Figure 8.12. Technical iteration 04 - Sections. Author, 2016.

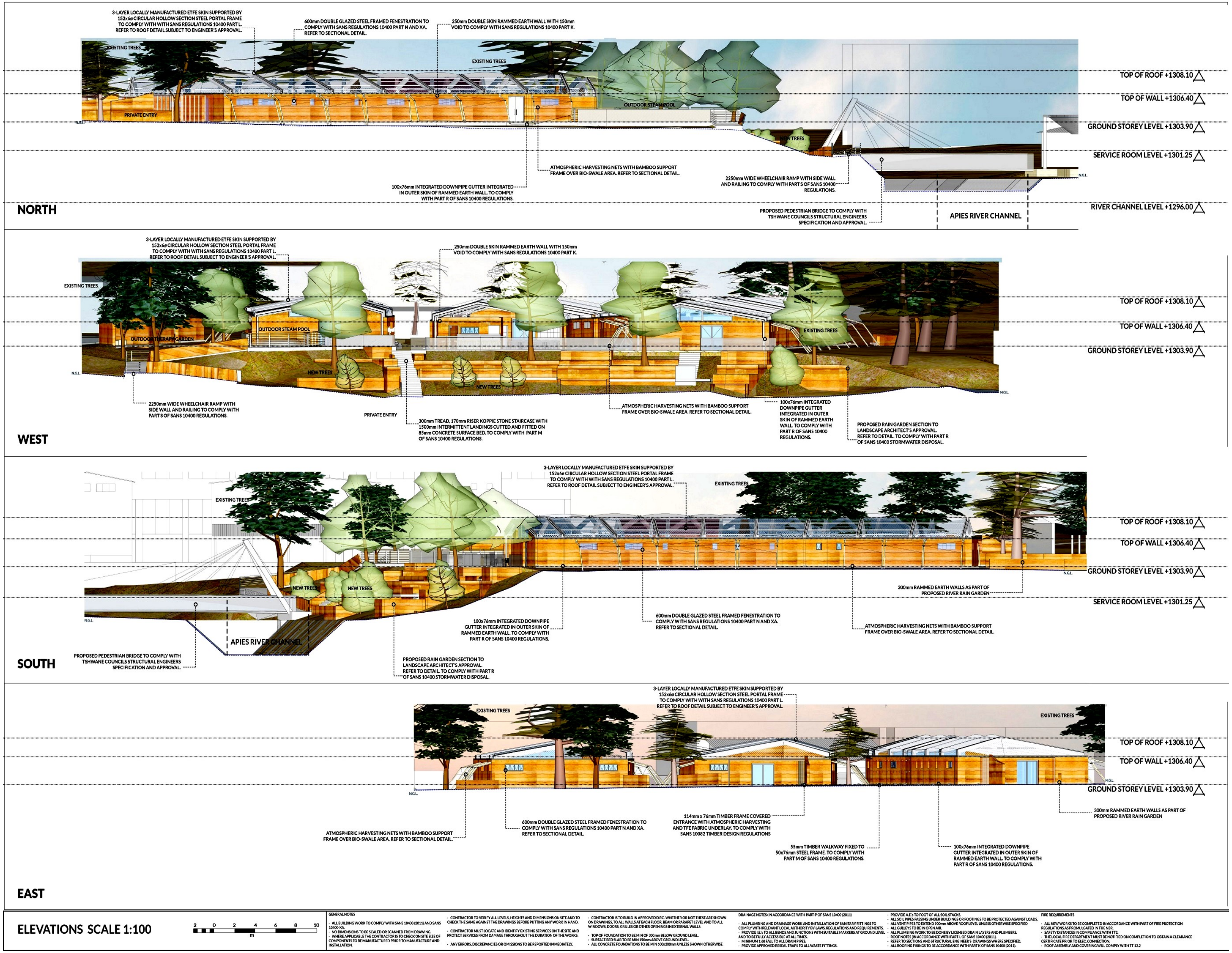


Figure 8.13. Technical iteration 04 - Elevations . Author, 2016.

Figure 8.14. Technical iteration 04 - River Space Experiences. Author, 2016.

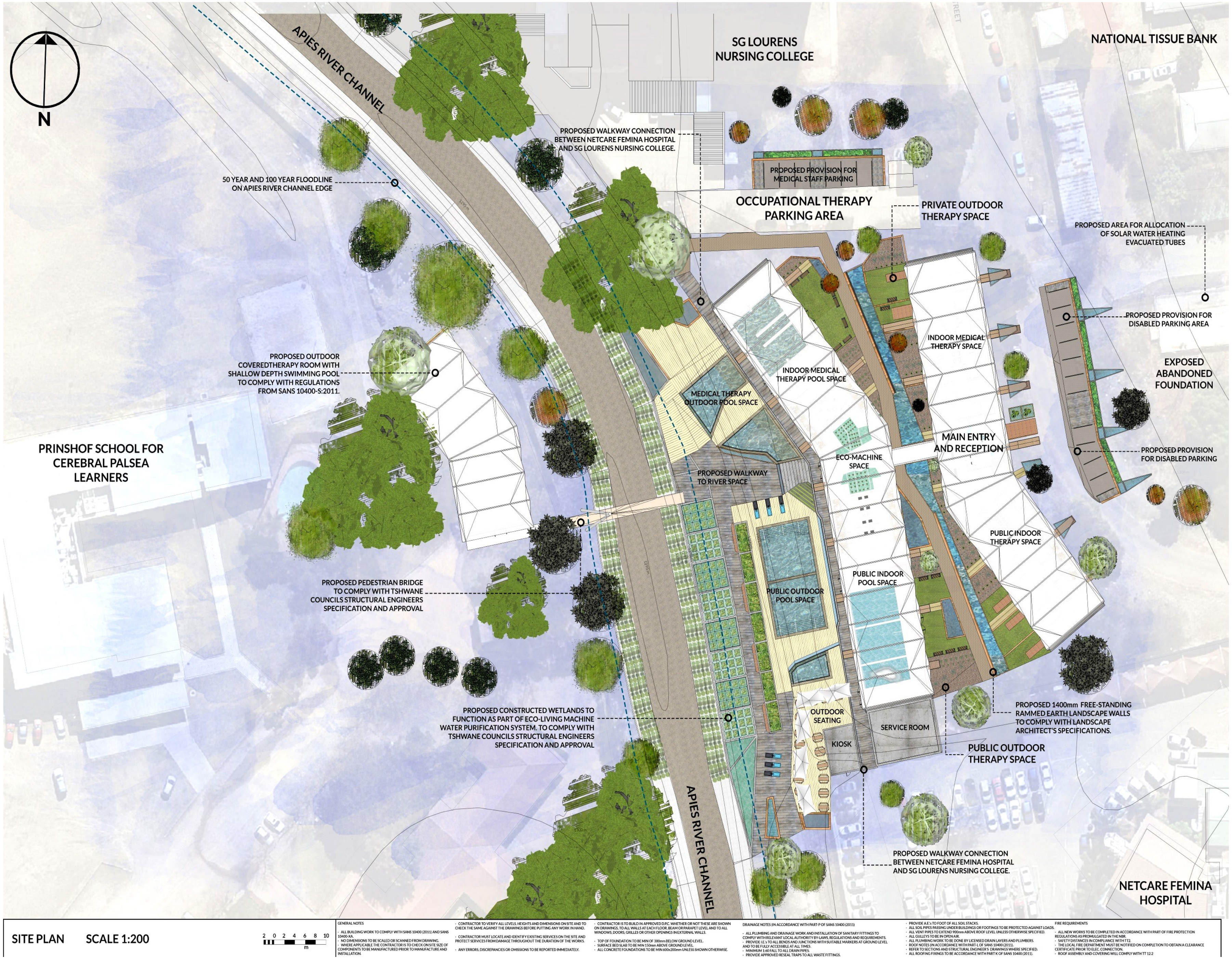


Figure 8.15. Final technical iteration (iteration 05) - Site Plan. Author, 2016.

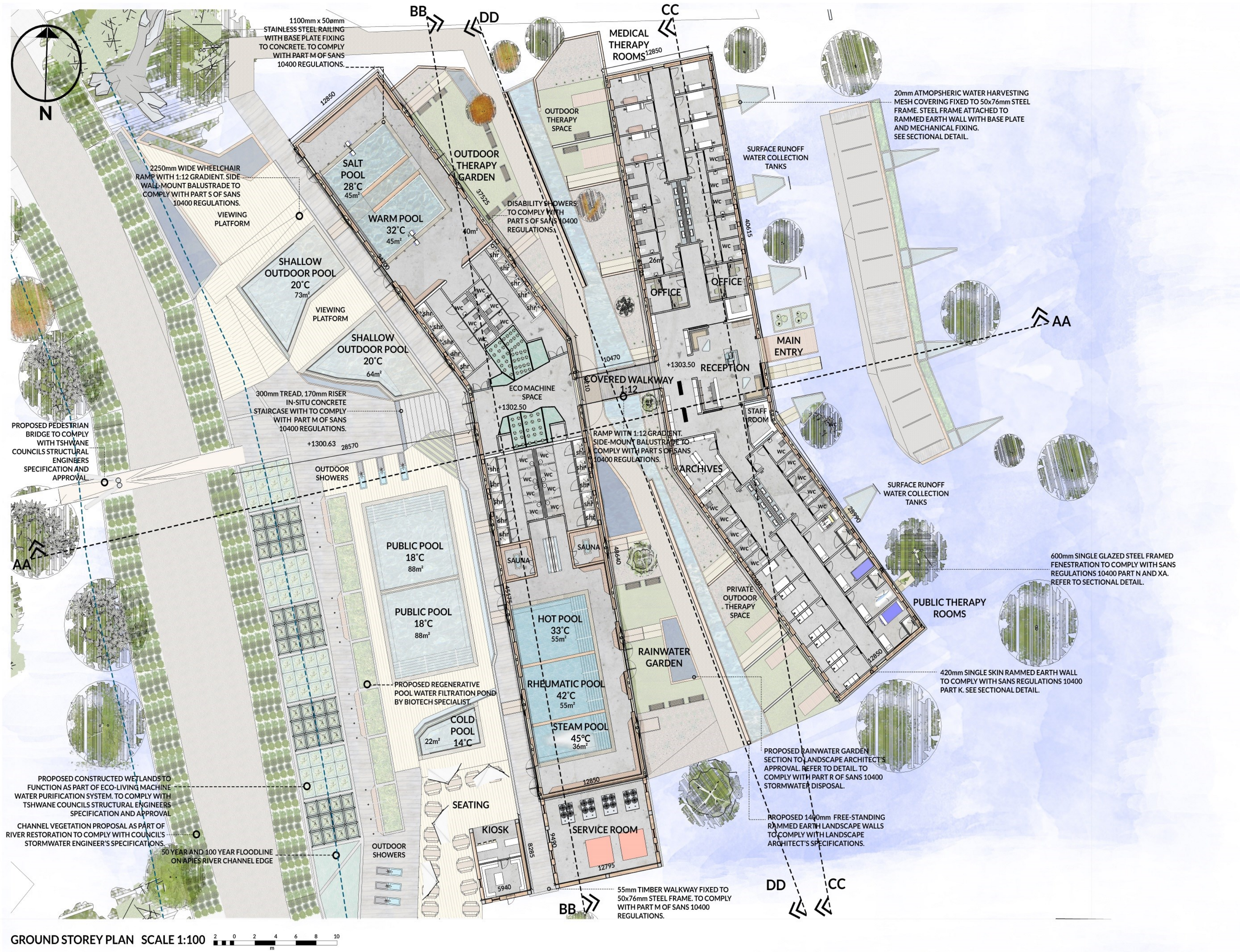


Figure 8.16. Final technical iteration (iteration 05) - Ground Storey Plan. Author, 2016.

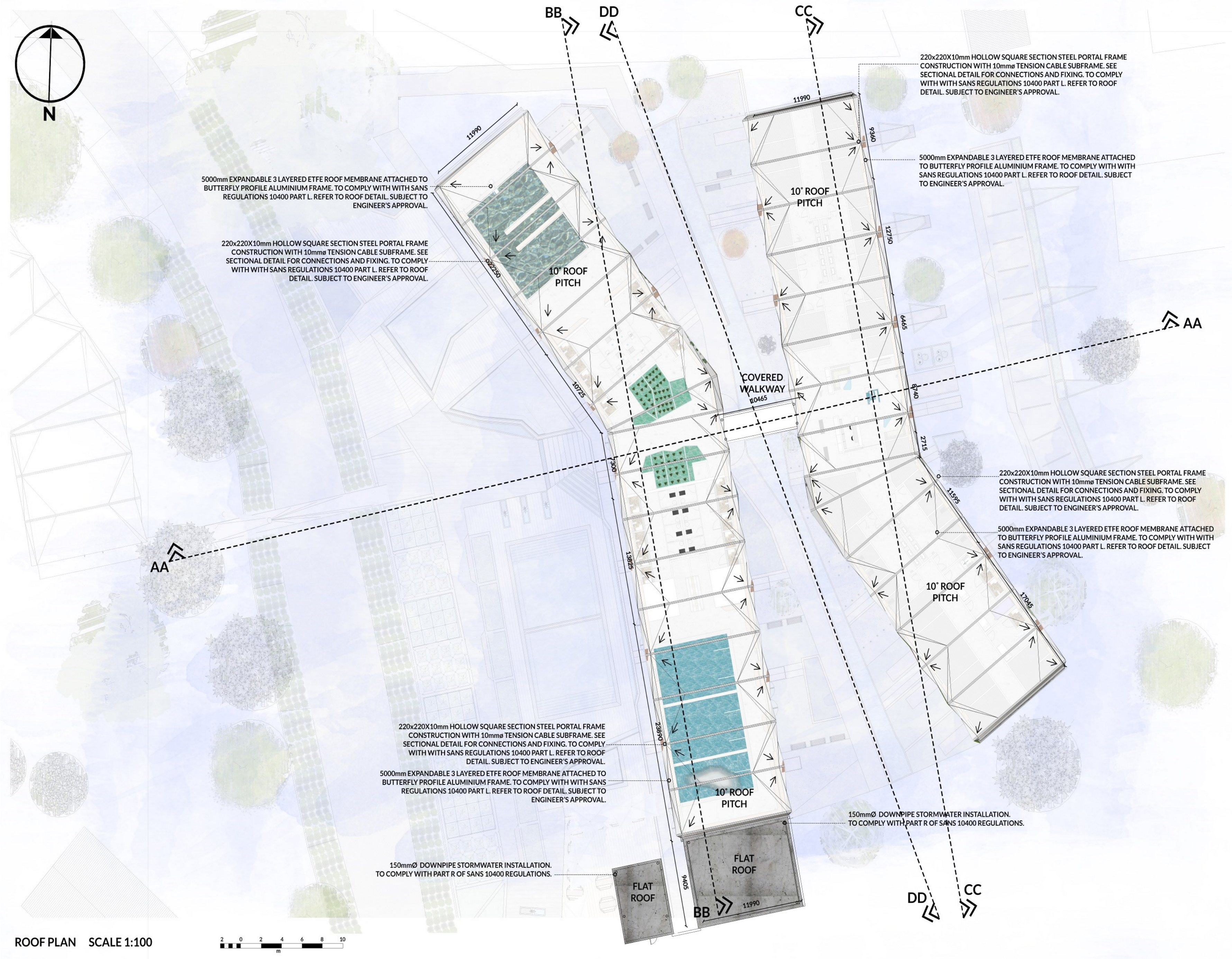


Figure 8.17. Final technical iteration (iteration 05) - Roof Plan, Author, 2016.

Figure 8.18. Final technical iteration (iteration 05) - Sections. Author, 2016.

Figure 8.19. Final technical iteration (iteration 05) - Elevations. Author, 2016.

Figure 8.20. Final technical iteration (iteration 05) - Perspectives. Author, 2016.

8.2 STRUCTURE AND SKIN

8.2.1 ROOF CONSTRUCTION INTENTIONS

A steel portal frame construction (see Figure 8.21) has been selected for the proposed building because of its benefits as a pre-fabricated building element, particularly the fact that it is time-efficient during assembly when compared to reinforced concrete construction (Wilson, 2013). With regard to structural strength, the loading of this material can be easily adapted and evolved, particularly with the lightweight ETFE roof system that has been chosen (Wilson, 2013).

Steel construction is an acceptable choice for the proposed building in terms of the ease of assembling the material and sourcing a manufacturer in the South African construction industry. An ETFE roof system (see Figure 8.22) has been chosen due to its flexibility as a climatically adaptive and responsive building skin, as previously mentioned, which is a quality reflected in its ability to control light transmission and solar gain (Wilson, 2013).

A conventional three-layer ETFE roof skin has an estimated U-value of 1.96 w/m²K, which is better than the U-value of triple glazing, provided the roof angle is between 15˚ and 20˚ (in other words, the angle of the roof should be closer to the horizontal axis), (Wilson, 2013). Light transmission across the UV spectrum is estimated to be between 320nm and 380nm (83% to 88%), which allows for the internal placement of vegetation (Wilson, 2013).

8.2.2 SPECIFICATIONS

The following consists of specifications for the ETFE roof skin and portal frame construction (see Figure 8.31):

- 114mm x 50mm aluminium clamping plate extrusion,
- 5mm x 20mm weather seal gasket,
- 20mmø primary support cable,
- 100mm inflated width, three-layer EFTE cushion membrane, 220mm x 220mm x 10mm, hollow, cold-rolled steel section portal frame construction with 12000mm span (subject to engineer's specifications),
- 5mm plastic composite, weather-resistant cover overlay (to be supplied and fitted by ETFE roof manufacturer),
- 100mm three-layered inflated ETFE roof membrane fitted to 100mm x 110mm L-profile aluminium track,
- 100mmø lateral sub-frame attached to main portal frame with steel clamp or custom-made, welded flange.

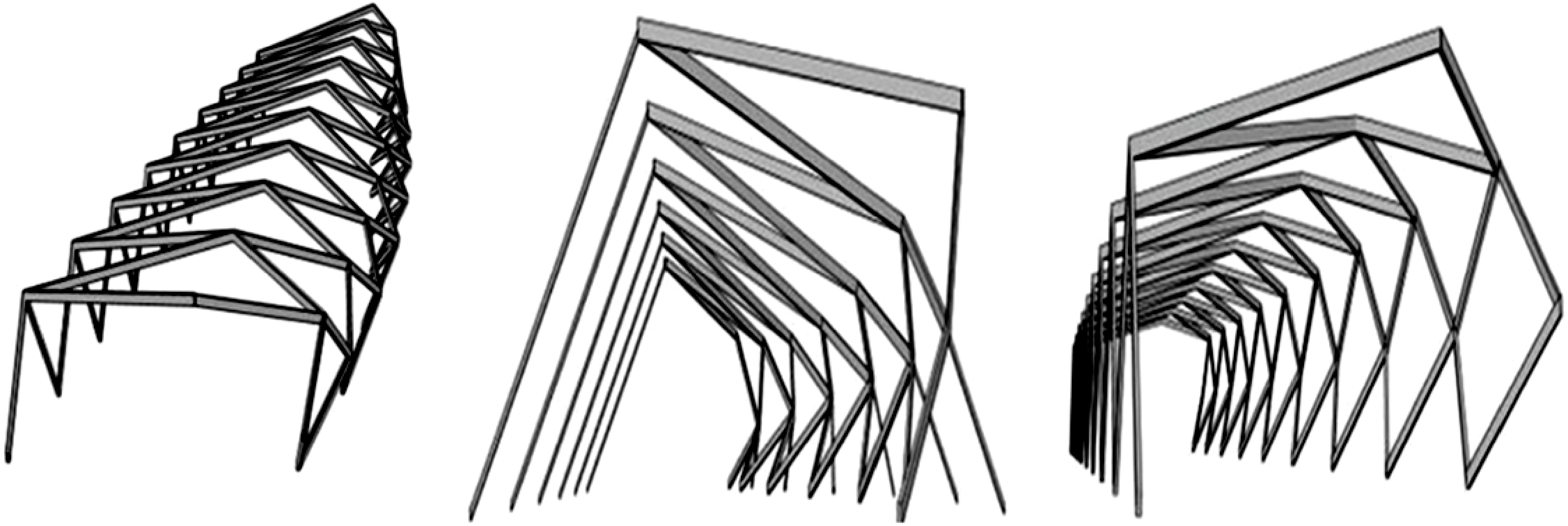


Figure 8.21. Modulated steel frame sections. Author's adaptation from Sketchup. 2016.

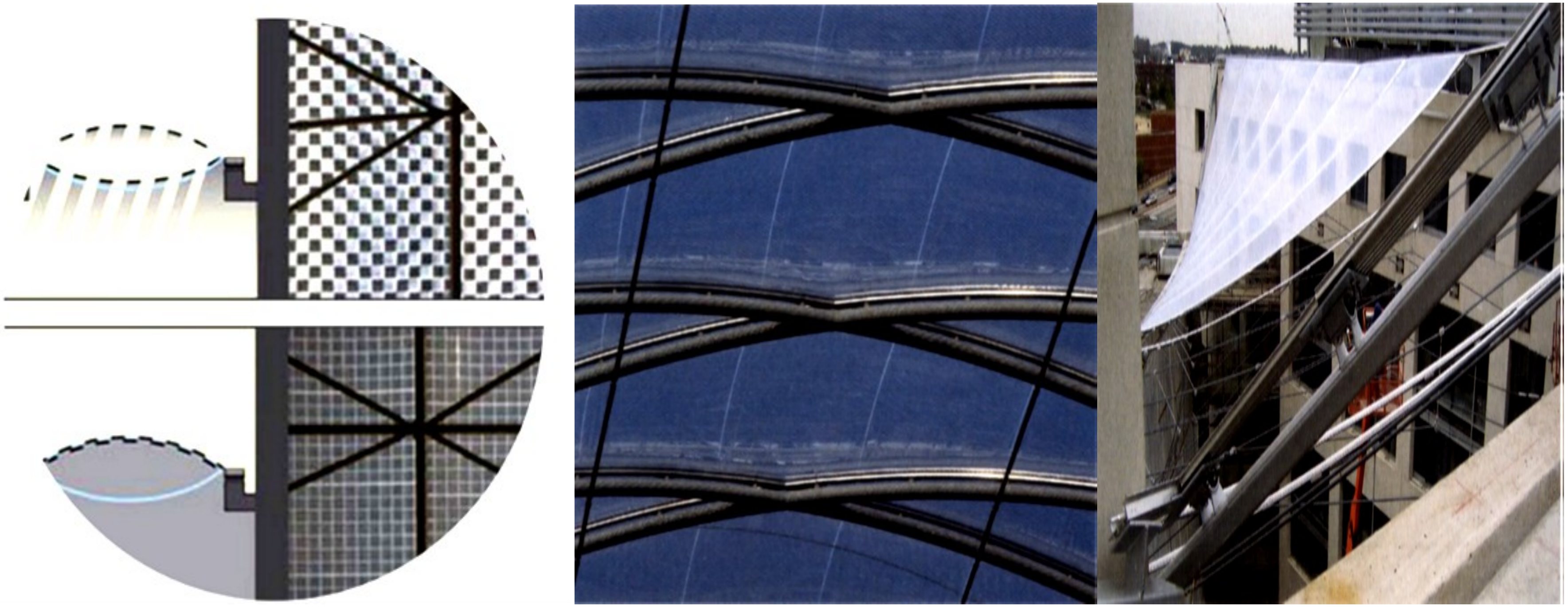


Figure 8.22. ETFE Roof Construction, p.38. p.95,p. 119. LeCuyer, 2008.

8.3 MATERIALS

8.3.1 RAMMED EARTH INTENTIONS

Historically, rammed earth has been used across various building typologies, for example, hospitals, schools, and bathhouses (Dobson, cited in Ciancio & Beckett, 2015:9). It possesses a high thermal mass and has the ability to absorb and release air, thereby removing particulate matter and replenishing the indoor air quality (Dobson, cited in Ciancio & Beckett, 2015:9). Furthermore, it is recognised for its high recyclable value (Dobson, cited in Ciancio & Beckett, 2015:9). In addition, rammed earth construction is known for providing a therapeutic influence on a building's occupants (Dobson, cited in Ciancio & Beckett, 2015:9).

8.3.2 RAMMED EARTH SPECIFICATIONS

The following pertains to rammed earth construction (see Figure 8.31):

- 25mm Rammed earth barrier erosion integrated into rammed earth wall made of trass-lime mortar.
- 420mm Rammed earth wall construction in 150mm layers with selected material (pi>5) stabilise with 4% lime, compact to 93% mod aashto.
- 380mmx19x200mm Service duct shaft with wastewater and water supply reticulation.
- 170mm Reinforced concrete surface bed with reference 100 mesh and 50mm non-slip finish floor screed on dpm in accordance with engineer's detail.
- 170mm Well compacted earth to 90% mod aashto and test cbr>10.
- 840mmx420mm Soil-cement foundation in 150mm layers with decomposed granite, stabilise with 2% ecobond, 2% cement, compact to 95% mod aashto. to structural engineer's specification and approval.
- Trench bottom cbr>25.

Figure 8.23. Rammed Earth Construction. p.33, Rael, 2009.

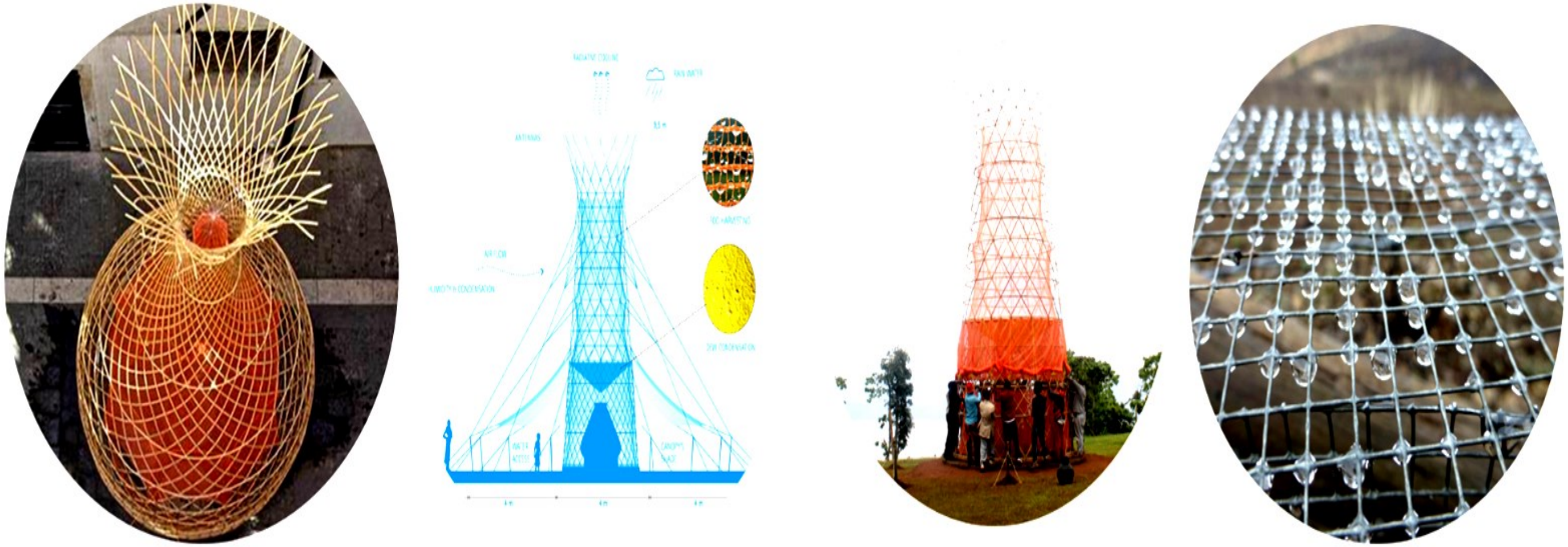
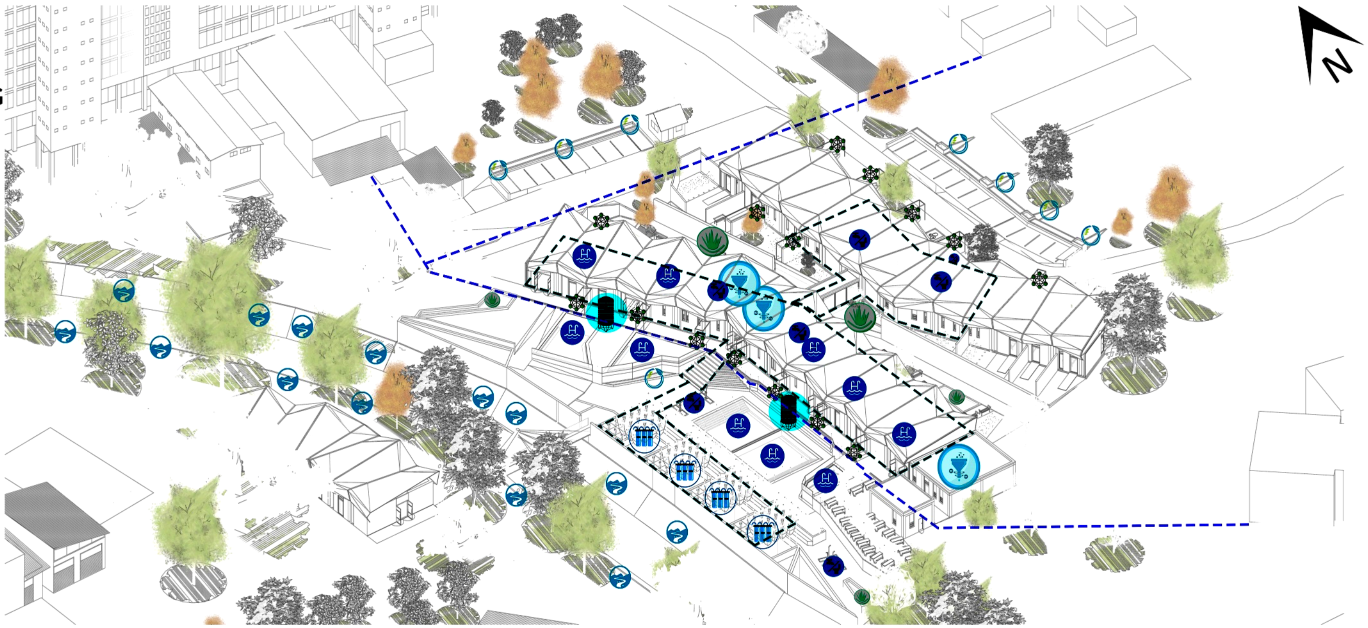


Figure 8.24. WarkaWater Atmospheric Harvesting. warkwater.org. 2016.

WATER

- RAINWATER GARDEN
- ATMOSPHERIC HARVESTING
- SWIMMING POOL
- DOMESTIC WATER USE
- SURFACE RUNOFF TANKS
- CONSTRUCTED WETLANDS
- WATER STORAGE
- ECO LIVING MACHINE
- CHANNEL VEGETATION



ENERGY

- LOCAL WIND POWER
- INTEGRATED HEAT PUMP
- LOCAL SOLAR WATER HEATING TUBES
- PASSIVE VENTILATION
- EVAPORATIVE COOLING (OPTIONAL)

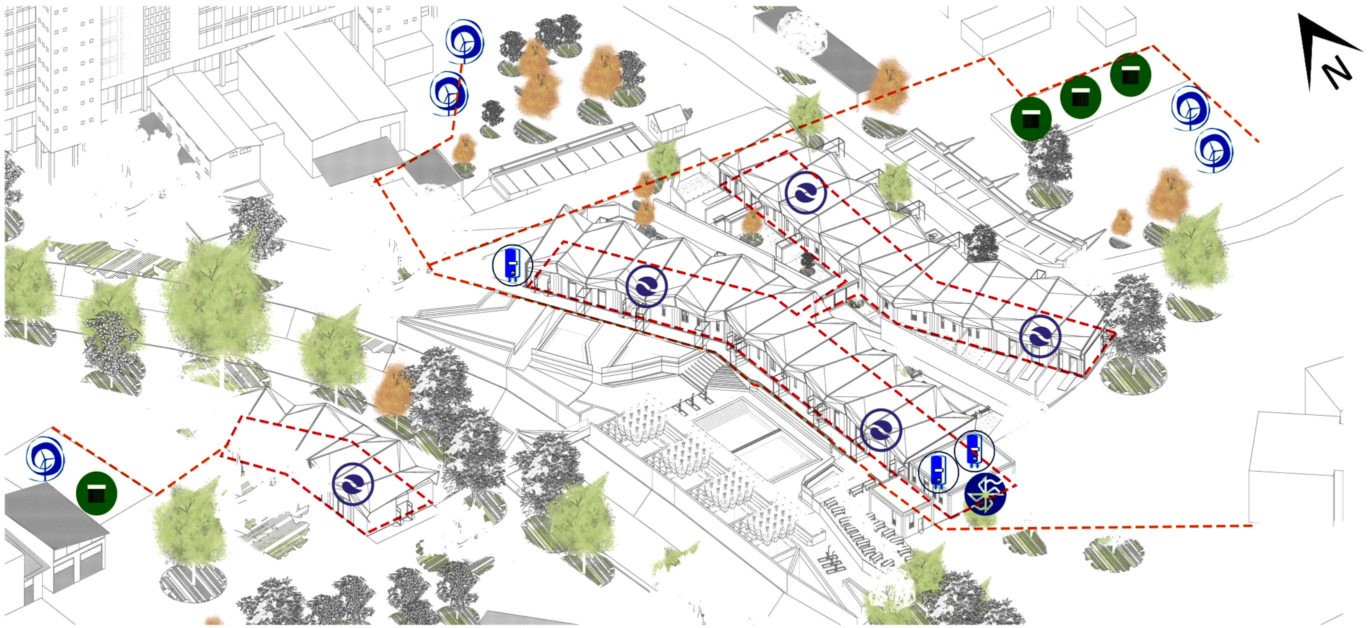


Figure 8.25. Water and Energy strategy diagram for the proposed intervention, Author, 2016.