MASTER LANDSCAPE PLAN

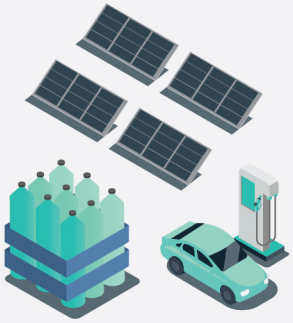
PHI SUEA HOUSE PROJECT


1. Energy System


2. Guest House A & B

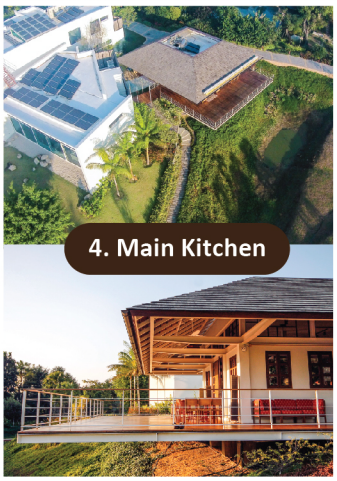

3. Main House

11.In progress : first green hydrogen refueling station

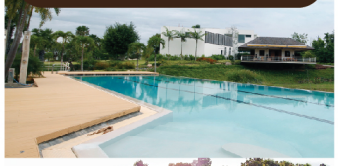


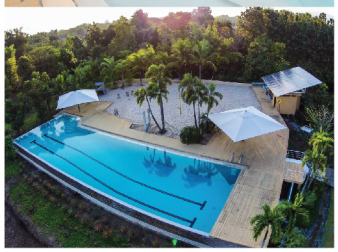
Title: Phi Suea House Master Landscape Plan

Scale: 5 10 50 100


4. Main Kitchen

10. Swimming Pool & Beach Volleyball Court



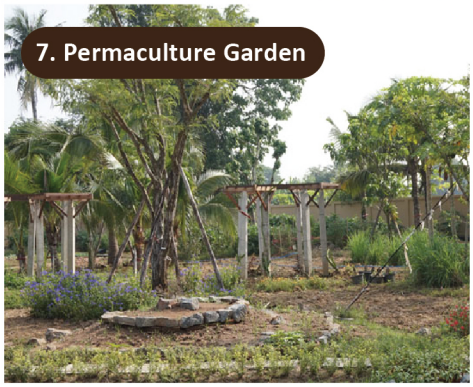



5. Workshop


6. Fish Pond


9. Nursery

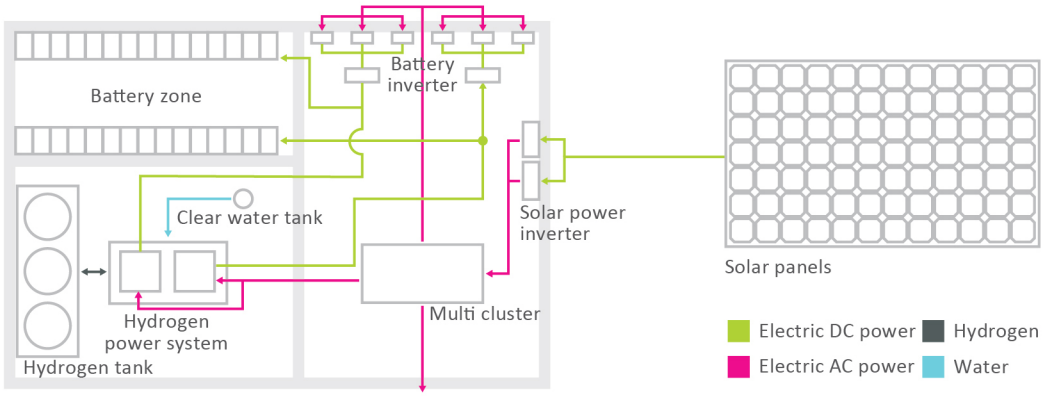

8. Baan Din


7. Permaculture Garden

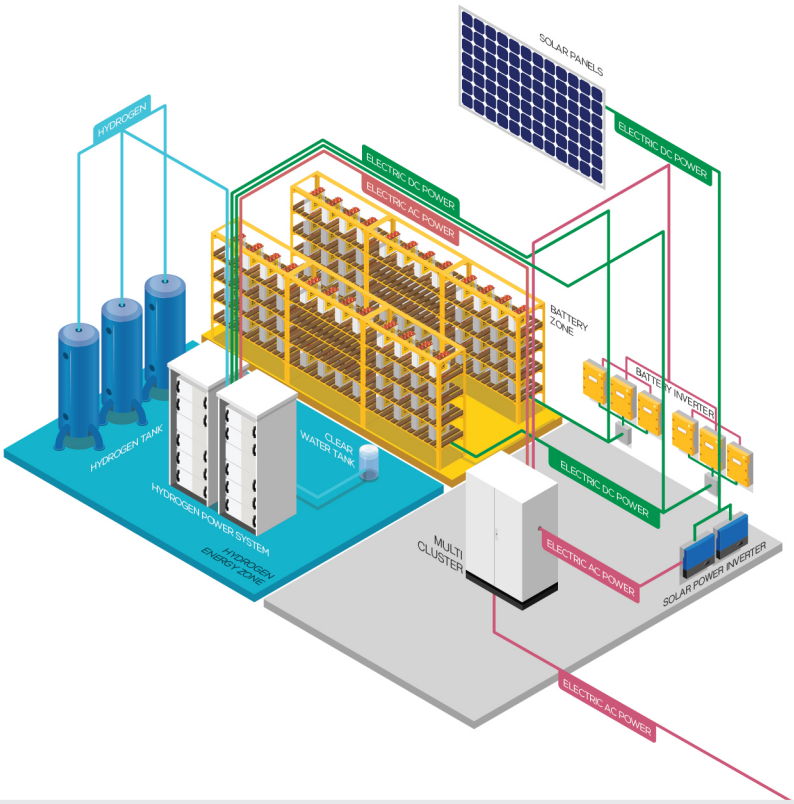
ENERGY SYSTEM

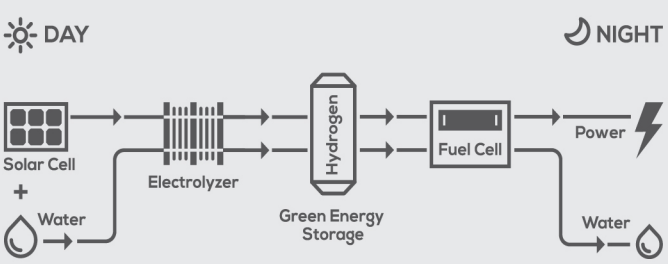
PV POWER / HYDROGEN ENERGY STORAGE / BATTERY

PHI SUEA HOUSE PROJECT



PV installed:	86kW
Average daily power production:	326.8kWh
Phi Suea House energy demand:	6000kWh monthly
Battery:	2x 2000Ah, 48V lead-acid battery banks
Hydrogen gas production rate:	max. 2000 litres/hour
Hydrogen storage capacity:	90,000 litres of H2 at 30 bar, equivalent to 130 kWh in the fuel cell





Day Time

- The electricity that solar panels generate is direct current (DC power).
- Electrolyser generates Hydrogen and Oxygen from water.
- We storage Hydrogen in a tank but Oxygen gas goes in the air.

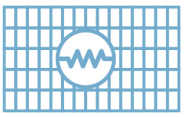
Night Time

- A solar inverter converts the electricity (DC power) from Hydrogen into alternating current (AC power) that can be used for your TV, computer, etc in your house.

FULL SYSTEM UTILIZATION

PHI SUEA HOUSE PROJECT

Energy Calculations

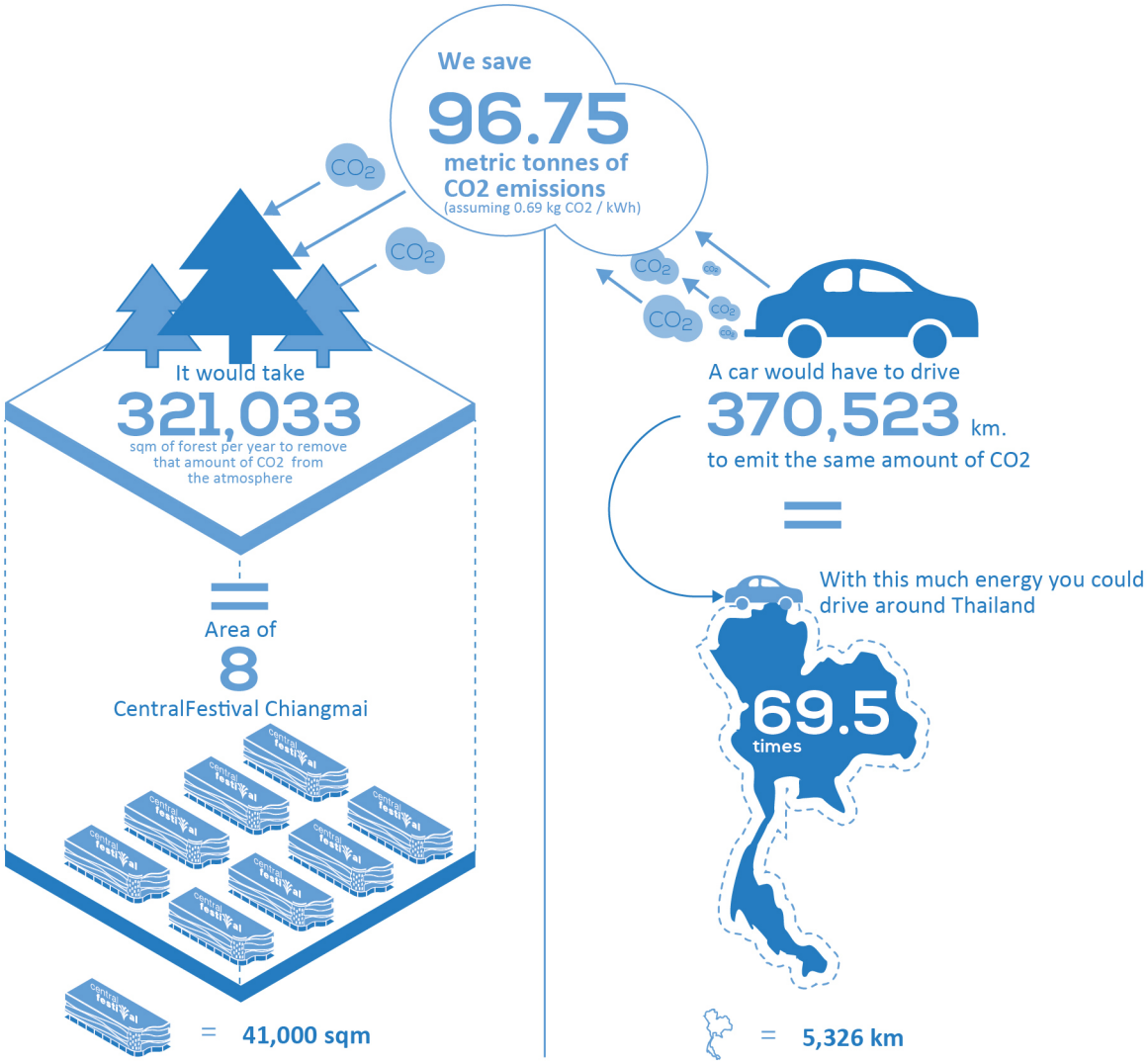
ENERGY BUILDING	GUEST HOUSE A	GUEST HOUSE B	Main House	6 kW solar pump for pond waterfall	9 kW solar pump for swimming pool and well pump
					
330 w	**315 w**	**315 w**	**250 w**	**250 w**	**250 w**
75 solar panels	64 solar panels	64 solar panels	84 solar panels are made in Chiang Mai!	24 solar panels	36 solar panels

Average overall yield is equivalent to 3.8 hrs of full irradiation per day

(75 x 330W) + (64x 315 W) + (64 x 315 W) + (84 x 250W) + (24 x 250W) + (36 x 250W) = 101.1 kW

101.1kW x 3.8hr = 384.2 kWh / day
384.2 kWh x 365 days = 140,233 kWh/year

We can produce an averageof **140,233** kWh/year from oursolar system



CO2 is a naturally occurring chemical compound consisting of two oxygen atoms bonded to one carbon atom. Humans produce additional carbon dioxide by burning fossil fuels for energy. CO2 absorbs and reflects the earth's heat and increases the planet's surface temperature when emitted in excess. This effect is called global warming. Global warming can only be reversed by reducing the amount of carbon dioxide emissions.

NATURAL FISH POND

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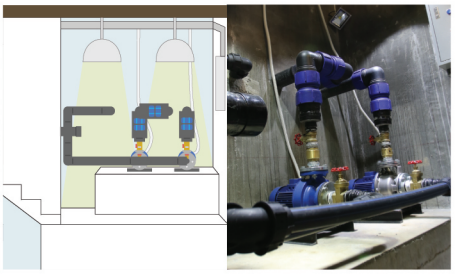
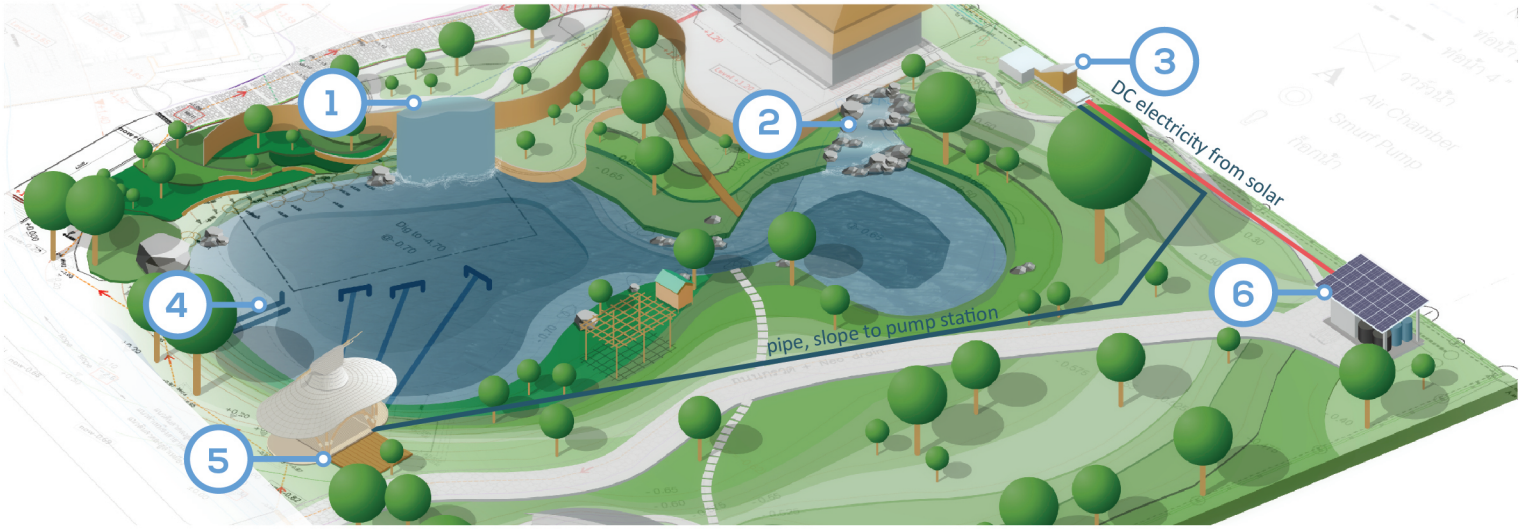
1. Large Waterfall
The large waterfall is the water's primary source of oxygen. Water is circulated by two pumps.

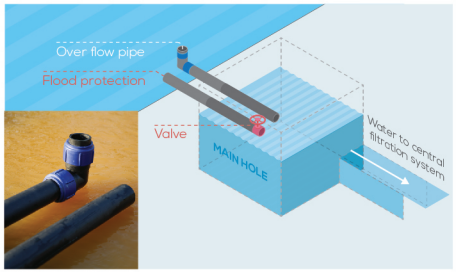
2. Small Waterfall
The small waterfall is the inlet of both ponds' water circulation.

3. Pump Room
Two pumps below water-level pump water from the pond to the small waterfall.

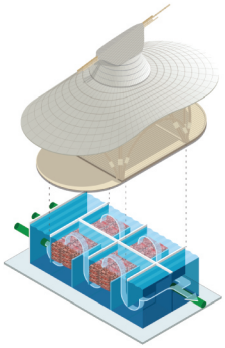




4. Correction Overflow/ Level Control
Overflow/Level Control: The overflow pipe prevents the natural fish pond from overflowing, by draining water when the water level goes above the pond's threshold. Before periods of heavy rain, the valve to the level control pipe is opened to lower the water level, and to drain water from the pond to the conveyance system.



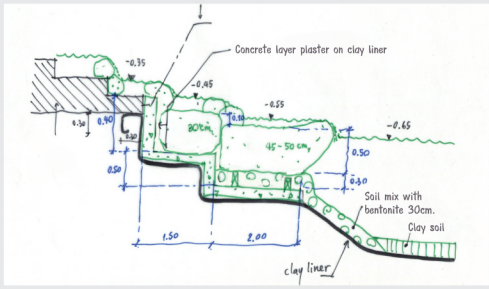
5. Filtering System
Gravity pushes water from the fish pond through chambers of the filtering system. It moves through sediment and natural coral filters before flowing into the pump room.



6. Solar Pump
A 3-phase DC pump is connected directly to a 6kW solar array via a controller. This setup allows for maximum water pumping efficiency, as there are no inverter or storage conversion losses. At full power, the pump can move over 100 m3 of pond water through the filter and into the waterfall every hour.

CLAY LINER
The natural fish pond is reinforced with a clay liner. A clay liner is a safe and convenient material:

- Long lasting
- Easy installation
- Self healing capacity
- High flexibility



TECHNOLOGY HIGHLIGHTS

Find more at phisueahouse.com

PHI SUEA HOUSE PROJECT

1. Hydrogen Energy System

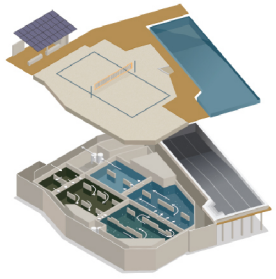
We have implemented a unique hybrid hydrogen and battery energy storage system to store excess power produced by solar panels during the day for later use.

2. KNX Automation

The trend towards building automation systems or smart homes is unstoppable due to the potential for energy saving and increased convenience. KNX is an open international building control standard that allows barrier-free integration and interoperability of products by any manufacturer.

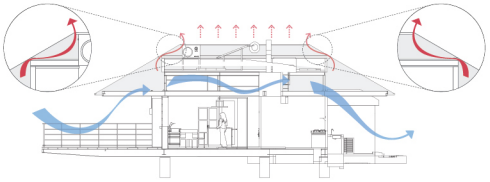
3. Rainwater Collection System

To minimize our impact on the land we live on, we have designed and built a water collection system to save and reuse as much of the rain and irrigation water as possible. An extensive surface drain system collects water and leads it into larger conduits, from where it continues to flow only by gravity into our 1000m3 water reservoir. The water is then aerated and filtered before being reused around the site.



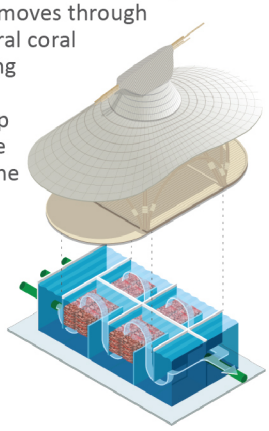
4. Windflow

Using basic physics – allowing hot air to flow freely up and out – we can keep rooms cool and notice a significant improvement in comfort. This design step incurs little cost but can yield great improvements and lower the energy demand for ventilation and cooling significantly.



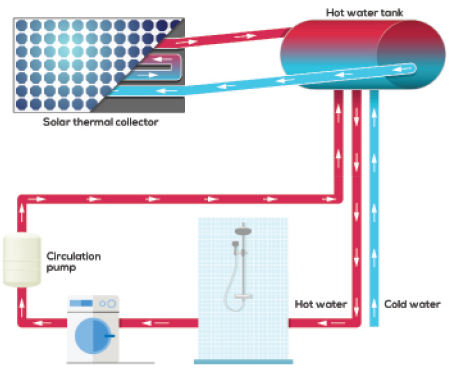
5. Fish Pond

The 600m3 fish pond has been designed and constructed following a fully organic approach.
A solar-pump pumps water into the waterfall at the upper pond. The water runs through the rocky waterway into the lower pond. From here, gravity pushes water into a filter under the Bamboo Sala and then through the chambers of the filtering system. The water moves through sediment and natural coral filters before flowing back through long pipes into the pump room leading to the small waterfall at the upper pond.



6. Solar Water Heating System

Solar water heating systems are used to warm up water for bathrooms and kitchens. The hot water system works by circulating water in a tank through solar thermal collectors. As the water contained in the panel heats up, its density decreases causing it to be pushed upwards by cooler water from the bottom of the tank. A well-insulated solar water heating system can hold a very high temperature exceeding 80 degrees Celsius for several days.



WATER

Collection & Treatment

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1. Pebble Gutter

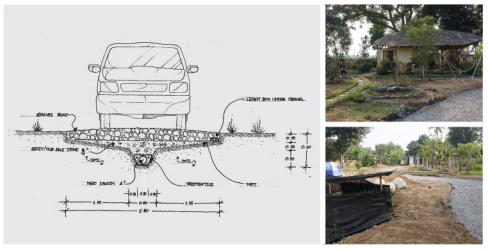
Location: Guest House A, Guest House B
Purpose: To collect water from the roof and transport it to the conveyance system.

2. Lawn Draining System

Location: Under the lawn
Purpose: The draining system collects the excess water from rain and irrigation and drains it into the conveyance system.

3. Garden Trail

Location: Underneath garden trail
Purpose: To drain water from the permaculture garden and garden trail into the conveyance system.

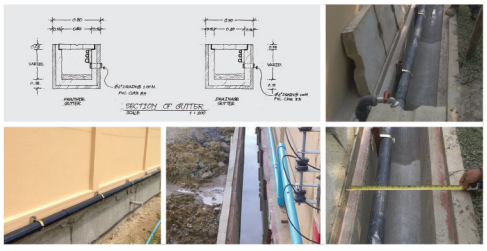


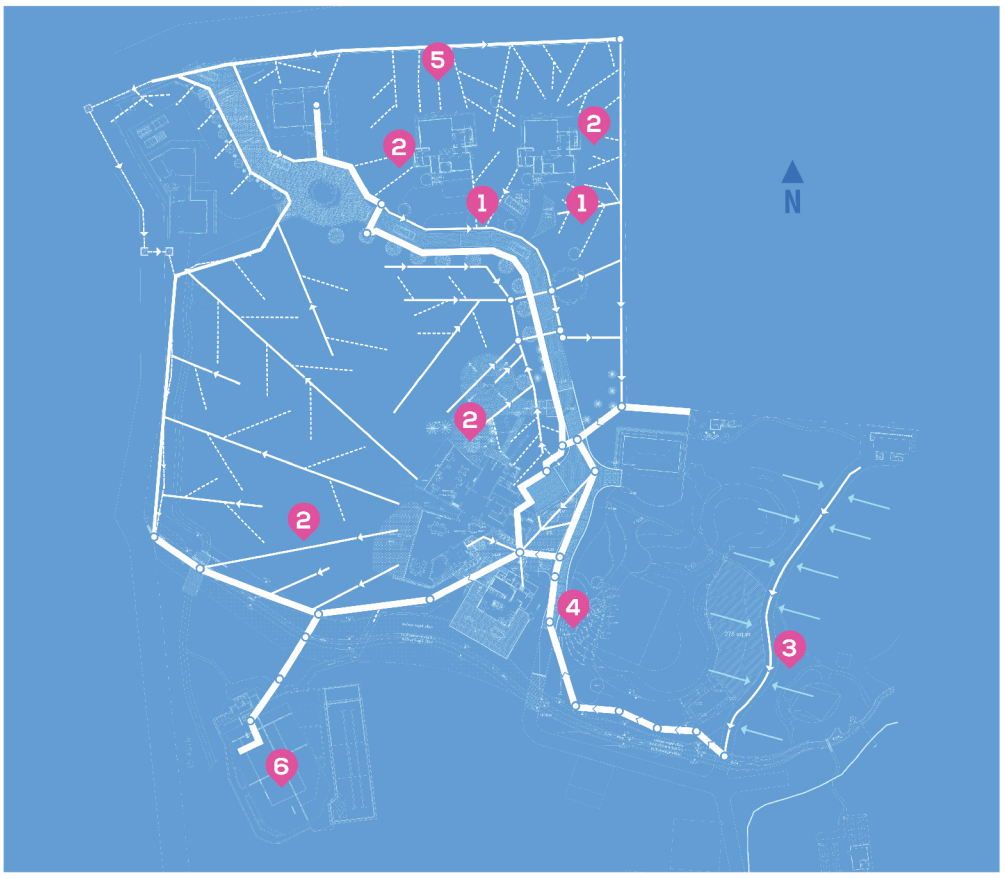
4. Conveyance System

Location: SIte center
Purpose: The backbone of the conveyance system is a large concrete pipe that transports water from around the site to the central filtration system.

5. Drainage Gutter

Location: Front area
Purpose: To collect water from around the site and drain it into the conveyance system.





6. Central Filtration System

Location: Beneath the swimming pool and beach volleyball court
Purpose: To collect, treat and store water for later use.

1. The water collected from around the site drains into the conveyance system and reaches the filtration system. A filter in the first chamber separates large debris and leaves from the water.

2. Water in the first tank undergoes mud precipitation.

3. The water cleaning process continues as oxygen is pumped from the bottom of the tank to aerate the water.

4. The water moves to the second tank to undergo an additional roundof aeration.

5. The purified water is collected and ready to be used for irrigation.