

2. WATER MANAGEMENT

2.1 Stormwater Management

Stormwater Management consists of implementing WSUD principles to manage the volume and quality of runoff during and after construction of the Estate and provide water recycling via treated effluent and sand stored stormwater. Stormwater quality runoff is managed by:

- a. At source controls including rainwater tanks, swales where grade permits and silt traps
- b. A treatment train of gross pollutants traps, infiltration and bioretention through the brook system, constructed bioretention facilities, swales and permeable paving where appropriate.
- c. A tertiary treatment facility consisting of sediment basins and Water Quality Control Pond (WQCP). Referred to herein as the pond or environmental lake.

Site discharge points are shown on Figure 2.2. They direct water to North Creek.

The proposed stormwater treatment train and water conveyance route are shown on Figures 2.1 and 2.2 overleaf. Existing drainage lines are shown on Figure 2.3. The train includes detention ponds, infiltration fields, bioretention facilities and the existing WQCP. The WQCP has been partially landscaped in accordance with the original consent conditions. Landscaping is to be completed in conjunction with revisions to completed sediment pond locations. Details of landscaping to new waterway areas and detention ponds are provided elsewhere in Deicke Richards landscape plans for the site.

The constructed pond was the subject of an Environmental Impact Statement (EIS) for its approval. It was designed to manage the water quality and quantity issues for all of the site together with upstream detention ponds and gross pollutant traps. The water quality outcomes will be improved by the addition of the at source systems and features to be included in the treatment train discussed in points a and b above.

Water quantity control is provided by the pond and three upstream detention ponds. Flows have been kept to existing levels to limit the impact on downstream habitats. This will also ensure that flow rates in the Brook and Watercourse will be maintained around existing levels. This is achieved in these structures via detention ponds which will also minimise debris and gross pollutant damage to these elements. Flow rates through the subdivision were also an issue in the EIS for the pond. Extensive modelling of the discharge rates and quantities was completed by WBM as specialist flood and stormwater consultants for the EIS approval. The recommendations provided by WBM have been included in the design of the pond and detention facilities. Locations of detention ponds have been modified by Ardill Payne and Partners (APP) to suit the new subdivision layout. Flow calculations for the revised detention pond locations are provided in the Appendices.

Where further detention ponds are required they are either sited above existing ground levels and mimic the existing ground topography or are located above ground water levels. Impacts on groundwater hydrology are therefore considered negligible. Detention ponds, sediment basins and Gross Pollutant Traps (GPT) have been strategically located to capture silts, gross pollutants and slow water discharge. One sediment basin already constructed to the north west of the WQCP is to be relocated to provide clearance around proposed buildings for maintenance access to the pond.. Conveyance of stormwater flow behaviour across the site is reproduced from existing to developed conditions by retention of site drainage lines and floodways

Theoretical modelling of the stormwater treatment train for the development footprint by Gilbert and Sutherland concluded that the lake will provide the no pollutant increase criteria required by Council. Full report available on request. Details of the water quality outcomes are provided in Table below.

Gilbert and Sutherland wrote Council's Stormwater Management Policy (Combined DCP Part 13) and the modelling completed by them demonstrates compliance with the stated policy. To date Gilbert and Sutherland's conclusions have been supported by water quality monitoring results required as part of the consent conditions for the pond.

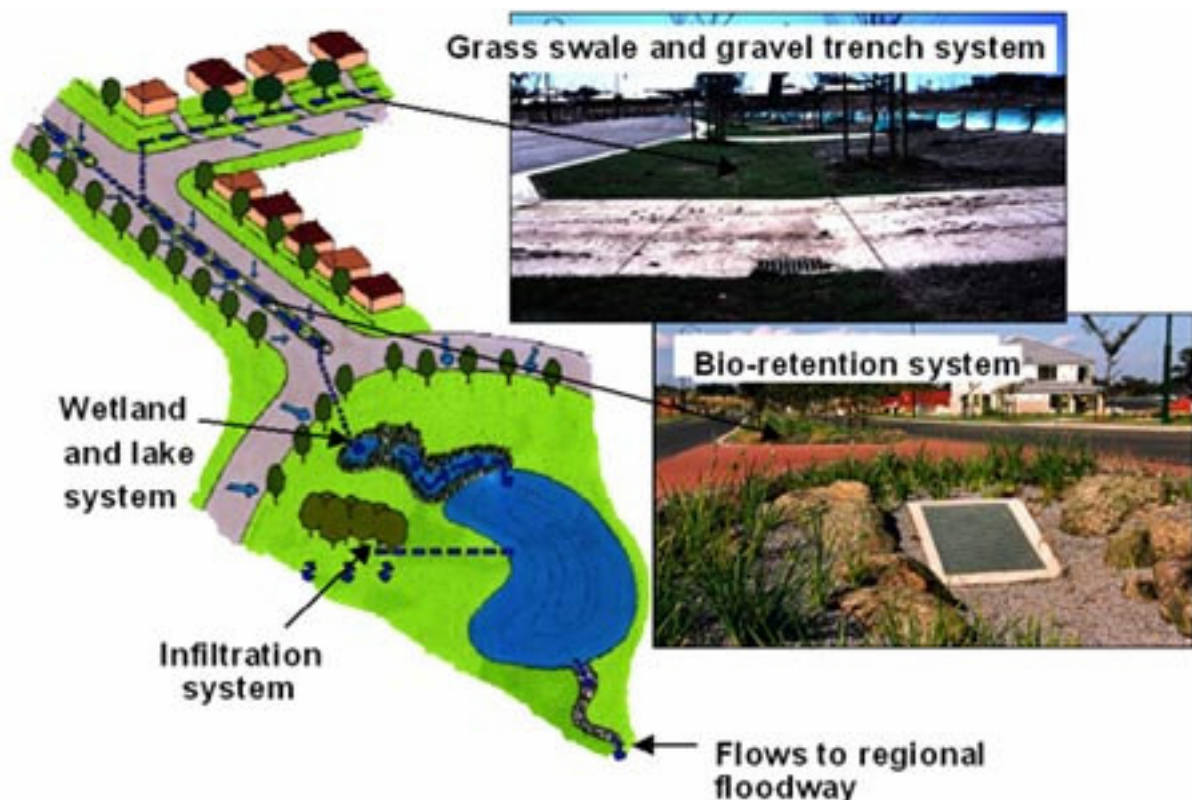


Figure 2.1 Concept Treatment Train

- 1** = PRIMARY TREATMENT – GROSS POLLUTANT TRAPS & SILT SETTLEMENT.
- 2** = SECONDARY TREATMENT – INFILTRATION & NUTRIENT STRIPPING VIA SWALES, BROOKS & PERMEABLE PAVEMENTS.
- 3** = TERTIARY TREATMENT – SETTLEMENT & NUTRIENT PATHOGEN REMOVAL.



Table 2.1 Water Quality Results for Pacific Pines Catchment
Stormwater Pollutant Load before and after Development
Values are in kilograms per year.

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	Undeveloped Catchment	Fully Developed Catchment	Pollutants Captured by GPTs, Detention Ponds, Open Space and WQCP	Pollutant load after treatment by EIS systems Col 2-3	Capture by Swales and Bioretention #	Pollutant load after treatment by extra systems Col 4-5
Total Nitrogen	880	1285	(648)	637	(19)	618
Total Phosphorous	106	174	(127)	47	(3)	44
Total Suspended Solids	18,657	63,300	(54,000)	9,300	(1,266)	8,034