



Case Studies WA LakeLands, Mandurah

Source Information:

Russell Burnett, Peet Limited

Biophysical Description:

LakeLands is a 2,500 lot estate surrounding Mandurah's Black Swan and Paganoni Lakes and their associated natural wetlands. These two major wetland areas require protection. Parts of the site west of the central limestone ridge had been historically cleared for grazing, while the area to the east had been parkland cleared.

Water Sensitive Urban Design Objectives and Principles:

The estate's drainage and nutrient management plan was endorsed as consistent with the Water Sensitive Urban Design (WSUD) principles by the approving authority; the Water and Rivers Commission who stated: "...The incorporation of on site containment and infiltration, over depth manholes, slotted pipework, location of infiltration basins within POS, the use of GPTs, flush kerbing and Atlantis containment cells within commercial areas are all applauded".

The WSUD features include drainage and landscape. Drainage is managed by swales, shallow overland flow paths (sometimes referred to as 'table' drains) and stormwater infiltration areas incorporated into public open spaces and road reserves. Where appropriate, there are trapped manhole covers, flush kerbing and slotted pipes. A feature of the infiltration system is that increased retention times will effectively remove heavy metals and nutrients due to settlement of suspended solids, and stormwater is infiltrated into the groundwater well beyond the buffer zone of the lakes. Landscaping includes retaining mature Tuart and Jarrah trees and underground boring when required in addition to front garden packages that restrict the amount of lawn and provide the opportunity for owners to choose drought tolerant plants. The species have been selected to tolerate occasional inundation. There is a rain sensitive override system for the reticulation and planting design is based on hydrozoning. In the public open spaces, chipped vegetation from site clearance operations have been turned to mulch and used to reduce moisture evaporation; fly ash was used in one stage of the development (as an experiment), which requires less frequent water use; and there is no reticulation in the native garden beds.





The protection requirements of the two significant lakes within the centre of the development site have directly influenced the drainage strategy throughout the estate; ensuring the 2-year and first flush systems are managed on-site, the 10-year



event retained in infiltration areas and swales, with the 100-year event having overland flow routes along roads to large infiltration areas. In isolated areas, the use of the over depth manholes and proprietary drainage cells have been adopted to achieve a ‘no flow’ and ‘storage at-source’ system of infiltration. A wetland management plan was approved in 2002 for Black Swan Swamp and Paganoni Swamp, as they would be retained. The plan included a commitment to implement a monitoring program and for the developer to establish a baseline of water levels and water quality.

The City of Mandurah, in conjunction with Peet Ltd., is now coordinating a feasibility report for using treated water from the Gordon Road Waste Water Treatment Plant. If the report is favourable, then it is intended to pump treated wastewater into the Central Park Lake Irrigation System, which will significantly reduce groundwater usage.

Planning Issues and Milestones:

Retention of mature Tuart and Jarrah trees and vegetation established the location of public open space. Mature trees were also used in road reserves. The vegetation chips were turned into mulch and used on public open space to help retain moisture usually lost to evaporation. This forefront planning meant that less vegetation needed to be cleared.

A number of plans needed to be in place before the approval of the development, including the Wetland Management Plan, the Monitoring program and the Drainage and Nutrient Management Plan {Note: these plans submitted at subdivision stage are now titled Urban Water Management Plans (UWMPs)}.

Development Schedule	
1993	Planning Commenced
1995	Discussions with Council Commenced
1996	Rezoning Application Lodged
1997	Rezoning Application Approved
1998	Outline Development Plan Lodged
2000	Outline Development Plan Approved
2001	Stage 1 Subdivision Application Lodged
2002	Subdivision Application Approved
2003 (Early)	Construction Commenced
2003 (August)	Stage 1 pre-released

Design Issues and Milestones:

The drainage and irrigation systems required detailed design to maximise water conservation and quality. This began with land use information.

Site Area	426.04 ha	
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Land Use Plan	Area (Hectares)	Percentage of Site
Residential	222.04	52.0%
Retail	10.70	2.4%
Commercial	9.50	2.1%
Community (Schools)	22.30	5.1%
Public Open Space	40.00	9.2%
Regional Open Space/ Conservation Areas (Paganoni Lake and wetland buffer)	48.40	11.2%
Freeway	62.10	15.6%
Railway line and Car Park	11.00	2.4%

From the above land use planning, WSUD features were allocated to each section of development. For example, the public open spaces were designed with drainage and amenity in mind, while the IWCM features of the residential homes focused mostly on landscaping. Careful design attention was paid to the conservation areas, where detailed plans required approval from the appropriate authorities.

Implementation Issues and Milestones:

Contractual agreements have been included for the fencing of trees prior to and during works and the imposition of financial penalties on the Civil Contractor for the unauthorised or accidental removal of trees. To avoid dieback, all trucks and equipment were washed down before they entered the site.

Infrastructure and Ownership:

The public open space was Crown vested, which means that rights are given to the Local Authority. Developers retain maintenance of the drainage system for 2-3 years, before control is transferred to the local government. The developer is responsible for defaults in infrastructure.

Operational Issues and Milestones:

Monitoring programs for the wetlands were required to establish baseline water levels and quality. The monitoring program began in 2002 and is ongoing.

Other ongoing projects include the re-vegetation of local native species within non-reticulated beds and to wetland buffers and road reserves. Local resident Alison Dixon assisted greatly in the relocation of fauna to wetland buffers or to national parks.

There is 40km of table drainage along the railway line, which is quite extensive.



Performance:

Deposit of sediment was noticeable during the first winter after construction but has now diminished to the point where it is dispersed through normal mowing operation. Infiltration into the natural substrate has proved much slower than expected in one infiltration basin, resulting in water ponding in the basin. Soil testing may prove there is an issue in other locations. In response to this, a small artificial wetland has been created. There is regular monitoring of the tree condition and remedial works by qualified arboricultural contractors and horizontal boring for service installation in tree root zones.

Cost and Benefit:

Some water sensitive urban design features also reduce cost; to the resident, developer or the local council. The incorporation of a rain sensitive irrigation system, not watering native garden beds or road reserves and the use of fly ash will use less water and therefore cost less to irrigate. Further, the developer has made a detailed irrigation strategy with clear directions for the most efficient use of water for plant establishment and on-going maintenance.

The developer used innovative marketing to build awareness with the residents to their natural surroundings in public open space. Instead of fountains or other artificial water features, Lakelands has commissioned steel artwork of swans and waterfall sculptures to reduce the consumption of energy, water and other materials, while bringing the lake imagery to the front of mind for residents or potential buyers. The drainage swale, designed to be both functional and attractive, it is used at main road development frontage.

Volume – flow, water saved, etc.:

According to American authorities, 100 mature trees capture approximately 250,000 gallons of rainfall per year by intercepting it on their leaves, branches and trunks, where it is absorbed, evaporates or slowly soaks into the ground, thereby reducing stormwater runoff.

Perception – Support of the Community:

The City of Mandurah has stated that the developer's consultation process should be used as a model for other major land development projects. The City of Mandurah and the developer are coordinating further monitoring and a potential treated wastewater system

The developers had a range of community working groups and information nights, including water wise seminars.



Other initiatives include establishing a GreenCorps Youth Employment Scheme. Under this program, 18 participants constructed a 2.5 kilometre limestone path, built and installed nesting boxes, assembled and installed park furniture and planted 15,000 seedlings. A further 1,750 seedlings were planted as a part of community and school planting days, gathering over 120 people.

Evaluation:

2005 WA UDIA Award 'Environmental'

2005 WA Environment Award 'Business leading by Example' Finalist

2005 HIA GreenSmart 'Development of the Year'

2005 PIA 'Environmental Planning or Conservation' Special Commendation

2006 WA UDIA 'Water Sensitive Urban Development' Award

