4.8 Integrated Water Management

Integrated water management (IWM) is a process which considers all elements of the water cycle. The University has adopted principles of integrated water management since its inception, including one of the first major developments in Queensland to integrate water harvesting and reuse and it intends continuous improvement in these practices. The 2012 Campus Master Plan advocates the collection and reuse of rainwater and stormwater on site in order to reduce demand on mains water supplies, and to ensure that the quality of water used is "fit for purpose", so that the highest quality water is used for potable supplies, whereas water of a lesser quality, such as harvested rainwater and stormwater, is used in areas where such high quality is not warranted. To further reduce the reliance on mains water supplies, water efficient fittings and low water demand infrastructure has been employed throughout the campus

Integrated Water Management Principles

Integrated water management planning that considers all elements of the water cycle (rainwater, stormwater, potable water and wastewater) is being emphasised in all new and existing areas within Queensland, consistent with changes to the Environmental Protection (Water) Policy 2009. In general, following this process will ensure that the water cycle is managed for multiple outcomes, including alternate water supplies, managing and recycling and reusing rainwater, stormwater and wastewater wherever possible, and above all, providing water that is "fit for purpose" rather than all water being treated to the highest quality. As such, the primary principle of IWM within the University will be that wherever possible, the water source used for a particular end use should reflect the quality required for that end use (i.e. be fit for purpose). In addition, water demand management through water efficient systems and practices helps to reduce water use by reducing overall water demand.

Rainwater harvesting is incorporated into an overall harvesting scheme which combines roof water and stormwater systems. As rainwater is of a higher quality than that generated from roads footpaths and other impervious surfaces, future buildings should incorporate additional harvesting into dedicated rainwater tanks for higher quality end uses and it may be worth considering retrofitting, if this is found to be appropriate.

On areas with considerable quantities of hard infrastructure, there is usually a surplus of water, and the inflows of drinking water are usually significantly less than that produced through rainwater and stormwater runoff and wastewater. As such, all elements of the water cycle should be considered relevant to an Integrated Water Management Plan for the campus that properly identifies water sources, demands and yields in a way that is consistent with the IWM principles outlined above.

Water Quality

The existing approach adopted for the management of water quality on the USC campus has employed the use of large passive treatment systems which form part of the site landscaping. As such, they serve multiple values, including increasing the aesthetic appeal of the campus and providing habitat. For example, the large expanse of vegetation in the south-west corner acts as a natural vegetated buffer to stormwater flows generated from within the adjacent Sienna College and portions of Chancellor Park, while providing a buffer to neighbouring developments, as well as shelter and food for wildlife.

All flow from the USC site and wider catchment currently passes from the site via the two large lakes that exist in the southern portions of the campus. The lakes will feature more prominently in the fully developed site as new University buildings are developed closer to the lake foreshore.

Ongoing water quality investigations show that the lake systems have relatively good water quality, however they do show signs of increased nutrient loads, especially nitrogen, which may result in eutrophication and phytoplankton (algal) blooms if further emphasis is not placed on management of surface runoff. This is likely as a result of land disturbance activities occurring around the site and the lack of maintenance of some of the treatment measures that have previously been implemented (refer discussion below). This sends a clear message that there is a continued need to focus on water quality management on site, during both construction activities (e.g. through appropriate erosion and sediment controls required for any land disturbing activities occurring on site, such as the construction of new buildings or ovals), and the maintenance of existing treatment systems. Developments occurring within the catchment, but outside the bounds of USC, such as the proposed Town Centre, will be responsible for their own management of the quality of water discharges from their site. USC should observe the quality of discharge from these developments that are directed through the campus.

Mooloolah River National Park

The University of the Sunshine Coast lies within a sub-catchment of the Mooloolah River National Park (MRNP). Being the park's western neighbour, USC (and others within the catchment) have a responsibility to ensure the water quality of the surface flow discharging from their lands does not cause significant impact on MRNP.

MRNP is characterised as a low nutrient environment. Hence, increases in nutrient levels from inflows derived from the University and surrounds may result in floristic changes within the MRNP, whereby the changed conditions favour alternate species better suited to higher nutrient environments. This is of concern as the plant communities and associated fauna of the MRNP have extremely high conservation values.

Water Quantity

USC occupies an approximately two-thirds of a sub-catchment draining into the Mooloolah River National Park, and ultimately into the Mooloolah River itself. The site receives overland stormwater flow from a section of Chancellor Park (part of Stage 9 and Scholars Way), from most of the primary and secondary components of Siena Catholic College, as well as the Chancellor College Primary and Middle Campuses. USC also discharges stormwater across its site boundary in the far south-east corner into another portion of Chancellor Park, before crossing under Claymore Road and entering the National Park.

There has been some incidence of localised flooding around the westernmost portions of the campus in previous years, due to water overflow from the lake system in the adjacent Chancellor Park residential development. Flooding problems can arise when structures or assets are built too low on the floodplain and hence intersect floodwaters, or when flood levels have increased as a result of catchment changes. Given the development to the west of the campus and the proposal for a Town Centre north of the campus, emphasis should be placed on examining flood management for the campus as a whole, for example, by reviewing peak flow rates of stormwater coming from sites adjacent to the University, and for a determination to be made as to the acceptability of these discharges compared to what was agreed for the site. If required, further attenuation works such as detention basins should be constructed to aid in the management of peak flows from these neighbouring areas.

The existing fill along the western boundary of the University (between the University campus and Siena College) has been safely "flattened out", with the loss in flood storage approximately compensated for by improvements in local conveyance characteristics (i.e. by the removal of the fill pile and "dishing" of the area). The regraded region directs flow towards the lake around both the existing and the future planned structures, including car parks. The regraded area should continue to be revegetated and have other appropriate erosion and sediment controls employed to limit possible impacts posed by intense rainfall.

The lakes on the University campus have been designed to limit flood peaks to that which is generated by the undeveloped catchment area, thereby protecting the hydrological functioning of the campus. This is also an important consideration for Mooloolah River National Park, which is downstream.

Previous Planning Recommendations

A number of recommendations regarding water management were provided in the original Campus Master Plan. These recommendations have been carried forward to the present day, with three in particular warranting reiteration and further discussion here.

Wetland treatment systems should be designed to ensure the water quality of runoff from the site does not adversely affect the National Park.

This recommendation has been largely addressed through the integration of a series of water quality improvement features and the development of on campus wetlands. The two large lakes should be considered as receiving water, rather than as part of the water quality treatment train. If water quality is not managed prior to entry into the lakes, ongoing and exacerbated water quality problems will arise, and pose a considerable health and maintenance burden on the University.

Components of the treatment train include extensively vegetated overland flow paths, and several drainage ponds, though a large number of these remain informal and should continue to be developed on a yearly basis. In a hydrologic sense, the lake system is designed to attenuate stormwater flows from the developed catchment back to pre-development flows so as to limit downstream impacts as a result of hydrologic changes.

All buildings should be located on the 'higher' portions of the site.

The site overall is has a relatively even fall towards its south-eastern corner. In general, buildings have been located away from existing drainage channels on the 'upper' portion of the campus to the north-west. As a consequence, drainage paths on-site have been extensively modified. Refer below and section *7.4 Site Controls.*

Existing low lying drainage paths should be left undisturbed wherever possible and vegetation regrowth in these areas should be encouraged.

While the upper site drainage paths on-site have been extensively modified as a result of the development of the University, those on the lower part of the campus below the lakes remain relatively intact. Most of the drainage paths are currently in reasonable condition and many are heavily vegetated, which presents both water quality improvement and hydrologic benefits. Some of the upper site drainage paths near the top of the catchment have signs of bed and stream bank erosion. This process will lead to minor gully erosion, which will not naturally rectify itself.

Refer Diagram 4.8.1

Drainage

There are two systems proposed for the handling of natural water run-off on the site.

The first is a 'closed' system, that is, water is captured and reused within the system. Collection points are within the central zone and also include run off from hard surfaces such as car parks and roads. These areas shed the largest amount of water and consequently will transport the highest levels of silt, nutrients and pollutants. The water is directed via a system of channels through vegetated swales and collected. From here the water is recycled to supplement the irrigation system providing for such areas as car parks, ovals and the open campus green. Following these recycling processes excess water passes through further vegetation treatments and eventually is received in two large lakes. The

vegetative filter system assists in disconnecting the hard surfaces from the drainage system, slowing down flows, promoting settlement of suspended sediment and adsorbed nutrients, and effecting passive irrigation of vegetation.
The second system is 'open ended', and involves the wider landscape of the campus. Although the run-off water from these areas is comparatively `cleaner' than the water run-off from areas more built up, it will be directed to the swale system for treatment before also passing into the lakes. This system, therefore, acts as a protective interface between the University site and the sensitive ecological system of the Mooloolah River National Park.

Swales

The swales physically resemble, and operate, as a natural creek system. Techniques to achieve this include the use of soft elements to re-contour and reconstruct the landscape to produce an economical low maintenance system. The use of large woody debris, pond zones and ephemeral vegetation may also serve to reduce the velocity of water run-off, thereby minimising the potential for erosion, which is a problem inherent in the site's friable soil, and to further provide a functioning aquatic ecosystem.

Refer Diagram 4.8.2

Irrigation

A major goal of the landscape strategy is to minimise irrigation. For this reason artificially created irrigation zones are limited in both location and area. Filters between the irrigated and non-irrigated areas are created with intermediate planting. In principle, high activity zones and exotic landscapes are sustained by intensive irrigation via an automatic irrigation system, while low use areas and passive zones, planted with predominantly native and endemic vegetation, rely on a combination of the site's existing hydrological cycle, water harvesting from the site and recycling of stored run off in holding ponds.

This approach aligns with a plant palette which has the capacity to be self sustaining and in accord with rainfall levels in the Sippy Downs area. The techniques for achieving the irrigation strategy range from fully automatic pop up sprinkler and dripper systems, to large mobile field sprinklers.

A key element of the irrigation strategy is water harvesting, where run-off is collected and recycled for irrigation. This aims to prevent any excess nutrient load entering the National Park and consequently disturbing the equilibrium of its ecosystem.

Recent Legislation

It should be noted that a number of laws regarding water management have been legislated since the previous iteration of the Campus Master Plan. These include the introduction of the Healthy Waters State Planning Policy, the Wetlands State Planning Policy, modifications to the Environmental Protection (Water) Policy and the technical and other documents developed by the *Water by Design* group (part of the Healthy Waterways Partnership). These documents have informed the development of the 2011 Campus Master Plan, and will need to be complied with whenever campus development is proposed and undertaken.

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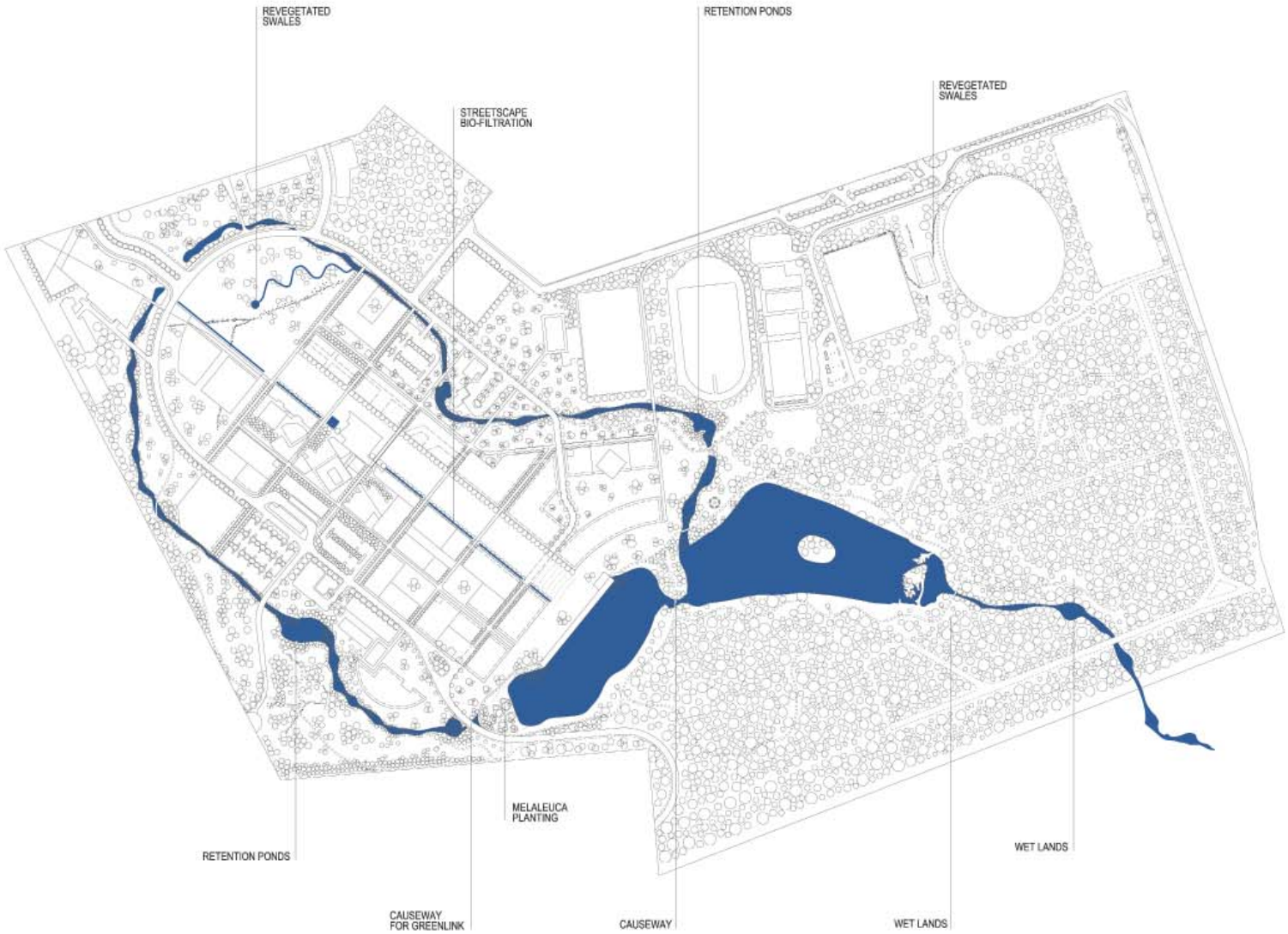

Diagram | 4.8.1

Integrated Water Bodies

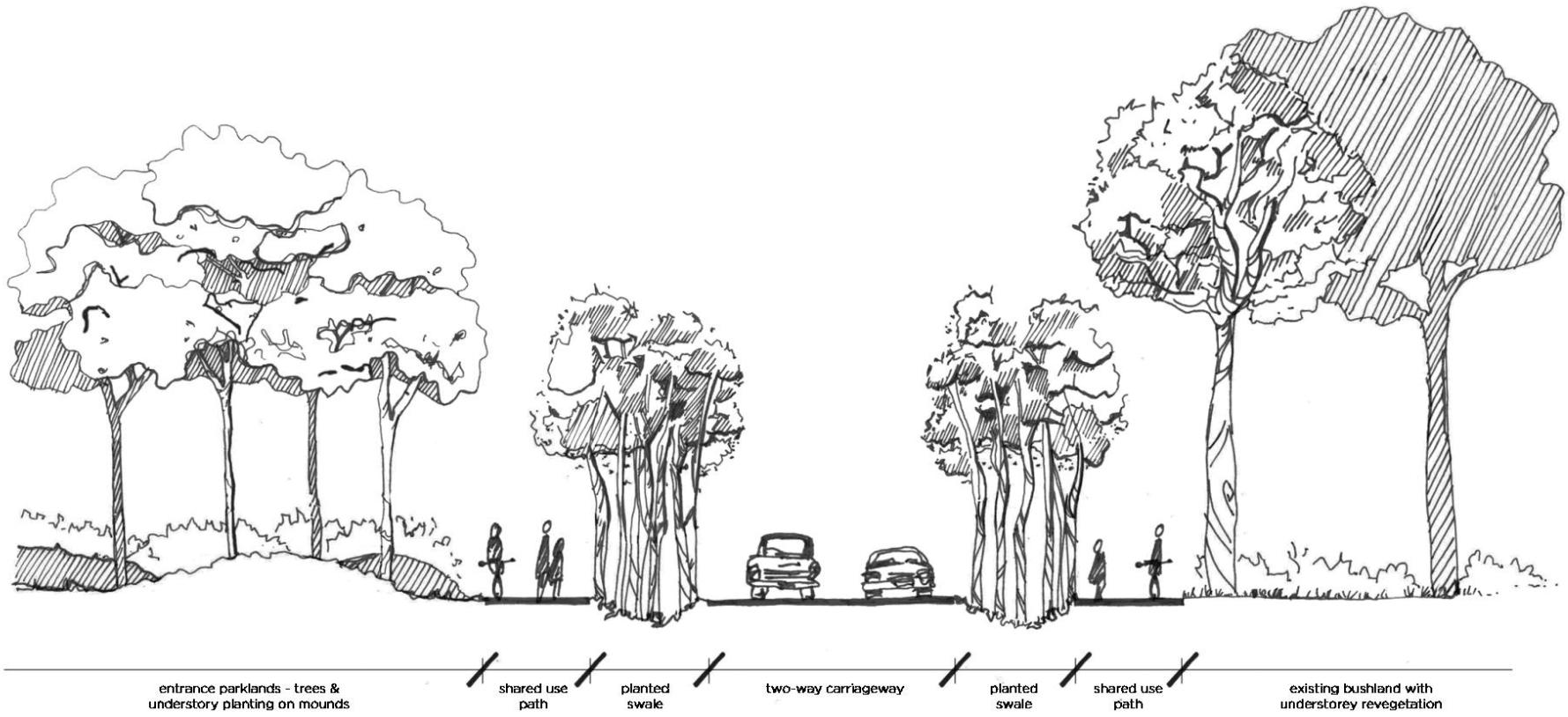

Diagram | 4.8.2

Entrance Road : Section