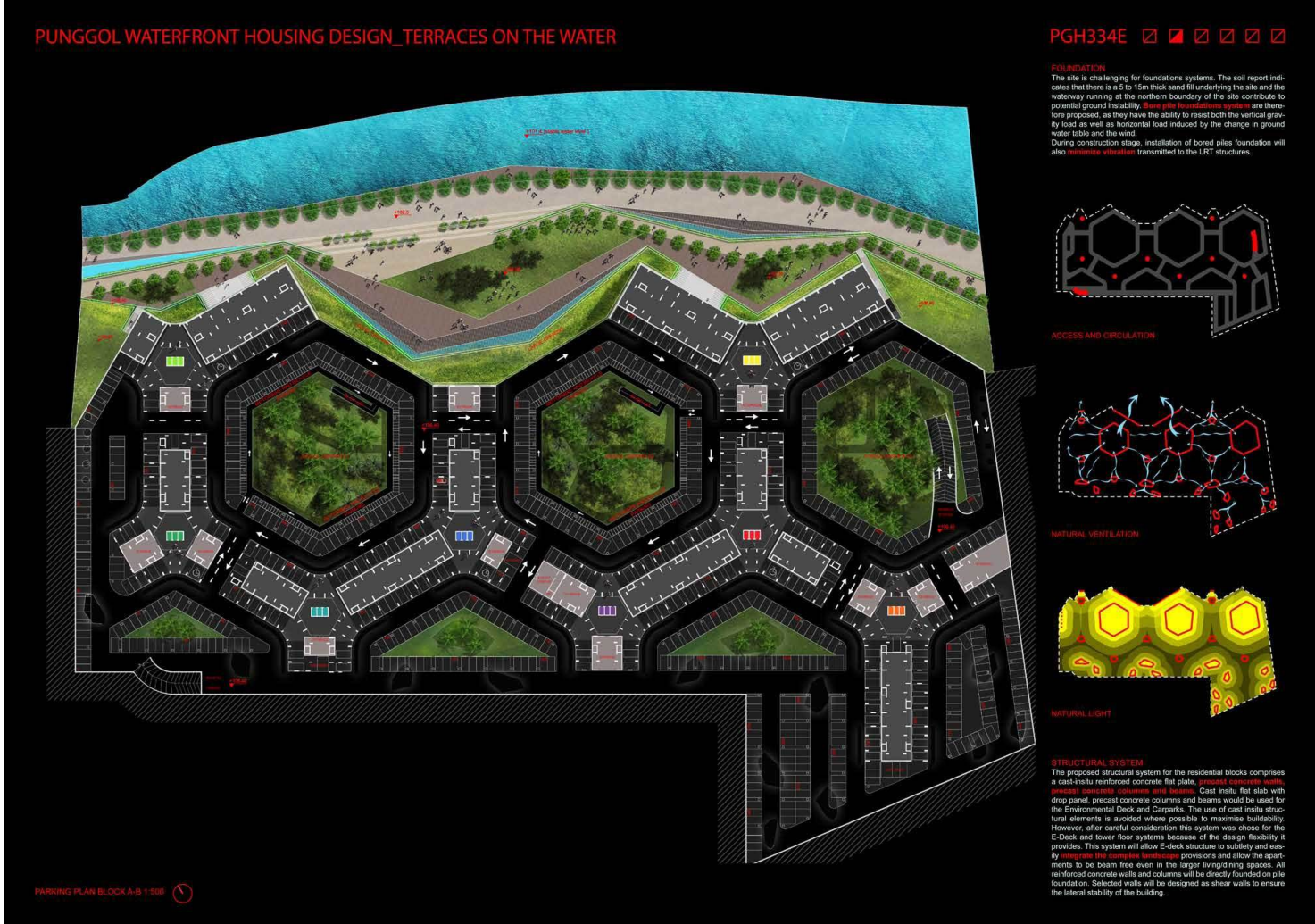
NATURAL VENTILATION



NATURAL LIGHT

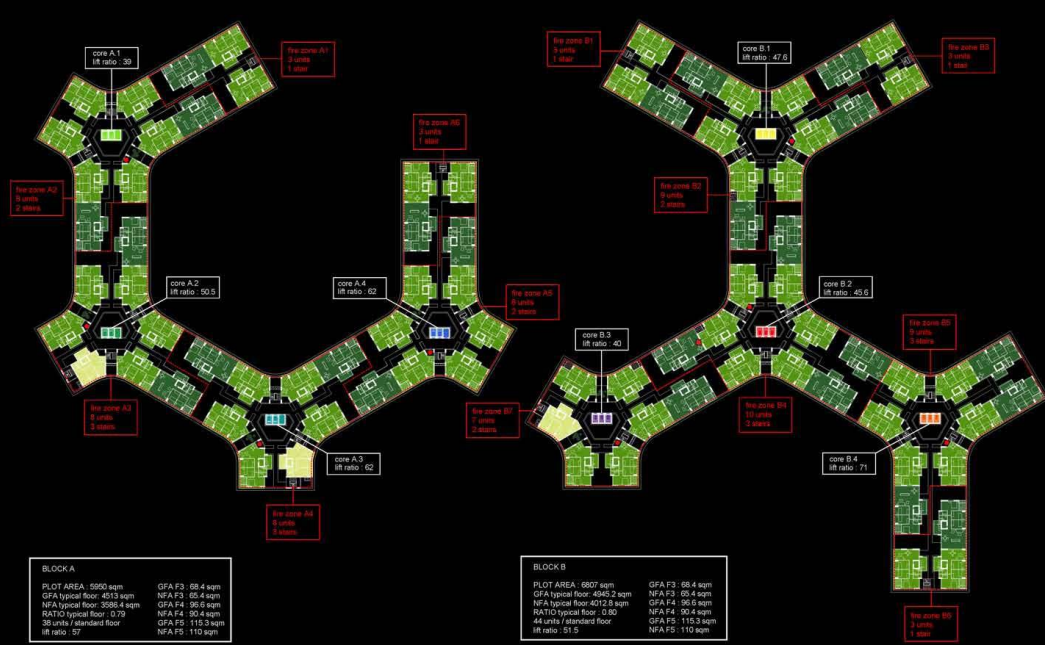
**STRUCTURAL SYSTEM**  
 The proposed structural system for the residential blocks comprises a cast-in-situ reinforced concrete flat plate, **precast concrete columns and beams**. Cast in-situ flat slab with drop panel, precast concrete columns and beams would be used for the Environmental Deck and Carparks. The use of cast in-situ structural elements is avoided where possible to maximise buildability. However, after careful consideration this system was chosen for the E-Deck and lower floor systems because of the design flexibility it provides. This system will allow E-Deck structure to stably and easily **integrate the complex landscape** provisions and allow the apartments to be beam free even in the larger living/dining spaces. All reinforced concrete walls and columns will be directly founded on pile foundation. Selected walls will be designed as shear walls to ensure the lateral stability of the building.

PARKING PLAN BLOCK A-B 1:300



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**BLOCK A**

PLOT AREA : 5990 sqm	GFA F3 : 68.4 sqm
GFA typical floor : 4513 sqm	NFA F3 : 68.4 sqm
NFA typical floor : 3599.4 sqm	GFA F4 : 66.6 sqm
RATIO typical floor : 0.79	NFA F4 : 60.4 sqm
30 units / standard floor	GFA F5 : 119.3 sqm
lift ratio : 57	NFA F5 : 110 sqm

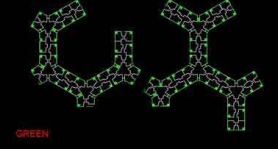
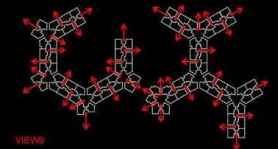
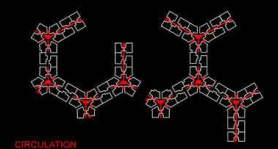
**BLOCK B**

PLOT AREA : 6807 sqm	GFA F3 : 68.4 sqm
GFA typical floor : 4945.2 sqm	NFA F3 : 68.4 sqm
NFA typical floor : 4212.9 sqm	GFA F4 : 96.6 sqm
RATIO typical floor : 0.80	NFA F4 : 90.4 sqm
44 units / standard floor	GFA F5 : 115.3 sqm
lift ratio : 51.5	NFA F5 : 110 sqm

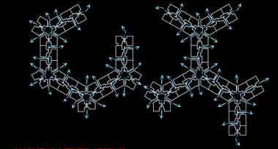
● CENTRAL REFUGE CHUTE SYSTEM



TYPICAL FLOOR PLAN BLOCK A-B 1-500



**NATURAL VENTILATION AND LIGHTING**  
To minimize building energy use, passive environmental design principles are applied throughout the project. Large horizontal and vertical exterior openings are carefully positioned to provide natural ventilation and maximize external lighting to the public areas of the building. These openings are integrated into the building form to allow the parking level, public lobbies and corridors to be passively ventilated and illuminated without placing them on the exterior of the building. Stairs are located at the building exterior but are open in design to allow ventilation and light to penetrate to the interior spaces behind. A computational fluid dynamics model will be created during the detail design process to assess the natural ventilation adequacy of each apartment. Exterior, car park and public area lighting systems are selectively placed on daylight and motion sensor controls to switch high efficiency fluorescent lighting only when natural daylight levels are insufficient.



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CROSS SECTION\_1:800



GENERAL VIEW, FIRST STAGE

**SUSTAINABLE FEATURES**  
 Sustainability is a primary focus of the buildings' design with the goal of creating one of Singapore's greenest buildings. The underlying principle of the Environmentally Sustainable Design (ESD) features is passive design. The "back to basics" approach is favoured over technically complex solutions as it concurrently **minimises energy costs and maximises system life span**. The shape and orientation of the building, as well as the generous building openings and shading features, exploit the natural air movement and sun path to **enhance natural ventilation** and lighting while minimising heat absorption. In addition to careful building design, the generous use of landscape features throughout the project – at ground, roof and intermediate levels makes this residential development both figuratively and literally green. The landscape features (described in more detail under the landscape section) contribute to **resilience**, not only through their reduction of the urban heat island effect and absorption of the green house gas CO2, but also in their storm water management and treatment, with the implementation of PUB's ABC design principles.

The combination of the **minimalistic design** and the 150 kWp photovoltaic (PV) installation means that approximately half of the projected public area daytime power demand will be offset by renewable solar energy. This lines up with the goal of creating one of **Singapore's greenest buildings**, as the project approaches zero energy use. It is not just the environmental impact of the buildings and surroundings that has been considered but also that of the social community that will reside there. The site location provides convenient **access to the LRT station** system and the planned future town centre in the area will allow residents to minimize their use of cars and buses. In addition,  **bicycle paths** will be provided throughout the parking level to further encourage the use of sustainable **transportation alternatives**.



LONGITUDINAL SECTION\_1:800

**ROOF EQUIPMENT**  
 Roof levels of HDB blocks are commonly dominated with tall water storage tanks and lift machine rooms. To **maximise usable space**, the roof spaces below Level 13 of the buildings will be clear of water tanks. Instead tanks on the highest roof tiers will feed the apartment under the lower roof tiers.



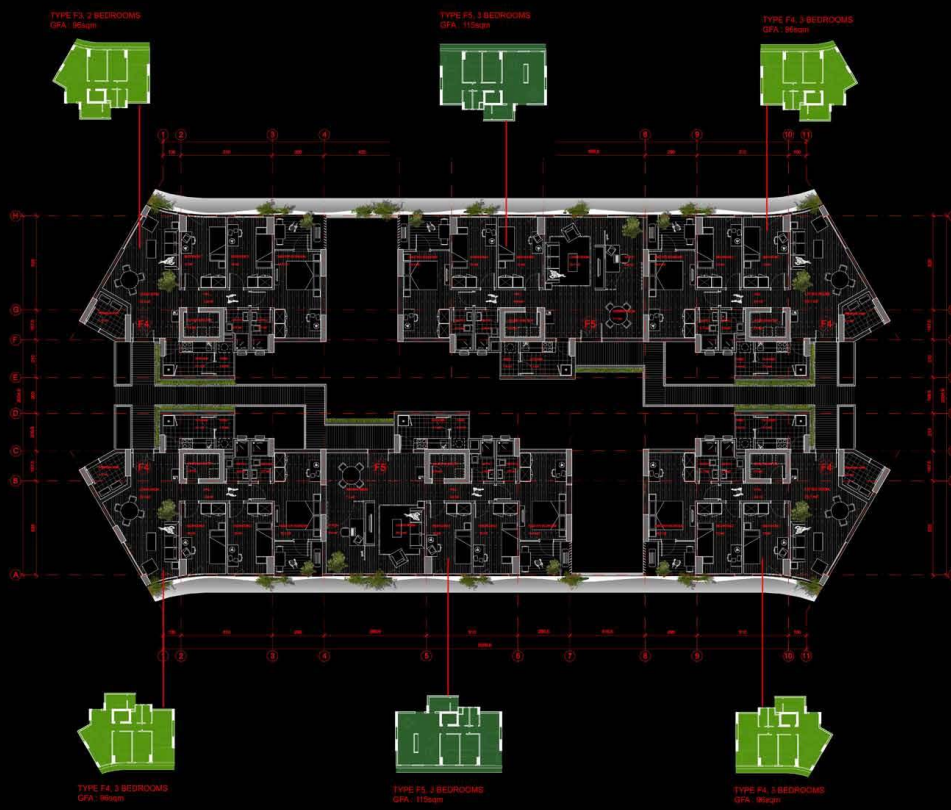
DENSITY AND LANDSCAPE



CONCEPTUAL MODEL

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TYPE P3, 2 BEDROOMS  
GFA: 105sqm

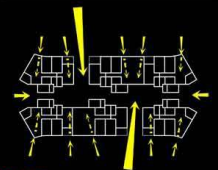
TYPE P3, 3 BEDROOMS  
GFA: 110sqm

TYPE P4, 3 BEDROOMS  
GFA: 116sqm

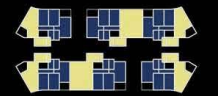
TYPE P4, 3 BEDROOMS  
GFA: 116sqm

TYPE P3, 2 BEDROOMS  
GFA: 105sqm

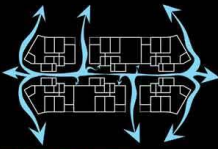
TYPE P4, 3 BEDROOMS  
GFA: 116sqm



NATURAL LIGHT



DAY/NIGHT LIVING



NATURAL VENTILATION CORRIDOR



NATURAL VENTILATION APARTMENT

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TYPOLGY 05\_ 'STUDY ROOM' OPTION\_1 150

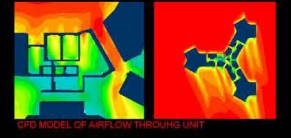


TYPOLGY 05\_ 'CURRENT' OPTION\_1 100



TYPOLGY 05\_ 'KING SIZE LIVING ROOM' OPTION\_1 100

**HUMAN SCALE AND COMFORT**  
 The dwelling units are designed to fully enjoy the views. All of the day used rooms have obstacle-free views toward the ocean, the jungle or the palm gardens. The large horizontal windows give priority to panoramas and generously bring daylight into all the rooms. The day/night zones are clearly defined in each apartment and on full height of the building to maintain good acoustical comfort for both day or night activities. All main living spaces have direct access to the terrace so that the cross ventilation is omnipresent in the units. Further more, each master bedroom can enjoy even more the nature with its own little green terrace.



CFD MODEL OF AIRFLOW THROUGH UNIT

**FLEXIBLE WITH TIME**  
 The dwelling units gives large choices of use and modification with the living environment development. Young couples can plan a F5 as a loft, then adjust a room and an office when they have their first child, and finally turn it into a full function F5 whenever they want, to match to their life evolution and needs stages. The dimensions of the rooms are adapted for various arrangements so that each family could freely create their own living environment. For example, a desktop computer or a reading loft may be planned next to the main door following each's desire. A dressing space or a make up table may be available at the end of the master bedroom. These examples show how the apartment is designed to be customized and to adapt to each resident's life style and desire.



TYPOLGY 05\_ 'STUDY ROOM' OPTION



TYPOLGY 05\_ 'CURRENT' OPTION



TYPOLGY 05\_ 'KING SIZE LIVING ROOM' OPTION



INTERIOR APARTMENT LIFE

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EXTERIOR VIEW COURTYARD AND COMMON GREEN

**LANDSCAPE CONCEPT**  
 One of the joys of living in Singapore is that you are never far from nature, you are surrounded on all sides by a lush verdant tapestry. With this project we try to bring this closeness to nature into the living spaces. Extending the lush vegetation vertically into the building, with sky gardens, balconies and roof terraces, we create a three dimensional tropical oasis within the urban fabric. Locating the car parking under the podium deck and moving away from the traditional lower block format we free up more space on the ground floor for parking and have the greenery down to the lower levels. The proposed canal to the north of the site gives us opportunities to link the water, urban form and landscape, visually and physically. By bringing our landscape down to the level of the canal we create opportunities for interesting landscape interventions, additional spaces for landscape facilities and a buffer to provide privacy and security for the residents.



GREEN HILLS SKYLINE

**FROM PUBLIC TO PRIVATE**  
 The open spaces are planned in the aim of creating variation from public to private. The Common Green is used as multi-functional space opened to the promenade. It maintains the terrace concept, bordered with green walls. Its pergolas give shadows and cool relaxing spaces with canal views. The open courtyards are mainly for resident use, but still accessible from the public promenade. The sky garden is an ideal relaxing place. Moving up from the parking level, it offers to residents and visitors a real opportunity to explore its small skyways and comfortable residential balconies. Also, it gives direct access from the parking to the courtyards via gentle slopes among the trees. The vertical gardens and the sky terraces are exclusively for residential usage. These relaxing and playing spaces on the rooftop gives landscape permeability on the whole waterway promenade. Pergolas and planters are provided to shade these spaces which are the beginning of a unique waterway promenade. Finally, very intimate terraces of each apartment keep the contact between the residents and the nature. These terraces also offer air-conditioner ledges which are not perceivable from outside. The delicate material of pergola panels offer a richness of life enjoying way, by a subtle mixture of social relationships in opening green spaces.

- 1 CHILDREN PLAYGROUND
- 2 WOODEN TERRACE
- 3 SKY OPENING

- 1 JUNGLE SKYWALK
- 2 PARKING SCOPE
- 3 BIOTOPES

- 1 WETLAND RETENTION
- 2 PROMENADE UNDER PERGOLA
- 3 GRAND STEPS GARDEN
- 4 COMMON PLAYGROUND (POND LAWN)

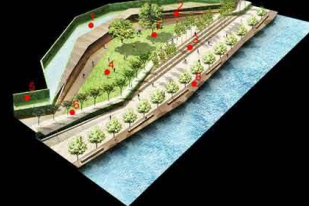
- 5 GREEN WALLS
- 6 JOGGING TRACK (DOOM)
- 7 SHADOW GARDEN
- 8 PLANTED CANAL SIDE PROMENADE



PUBLIC ROOF TERRACE (RESIDENT USED)



COURTYARD (PUBLIC AND RESIDENT USED)



COMMON GREEN (PUBLIC USED)



LANDSCAPE\_NATURE EVOLUTION

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EXTERIOR COMMON GREEN

A SUSTAINABLE LANDSCAPE

Whilst we aim to use the landscape design to provide the **best possible living environment** for the residents, through the landscape we can also contribute to the wider environment.

WATER CONSERVATION

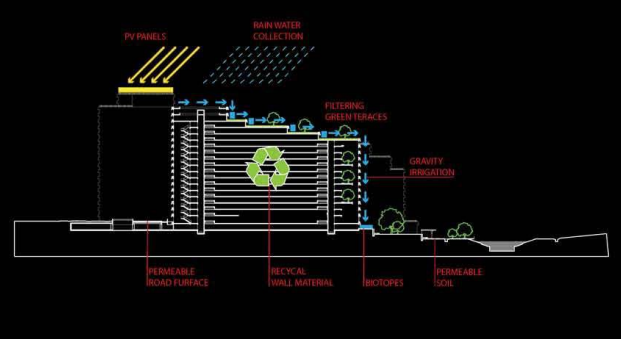
There are two key aims we will achieve in this project. The first is that the landscape will be wholly irrigated using only harvested rainwater. In order to achieve this we will capture as much **rainwater as possible**, eliminating the need for complicated pumping and piping. We will also ensure plants selected are sufficient to endure occasional drought conditions, and soil bodies are sufficient to maintain a healthy planting system. Secondary water discharged from the site will be cleaned, filtered and attenuated, and have no adverse impact to other 'downstream' developments. In order to achieve this we will utilize **rainwater harvesting tanks, stormwater planters, swales, infiltration trenches, permeable paving, wetlands**, using most modern techniques and methods to maximize the benefit, and ensure the seamless integration into the landscape design.

BIO-DIVERSITY

Through extensive planting we will encourage **the flora and fauna** to flourish. In order to further enhance the local **bio-diversity**, we will aim to maximize the selection of **native indigenous species**. To encourage birds and trees and shrubs that produce berries and fruits will be planted in selected areas. Larger trees will be fitted with boxes to encourage the roosting of bats and birds. Overall the aim is to create a balance self-sustaining **ecosystem** from the smallest to the largest or native plant and animal species. This will be further enhanced by providing information in the form of sign boards and leaflets to inform residents of the plants and animals they are likely to observe, and the ecosystem around them.

RECYCLING

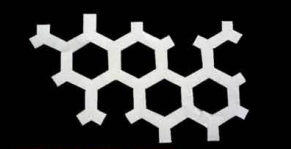
In the construction of the project we aim to use as little of the Earth's natural resources as possible. This includes the **re-use of materials**, using **recycled materials** for landscape elements, using **paint from local natural resources** and minimizing the use of artificial chemicals in the landscape maintenance regime. Once the project is completed we hope to continue these good intentions and encourage the residents to engage in the maintenance of the landscape and **encourage the use of water and garden waste** as part of the landscape maintenance regime.



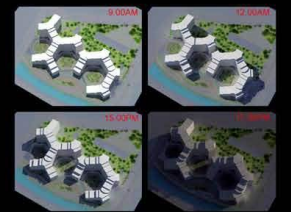
GREEN FEATURES



PRECAST ELEMENT



GRID AND COURTYARDS CONCEPT



SUN AND SHADOW\_21ST DECEMBER

# PUNGGOL WATERFRONT HOUSING DESIGN\_TERRACES ON THE WATER

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## 7 ENTRANCE GARDEN



BRAHEA ACULEATA

## 8 REED GARDEN



FAKHAHACHEE NYMPHAEA

## 9 JUNGLE TREES

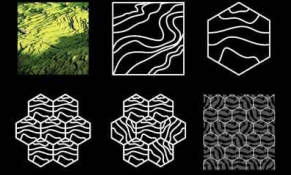


SAMANEA SAMAN FAGREA FRAGRAN FICUS MICROCARPA ACROCOMIA ACULEATA

## 1 PROMENADE TREE

PONGAMIA PINNATA

LAGERSTROEMIA SPECIOSA



GROUND PATTERN

## 2 COMMON GREEN TREE

FICUS MICROCARPA

## 3 BIOTOPE AQUATIC TREE

ZIZANIA AQUATICA

WASABI

## 4 GREEN BUFFER TREE

BOUGAINVILLEA



JUNGLE



GREEN TERRACES



PALM GARDEN



RICE FIELDS

## 8 GREEN PAVEMENT



GRASS PROTECTION

## 9 FILTER STRIP



GRASS SWALE

## 10 SCHOOL GARDEN



FAGREA FRAGRAN

## 10 PALM GARDEN



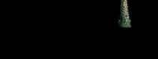
ACROCOMIA ACULEATA

## 10 ROMANOFFIANUM

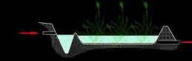
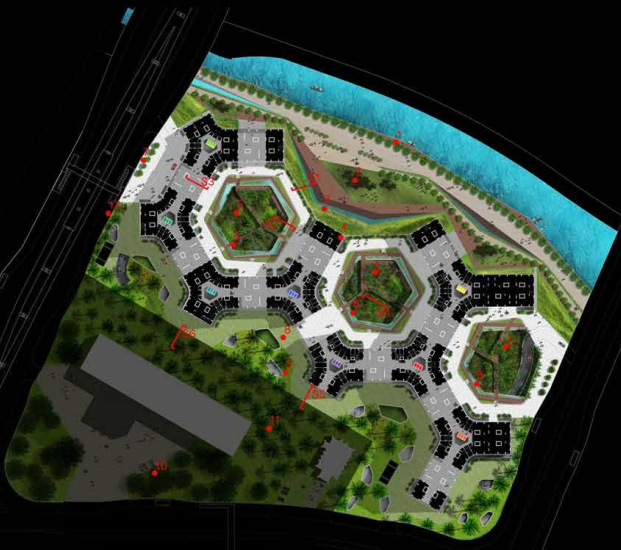


ROMANOFFIANUM

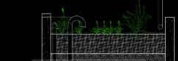
## WASHINGTONIA FILIFERA



WASHINGTONIA FILIFERA



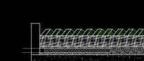
S1 + S2 PLANTED WETLAND



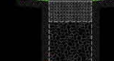
S3 RAIN PLANTER



S4 RAIN GARDEN



S5 GREEN DRIVEWAY



S8 FILTER STRIP

TREES PLAN AND WATER TREATMENT