# Sydney Fish Markets

Water Sensitive Urban Design

Concept design – August 2010

# Water cycle management objectives for Sydney Fish Markets

Sydney Harbour Foreshore Authority is responsible for Blackwattle Bay maritime commercial facilities, parkland and Sydney Fish Market.

SHFA has a commitment to reduce their operational and precinct footprint by 80 percent by the year 2020.

In terms of water cycle management, SHFA's sustainability strategy ("easy as 80/20") emphasises:

- collecting rainwater
- by 2010, using harvested rainwater on all parks
- by 2020, reducing potable water consumption by 80% across SHFA precincts

Sydney Fish Markets can also play a role in reducing pollutant loads from stormwater discharging into Sydney Harbour. Best practice targets (widely used in NSW) are:

- 85% reduction in the mean annual load of total suspended solids
- 60% reduction in the mean annual load of total phosphorus
- 45% reduction in the mean annual load of total nitrogen

# Blackwattle Bay Catchment

Blackwattle Bay Catchment is upstream of the Fish Markets, and includes Sydney University, Darlington, Wentworth Park and Glebe. The Catchment is 265ha and is comprised of:

- Residential (109 Ha / 41%).
- Commercial (34 Ha / 13%).
- Industrial (31 Ha / 12%).
- Open Space (31 Ha / 12%).
- Special Uses (59ha / 22%) – University of Sydney, University of Technology, etc.

Modelled Stormwater Loads of the Blackwattle Bay Catchment

| Pollutant | Average Annual Load |
|---|---|
| Suspended Solids | 286,000 kg/yr |
| Total nitrogen | 6510 kg/yr |
| Total Phosphorus | 981 kg/yr |
| Gross Solids (plastics, cans, bottles) | Wet load ~27900 kg/yr or 112 $m^3$/yr |
| Organic matter (leaves, grass) | |

# Blackwattle Bay Catchment

Much of the stormwater system in Blackwattle Bay was developed during the mid to late 1800s. During the early 1800s heavy industries such as tanneries, copper smelting, pig yards and tobacco works forced out of the city centre located in the Catchment. Blackwattle Creek drained most of these factories and was by 1850 known as Blackwattle Swamp (Glebe Society 2003).

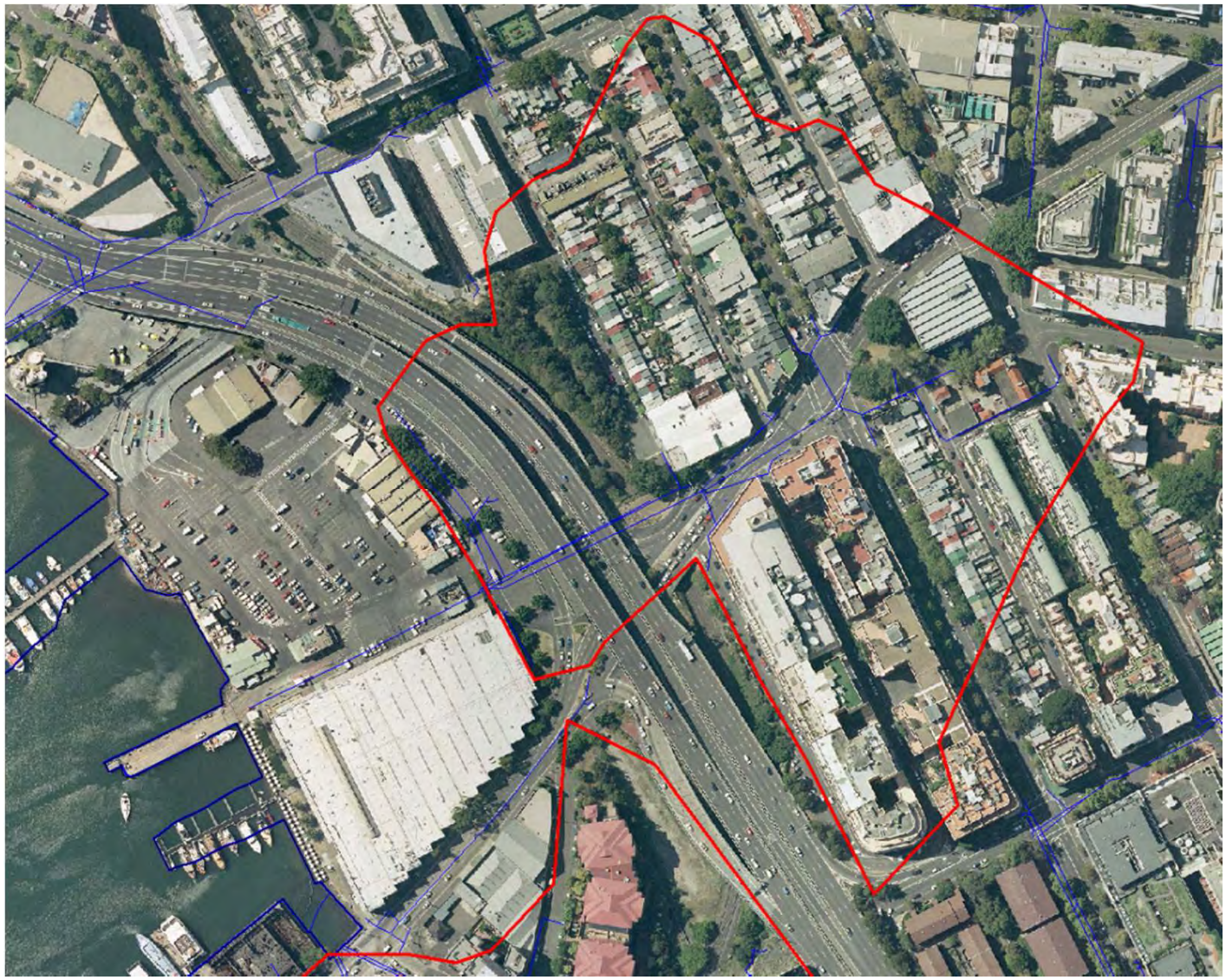
In 1873 work began on the reclamation of Blackwattle Swamp using harbour dredgings, where men shovelled the sediments into wheel barrows to the dumping sites. Enough work was completed by 1877 to allow the laying of pipes to channel sewage and stormwater to Blackwattle Bay. In 1880 the original open sewer was covered by a large open dish drain and an additional 18 inch sewer pipe was laid beneath the dish drain. As part of Sydney's early combined stormwater/sewerage conveyance system all sewers discharged into Blackwattle Bay.

Construction of Wentworth Park commenced in 1882. As part of the raising of the swamp area between 1906 and 1910 the sewer was covered over the present Blackwattle Lane. The sewer scheme is connected to the Bondi Ocean Outfall System (BOOS). The original stream is located approximately 3.5 metres below the present ground surface. The Wentworth Park area is still subject to periodic flash flooding during heavy thunderstorms.

As a result of the past industrial, activity sediments in Blackwattle Bay are heavily contaminated. Sediments have been tested and show high levels of zinc >900 ppm, lead >400 ppm and copper >300 ppm, consistent with other high loadings found in similar embayments of Iron Cove, Rozelle Bay, and Hen and Chicken Bay.

Sydney University (Birch and Taylor 1999) also examine the bioavailablility of toxicants entering the food chain, and showed that stormwater drains adjacent to the Sydney Fish Markets show high deposition of sediments that typically contains high levels of contaminants. It was found that sediments in Blackwattle Bay exceeds Cu concentrations where adverse biological effect is expected, as is the case for Pb and Zn.

# Blackwattle Bay Catchment

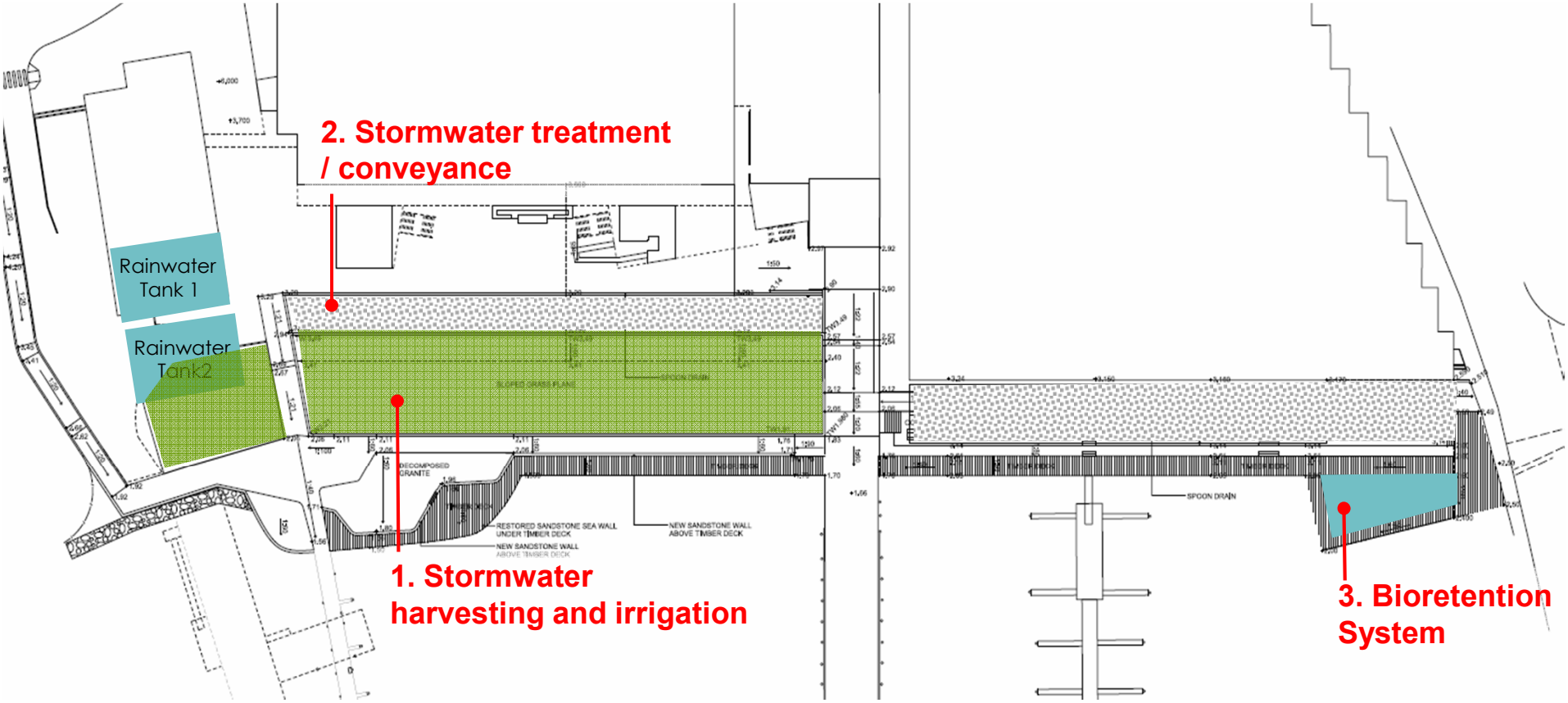


Immediately to the east of the Fish Market is an 8.5ha catchment which includes sections of Pyrmont.

To the north of the site is another stormwater system which flows along Union Street, and into Blackwattle Bay to the north of the Hymix concrete batching plant.

# Fish Market Redevelopment

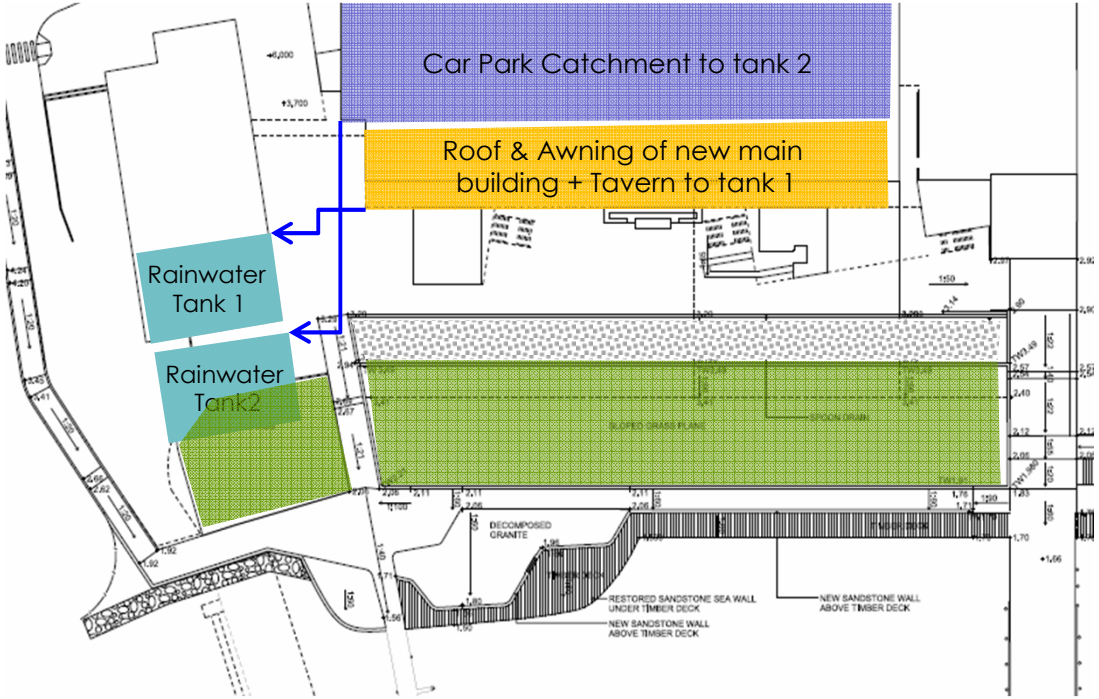
The redevelopment proposal includes two new buildings as well as open space areas. As part of the open space works three main areas of stormwater related work are proposed as shown in the figure. These works are outlined in the following pages.



# 1. Stormwater Harvesting and Irrigation

The redevelopment proposal includes two new buildings and will incorporate two stormwater tanks. One stormwater tank will be underneath the tavern and collect water from the roof of the tavern as well as the awning on the new main building. The second stormwater tank will collect water from the new car park and be used for irrigation and external wash-down. The catchment, location, tank size and demands for each of the tanks is shown in the table.

| Tank | Source Catchment | Catchment Size | Tank Location | Tank Size | Tank end use | Demand for irrigated water from tank |
|---|---|---|---|---|---|---|
| 1 | Roof & Awning of new main building + Tavern | 3,000m2 | Under Tavern | 100 kL | Internal Toilets and Wash-down in the new building | 13 kL/day |
| 2 | Car Park | 7,000m2 | Under turning circle infront of tavern | 400kL | Irrigation grassed areas + External area hose down + Trade Waste area wash down + Mech. plant cooling water. | 2.5ML/yr seasonally adjusted + 20kl/day |



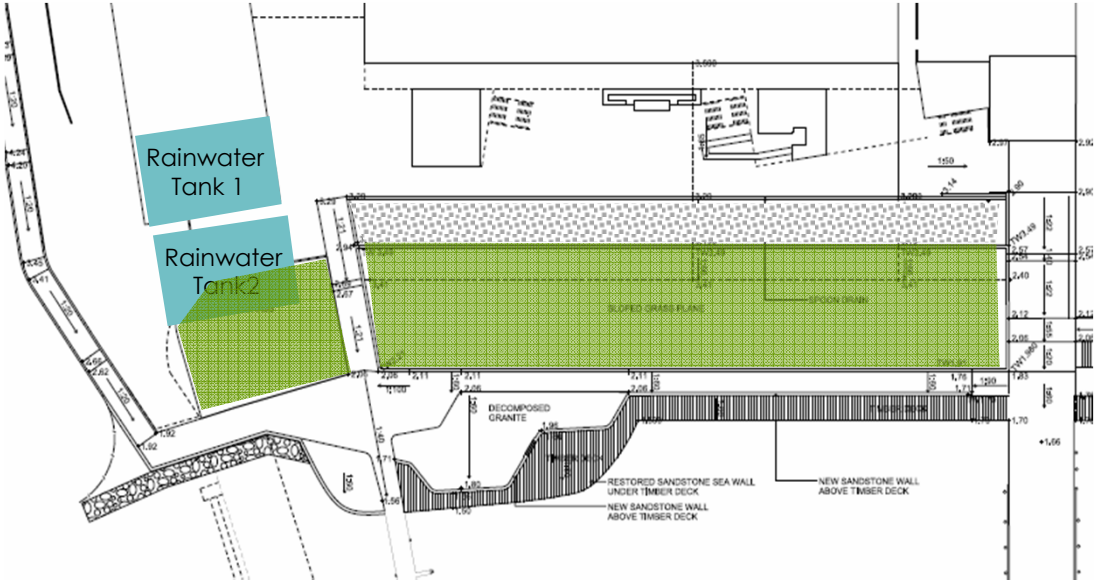

Currently Claudio's utilises roofwater for hose-down of external areas (image below), and it is proposed that the roofwater will be used for the same purpose.

# 1. Stormwater Harvesting and Irrigation

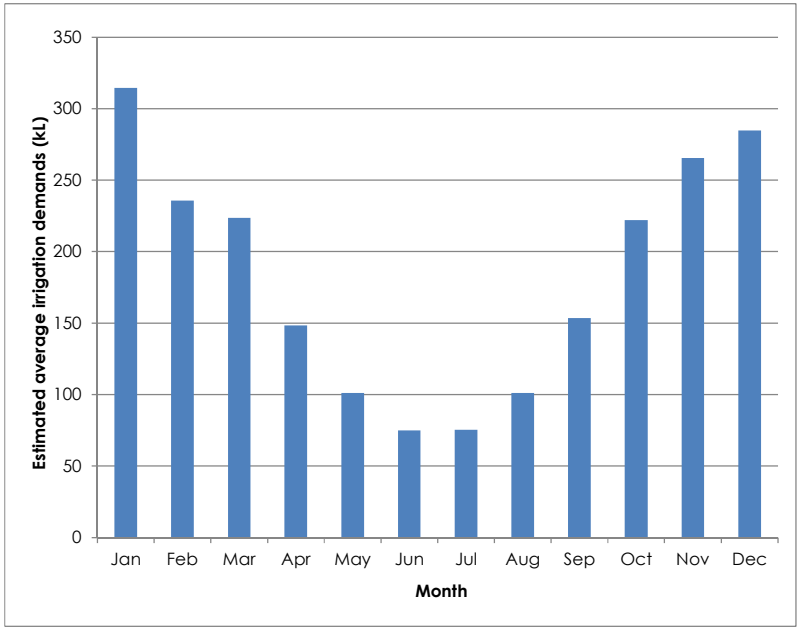
Irrigation demands at the Fish Markets will be met with non-potable water, in keeping with SHFA's sustainability strategy. Future irrigation demands at the Fish Markets were estimated using Sydney Water's "WaterRight" gardens tool. Irrigation demands were estimated at **2,200kL/year**.

Water demands have been estimated based on:

- A 3,000 $m^2$ area of grass (as shown below), subject to high traffic and maintained to a high standard
- Approximately 20 trees, with moderate water requirements



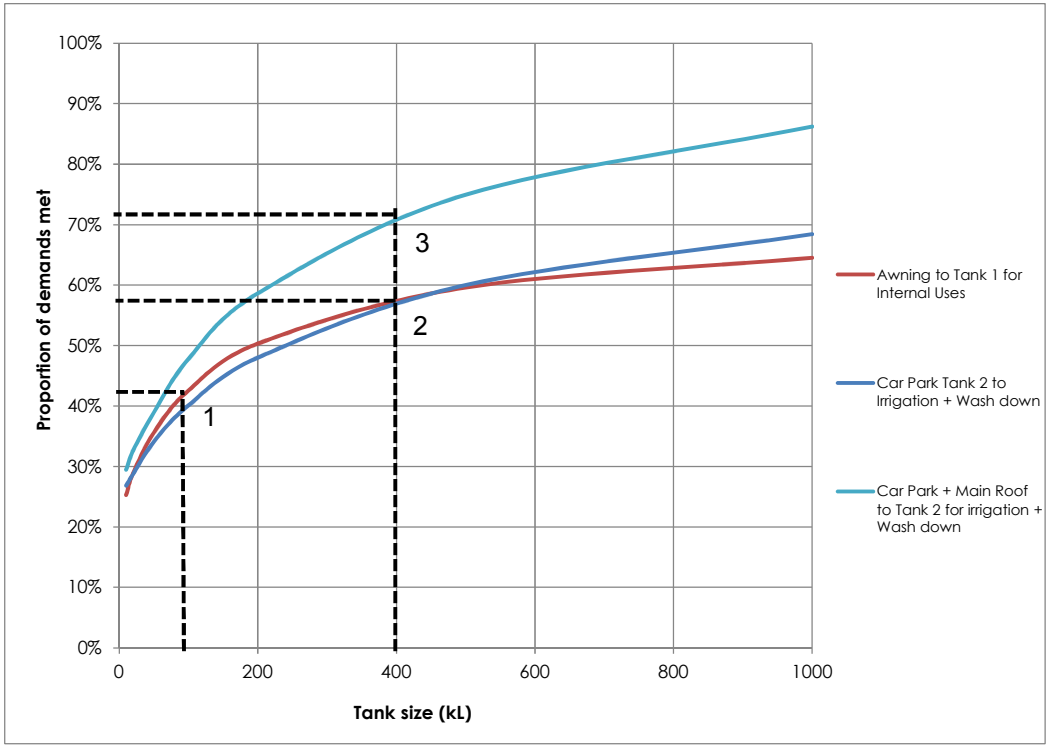

Irrigation water demands will follow a seasonal pattern, estimated to reflect monthly evapo-transpiration at the site:



# 1. Stormwater Harvesting and Irrigation

Water balance modelling has been undertaken to assess the potential for stormwater harvesting to supply future irrigation demands at the Fish Markets for the two tanks. Results are shown below, indicating that

1. Tank 1 (100kL rainwater tank) – would meet 42% of the Internal Toilets and Wash-down in the new building.
2. Tank 2 (400kL stormwater tank) – would meet a moderate proportion (58%) of the irrigation and wash-down demands.
3. If the half of the main roof of the existing building (5,000m2) was diverted to Tank 2 (along with the current catchments) and the demands remain the same, the tank would meet 72% of the irrigation and wash-down demands.

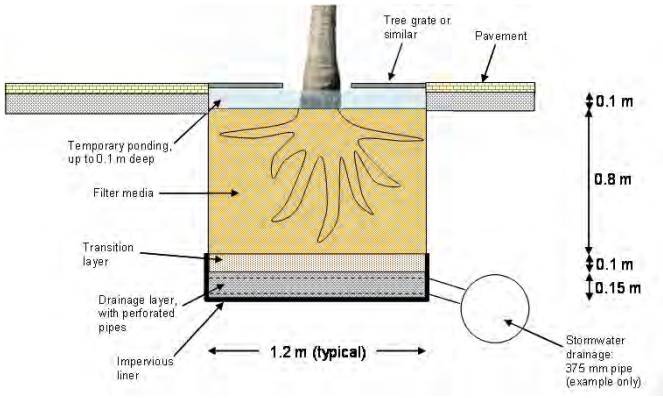



**Underground stormwater tank**

# 2. Stormwater Conveyance and Treatment

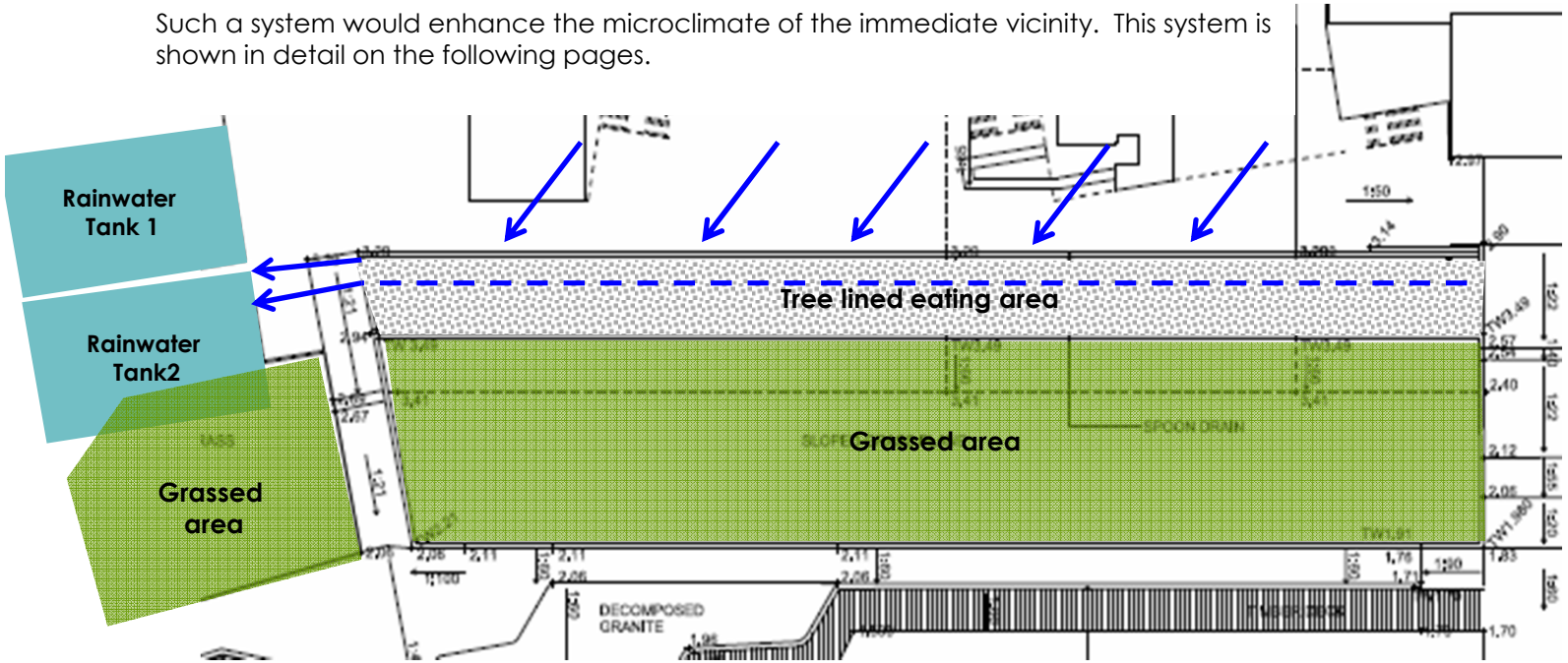
The interface areas between the proposed redevelopment and open space areas can include a paved area with seating and trees for shade.

It is proposed to utilise a bioretention system to treat stormwater as well as acting as a passive irrigation system for the vegetation within the tree lined eating area. Stormwater would flow by gravity from the concrete area in front of the new building into kerb and gutter along the interface between the concrete paved area and the eating area. The kerb and gutter would drain at regular intervals into the bioretention system. Treated stormwater from the bioretention system would be directed to rainwater tank flow, as would overflows from the kerb and gutter.



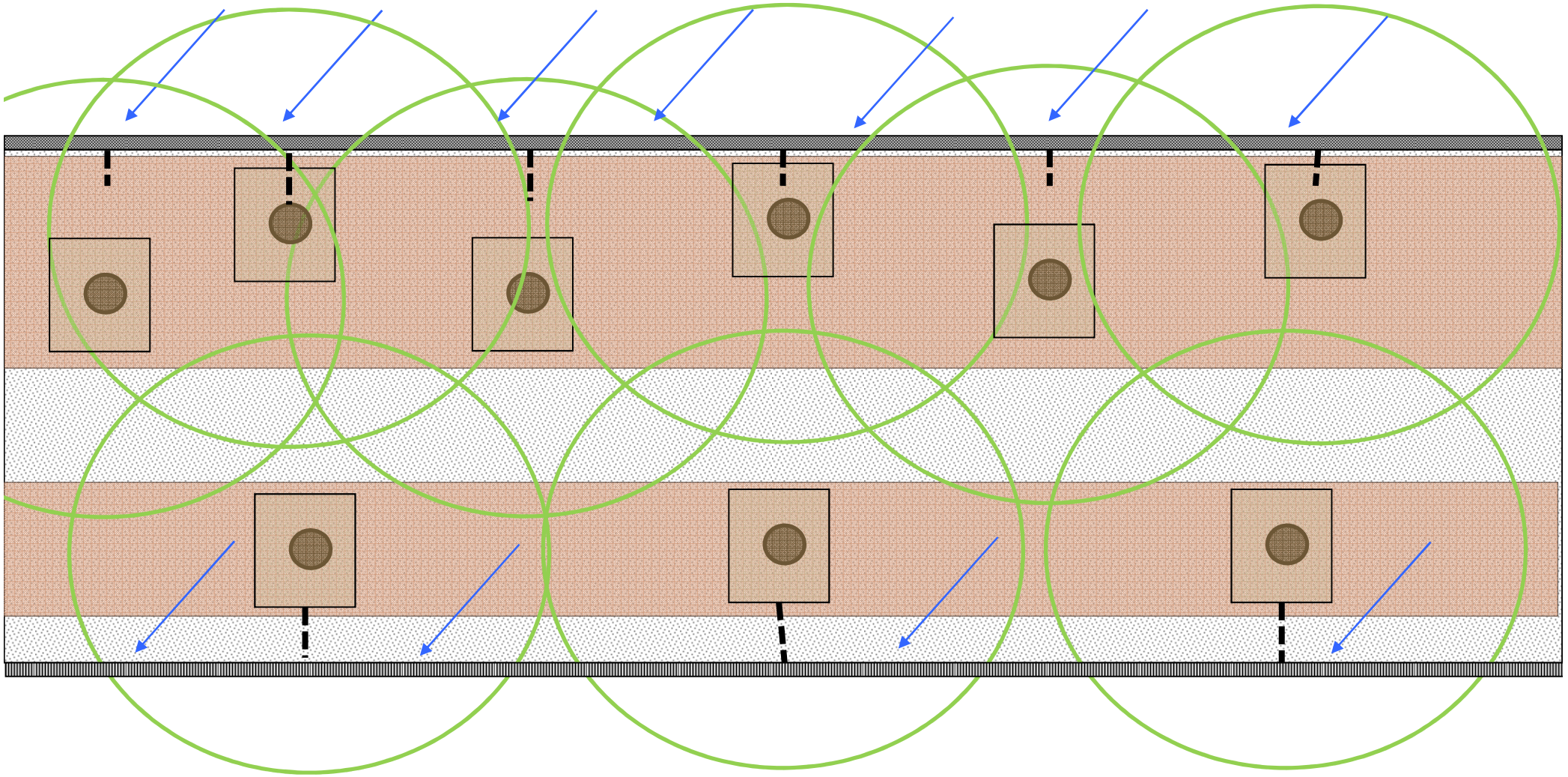

**Cross—section of a bioretention system**

Such a system would enhance the microclimate of the immediate vicinity. This system is shown in detail on the following pages.



# 2. Stormwater Conveyance and Treatment

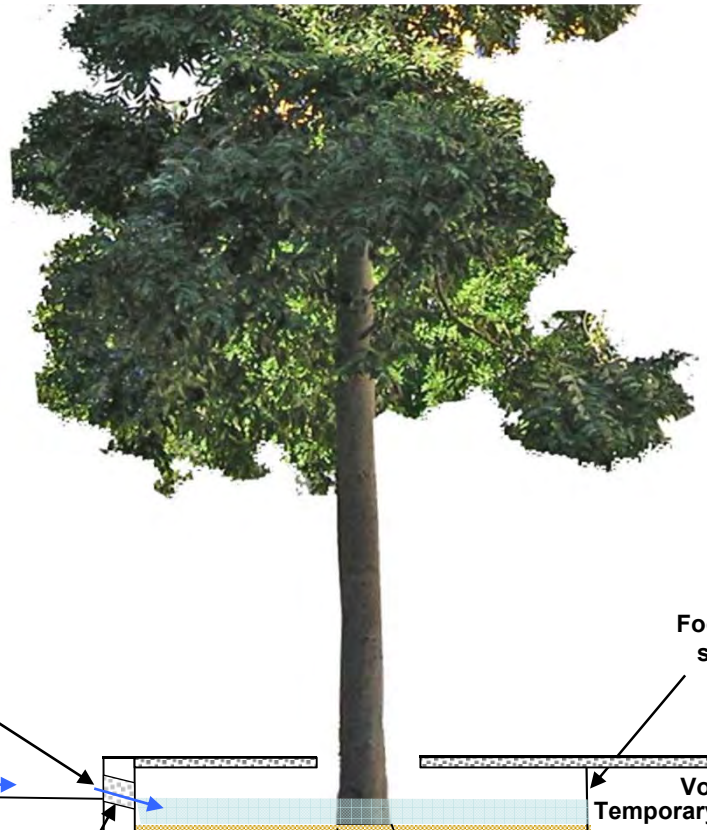
It is proposed that the trees would sit in two long linear garden beds which continue along the length of the raised concrete dining area (100m). Stormwater from the concrete area in front of the new building would be directed to the kerb and allowed to enter the bioretention system. Stormwater from the seating area, would follow the grade towards the water and be directed into a similar kerb and gutter system along the interface between the eating area and the grass. Stormwater would be directed into the garden beds.

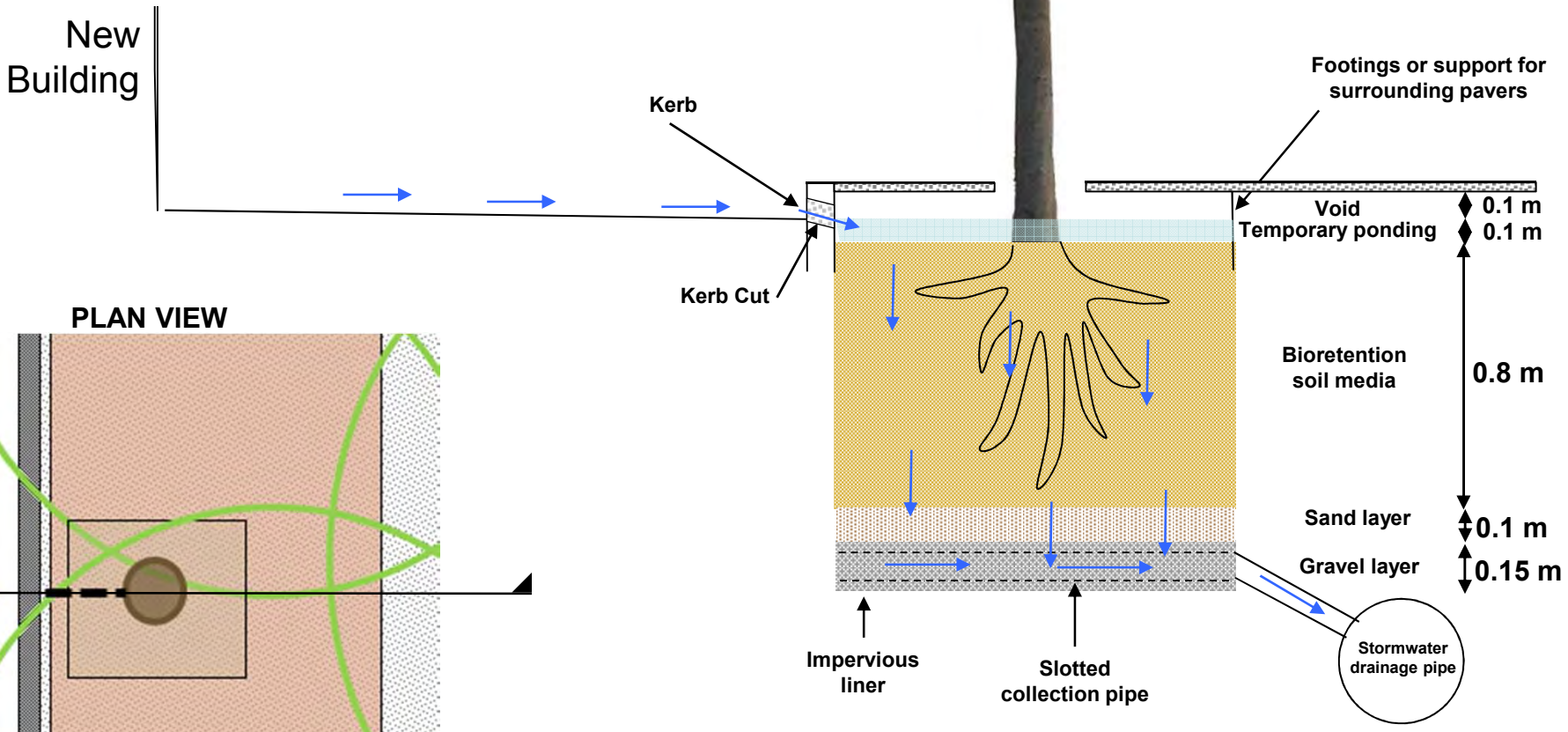


# 2. Stormwater Conveyance

Cross section of the tree  pit, with stormwater flows allowed to enter the bioretention system through n opening within the kerb. Flows beyond the capacity of the system flow along the kerb and into a collection pit, and into the stormwater tank for reuse. It is proposed that there would be 3-4 overflow pits along the length of the kerb and getter.

Treated stormwater flows are collected in a stormwater pipe and flow to the stormwater tank for reuse.

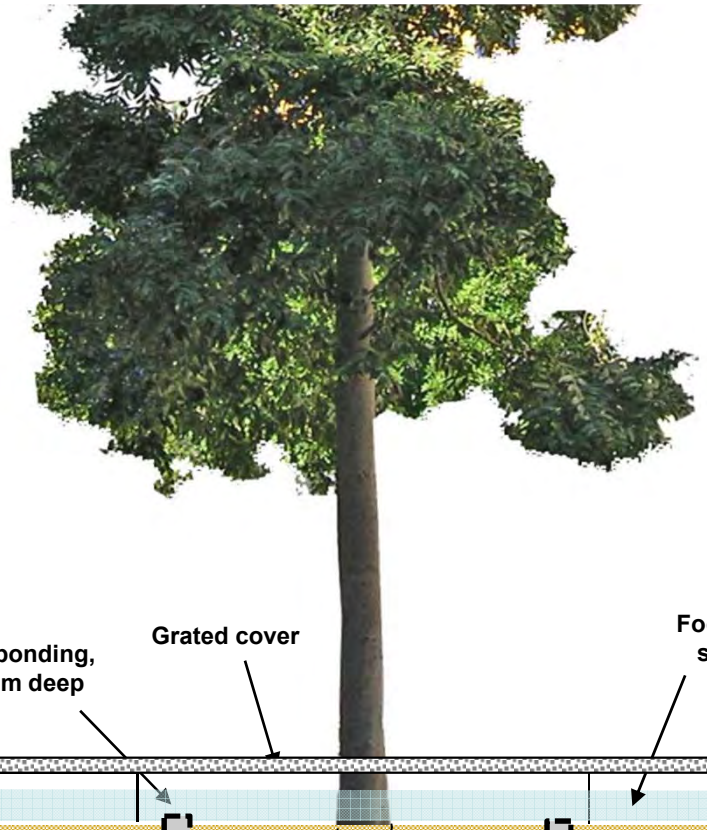


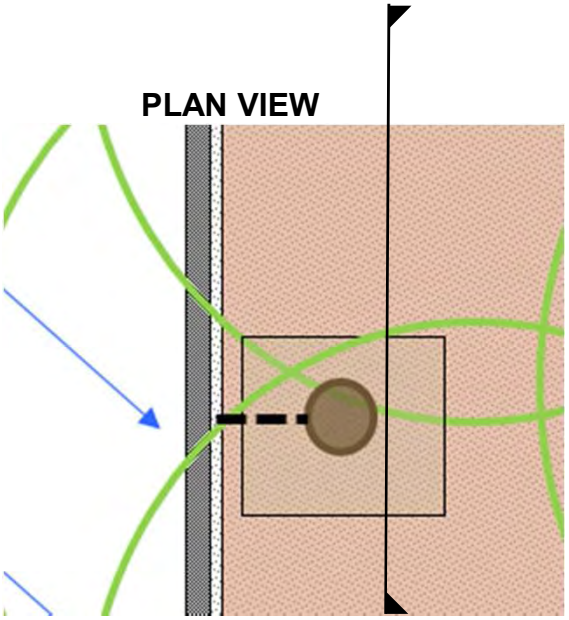


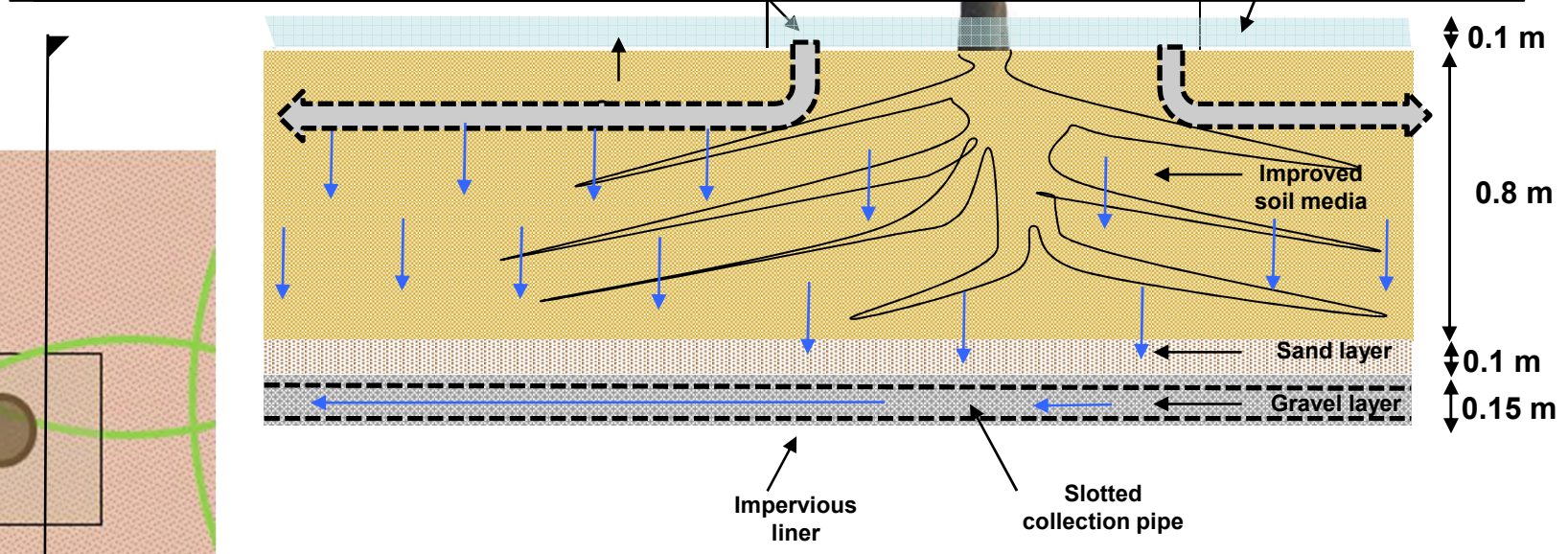

**PLAN VIEW**

# 2. Stormwater Conveyance

The trees would be planted within the larger garden bed to allow expansion of roots within the garden bed.





# 2. Stormwater Conveyance and Treatment

Directing flows into the bioretention system would require a kerb cut or other entrance at semi-regular intervals along the length of the system. Examples of possible systems are shown.

Kerb opening in South Granville

Kerb opening at Pirrama Park

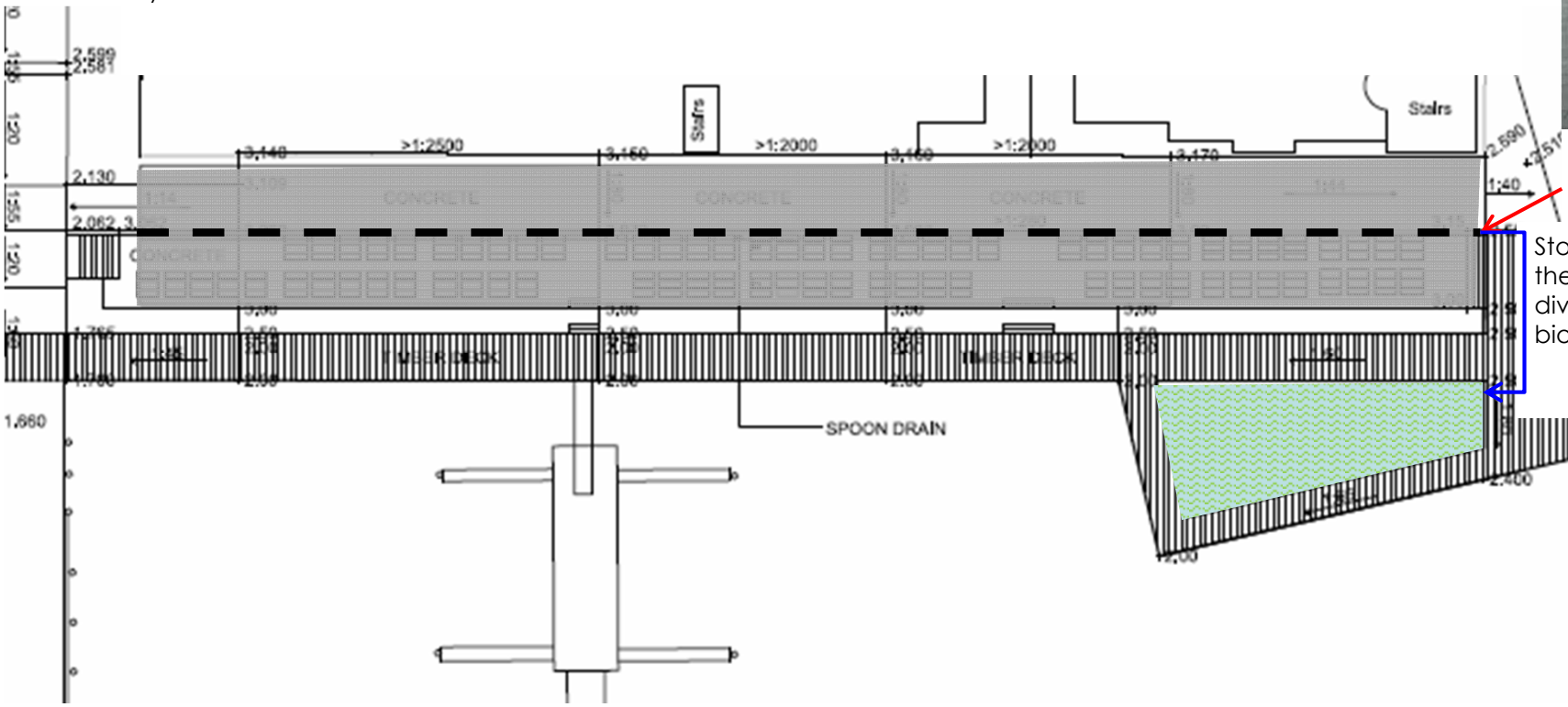
Kerb opening in Darlinghurst

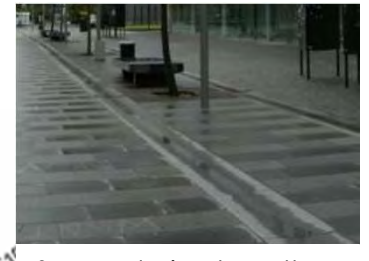

A drain could be as discrete as a slot in the pavers (providing there is sufficient depth for this type of solution

# 3. Bioretention System

A 200m2 bioretention system is proposed for the Bridge Road entrance to the fish markets. The bioretention system will be planted with *juncus* and other species to create an environment similar to the swamp marsh that would have been evident prior to the catchments development.

The bioretention system will take flows from the paved area infront of the existing fish markets building – approximately 1,200m2. Stormwater from the paved area will be collected by spoon drain along the length of the paved area, as shown in the image below. The spoon drain will divert stormwater at 3-4 points along the length of the drain into a piped drainage system flowing beneath the spoon drain. The diversions will be steel grates (or similar) within the spoon drain. The stormwater within the piped drainage will be directed to the bioretention system.

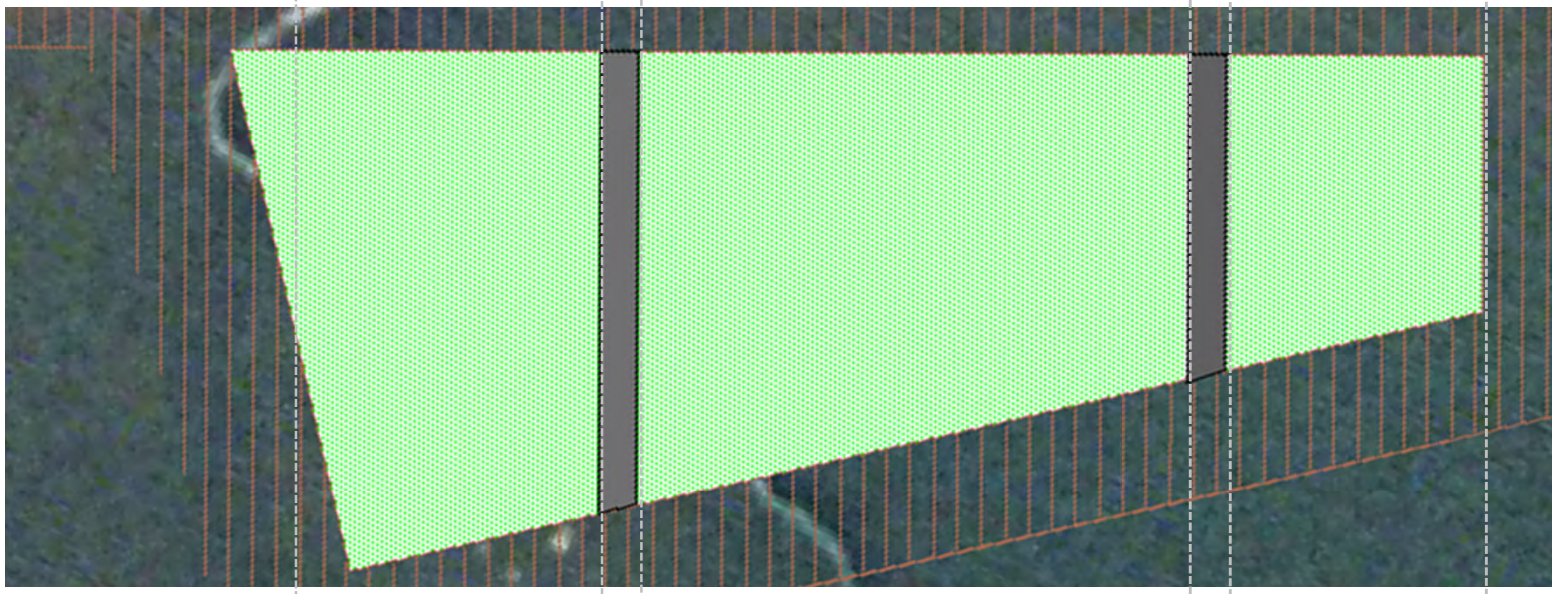


Spoon drain along the length of the paved area

Stormwater flows from the spoon drain diverted to the bioretention system

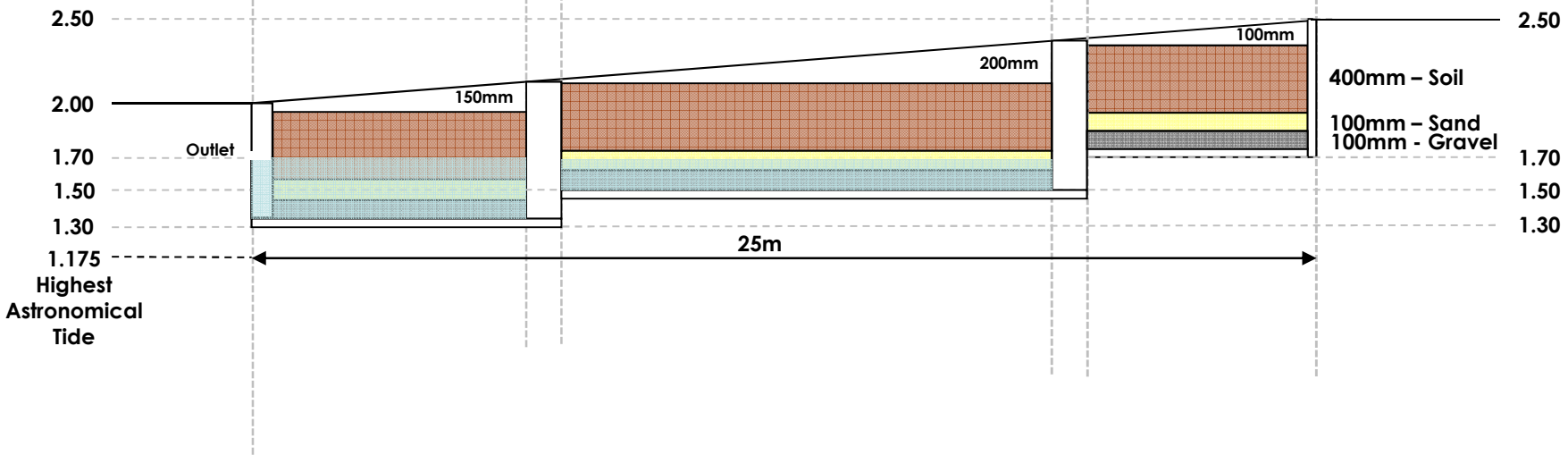
# 3. Bioretention System – Design and Section



The design of the bioretention system needs to consider the level change of the surrounding deck. The system will need to be level along the length of the system to allow water to spread across the surface. Three tiers (900mm) have been designed to allow for people to cross the system at regular intervals.

The cross section is shown attached.

A key issue for the system will be the weight of both the concrete bed and soil media. This will need to be considered in the design.



# 3. Bioretention System – other catchments

The bioretention system of 200m2, is able to remove pollutants from a large catchment. It is possible that the system can treat a catchment up to 10,000m2 to best practice stormwater targets.

Other external catchments which could be directed into the bioretention system include:

1. South-western portion of the fish markets roof (2,500m2)
2. Bridge road immediately adjacent to the bioretention system
3. Larger Bridge Road Catchment (7,000m2), dependent on the depth of the stormwater drainage.

Further assessment of these options should be undertaken in the design of the project.