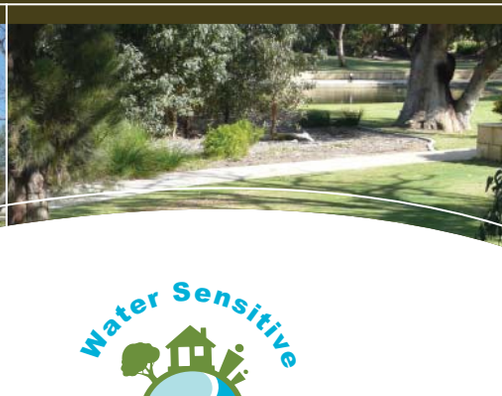
PEEL-HARVEY

WATER SENSITIVE URBAN DESIGN TOUR

Aimed at improving management of our water resources.

SITE DESCRIPTIONS

www.peel-harvey.org.au
www.newwaterways.com.au



Water Sensitive Urban Development

Special acknowledgements and thanks to the following developers for their innovation, contributions and support for this project:

mirvac

Port Bouvard Limited

Cedar Woods

PEET

SITE LOCATIONS

SITE 1		QUANDONG PARK, SEASCAPES, HALLS HEAD
SITE 2		SANTALUM CIRCUS, SEASCAPES, HALLS HEAD
SITE 3		NORTH PORT STAGE 12, LINVILLE STREET & BOXGUM LINK, PORT BOUVARD, WANANNUP
SITE 4		CHANNEL VIEW, PORT BOUVARD, DAWESVILLE
SITE 5		ENCHANTRESS LANE & ESTUARY ROAD, DAWESVILLE
SITE 6		SNAKE DRAIN, MARINERS COVE, DUDLEY PARK
SITE 7		ALCOA WETLAND, PINJARRA ROAD, PINJARRA
SITE 8		CANTWELL PARK, SOUTH WEST HIGHWAY, PINJARRA
SITE 9		MEADOW SPRINGS DRIVE, MEADOW SPRINGS
SITE 10	**A**	JANE KENNAUGH RESERVE, LORETTA PARKWAY LAKELANDS
	B	YINDANA LANE, LAKELANDS
	C	BALLARD MEANDER, LAKELANDS

Water Sensitive Urban Development

ABOUT THE PEEL-HARVEY

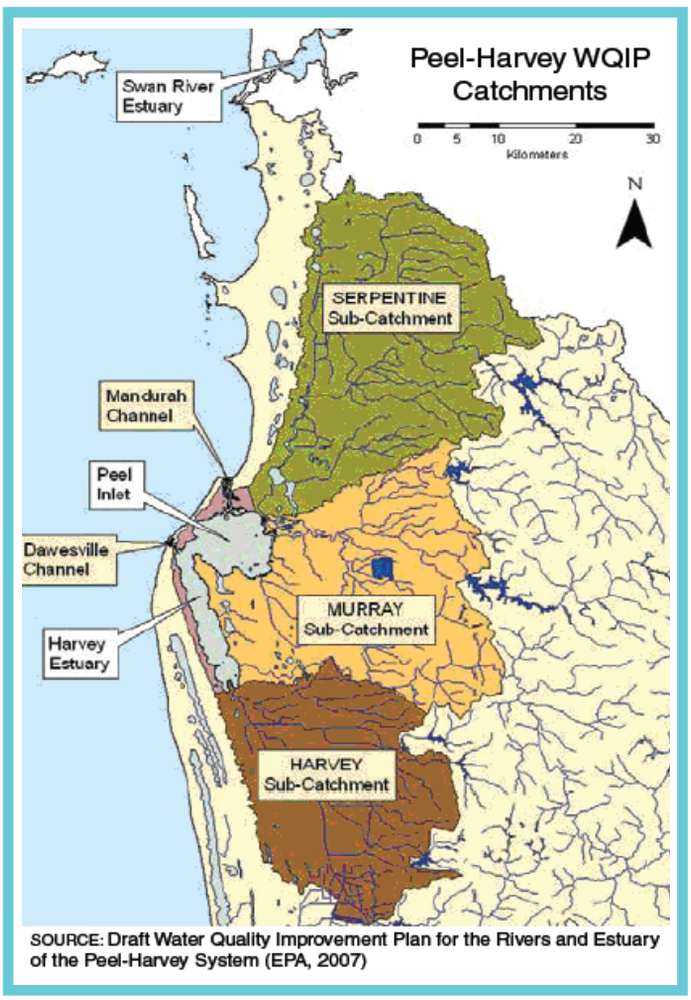
The Peel region is one of the fastest growing urban areas in Australia. It is this rate of growth which, when coupled with the declining health of the waterways, evidenced by increasing algal blooms and fish deaths, is threatening the health of the internationally significant Peel Inlet and Harvey Estuary.

The Peel-Harvey coastal catchment was identified as a priority hotspot under the Australian Government's Coastal Catchments Initiative in 2003.

Water sensitive urban design has been identified as the most beneficial philosophy for holistic management of urban water resources. It provides a framework for minimising the impact of urbanisation on the natural water cycle. Water sensitive urban design addresses water quality, water quantity and water conservation, together with broader social and environmental objectives within the context of urban planning and development.

It is imperative that water sensitive urban design is a key objective for urban areas to reduce the impact of both existing and new urban communities on our water resources.

This booklet contains information on ten urban development sites in the Peel-Harvey catchment which showcase different methods of achieving better urban water management outcomes.



SOURCE: Draft Water Quality Improvement Plan for the Rivers and Estuary of the Peel-Harvey System (EPA, 2007)

The practices employed at each site are a direct response to the conditions and constraints of each site. They were chosen to achieve the objectives of water sensitive urban design while supporting the urban and community vision for each development. The key water management objectives for each site are highlighted, together with the leading management practices which have been implemented on the ground.

Better management of our urban water resources using water sensitive urban design techniques also generally facilitates the achievement of other sorts of objectives. These have been identified where possible to demonstrate how these approaches are able to achieve multiple objectives.

This project is a strategic initiative of the Peel-Harvey Catchment Council achieved through funding provided by the South West Catchments Council; with support from the Australian and Western Australian Governments.

SITE 1 - QUANDONG PARK, SEASCAPES

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Mirvac

Position: E376432 N6397650
32° 33' 06"S 115° 41' 02"E

Quandong Park is bordered by Quandong Parkway and Asper Way, in Halls Head.

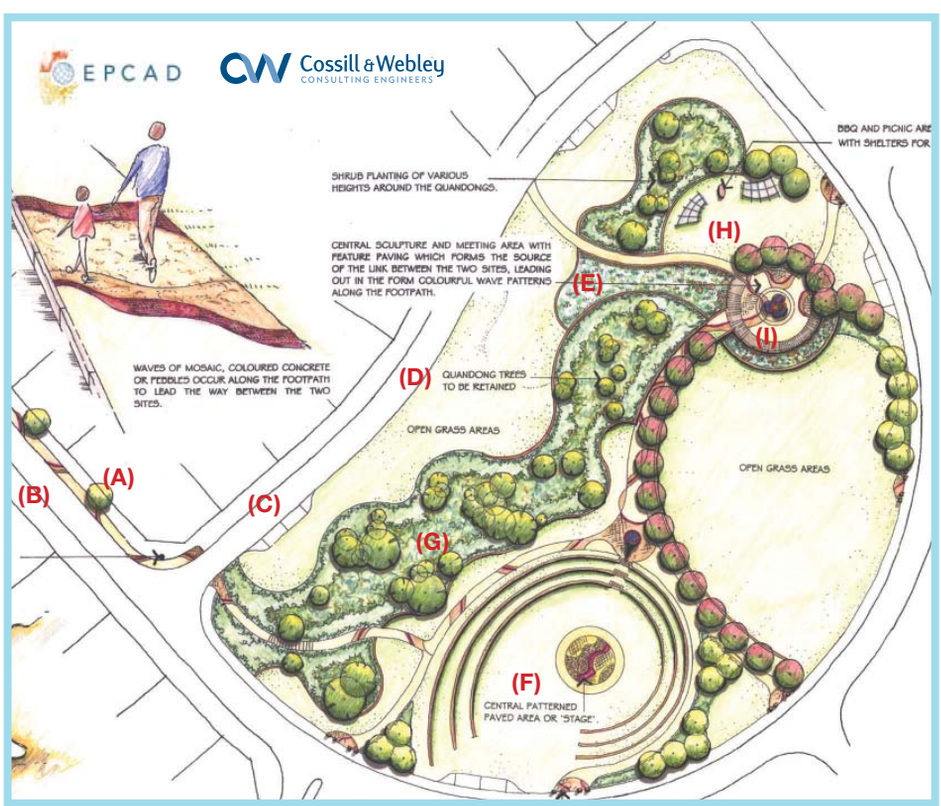
It is a seaside development, with construction of shopping and lifestyle facilities currently under way. The Quandong trees in and around the development have been retained due to their cultural and environmental significance. Some of the mature trees are up to 200 years old.

Key site objectives include:

- Flood protection for the surrounding development - the overall public open space design will accommodate a 1 in 100 year event
- Infiltration of stormwater on site
- Stormwater quality management to protect the Peel-Harvey catchment and costal areas

Best management practices include:

- Bottomless manhole infiltration features at primary source points to quickly disperse large amounts of water **(A)**
- Median swales with vegetated bioretention areas which assimilate nutrients in stormwater runoff **(B)**
- Gross pollutant traps at the kerb line for ease of access and maintenance **(C)**
- Flush kerbing around the public open space to distribute storm water evenly and minimise need for piped systems **(D)**
- Rock waterfall features at the stormwater bubble up points act as a gross pollutant trap whilst calming flows **(E)**
- Atlantis infiltration systems to retain smaller infrequent events underground and replenish groundwater aquifiers, ensuring public amenity of active playing spaces is not compromised **(F)**



When it rains, water is initially stored in the bottomless entry pits in the street network. If this capacity is exceeded, water then flows out of the bubbleup into the rock waterfall. In extremely large events, water is retained in the amphitheatre in underground storage cells and infiltrated over a period of a few hours to a day.

Other objectives achieved include:

- Vegetation and biodiversity protection by retaining the quandong trees in and around the development **(G)**
- High quality public amenities **(H)**
- Incorporation of local artwork **(I)**

NOTE: this public open space area was originally irrigated with treated wastewater which supported the larger than usual areas of turf.

SITE 2 - SANTALUM CIRCUS, SEASCAPES

Water Sensitive Urban Design Tour

Developer: Mirvac

Position: E375816 N6396418
32° 33’ 45”S 115° 40’ 36”E

Santalum Circus is in the Seascapes development on the western side of Old Coast Road in Halls Head.

This public open space area provides a water quality treatment and water quantity management function, while also providing space for active recreation. This is achieved via the landscape design and is complemented by a children’s playground and covered picnic area with tables.

Key site objectives include

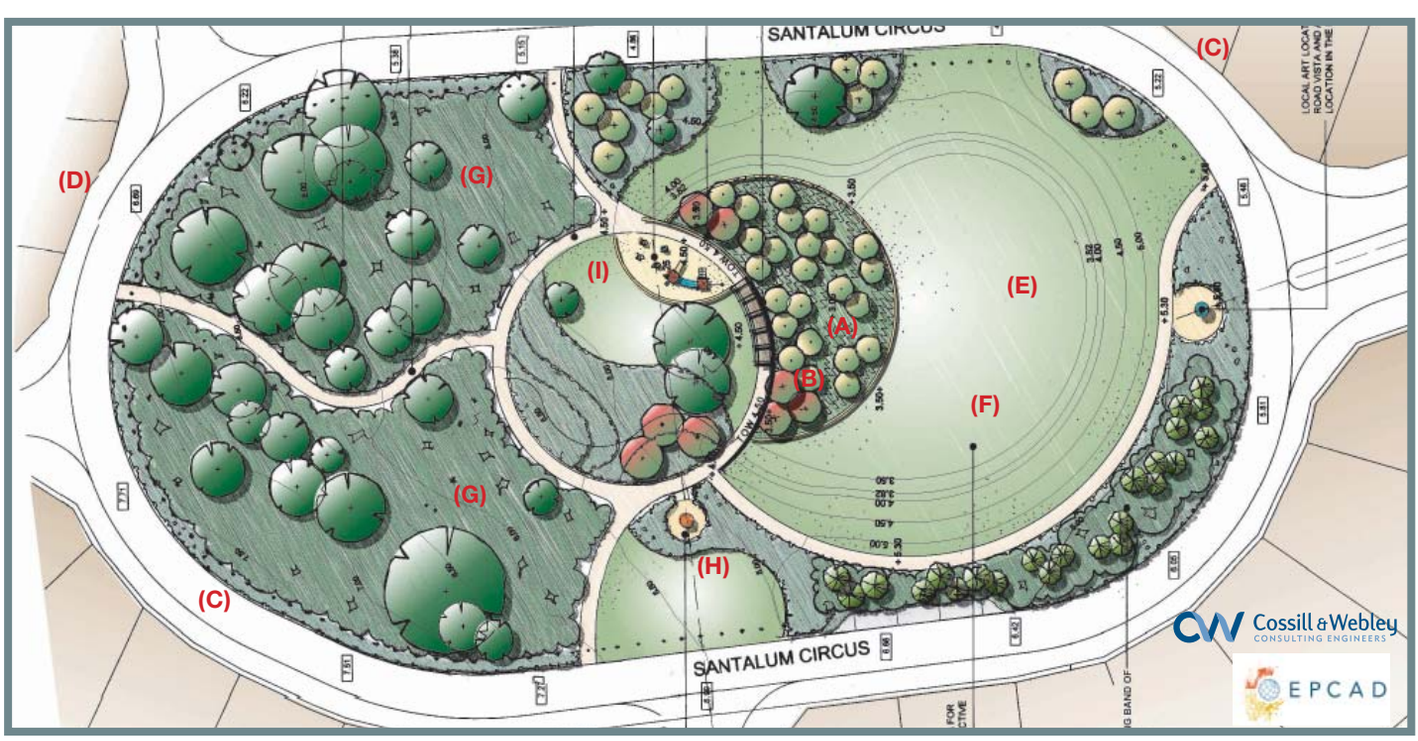
- Management of low flows to achieve recharge and treatment of stormwater from the surrounding development
- Detention of stormwater to achieve flood protection objectives

Best management practices include:

- Wet detention area to facilitate recharge of treated stormwater to the groundwater store **(A)**
- Bubble ups to distribute stormwater to be infiltrated **(B)**
- Flush kerbing to direct stormwater flows to vegetated areas **(C)**
- Protection of the public open space area during house construction by sediment fences **(D)**
- Detention of larger flows in active public open space area **(E)**

Other objectives achieved include:

- Provision of sufficient area for active recreation **(F)**
- Retention and revegetation of local bushland **(G)**
- Incorporation of local art **(H)**
- Community meeting places and facilities **(I)**



SITE 3 - NORTH PORT STAGE 12, LINVILLE ST & BOXGUM LINK, PORT BOUVARD, WANNANUP

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Port Bouvard

Position: E373342 N6392907
32° 35' 38"S 115° 39' 01"E

North Port development is located to the north of the Dawesville Channel in Wannanup. Stage 12 can be accessed via Linville St and Boxgum Link.

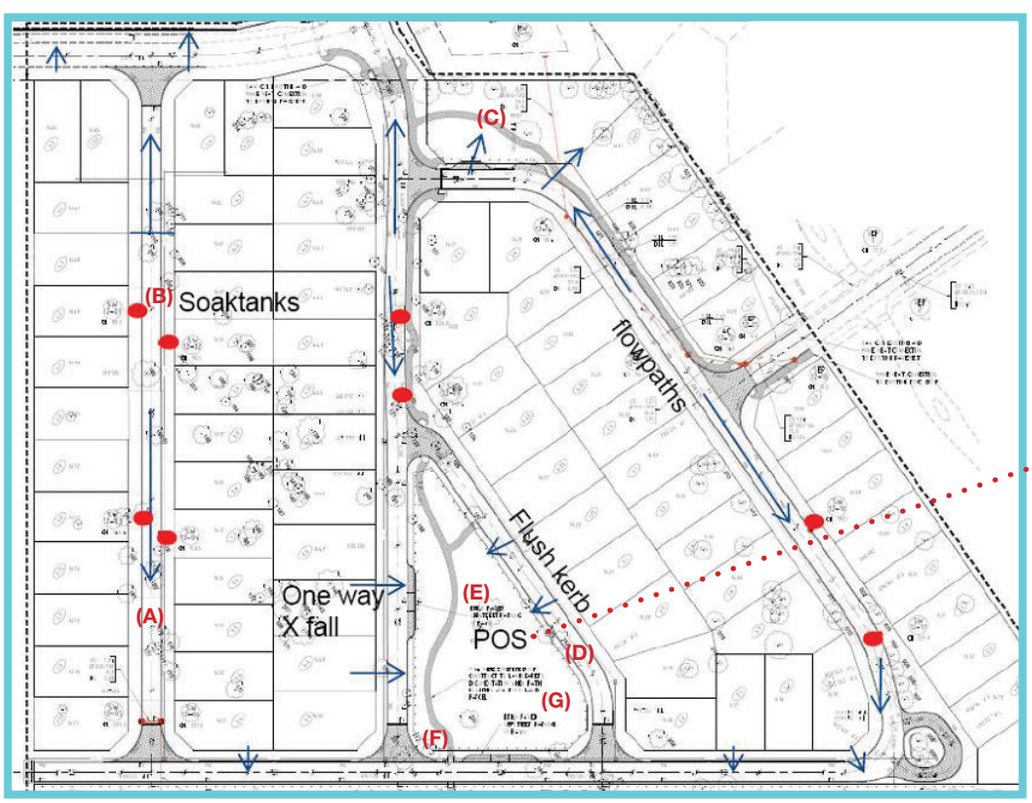
A key factor in the design of the development was the achievement of water sensitive urban design objectives to minimise its impact on the nearby Peel Inlet.

Site objectives include:

- Maximise local infiltration
- Diversion and detention of the first flow runoff (which contains high amounts of pollutants)
- Minimising the amounts of impervious areas to increase infiltration
- Integration of stormwater treatment systems into the urban form
- Minimise runoff velocities to prevent erosion

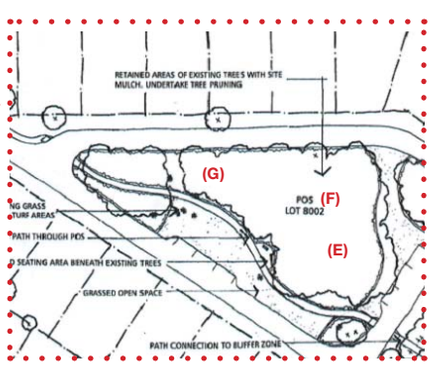
Best management practices include:

- Incorporation of weep holes, aggregate (metal bed) and traps within all gully and side entry pits to maximise local infiltration, detain all first flow runoff and minimise the volumes and areas required for detention basins **(A)**
- Over depth manholes and propriety drainage cells to achieve a "no flow" system of infiltration **(B)**
- Incorporation of swales to facilitate stormwater treatment and infiltration **(C)**
- Flush kerbing where adjacent to public open space areas or large medians; to direct stormwater to infiltration areas **(D)**



Other objectives include:

- Design of public open space to accommodate infiltration of stormwater without detriment to public amenity or environmental values **(E)**
- Retention of existing local native bushland and landform to reduce and filter runoff **(F)**
- Conservation of water through minimising turfed areas **(G)**



Public open space (POS)

SITE 4 - CHANNEL VIEW, DAWESVILLE

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Port Bouvard

Position: E372218 N6391488

32° 36' 24"S 115° 38' 18"E

Channel View is in the Southport precinct of Port Bouvard which surrounds the prestigious 'Cut' Golf Course and neighbours the Indian Ocean. It is located on the western side of Old Coast Road, immediately south of the Dawesville Channel.

It has been built on an area sensitive to nutrient loading and contamination discharge. In order to prevent further negative environmental impacts in the area, special attention was given to the implementation of water sensitive urban design principles, particularly to prevent nutrients from mobilising to the nearby estuary.

Key site objectives include:

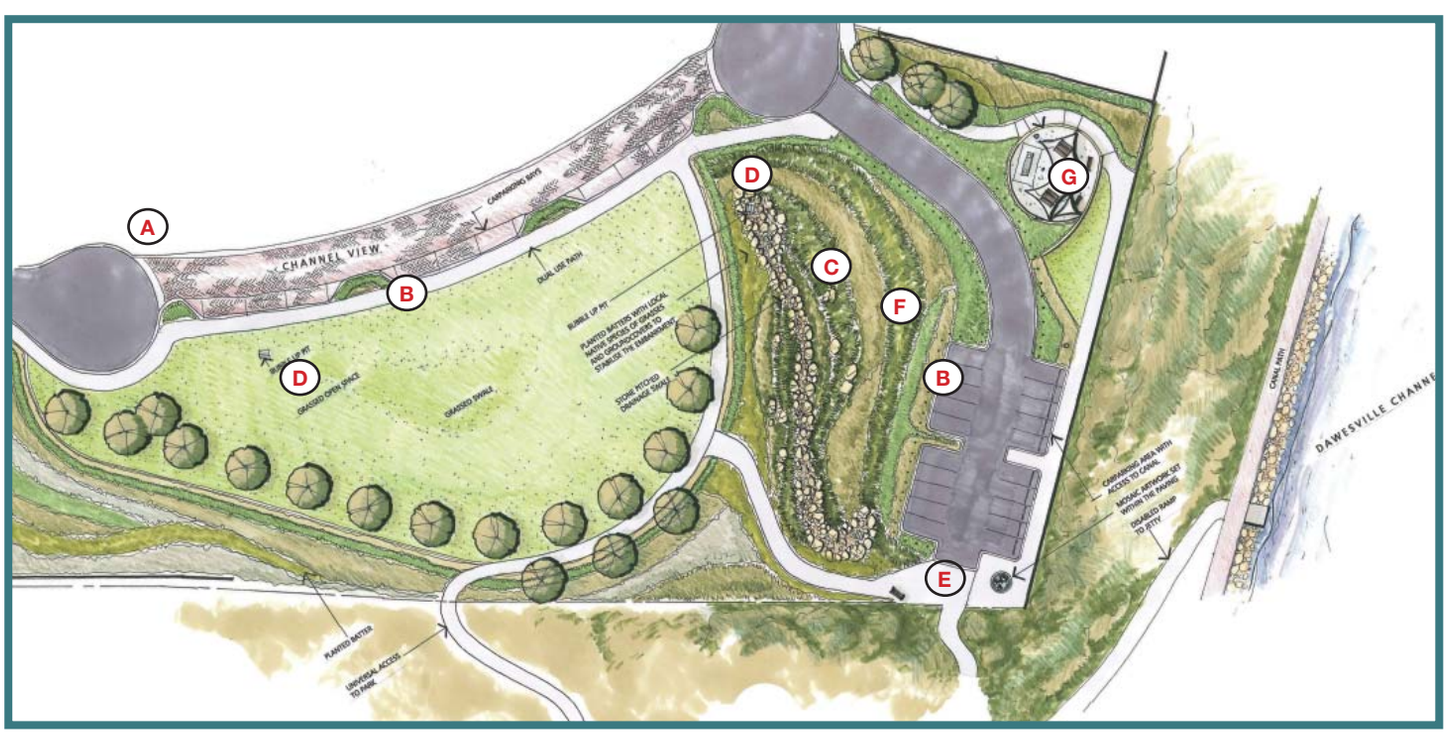
- Infiltration and treatment of stormwater
- No direct discharge of stormwater to the estuary

Best management practices include:

- Lot level infiltration to reduce the need for a piped stormwater system **(A)**
- Water sensitive road design including flush and broken kerbing and incorporating soak tanks to increase onsite infiltration **(B)**
- A bioretention system with rockfall to slow water flows and treat frequent stormwater events prior to discharge to the receiving environment **(C)**
- A bubble up feeds into grassed swale area to increase onsite infiltration **(D)**

Other objectives achieved include:

- Incorporation of public art **(E)**
- Vegetation regeneration and retention **(F)**
- Provision of a public area which maximises community use of the area and allows access to the estuary **(G)**



SITE 5 - ENCHANTRESS LANE & ROAD, DAWESVILLE

Peel-Harvey Water Sensitive Urban Design Tour

Position: E372603 N6391202

32° 36’ 33”S 115° 38’ 32”E

Channel Heights is a small development, located as its name suggests, on the Dawesville Channel.

It comprises 66 single residential blocks ranging from 540sqm to 1000sqm. The development lies on the south side of the Dawesville Channel and entrance is gained by taking the first left onto Estuary Road after crossing the Dawesville Bridge.

Key site objectives include:

- Infiltration of stormwater as close to source as possible
- Treatment of stormwater prior to its discharge to the estuary

Best management practices include:

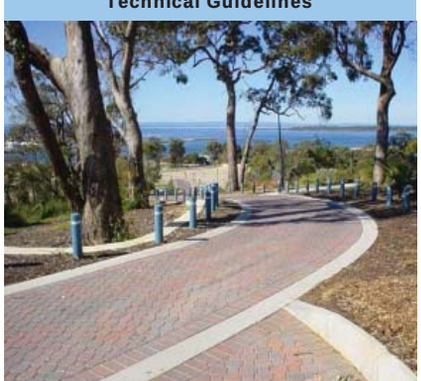
- Flush kerbing, vegetation retention and meandering pathways to slow water flowing down the roads and allow for greater infiltration **(A)**
- A small park with a bubble up system in a small vegetated area serves to effectively contain stormwater flows and includes soak tanks for larger flows from the upper street system **(B)**
- A no pipe system has been used to promote increased infiltration throughout Enchantress Lane **(C)**

Other objectives achieved include:

- Provision of community infrastructure (barbeques) in the small area of public open space **(D)**
- Subdivision design which retains and celebrates the landform and landscape values **(E)**

Channel Heights is pictured on the cover of the Peel-Harvey WSUD Technical Guidelines.

Peel-Harvey Coastal Catchment Water Sensitive Urban Design Technical Guidelines



Prepared for the Peel Development Commission
Funded by the NHT Coastal Catchments Initiative
October 2006

SITE 6 - SNAKE DRAIN, MARINERS COVE

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Cedar Woods

Position: E381269 N6397255
32° 33' 20"S 115° 44' 07"E

Mariner's Cove is located immediately south of Mandurah Road, off Mariner's Cove Drive within 5 minutes of the Mandurah Town Centre.

The snake drain is located on Darwin Terrace on the edge of the internationally significant Creery Wetlands, a key component of the Ramsar listed Peel-Yalgorup System. The protection of these wetlands, having consideration of the shallow depth to groundwater and predominantly clay soils were key elements guiding the design of this area.

Key site objective:

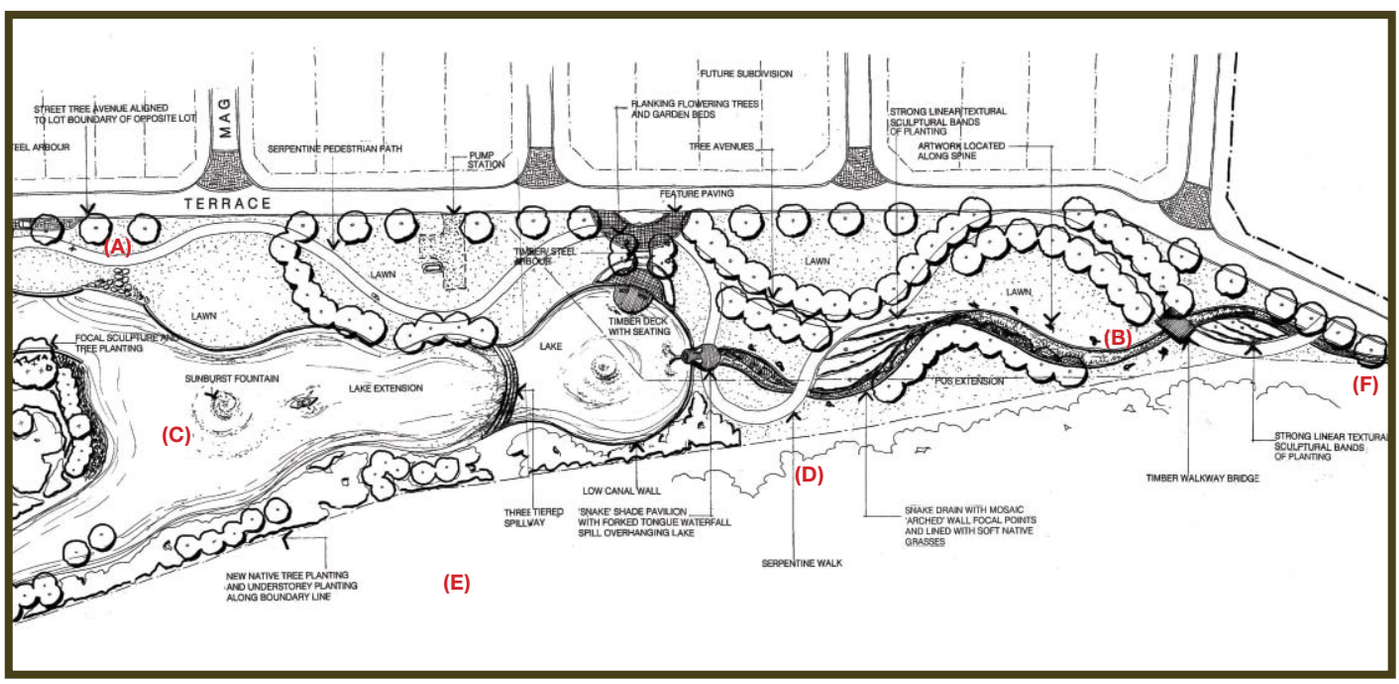
- Water quality management to ensure treatment of stormwater prior to discharge

Best management practices include:

- Gross pollutant traps to prevent litter and other pollution from reaching the wetlands **(A)**
- Lineal swale to retain and convey stormwater by allowing for nutrient assimilation **(B)**
- A constructed lake, to retain and treat stormwater **(C)**
- Retention of native vegetation and revegetation to protect the health of the nearby Ramsar listed Creery Wetlands **(D)**

Other objectives achieved include:

- Vegetation and biodiversity protection - Just under 50% of the site was ceded for the Creery Wetlands Nature Reserve **(E)**
- Controlled and responsible human access to Creery Wetlands **(F)**
- Successful education program on small lot concepts for the City of Mandurah Councillors and Senior Executive



SITE 7 - ALCOA PINJARRA WETLAND, RESTORATION PROJECT, PINJARRA ROAD

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Partnership between Peel-Harvey Catchment Council, Alcoa, Greening Australia, South West Catchments Council and the Shire of Murray

Position: E393929 N6389555

32° 37' 35"S 115° 52' 10"E

Alcoa Pinjarra Wetland Restoration

Project is located on Pinjarra Road, Pinjarra.

The restoration project is a partnership between Alcoa, Peel-Harvey Catchment Council, Greening Australia and the Shire of Murray with funding provided by Alcoa, South West Catchments Council (with support from the Australian and Western Australian Governments) and the Peel Development Commission.

Formerly a wetland, this degraded reserve had been filled and channelised to form an urban drain. The choice of this site for the restoration project was based on many factors including that it conveys more than 20% of the Pinjarra town site stormwater which is discharged directly into the Murray River approximately 500m downstream. The site also had significant remnant vegetation and an indigenous cultural history, and due to the size of the reserve there was room to undertake a large scale intervention, which is often difficult in an urban area.

The project altered the drainage infrastructure to reinstate the former wetland functions of the site; assisting with nutrient stripping through encouraging sedimentation and nutrient uptake by native sedges, rushes, shrubs and trees planted on the banks. An important design specification of the project was to maintain the conveyance capacity in high flows while slowing down the water in low flow periods. The wetland design and modelling was undertaken by Syrinx Environmental.

Key site objective:

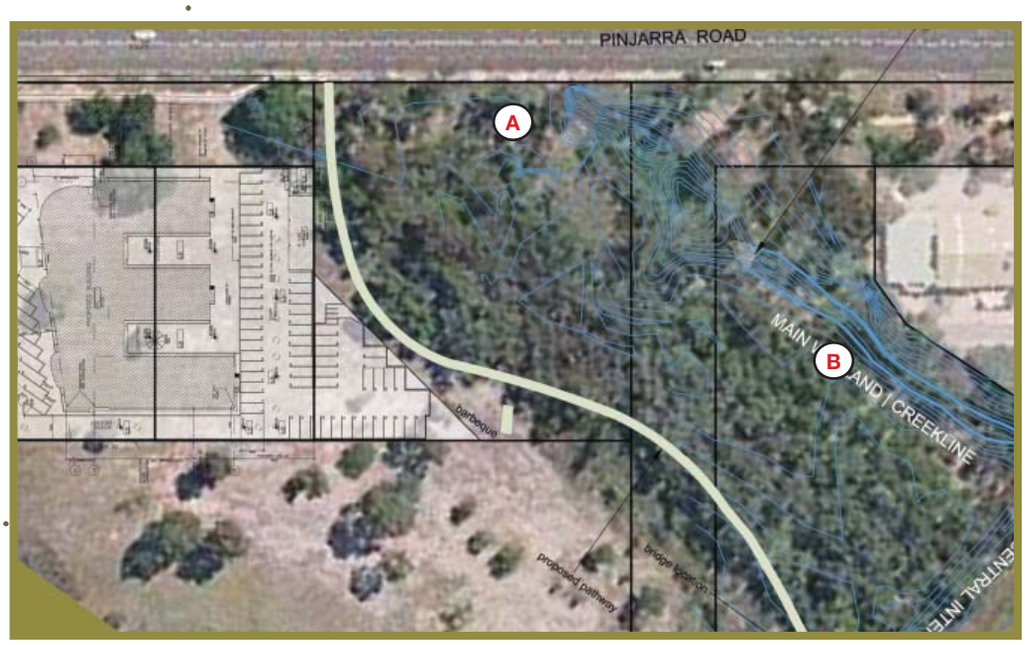
- Improved water quality and quantity management of an existing drainage system via construction of a wetland area

Best management practices include:

- Redesign of the creekline and wetland to slow water flows, increase retention times and improve habitat values without compromising flood conveyance of the system **(A)**
- Rehabilitation of existing wetland vegetation including weed control (primarily Watsonia, Japanese Pepper and Flame Trees), and revegetation along the main wetland/creekline and the central and southern-most intersecting creeklines **(B)**

Other objectives to be achieved include:

- Amenity improvements including a path and barbeque with a bridge over the central intersecting creek
- In the longer term, interpretive signage will be installed along the pathway with the intention of engaging people visiting the site and increasing interest in the project



(Design and diagrams by Syrinx Environmental)

SITE 8 - CANTWELL PARK, PINJARRA FORESHORE, PINJARRA

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Partnership between the Shire of Murray, Peel-Harvey Catchment Council and the South West Catchments Council

Position: E394600 N6389432
32° 37' 39"S 115° 52' 35"E

Cantwell Park is located on the South West Highway, Pinjarra.

This project is a hard engineering, end of pipe retrofit solution to improve stormwater management. This engineering approach was taken in response to limited public space, high slopes and the need to remove oil and sediment from the stormwater.

Key site objective:

- In-system pollution control which is able to treat 80% of the total stormwater flow from the catchment

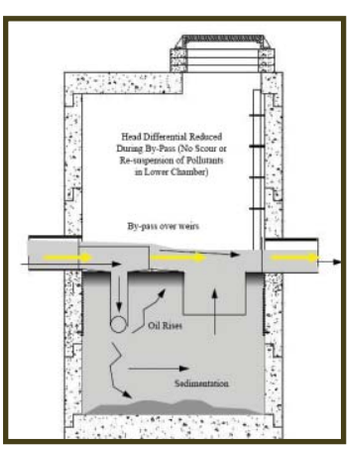
Best management practices include:

- Gross pollutant traps and oil / grit separator to capture and retain a range of contaminants from stormwater generated from carparks, industrial and commercial sites, roads and highways, petrol stations and high/medium density residential developments. Suspended solids, sediment, oil, grease and debris are retained in a centrally located solids catchment chamber **(A)**
- Retrofitting of existing manhole chambers and drain and curb inlet treatment so that stormwater enters the inlet grate or curb inlet and is channelled into the separation chamber **(B)**

Other objectives include:

- Monitoring of results for research and development - Initial monitoring of the drain outlet was completed in May 2007 to capture the 'first flush' event

high flow



low flow

SITE 9 - MEADOW SPRINGS DRIVE, MEADOW SPRINGS

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Mirvac

Position: E383260 N6403703
32° 29’ 52”S 115° 45’ 26”E

The Meadow Springs

development is located about 4km to the north of the Mandurah City Centre.

It is a well established estate located within and around a championship golf course. It also features an established shopping centre and school.

The development design has embraced the concept of water sensitive urban design throughout. This area of public open space is located at the corner of Meadow Springs Drive and Oakmont Avenue.

Key site objective:

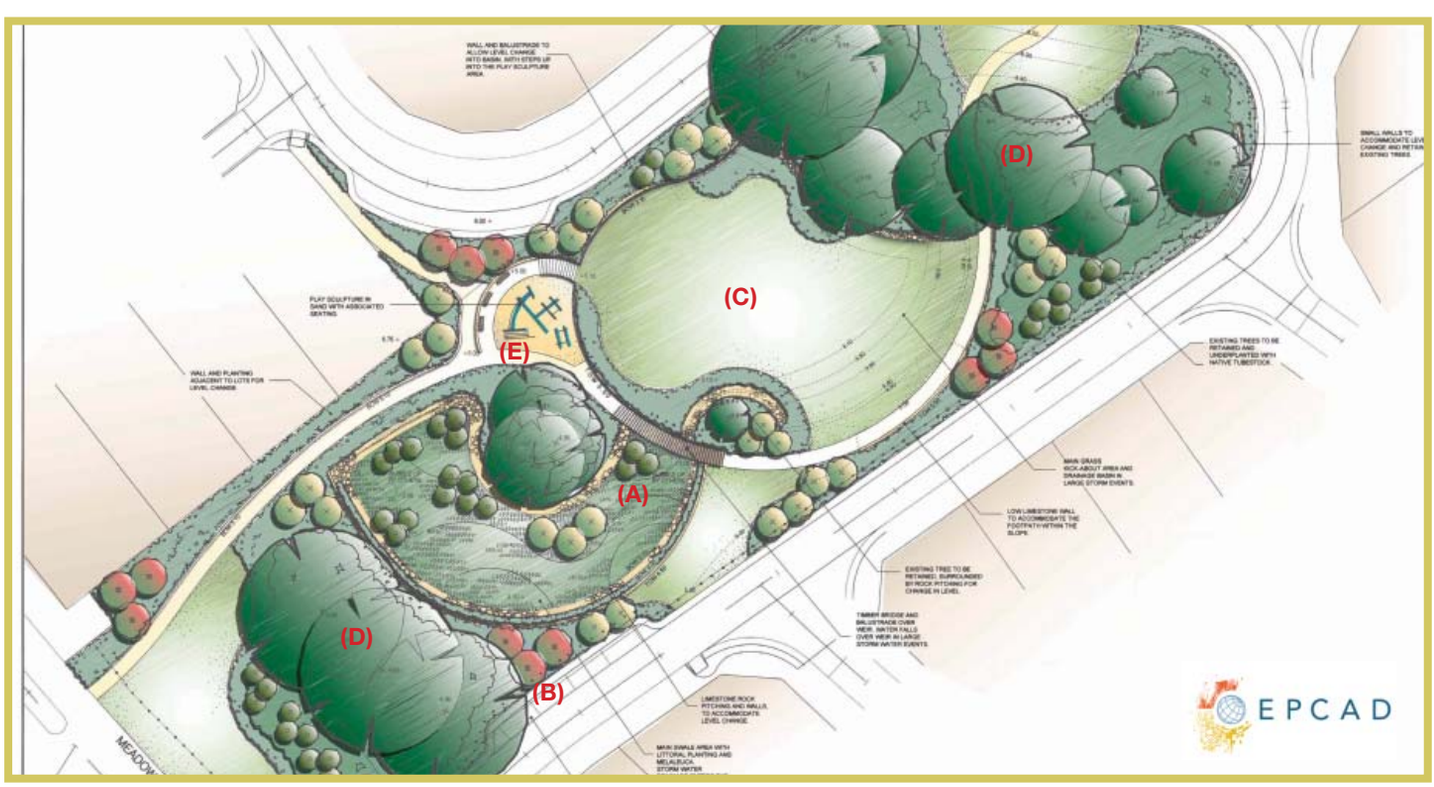
- Infiltration and detention of stormwater

Best management practices include:

- Vegetated swales with bubble up to aid treatment and infiltration **(A)**
- Alternate kerb arrangements to direct stormwater flows **(B)**
- A reduced pipe network in the streets, with stormwater being managed largely via road and kerb design
- Grassed infiltration basin to retain larger stormwater events **(C)**

Other objectives achieved include:

- Vegetation retention and revegetation are featured throughout Meadow Springs to conserve local bushland and biodiversity **(D)**
- High public amenity of parkland and facilities **(E)**



SITE 10A - JANE KENNAUGH RESERVE, LORETTA PARKWAY, LAKELANDS

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Peet Ltd

Position: E384056 N6407041
32° 28' 05"S 115° 45' 60"E

Jane Kennaugh Reserve,

Lakelands Private Estate is located off Mandurah Road, on Catalina Drive.

Priority has been given to enhancing and preserving the natural features and habitat potential of the site, such as preservation of local tuart trees and wetland features where possible. Water sensitive urban design objectives have been a key driver for the final form of the development, which successfully integrates water into the streetscape and series of parks. One such park is Jane Kennaugh Reserve on Loretta Parkway and Ada Lane.

Key site objective:

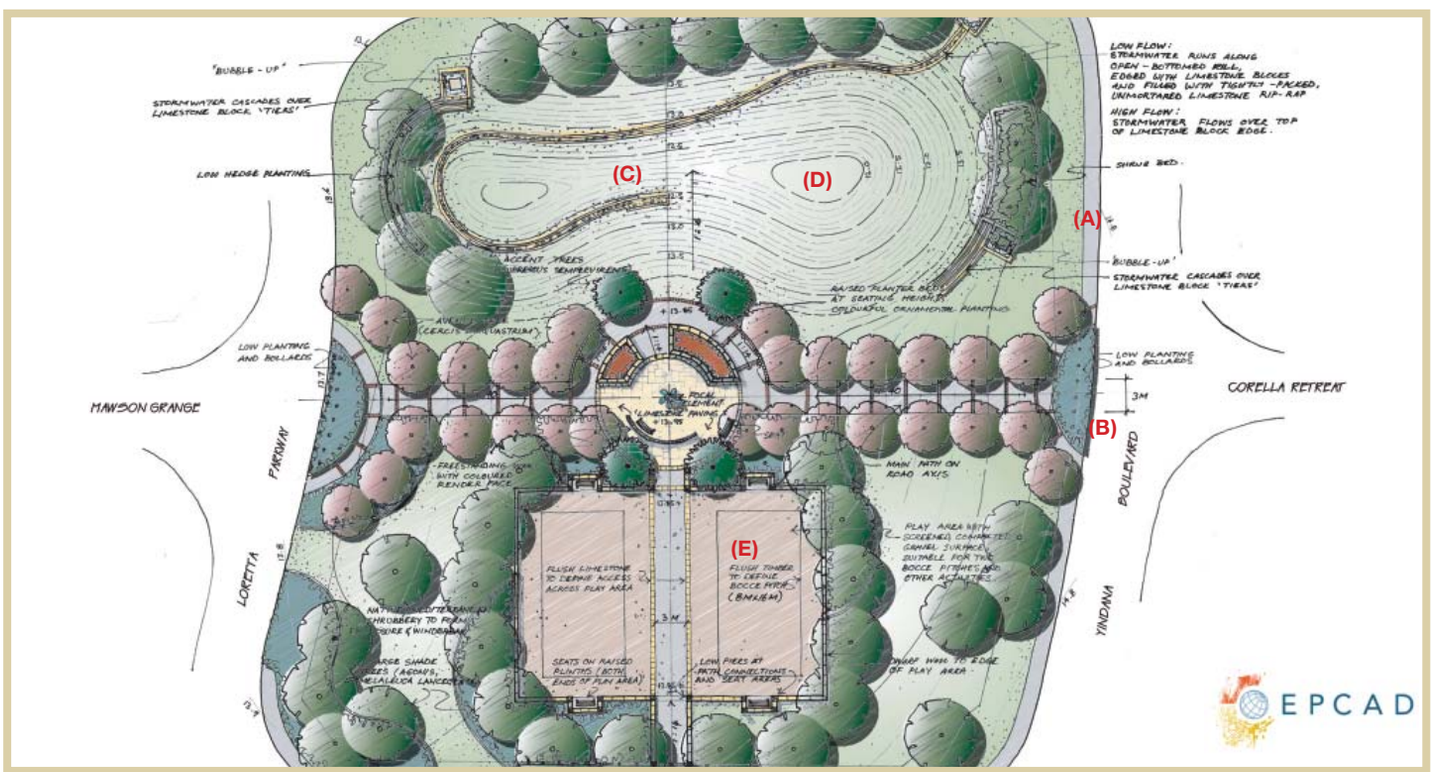
- Improved landscaping and integration of water and amenity into public open space and the urban form

Best management practices include:

- Flush kerbing to disperse stormwater flows at point of contact **(A)**
- Upstream lineal infiltration cells and leaky pits in road verges to reduce the need for piping and enhance stormwater infiltration **(B)**
- A bubble up which flows into a rock waterfall and feeds into a swale at the north of the park to aid infiltration and treatment. The park itself acts as an overland flow path in larger rainfall events **(C)**
- Application of fly ash to amend soils under public open space and minimise transfer of nutrients to the groundwater **(D)**

Other objectives include:

- High amenity public space with community facilities **(E)**

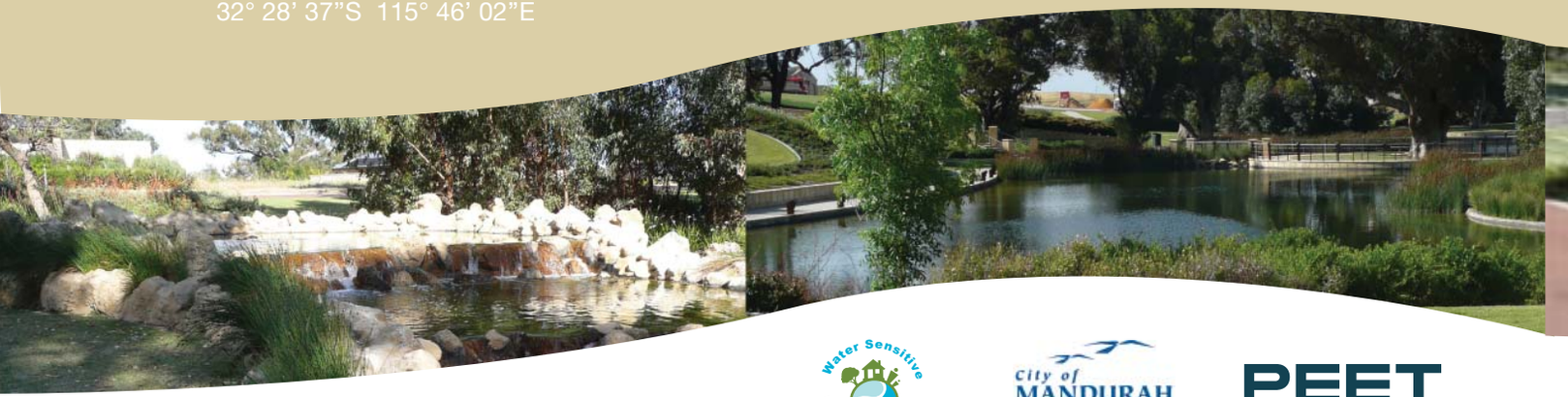


SITE 10B - YINDANA LANE, LAKELANDS

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Peet Ltd

Position: E384116 N6406040
32° 28’ 37”S 115° 46’ 02”E



The Peet Ltd Lakelands

Private Estate development maximises onsite infiltration by installing over depth access chambers, soakwells, underground storage cells, and storm tech units in the street network and in some lots.

Another water sensitive urban design park is located on Yindana Lane and Nullewa Parkway, Lakelands. This park contains a lake used to irrigate the surrounding public open space.

Key site objective:

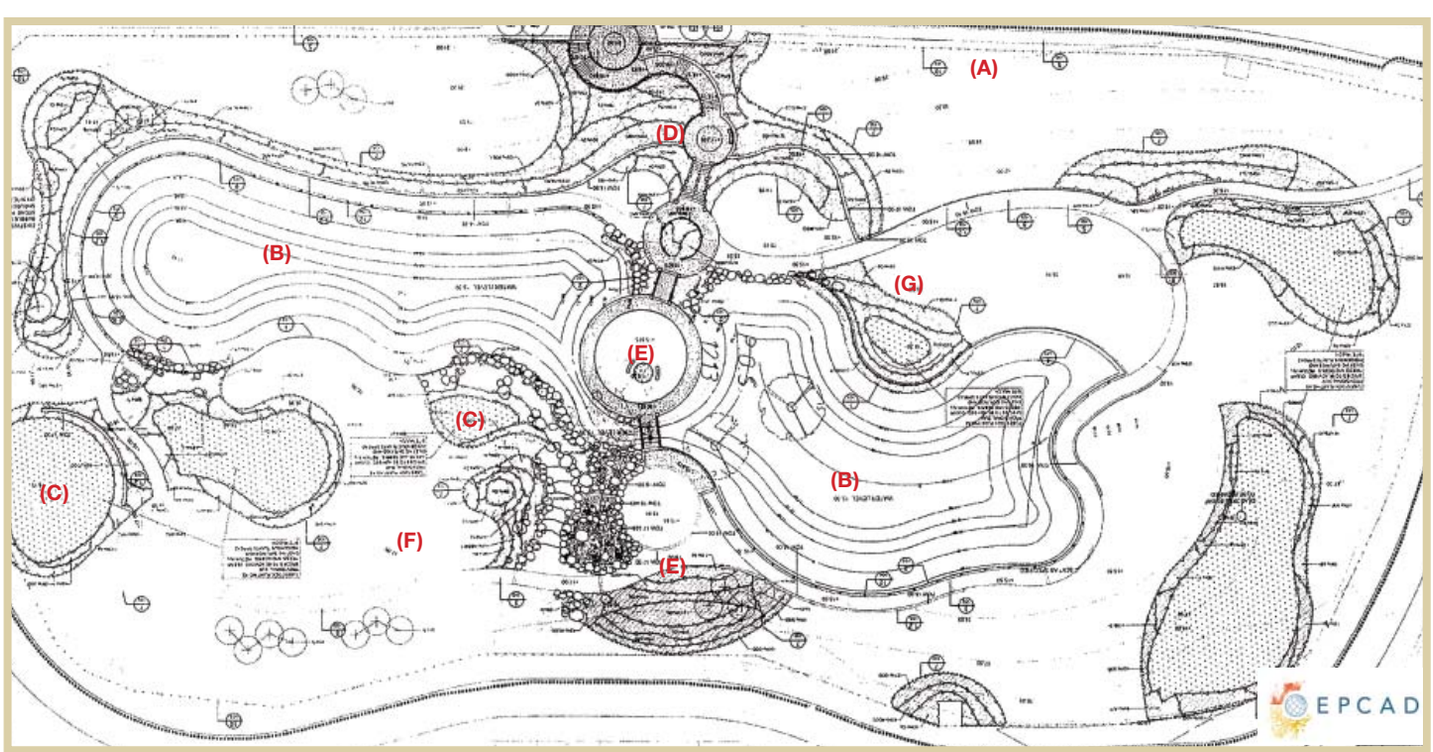
- Improved water use efficiency through storage and reuse of stormwater and smart irrigation practices

Best management practices include:

- Flush kerbing to disperse stormwater at point of contact **(A)**
- Capture of stormwater for reuse **(B)**
- Bush bioretention filters and lineal drainage swales **(C)**

Other objectives include:

- Use of native planting to minimise water use **(D)**
- Retention of local tuart trees and introduction of wetland features **(E)**
- High amenity passive recreation space **(F)**
- Enhancing and preserving the natural features of the site **(G)**



SITE 10C - BALLARD MEANDER, LAKELANDS

Peel-Harvey Water Sensitive Urban Design Tour

Developer: Peet Ltd

Position: E384170 N6405594
32° 28’ 51”S 115° 46’ 02”E

Lakelands Private Estate development also contains an area of public open space on Ballard Meander.

This area contains a kickabout space, tennis hit-up wall, informal cricket pitch and an adventure playground with barbeques, tables and seats.

Key site objectives:

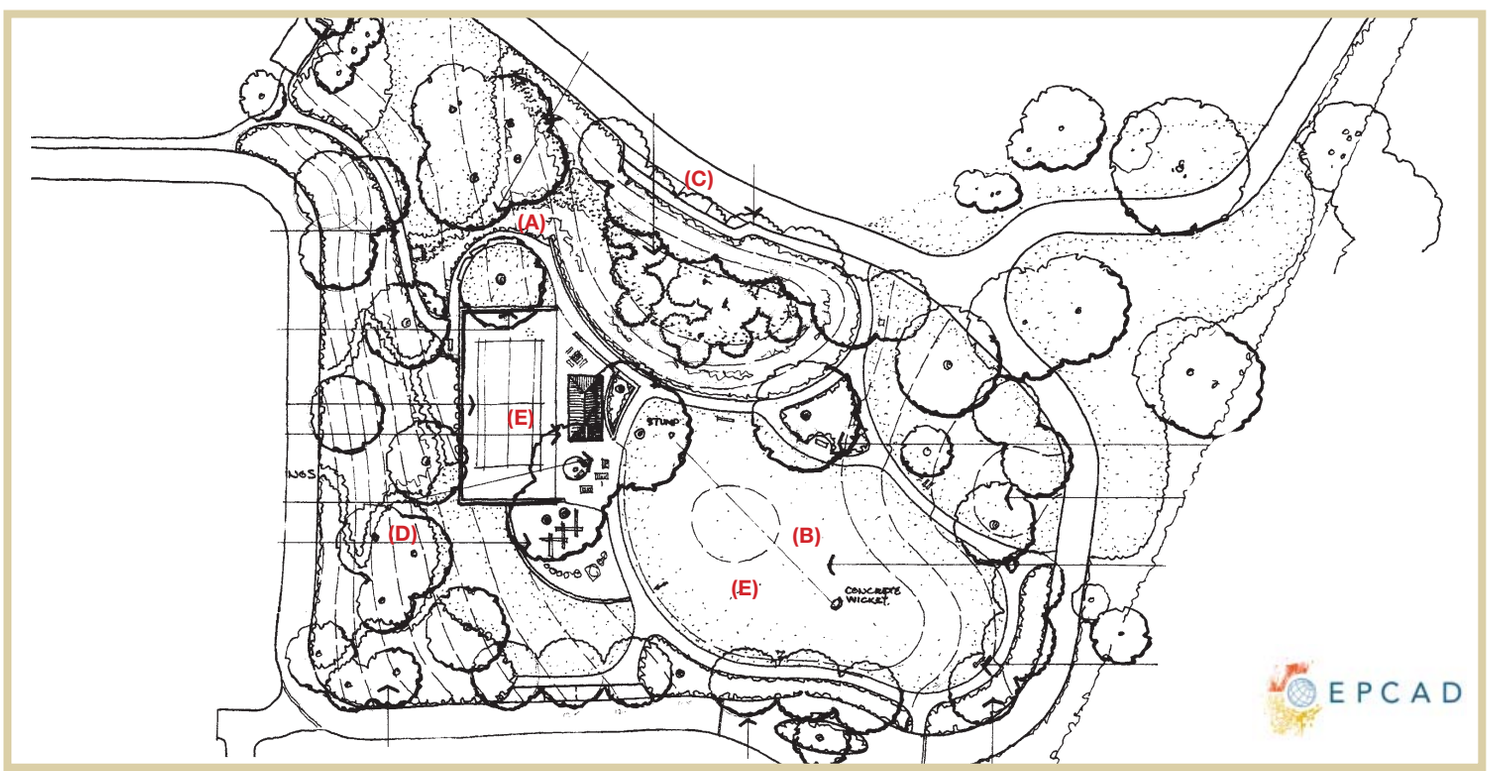
- Infiltration and detention of large stormwater events
- Treatment and retention of smaller stormwater events
- Retention of native trees

Best management practices include:

- Infiltration and treatment of low velocity stormwater events via bubbleups, rockfalls and vegetated areas **(A)**
- Grassed infiltration basin for larger events within active recreation area **(B)**
- Flush kerbs to disperse stormwater at point of contact **(C)**

Other objectives include:

- Retention of native vegetation **(D)**
- Active and passive recreation areas **(E)**
- Limited reticulation of native garden areas



OTHER SPECIAL ACKNOWLEDGEMENTS:

Funding by:

With Support from:

www.peel-harvey.org.au
www.newwaterways.com.au

PEEL-HARVEY

Water Sensitive Urban Design Tour

This map has been provided to facilitate a self-guided tour of water sensitive urban design sites in the Peel-Harvey catchment.

It identifies ten urban development sites in the Mandurah and Pinjarra regions which exhibit current best practice in water sensitive urban design in 2008.

The site numbers indicate the most efficient pathway around all ten sites and a brief description is provided of the key water sensitive urban design practices incorporated into each design.

Each site tackles the management of water resources in a different way, responding to the conditions and constraints of the site and delivering an urban form which is liveable and vibrant.

Each design has the support of the local government in terms of management and maintenance of the water quality and quantity management measures employed. Both Councils are also working actively to reduce water use within public open spaces, utilising water reuse where possible.

We hope you enjoy the experience and opportunity to view these innovative solutions to better urban water management.

Acknowledgements to:

GOVERNMENT OF WESTERN AUSTRALIA

Australian Government

SOUTH WEST CATCHMENTS COUNCIL

SHIRE OF MURRAY

PEEL-HARVEY CATCHMENT COUNCIL (Inc.)

THE PEEL REGION PEEL DEVELOPMENT COMMISSION

City of MANDURAH

renew environmental services

New WAter Ways

Essential Environmental

SITE DESCRIPTIONS

SITE 1: PARK - Seascapes Quandong Parkway and Asper Way, in Halls Head – contains detention storage areas and promotes greywater reuse

SITE 2: SANTALUM CIRCUS - Public open space, Seascapes, Halls Head - features low flow water quality treatment, flush kerbing and detention storage area

SITE 3: NORTH PORT STAGE 12 - Linville Street, Boxgum Link, Port Bouvard, Wannanup – maximises local infiltration, minimises areas of impervious surface and exhibits a no pipe system in the streets

SITE 4: CHANNEL VIEW - Port Bouvard, Dawesville - maximises lot level infiltration which is supported by water sensitive road and kerb system, with vegetation planting

SITE 5: ENCHANTRESS LANE & ESTUARY RD - Dawesville – features water sensitive road design, lot infiltration and a bioretention basin

SITE 6: MARINERS COVE - Snake Drain, Darwin Tce, Dudley Park – utilises a bioretention system and constructed wetland to protect the environmental values of the nearby Ramsar listed wetlands

SITE 7: ALCOA WETLAND - Pinjarra Rd, Pinjarra – is a reconstructed wetland to improve the water quality entering the nearby estuary

SITE 8: PINJARRA FORESHORE - Cantwell Park, South West Highway, Pinjarra – is a retrofit example which has utilised a gross pollutant trap, oil/grit separator and porous pavement to reduce the input of nutrients and pollution to the Murray River

SITE 9: MEADOW SPRINGS - Meadow Springs Drive – contains a vegetated swale system which maximises infiltration

SITE 10a, b & c: LAKELANDS - Yindana Lane, Catalina Drive and Ballard Meander – contains an integrated park system which incorporates stormwater successfully into the public open space, featuring infiltration areas, landscape planning and water quality treatment

SITE LOCATIONS

1 **QUANDONG PARK -** Seascapes, Halls Head
position: E376432 N6397650
32° 33’ 06”S 115° 41’ 02”E

2 **SANTALUM CIRCUS -** Seascapes, Halls Head
position: E375816 N6396418
32° 33’ 45”S 115° 40’ 36”E

3 **NORTH PORT STAGE 12 -** Linville Street & Boxgum Link, Port Bouvard, Wannanup
position: E373342 N6392907
32° 35’ 38”S 115° 39’ 01”E

4 **CHANNEL VIEW -** Port Bouvard, Dawesville
position: E372218 N6391488
32° 36’ 24”S 115° 38’ 18”E

5 **ENCHANTRESS LANE & ESTUARY RD**
- Dawesville
position: E372603 N6391202
32° 36’ 33”S 115° 38’ 32”E

6 **SNAKE DRAIN -** Mariners Cove, Dudley Park
position: E381269 N6397255
32° 33’ 20”S 115° 44’ 07”E

7 **ALCOA WETLAND -** Pinjarra Road, Pinjarra
position: E393929 N6389555
32° 37’ 35”S 115° 52’ 10”E

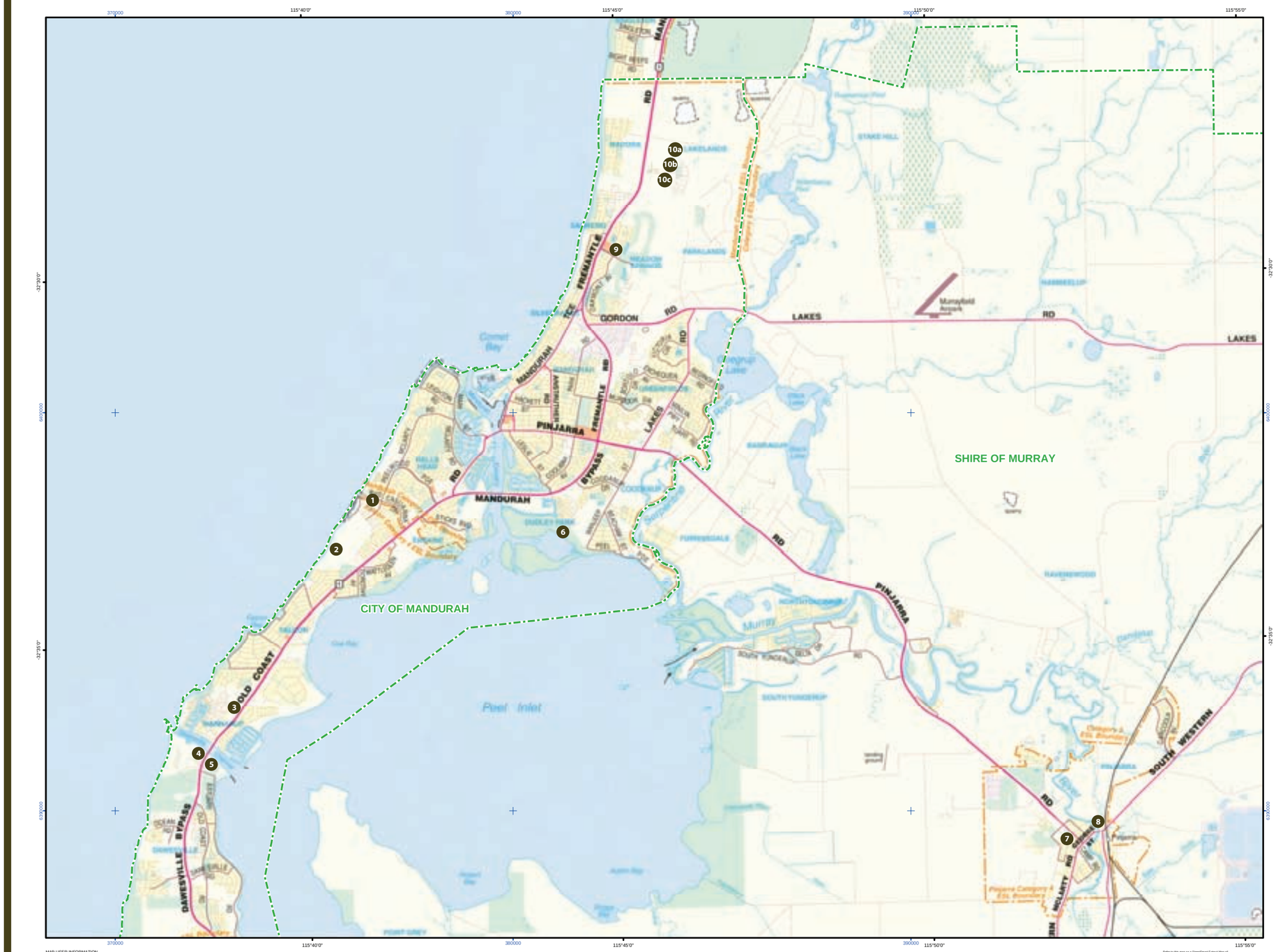
8 **CANTWELL PARK -** South West Highway, Pinjarra
position: E394600 N6389432
32° 37’ 39”S 115° 52’ 35”E

9 **MEADOW SPRINGS DRIVE -** Meadow Springs
position: E383260 N6403703
32° 29’ 52”S 115° 45’ 26”E

10a **LAKELANDS -** Jane Kennaugh Reserve, Loretta Parkway
position: E384056 N6407041
32° 28’ 05”S 115° 45’ 60”E

10b **LAKELANDS -** Yindanna Lane
position: E384116 N6406040
32° 28’ 37”S 115° 46’ 02”E

10c **LAKELANDS** -Ballard Meander
position: E384170 N6405594
32° 28’ 51”S 115° 46’ 02”E



MAP USER INFORMATION

PROJECTION	Universal Transverse Mercator.
GRID VALUES	Map Grid of Australia (MGA) values are shown in metres.
GRATICULE VALUES	Longitude & latitude values are shown in degrees, minutes and seconds.
DATA SOURCES	Data sourced from the StreetSmart 2008 Street Directory Edition 49. For map legend information refer to the StreetSmart 2008 Street Directory Edition 49.

2 1.5 1 0.5 0 2 4 6 8 Kilometres

Scale: 1:85,000

FOR INFORMATION PURPOSES ONLY. THIS MAP IS A PICTORIAL REPRESENTATION OF LANDGATE DATASETS AND IS INTENDED TO BE AN OVERVIEW OF GENERAL GEOSPATIAL INFORMATION

Landgate

Mandurah and Surrounds