

## **Landcom TBL Reporting WSUD Indicator 2008-09**



**Report  
Prepared by Equatica**

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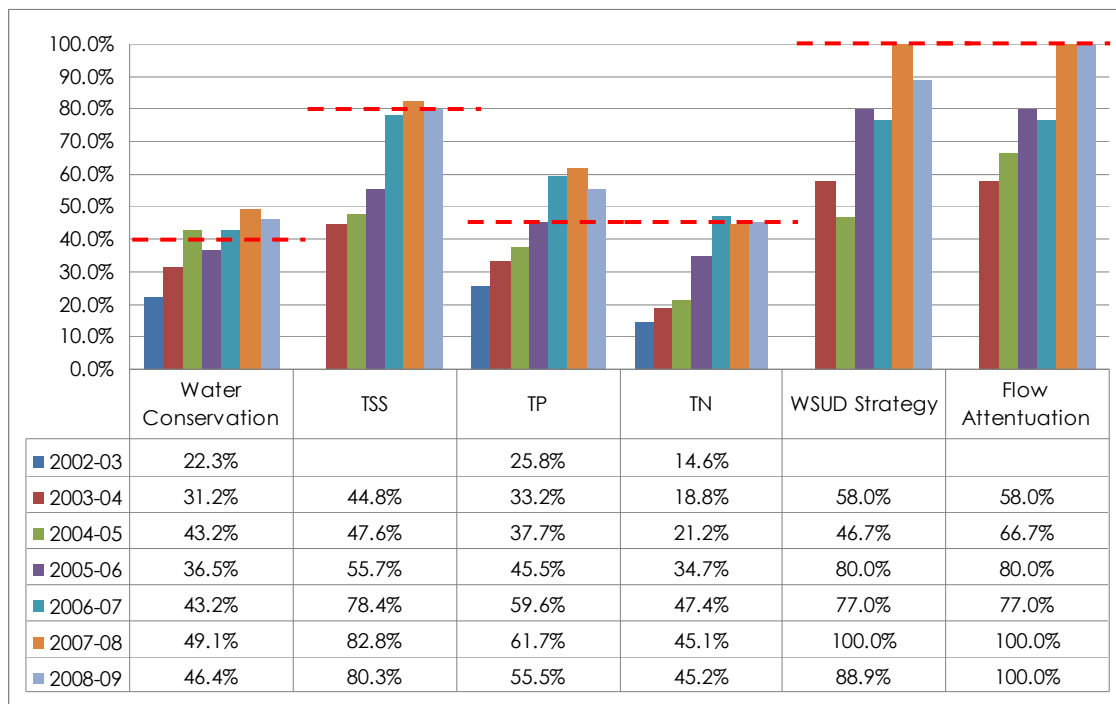
# 1. EXECUTIVE SUMMARY

In 2002 Landcom developed its Sustainability Strategy, supported by a range of triple bottom line (TBL) performance indicators. Water Sensitive Urban Design (WSUD) is one of the TBL indicators to be assessed in the 2008-09 Annual Report relating to the TBL targets of potable water conservation, stormwater quality management and flow attenuation.

This report documents the procedure and assessment of the WSUD indicator for components of Landcom projects that have reached practical completion in the 2008-09 year. Fourteen projects have WSUD components available for assessment, including seven projects that have constructed dwellings, and nine projects that have undertaken civil works. Two projects have both constructed dwellings and completed civil works.

The WSUD TBL assessment is related to four specific target areas: organisational, potable mains water conservation, pollution control, and flow management. While each of these target areas has one indicator, pollution control targets are expressed as three: the reduction in the annual load of total suspended solids (TSS), total nitrogen (TN) and total phosphorus (TP). Hence a total of six indicators record the WSUD analysis.

Projects with civil works are assessed for three themes – WSUD strategy, stormwater management and flow attenuation, where as projects with dwellings are assessed for potable water management based on their BASIX Certificates. Figure 1 outlines the results of the WSUD assessment for each indicator in 2008-09. The results are shown with the previous six years results as well as Landcom's WSUD targets. There has been an overall increase in the WSUD results assessed in the 2008-09 TBL report.



**Figure 1: Results of WSUD indicator assessment for 2002-03 through to 2008-09, and target indicated by red line.**

The overall indicator for water conservation at 46.4% has exceeded Landcom's target of 40%, with BASIX being applied in all developments. Pollutant reduction (TN, TP, TSS) from Landcom developments is consistent with previous years with TSS, TP and TN all attaining the targets. The indicator for flow attenuation remained high (100%).

## 2. INTRODUCTION

This report presents an assessment of the Landcom projects against its Triple Bottom Line (TBL) targets for Indicator 1 – Integrated Urban Water Cycle Management. The performance assessment is for those projects or stages of projects reaching practical completion and has been undertaken for Landcom's 2008-09 Annual Report.

In 2002-03, Landcom developed a Sustainability Strategy and a framework for TBL assessment to measure its performance with respect to a range of social, environmental and economic outcomes. Landcom's Triple Bottom Line performance is reported publicly in its Annual Report.

Landcom's indicator 1 "Integrated Urban Water Cycle Management" is related to four specific target areas:

- organisational
- water conservation
- pollution control, and
- flow management.

This report presents an overview of Landcom's and water targets, and identifies the development projects that have been included for assessment in the 2008-09 Annual Report. The report outlines the methodology applied to assess each project against the target areas, with results and conclusions presented. The results of the assessment are presented, followed by a discussion on the interpretation of the results. Specific information on each of the projects is contained within the Appendix to this report.

### 3. LANDCOM'S WSUD STRATEGY AND TARGETS

Landcom's WSUD Strategy includes objectives for water conservation, pollution control and mitigation of the effect of increased flow as a result of catchment urbanisation. The implementation of the WSUD strategy aims to achieve the protection of aquatic ecosystems and water resources.

The strategy has been developed to provide Landcom development staff, its consultants and private sector partners with an overview of WSUD guiding principles and practices together with selection guidelines of suitable and appropriate WSUD practices. The specific WSUD targets within the strategy are listed in Table 1.

**Table 1 Landcom's WSUD Targets**

Objective	Performance Measure and Target
WSUD Strategy	(a) 100% of projects to have project-specific WSUD strategies.
Water Conservation	(a) Combination of water efficiency and reuse options – 40% reduction on base case.
Pollution Control	(a) 45% reduction in the mean annual load of Total Nitrogen (TN).
	(b) 45% reduction in the mean annual load of Total Phosphorus (TP).
	(c) 80% reduction in the mean annual load of Total Suspended Solids (TSS).
Flow Management	(a) Post-development storm discharges = pre-development storm discharges for one and a half years ARI event. The purpose of this is to minimise the impact of frequent events on the natural waterways and to minimise bed and bank erosion.

To complement the WSUD targets, Landcom's mandatory WSUD requirements are:

- All Landcom projects must have a project specific WSUD strategy developed appropriate to the size, scale and complexity of the project. The WSUD strategies must meet Landcom WSUD targets (related to objective 1 - organisational).
- Priority must be given to the use of non-potable water sources for public domain irrigation within all Landcom projects (related to objective 2 – water conservation).
- Where reticulated recycled water is available from the local water utility, it must be used for appropriately matched uses such as toilet flushing, garden watering etc. (related to objective 2 - water conservation).

This report presents the assessment for each of these targets for each of the projects listed in the next section.

## 4. 2008-09 PROJECTS FOR ASSESSMENT

Landcom WSUD targets are assessed against works completed for each project in 2008-09. Fourteen developments have WSUD components available for assessment, as shown in Table 2. Table 2 summarises whether the development had civil works or dwellings (or both) completed in the 2008-09 year.

Projects with civil works are assessed for the themes WSUD strategy, stormwater management and flow attenuation, where as projects with dwellings are assessed for potable water management based on their BASIX Certificates.

As can be seen in Table 2 there are nine developments with civil works and seven developments with dwellings constructed. The assessment of the projects for each of the criteria is outlined in the following section.

**Table 2 Landcom Projects for WSUD Analysis**

Project	Civil Works	Dwellings Constructed
1 Discovery Point	√	x
2 Garden Gates	√	x
3 Koala Bay	√	x
4 Macarthur Gardens	x	√
5 Minto	√	x
6 Newbury	x	√
7 Park Bridge	√	√
8 Park Central	√	√
9 Redgum -St Marys	x	√
10 Rouse Hill	x	√
11 The Ponds (Stage 1)	√	x
12 The Ponds (Stage 2)	√	x
13 Vantage	√	x
14 Waterford (Punchbowl)	x	√

## 5. WSUD TBL ASSESSMENT

Landcom's WSUD TBL assessment is based on the four related themes: WSUD strategy, potable water management, stormwater management and flow attenuation. While each theme is given a single mark, either a "yes/no" or a "%" reduction, the marks are based on the following assessment methods for each theme.

Data for each indicator was derived from a range of sources including interviews with Landcom Development Managers, previous years data and follow up with external project managers as needed. This data collection method enabled an assessment of the approach to WSUD and associated WSUD strategy that has been applied to each project. The data collection was supported by relevant reports such as the WSUD strategies, flood studies, stormwater management plans and works as executed drawings for each project.

A review of each project, specific data sources and the assessment of each project are listed in Appendix 1.

### 5.1 ORGANISATIONAL

It is a requirement of Landcom's Sustainability Policy that all Landcom projects have a project specific WSUD strategy developed appropriate to the "size, scale and complexity of the project". The WSUD strategies are designed to meet Landcom WSUD targets. Landcom targets are those for water conservation, stormwater pollution control and flow management as listed in the sustainability policy and Table 2 "Landcom's WSUD Targets".

A project is assessed when it has civil works completed in the year and receives either a yes or no score. The score is based on the specific strategy, appropriate to the size, scale and complexity of the project. The WSUD Strategy is designed to meet the WSUD targets of potable water management, best practice stormwater pollution control, and flow attenuation.

If a project has developed an integrated water cycle plan to address these themes then the project was scored with a yes. Conversely, if a project has a plan for conventional drainage this was not considered to be a WSUD strategy and the project was accordingly scored with a "no".

A "grey" area exists whereby a project may have developed a stormwater plan to install a gross pollutant trap or other WSUD elements, however, these elements may not have been designed to meet the Landcom WSUD targets. This is primarily because these targets were developed in 2003, whereas some of these projects were masterplanned prior to this date.

### 5.2 WATER CONSERVATION

The Landcom WSUD Strategy water conservation target is to achieve a 40% reduction in typical potable mains water use through a combination of water efficiency and reuse options. This is consistent with the BASIX Scheme which requires all new residential developments in NSW meet a 40% reduction in potable mains water consumption. With the release of the BASIX Tool in 2004 the Landcom assessment of water conservation targets adopted this measure from the 2004-05 reporting. The data inputs for BASIX include allotment footprints, roof areas, landscaping and type, fittings, appliances and reuse tank size. The use of BASIX allows accurate results and takes into account regional variances. The BASIX Certificate outlines potable mains water reduction initiatives for each project, and where undertaken are recorded in Appendix 1. For those developments that do not have a BASIX certificate, ie they submitted a DA prior to BASIX coming online, or they are a townhouse / apartment that only required a BASIX certificate more recently, the BASIX score has been simulated through the BASIX online tool.

To determine the results of the water conservation targets for the projects available for the 2008-09 Annual Report the following formula has been adopted:

*Weighted proportional savings -  $\sum$  = (No Projects in Development / Total No of Projects) \* BASIX % reduction in water consumption compared to base case*

### 5.3 POLLUTION CONTROL

Landcom's pollution control targets are to reduce the total nitrogen (TN), total phosphorous (TP) and total suspended solids (TSS) loads generated from developments as compared to typical urban development, by 45%, 45% and 80% respectively. The reduction is met through the adoption of a range of WSUD elements and quantified through modelling.

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) has been used as an assessment tool since the 2004-05 TBL reporting, to test the expected performance of the WSUD elements employed on developments. For this assessment a MUSIC model has been developed for each project, to determine the treatment efficiency for the component of the project reaching practical completion in the 2008-09 financial year. The reduction is based on either:

Determining the total treatment efficiency for the whole of the development area, so that the whole development is modelled. The treatment efficiencies are then applied to the area reaching practical completion in 2008-09, or

Determining the specific treatment efficiencies for the portion of the project that has been developed in 2008-09, based on the model generated for that portion of the site.

The application of these methods is based upon whether there are discrete development areas in the project, in which case the second determination would be applied. If the project is a component of a larger system, then it would be measured as a whole. The treatment efficiency has been determined for every project that has civil works undertaken this year even if the WSUD elements have not been delivered.

The stormwater pollution removal targets give one figure for the removal efficiency of each of the TSS, TN and TP. To determine an overall pollution removal efficiency for the various projects, a weighting formulae has been developed to allow for the projects to be averaged, namely:

$$\text{Weighted treatment efficiency (2008-09)} - \sum = ((A * RFa) * 10) / ROt * E$$

Where A = Project impervious area developed (2008-09) (ha)  
ROt = Total mean runoff for the developed area (2008-09) (kL)  
RFa = project average rainfall (mm)  
E = pollutant treatment efficiency (%)

### 5.4 FLOW MANAGEMENT

Flow management / attenuation targets for each project have been assessed to ensure that the post-development storm discharges = pre-development storm discharges for 1.5 year ARI event.

For this analysis a project receives either a yes or no score based on flow attenuation measures that have been put in place. The measure is subjective based on an assessment of the project, after consultation with the project managers, with the score determined by the experience and knowledge of the author.

## 6. WSUD TBL RESULTS

The results of the assessment for each of the four WSUD indicators is outlined in the following sections. More detailed information on the assessment for each project is contained within Appendix 1 which has a description of the project as well as detail of the WSUD elements employed.

### 6.1 ORGANISATIONAL

Eight of the nine (or 89%) of the projects assessed for the 2008-09 TBL Reporting have a WSUD Strategy (Table 3). The WSUD strategy varies in depth and complexity based on whether the project was commissioned before or after Landcom had adopted its sustainability policy.

**Table 3 Assessment of WSUD Strategies in the 2008-09 Reporting Year**

Project		Civil Works	WSUD Strategy
1	Discovery Point	√	X
2	Garden Gates	√	√
3	Koala Bay	√	√
5	Minto	√	√
7	Park Bridge	√	√
8	Park Central	√	√
11	The Ponds (Stage 1)	√	√
12	The Ponds (Stage 2)	√	√
13	Vantage	√	√

The projects with a WSUD Strategy vary in detail from those with integrated water cycle management initiatives to optimise the use of water through stormwater harvesting and reuse on a regional scale, to those that contain a stormwater quality focus.

The one project without a WSUD strategy is Discovery Point with the only stormwater controls being rainwater tanks for irrigation and an on-site detention (OSD) tank for flow attenuation. This is primarily as the site was masterplanned prior to the introduction of Landcom's WSUD Strategy, and at the infancy of stormwater controls for new developments. Despite this Australand has received a grant for blackwater treatment and reuse through the site through the Department of Environment and Climate Change. The blackwater will be reused through the apartments for toilet flushing.

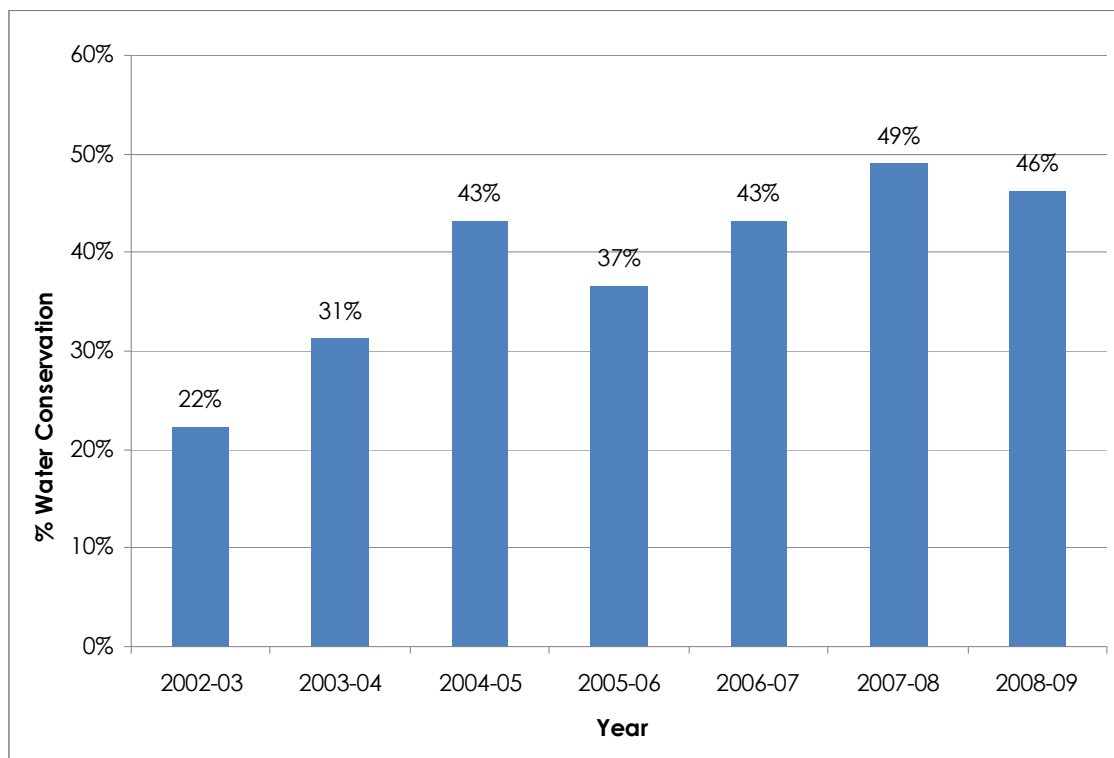
### 6.2 WATER CONSERVATION

The TBL assessment for potable water conservation was based on the BASIX certificates produced for each dwelling through the Development Application process. In 2008-09 there were 227 residential dwellings in which Landcom delivered in seven projects (listed in Table 5). In comparison to the past several years there were 166 dwellings delivered in 2005-06, 161 in 2006-07 and 477 in 2007-08, suggesting that 2008-09 is an average year in terms of dwellings delivered, as compared to an outlier year such as 2007-08.

Table 4 presents the assessment of potable water management savings for 2008-09, and shows that for the 227 dwellings delivered by Landcom, there was an average BASIX score of 46.4 which exceeds the Landcom target of 40. All of the dwellings meet the BASIX benchmark as a baseline with dwellings at Newbury Estate and Park Bridge attaining average scores closer to 50 as a result of the reclaimed water available for toilet flushing and private open space irrigation in these locations.

**Table 4 Assessment of Potable Water Management for the 2008-09 Reporting Year**

Projects - In Project Delivery	Dwellings	Type	BASIX	
			BASIX % reduction in water consumption compared to base case	BASIX Weighted Proportional Savings
Macarthur Gardens	26	Separate (15), Attached (9), Apartments (2)	41.0	4.7
Newbury Estate	91	Separate Dwellings (67) & Attached (24)	49.9	20.0
Park Central	20	Separate	41.4	3.6
Redgum – Swanston St Marys	12	Separate	40.3	2.1
Rouse Hill	7	Attached (7)	42	1.3
Park Bridge	56	Separate	48.6	12.0
Waterford	15	Separate	40.3	2.7
Total	227			46.4



**Figure 2: Potable mains water reduction over time**

### 6.3 STORMWATER POLLUTION CONTROL

The 2008-09 TBL assessment for pollution control involved the assessment of the stormwater management elements of those projects where civil works had taken place during 2008-09 (Table 5). The pollution control measures identified in the projects ranged from minimal (rainwater tanks) through to wetland and bioretention systems. An overview of the projects assessed and the pollution reduction outcomes for 2008-09 is shown in Table 7.

Each project was modelled through MUSIC, and Table 7 outlines the TN, TP and TSS pre and post loads and treatment efficiency for each project. The weighted efficiency is determined through multiplying the treatment efficiency by the weighted runoff from the area developed in 2008-09 (see methods section). More detailed information on the stormwater management initiatives and MUSIC modelling for each project is contained in Appendix 1.

**Table 7 Pollution Control Projects for the 2008-09 Reporting Year**

Projects	Mt Annan Sth - Garden Gates	Minto	Park Bridge	Park Central	The Ponds Stage 1	The Ponds Stage 2	Discovery Point	Vantage	Koala Bay	TOTALS
Area Developed (ha) 2009	12.4	11.4	11.4	6.2	10.6	37.6	0.7	8.6	3.1	102
TP Load (kg/year)	Pre	36.0	23.9	12.9	13.9	9.8	35.1	1.7	21.4	7.6
	Post	15.8	8.0	4.3	6.5	3.5	19.3	1.4	8.6	2.4
	Treatment Efficiency %	56%	66%	66%	53%	64%	45%	16%	60%	69%
	Weighted TP efficiency	5.8	7.7	7.9	2.7	6.6	16.3	0.2	5.9	2.4
TN Load (kg/year)	Pre	487.7	70.7	99.1	100.4	68.6	246.7	19.5	156.0	55.8
	Post	276.0	37.2	58.0	76.8	26.1	135.7	14.0	85.8	30.5
	Treatment Efficiency %	43%	47%	42%	24%	62%	45%	28%	45%	45%
	Weighted TN efficiency	4.5	5.5	4.9	1.2	6.4	16.3	0.3	4.4	1.6
TSS Load (kg/year)	Pre	32,650	27,624	7,341	6,846	4,700	16,761	869	9,322	3,613
	Post	11,101	3,646	616	1,615	658	3,352	782	1,864	722
	Treatment Efficiency %	66%	87%	92%	76%	86%	80%	10%	80%	80%
	Weighted TSS efficiency	6.8	10.1	10.9	4.0	8.8	29.0	0.1	7.9	2.7

The results from the stormwater pollution control modelling are presented in context with previous years' results and Landcom's pollution removal targets (Table 8). In 2008-09, an area of approximately 102 ha was developed by Landcom. The results of the modelling shows that all of Landcom's targets were exceeded, with nitrogen and suspended solids just meeting the targets.

**Table 8 Pollutant reductions for Landcom developments**

WSUD target	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	Target
TN	14.6%	18.8%	21.2%	34.7%	47.4%	45.1%	45.2%	45.0%
TP	25.8%	33.2%	37.7%	45.5%	59.6%	61.7%	55.5%	45.0%
TSS	No Data	44.8%	47.6%	55.7%	78.4%	82.8%	80.3%	80.0%

#### 6.4 FLOW MANAGEMENT

All of the projects have some form of flow attenuation measures in place (shown in Table 9). These systems are often in place as detention systems / basins designed to cater for flood retardation.

**Table 9 Assessment of Flow Attenuation for the 2008-09 Reporting Year**

Project	Civil Works	Flow Attenuation
1 Discovery Point	√	√
2 Garden Gates	√	√
3 Koala Bay	√	√
5 Minto	√	√
7 Park Bridge	√	√
8 Park Central	√	√
11 The Ponds (Stage 1)	√	√
12 The Ponds (Stage 2)	√	√
13 Vantage	√	√

## **7. WSUD TBL CONCLUSION AND RECOMMENDATIONS**

This assessment has been prepared as the WSUD component of Landcom's 2008-09 Annual Report. There has been an overall improvement in the WSUD results assessed in the 2008-09 TBL report. Significant was the increase in the number of projects with WSUD strategies designed to meet Landcom WSUD targets. Eight of the nine (or 89%) of the projects assessed for the 2008-09 TBL Reporting have a WSUD Strategy.

The water conservation indicator for 2008-09 was determined as an average of the BASIX score for the 227 dwellings assessed. The average BASIX score of 46.4 exceeded the Landcom target of 40. All of Landcom's dwellings attained the minimum BASIX score of 40. The dwellings at both Newbury Estate and Park Bridge have reclaimed water available for toilets and irrigation, with dwellings in these developments having average BASIX scores approaching 50.

The stormwater quality control indicators show an increase from the previous year. The TSS, TP and TN pollution reductions all exceeded the Landcom targets this year, with reduction of 80.3%, 55.5%, and 45.2%, respectively. All of Landcom projects have flow attenuation (100%) elements.

## **8. APPENDIX 1 – LANDCOM PROJECTS 2008-09**

1. Discovery Point
2. Garden Gates
3. Koala Bay
4. Macarthur Gardens
5. Minto
6. Newbury
7. Park Bridge
8. Park Central
9. Redgum -St Marys
10. Rouse Hill
11. The Ponds – Stage 1
12. The Ponds – Stage 2
13. Waterford (Punchbowl)
14. Vantage (Corlette)

## 8.1 DISCOVERY POINT

Discovery Point is located on the south bank of the Cooks River immediately west of the Princess Highway. The site is being developed by Australand based on a masterplan from the early 2000's. Two of the nine stages of the development have been completed (Stage 1 Greenbank and Stage 2 Verge) as well as the restoration of some heritage buildings (Chapel, Temple House and gardens).



The area developed to date namely Stages 1 and 2 are 3,616m<sup>2</sup> and 3,210m<sup>2</sup>, respectively.

### WSUD STRATEGY

The site does not have a specific WSUD strategy and the only stormwater controls are due to rainwater tanks for irrigation and an OSD tank for flow attenuation. This is primarily as the site was masterplanned prior to the introduction of Landcom's WSUD Strategy, and at the infancy of stormwater controls for new developments. Despite this Australand has received a grant for blackwater treatment and reuse through the site through the Department of Environment and Climate Change. The blackwater will be reused through the apartments.

### POTABLE WATER MANAGEMENT

No houses have been built by Landcom, therefore no assessment is applicable.

### STORMWATER MANAGEMENT

Site 1 Roof – Approx 1,986m<sup>2</sup>; Site 2 Roof – Approx 677m<sup>2</sup> flows to a combined tank of 40kL which is reused for car park washbays and private open space (approximately 23,000m<sup>2</sup>). There is an OSD tank of 50kL of which 5,000m<sup>2</sup>. The high reuse of water for open space irrigation was measured with the results shown in the table below. Reductions are due to rainwater being reused through the development and therefore being taken from the stormwater stream and not reaching receiving environments.

Discovery Point	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	869.0	782.0	10.1%
Total Phosphorus (kg/yr)	1.7	1.4	16.0%
Total Nitrogen (kg/yr)	19.5	14.0	28.1%
Gross Pollutants (kg/yr)	142.0	74.2	47.7%

### FLOW ATTENUATION

Flow attenuation is to be managed through the OSD system and the rainwater tank.

### INFORMATION SOURCES

Communication with  
 Pierre Abrahamse, NSW State Manager Apartments, Residential Division, Australand  
 Chris Pope site Manager Apartments, Residential Division, Australand

## 8.2 GARDEN GATES - MT ANNAN SOUTH

Garden Gates is a 69 Hectare development in Camden Council Local Government Area (LGA), with a development potential of approximately 650 lots. The site is developing agricultural land and has a large existing farm dam on site. Precincts 36A, 39B, 40 and 45A were developed in 2008-09, equating to an area of approximately 12.4 ha, comprised of:

Precinct	Residential (m <sup>2</sup> )	Roads (m <sup>2</sup> )	Open Space (m <sup>2</sup> )	Total (m <sup>2</sup> )
Precinct 36A	9,136	7,675	8,639	25,450
Precinct 39B	9,757	2,693	0	12,450
Precinct 40	23,676	13,416	22,700	59,790
Precinct 45A	17,186	9,114	0	26,300
TOTAL	59,755	32,898	31,339	123,990

TBL reporting for this year includes civil works only.



### WSUD STRATEGY

The site does have a WSUD strategy to meet Landcom WSUD targets.

### POTABLE WATER MANAGEMENT

No houses have been built by Landcom, therefore no assessment is applicable.

### STORMWATER MANAGEMENT

The site stormwater management was determined through a study by GHD (2002). The existing farm dam has been regraded and converted into a 2ha wetland for water pollution control. The wetland includes detention storage of 1.3m above the mean water level of the dam. For the creeks draining to the wetland, riparian corridors will be established and vegetated. Also incorporated into the development are silt traps, buffer strips and swales to trap sediment from urban runoff.

The wetland has been modelled through MUSIC to determine the pollution reduction as a result of the wetland. The wetland has a surface area of 18,383 m<sup>2</sup>, and permanent pool of 13,048 m<sup>3</sup>. Given that the whole development flows into the wetland and there are limited localised

stormwater treatment measures, the whole development was modelled so as to determine the effectiveness of the wetland as a whole and then the 2008-09 developed area of 12.4 ha was proportioned as a percentage of the developed area. Results of the modelling show that the mean annual reduction of TP meets best practice while that of TSS and TN are below best practice.

Garden Gates Mt Annan – Precincts 36A, 39B, 40 and 45A			
Parameter	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	32,650	11,101	66%
Total Phosphorus (kg/yr)	36.0	15.8	56%
Total Nitrogen (kg/yr)	487.7	276.0	43%

#### **FLOW ATTENUATION**

Flow attenuation is to be managed through the wetland system which takes flows from 60 ha of the site, with a further detention basin downstream of the site to minimise any flooding issues on the local creeks.

#### **INFORMATION SOURCES**

GHD (2002). *Garden Gates South: Stormwater Management System*, Report prepared for Landcom, February 2002.

Communication with Luis Valarezo, Development Coordinator, Camden Illawarra, Development South (Landcom).

### 8.3 KOALA BAY

Koala Bay is located at Port Stephens near Newcastle. The focus of the development is in creating harmony between bushland, water and affordability. The civil works for Precinct 4 were completed in 2007-08 and included 56 lots and two reserves. The Koala Bay project area is 23.85 ha, and precinct 5, which was developed in 2008-09, is 3.05ha comprising 0.457ha roads, and 2.593ha lots.



#### WSUD STRATEGY

There is no specific WSUD strategy developed for the site to meet Landcom WSUD targets. Despite this there is management of both stormwater management based on on-site detention of stormwater and the site includes ponds for stormwater management from the site. These components together can be construed as a WSUD strategy for the site.

#### POTABLE WATER MANAGEMENT

No houses have been built by Landcom, therefore no assessment is applicable.

#### STORMWATER MANAGEMENT

Stormwater management initiatives include a large wetland and a detention basin in a nearby reserve to treat urban runoff. Detailed information on the stormwater treatment train is not available for the site. The treatment efficiency has been estimated in MUSIC by modelling a wetland of 2700 square metres surface area, with 50% of vegetated cover and an extended detention depth of 0.65m. Pollutant reductions are as follows.

Koala Bay	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	3,613.3	722.7	80.0
Total Phosphorus (kg/yr)	7.6	2.4	69.0
Total Nitrogen (kg/yr)	55.8	30.5	45.0

#### FLOW ATTENUATION

Flow attenuation is provided by a detention area and the stormwater treatment wetland.

#### INFORMATION SOURCES

Communication with Stephen Aebi (Landcom)

## 8.4 MACARTHUR GARDENS

Landcom is partnering with Stockland to deliver the Macarthur Gardens development. The project will develop approximately 800 new homes, and deliver 1,000 jobs with a \$250 million expansion of the Regional Centre. The site is in close proximity to Macarthur railway station, shopping centres, the Campbelltown hospital and Southwestern Institute of TAFE.

The total area of the site is approximately 50 ha of which 22.3 is non-developable (representing non-disturbed or rehabilitated zones). The largest portion of non-developable area is the creek riparian zone which runs south-north through the site and is targeted for significant creek rehabilitation works. A golf course is located to the south of the development site.

In 2008-09, 26 homes have been built with a typical house with an average of 3 bedrooms with an average land footprint of 330m<sup>2</sup>.



### WSUD STRATEGY

There is a WSUD strategy prepared for the site. The WSUD strategy for the site was developed by Patterson Britten c.2002. Ecological Engineering undertook a review of this strategy in 2004, providing advice on incorporating WSUD at various stages of the project and to ensure that the project met Landcom's WSUD targets.

## POTABLE WATER MANAGEMENT

26 dwellings constructed at Macarthur gardens achieved an average BASIX score of 41.0. All of the houses are fitted with 2–3300 KL rainwater tanks fitted to toilet and laundry, AAA fittings and showerheads, and dual flush toilets (4.5/9L). The BASIX Certificate information for the houses are shown in the table below.

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
1	Mac Gardens	Rimell 904121	Separate	3	374	168	45%	209	56%	52	3	4	5	5	-	3000	169	√	√	√	-	40
2	Mac Gardens	08-8733 F	Separate	4	403	193	48%	182	45%	35	3	4	4	5	-	2400	193	√	√	√	-	40
3	Mac Gardens	ALCANTARA (907179)	Separate	3	314	183	58%	135	43%	7	3	4	5	5	-	2440	183	√	√	√	-	40
4	Mac Gardens	09-9382A	Separate	3	360	175	49%	84	23%	0	3	3	3	3	-	2150	175	√	√	√	-	40
5	Mac Gardens	09-9287 A	Separate	4	385	184	48%	104	27%	0	3	3	3	3	-	2800	184	√	√	√	-	40
6	Mac Gardens	#08-8464 No1	Attached	2	435	218	50%	26	6%		3	3	3	3	-	2000	218	√	√	√	-	49
7	Mac Gardens	#08-8464 No2	Attached	2	435	218	50%	54	12%		3	3	3	3	-	2000	218	√	√	√	-	49
8	Mac Gardens	#08-8464 No3	Attached	2	435	218	50%	0	0%		3	3	3	3	-	2000	218	√	√	√	-	49
9	Mac Gardens	No 18 Stowe Ave	Separate	4	292	121	41%	92	32%		3	3	3	3	-	3300	121	√	√	√	-	40
10	Mac Gardens	No 14 Stowe Ave	Separate	4	297	121	41%	92	31%		3	3	3	3	-	3300	121	√	√	√	-	40
11	Mac Gardens	No 10 Bartram rd	Separate	4	294	117	40%	78	27%		3	3	3	3	-	3000	117	√	√	√	-	40
12	Mac Gardens	No 25 Fairchild rd	Separate	3	287	160	56%	88	31%		3	3	3	3	-	3000	160	√	√	√	-	40
13	Mac Gardens	No 29 Fairchild rd	Separate	3	277	160	58%	88	32%		3	3	3	3	-	3000	160	√	√	√	-	40
14	Mac Gardens	#08-8971 No1	Attached	2	202	83	41%	42	21%		3	3	3	3	-	3000	83	√	√	√	-	40
15	Mac Gardens	#08-8971 No2	Attached	2	206	80	39%	126	61%		3	3	3	3	-	3000	80	√	√	√	-	40
16	Mac Gardens	GUPTA(907215) – Rev2	Separate	3	314	178	57%	133	42%		3	3	5	5	-	3000	178	√	√	√	-	40
17	Mac Gardens	MANN/JOHNSON (908072)	Separate	4	418	206	49%	199	48%		3	4	5	5	-	3000	206	√	√	√	-	40
18	Mac Gardens	WALKER (908165)	Separate	3	279	175	63%	111	40%		3	4	3	3	-	3000	175	√	√	√	-	40
19	Mac Gardens	PIRIE(907081)-Rev1Dw1	Apartment	2	389	204	52%	95	24%		3	4	3	3	-	2400	101	√	√	√	-	40
20	Mac Gardens	PIRIE(907081)-Rev1Dw2	Apartment	2							3	4	5	5	-	2400		√	√	√	-	40
21	Mac Gardens	McPHILLIPS (907276)-Rev1	Separate	3	374	215	57%	128	34%		3	4	5	5	-	2440	215	√	√	√	-	40
22	Mac Gardens	NO 19 CARLTON RD	Separate	4	350	125	36%	155	44%	15	3	3	3	3	-	5000	125	√	√	√	-	40
23	Mac Gardens	Lot 99-102-1	Attached	3	1321	538	41%	259	20%	10	3	4	5	5	-	4000	140	√	√	√	-	40

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
24	Mac Gardens	Lot 99-102-2	Attached	3				181		10	3	4	5	5		4000	129	√	√	√	-	40
25	Mac Gardens	Lot 99-102-3	Attached	3				166		10	3	4	5	5		5000	129	√	√	√	-	40
26	Mac Gardens	Lot 99-102-4	Attached	3				219		10	3	4	5	5		4000	140	√	√	√	-	40
	Average			3	379	180		122		18	3	3	4	4		3024	158					41.0

Open space irrigation also occurs through water storage tanks which are a component of the stormwater treatment / bioretention systems on site.

**STORMWATER MANAGEMENT**

No Civil Works were completed in 2008-09

**FLOW ATTENUATION**

No Civil Works were completed in 2008-09

**INFORMATION SOURCES**

BASIX certificates.

## 8.5 MINTO

One Minto is the redevelopment of a former public housing estate into a fully masterplanned community. 800 dwellings will be demolished and in their place 1150 dwellings will be built. Public housing for 350 dwellings (30%) will be integrated throughout development. One Minto is an urban renewal project of State significance and a collaboration between Campbelltown City Council, the Department of Housing, and Landcom. In the 2008-09 TBL reporting year the civil works for Stages 2 & 8 (89 Lots) were completed Apr 09, with an area of 114,000m<sup>2</sup>.

### WSUD STRATEGY

A WSUD strategy has been prepared for the Minto redevelopment.

### POTABLE WATER MANAGEMENT

A series of houses are under construction but none were completed for assessment in the 2008-09 year.

### STORMWATER MANAGEMENT

Stormwater at Minto is treated through a combination of rainwater tanks, gross pollutant traps, and bioretention swales. Results of the modelling shown in the table below indicate that the mean annual reductions of TSS, TP and TN meet best practice.

One Minto	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	27,624.5	3,646.4	87
Total Phosphorus (kg/yr)	23.9	8.0	66
Total Nitrogen (kg/yr)	70.7	37.2	47

### FLOW ATTENUATION

Flow attenuation occurs through the bioretention and rainwater reuse systems.

### INFORMATION SOURCES

Communication with Michael Hodges Civil Design Manager, Cardno Hughes Truman Water Management (2005) Minto Urban Renewal Project. Water Cycle Management. July 2005.



## 8.6 NEWBURY ESTATE

Landcom in partnership with Mirvac is developing the 157 ha Stanhope Gardens. When completed, the development will have approximately 1,800 homes, a self-contained town centre, two schools, 16.5 hectares of parkland and a \$14 million shopping precinct. It will create 2,400 jobs for people living in Western Sydney.

The civil construction on the site has been completed with all DA's for the site also approved.

The site was masterplanned in the early 2000's, with the masterplan approved in 2003/04. Stormwater management through this process was in response to flood attenuation and the needs of Rouse Hill Development Corporation. The site was masterplanned prior to the establishment of Landcom's WSUD policy and the DAs lodged prior to the gazetting of the BASIX Scheme.



The progressive developed land within the Newbury Estate is as follows:

- 61.07 ha developed by end of 2002/2003 including 13,500 sq.m constructed wetland (37.2% of development, 57.4% of treatment options implemented)
- 112.77 ha developed by end of 2003/2004 including an additional 10,000 sq.m constructed wetland (68.7% of development, 100% treatment options implemented)
- 157.7 ha developed by the end of 2004/2005, relating to 45ha civil works done in this period. All civil works completed
- 32 houses were delivered during 2005-06
- 52 homes were built during 2007-08
- 74 homes were built during 2008-09

### WSUD STRATEGY

No civil works undertaken in 2008-09.

### POTABLE WATER MANAGEMENT

The site is served by the Rouse Hill Reclaimed Water system which is used for public and private open space irrigation, and toilet flushing. It is assumed that all of the houses use dual flush toilets as this is now standard practice. All of the houses are built with at least AA rated showerheads as standard.

Landcom and Mirvac have developed a residential design guide for the development, however there is only limited mention of water management. The design guide states that "turfing is required in the front yard as a minimum, and that no more than one third of the front yard is to be paved". It is understood that these features have more to do with amenity than stormwater management. There is no requirement for water efficiency or the inclusion of water efficient species. Despite this and as a result of the reclaimed water system, there is a high percentage reduction in potable mains water as compared to the base case. 91 dwellings were constructed in the 2008-09 year, which were modelled through the BASIX online tool to have a potable water conservation reduction of 49.9.

### STORMWATER MANAGEMENT

Not reported for the 2008-08 TBL Reporting. Stormwater Management for the entire site was determined through the 2004-05 TBL reporting, when the civil works were completed.

### FLOOD ATTENUATION

No civil works undertaken in 2008-09.

### INFORMATION SOURCES

BASIX certificates

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score Coastal
1	Newbury	Lot 75	Separate	3	326	154	47%	382	117%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
2	Newbury	Lot 19 - 19 brackley	Separate	3	365	156	43%	186	51%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
3	Newbury	Lot 21 - 21 kentmere	Separate	3	369	206	56%	155	42%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
4	Newbury	Lot 57 - 57 elmstree	Separate	3	390	180	46%	110	28%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
5	Newbury	Lot 57 - 57 singleton	Separate	3	401	168	42%	173	43%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
6	Newbury	Lot 75 - 75 yarendale	Separate	3	373	206	55%	164	44%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
7	Newbury	Lot 100 - 100 belmont	Separate	3	375	180	48%	146	39%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
8	Newbury	Lot 101 - 101 belmont	Separate	3	375	149	40%	188	50%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
9	Newbury	Lot 7.1-01	Separate	4	408	153	38%	229	56%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
10	Newbury	Lot 7.1-02	Separate	3	349	121	35%	169	48%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
11	Newbury	Lot 7.1-03	Separate	3	300	121	40%	151	50%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
12	Newbury	Lot 7.1-04	Separate	4	371	160	43%	168	45%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
13	Newbury	Lot 7.1-05	Separate	4	555	151	27%	314	57%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
14	Newbury	Lot 7.1-06	Separate	4	484	186	38%	305	63%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
15	Newbury	Lot 7.1-07	Separate	3	326	122	37%	182	56%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
16	Newbury	Lot 7.1-08	Separate	3	421	153	36%	239	57%	0	3	3	3	3	-	Retic	0	√	√	-	-	48
17	Newbury	Lot 7.1-09	Separate	4	369	126	34%	219	59%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
18	Newbury	Lot 56 - 56 singleton	Separate	3	412	175	42%	186	45%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
19	Newbury	Lot 58 - 58 singleton	Separate	3	425	173	41%	196	46%	0	3	3	3	3	-	Retic	0	√	√	-	-	49

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score Coastal
20	Newbury	Lot 59 - 59 singleton	Separate	3	400	149	37%	192	48%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
21	Newbury	Lot 2 - 2 ashtead	Separate	3	332	149	45%	152	46%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
22	Newbury	Lot 7.5-02	Attached	3	288	87	30%	187	65%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
23	Newbury	Lot 3 - 3 ashtead	Separate	3	360	180	50%	137	38%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
24	Newbury	Lot 7.5 -03	Attached	3	227	77	34%	145	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
25	Newbury	Lot 7.5 -04	Attached	3	227	69	30%	145	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
26	Newbury	Lot 7.5 -05	Attached	3	246	67	27%	163	66%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
27	Newbury	Lot 7.5 -06	Attached	3	228	69	30%	146	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
28	Newbury	Lot 7.5 -07	Attached	3	252	67	27%	169	67%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
29	Newbury	Lot 7.5 -08	Attached	3	226	70	31%	144	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
30	Newbury	Lot 7.5 -09	Attached	3	236	67	28%	153	65%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
31	Newbury	Lot 7.5 -10	Attached	3	223	69	31%	142	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
32	Newbury	Lot 7.5 -11	Attached	3	230	67	29%	147	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
33	Newbury	Lot 7.5 -12	Attached	3	214	69	32%	147	69%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
34	Newbury	Lot 7.5 -13	Attached	3	246	67	27%	163	66%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
35	Newbury	Lot 7.5 -14	Attached	3	226	70	31%	145	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
36	Newbury	Lot 7.5 -15	Attached	3	225	67	30%	125	56%	0	3	3	3	3	-	Retic	0	√	√	-	-	52
37	Newbury	Lot 7.5 -16	Separate	3	286	88	31%	183	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
38	Newbury	Lot 7.5 -17	Separate	4	419	156	37%	291	69%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
39	Newbury	Lot 17 - swanley st	Separate	4	450	164	36%	229	51%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
40	Newbury	Lot 7.5 -18	Separate	4	308	159	52%	180	58%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
41	Newbury	Lot 18 - swanley st	Separate	4	450	204	45%	208	46%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
42	Newbury	Lot 7.5 -19	Separate	4	306	160	52%	177	58%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
43	Newbury	Lot 19 - swanley	Separate	4	450	201	45%	213	47%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
44	Newbury	Lot 7.5 -20	Separate	4	378	160	42%	243	64%	0	3	3	3	3	-	Retic	0	√	√	-	-	49

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score Coastal
45	Newbury	Lot 20 - 20 kentmere st	Separate	3	409	200	49%	201	49%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
46	Newbury	Lot 20 - swanley	Separate	4	450	181	40%	308	68%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
47	Newbury	Lot 7.5 -21	Separate	4	466	179	38%	315	68%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
48	Newbury	Lot 7.5 -22	Separate	4	454	151	33%	326	72%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
49	Newbury	Lot 22 - kentmere	Separate	3	375	216	58%	151	40%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
50	Newbury	Lot 7.5 -23	Separate	4	404	169	42%	276	68%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
51	Newbury	Lot 28 swanky	Separate	3	380	148	39%	208	55%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
52	Newbury	Lot 31 Drayton	Separate	3	380	147	39%	194	51%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
53	Newbury	Lot 115 - 36 hunde pl	Separate	3	400	163	41%	183	46%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
54	Newbury	lot 37 Kirk pl	Separate	3	456	163	36%	254	56%	0	3	3	3	3	-	Retic	0	√	√	-	-	48
55	Newbury	lot 41 - Ranford	Separate	3	352	180	51%	144	41%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
56	Newbury	Lot 43 hude pl	Separate	3	419	163	39%	203	48%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
57	Newbury	Lot 55 - singleton	Separate	3	400	180	45%	146	37%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
58	Newbury	Lot 64 - Drayton	Separate	4	501	169	34%	269	54%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
59	Newbury	lot 65 - Drayton	Separate	4	450	175	39%	241	54%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
60	Newbury	Lot 66 Watford	Separate	4	550	201	37%	293	53%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
61	Newbury	Lot 74 - Upton	Separate	3	417	216	52%	190	46%	0	3	3	3	3	-	Retic	0	√	√	-	-	50

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score Coastal
62	Newbury	lot 75 Rawson	Separate	3	417	216	52%	192	46%	0	3	3	3	3	-	Retic	0	√	√	-	-	50
63	Newbury	Lot 80 Sanford	Separate	3	374	206	55%	160	43%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
64	Newbury	Lot 107 Bradford	Separate	3	352	180	51%	146	41%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
65	Newbury	lot 107 Epsom	Separate	3	407	187	46%	278	68%	0	3	3	3	3	-	Retic	0	√	√	-	-	48
66	Newbury	Lot 108 Epsom	Separate	3	403	187	46%	183	45%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
67	Newbury	Lot 114 belmont	Separate	3	375	216	58%	152	41%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
68	Newbury	Lot 114 kenford	Separate	3	390	199	51%	137	35%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
69	Newbury	Lot 115 Aldridge	Separate	3	375	180	48%	166	44%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
70	Newbury	Lot 118 Stanhope	Separate	3	375	216	58%	152	41%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
71	Newbury	Lot 121 elmstree	Separate	3	375	216	58%	149	40%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
72	Newbury	Lot 127 Woodward	Separate	3	369	216	59%	145	39%	0	3	3	3	3	-	Retic	0	√	√	-	-	51
73	Newbury	Lot 6601 swanley	Separate	4	539	177	33%	331	61%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
74	Newbury	Lot 6602 Drayton	Separate	4	539	177	33%	331	61%	0	3	3	3	3	-	Retic	0	√	√	-	-	49
75	Newbury	Lot 72-02	Separate	3	325	113	35%	189	58%	0	3	3	3	3		Retic	0	√	√	-	-	50
76	Newbury	Lot 72-003	Attached	3	251	92	37%	150	60%	0	3	3	3	3		Retic	0	√	√	-	-	52
77	Newbury	Lot 72-004	Attached	3	255	90	35%	154	60%	0	3	3	3	3		Retic	0	√	√	-	-	52
78	Newbury	Lot 72-005	Attached	3	251	93	37%	144	57%	0	3	3	3	3		Retic	0	√	√	-	-	52
79	Newbury	Lot 72-006	Attached	3	256	90	35%	156	61%	0	3	3	3	3		Retic	0	√	√	-	-	52

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score Coastal
80	Newbury	Lot 72-007	Attached	3	253	85	34%	154	61%	0	3	3	3	3		Retic	0	√	√	-	-	52
81	Newbury	Lot 72-008	Attached	3	256	90	35%	150	59%	0	3	3	3	3		Retic	0	√	√	-	-	52
82	Newbury	Lot 72-009	Attached	3	242	93	38%	143	59%	0	3	3	3	3		Retic	0	√	√	-	-	52
83	Newbury	Lot 72-010	Attached	3	252	90	36%	152	60%	0	3	3	3	3		Retic	0	√	√	-	-	52
84	Newbury	Lot 72-011	Attached	3	232	89	38%	116	50%	0	3	3	3	3		Retic	0	√	√	-	-	52
85	Newbury	Lot 72-012	Attached	3	288	110	38%	173	60%	0	3	3	3	3		Retic	0	√	√	-	-	51
86	Newbury	Lot 72-013	Separate	4	448	161	36%	307	69%	0	3	3	3	3		Retic	0	√	√	-	-	50
87	Newbury	Lot 72-014	Separate	4	459	152	33%	293	64%	0	3	3	3	3		Retic	0	√	√	-	-	51
88	Newbury	Lot 72-015	Separate	4	475	138	29%	213	45%	0	3	3	3	3		Retic	0	√	√	-	-	51
89	Newbury	Lot 72-016	Separate	4	502	168	33%	328	65%	0	3	3	3	3		Retic	0	√	√	-	-	49
90	Newbury	Lot 72-017	Separate	4	506	174	34%	329	65%	0	3	3	3	3		Retic	0	√	√	-	-	50
91	Newbury	Lot 72-018	Separate	4	490	126	26%	337	69%	0	3	3	3	3		Retic	0	√	√	-	-	50
				3.3	364.0	146.4	0.4	198.9	0.6	0.0	3.0	3.0	3.0	3.0								49.9

## 8.7 PARK BRIDGE

Park Bridge is a "community surrounded by nature". The development is located near the Liverpool CBD, the M7 motorway and is adjacent to the Western Sydney Parklands. The designer homes and streetscapes are beautifully presented with an amazing array of meticulously maintained luxury community amenities - swimming pool, tennis courts, pocket parks, the BBQ pavilion and landscaped gardens.



Sustainability initiatives within the development include energy efficient hot water systems, gas appliances, low water use appliances and fittings. Recycled water will be connected to the development in the near future and waterwise landscaping is integrated throughout the estate.

The project is being delivered with Mirvac and in the 2008-09 year the area of civil works completed was 11.418ha, comprising 7.852 ha in Stage 1a and 3.566 ha in Stage 1b.

### WSUD STRATEGY

The development has a WSUD strategy

### POTABLE WATER MANAGEMENT

56 dwellings were completed in 2008-09 as outlined in the table below.

### STORMWATER MANAGEMENT

The stormwater management elements of the project were determined in the 2004 JW Prince report Stormwater Management Strategy Southern Hoxton Park Aerodrome Precinct release area, and determined using MUSIC v2. The strategy for water management includes efficient fittings and appliances, as well as recycled water which will be connected once the wastewater treatment plant is fully operational.

Stormwater is treated through a Gross Pollutant Trap (GPT) and then through bioretention raingardens, prior to discharge to a local creek which has been rehabilitated. Originally inlet filter systems were to be used however Council had issues with the maintenance implications and sought to concentrate maintenance to one location hence the GPT unit. The bioretention systems have been designed with a sandy loam bed up to 1m and 200mm of extended detention. The system has been modelled to have the following performance.

Park Bridge	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	7,341.8	616.7	91.6%
Total Phosphorus (kg/yr)	12.9	4.3	66.3%
Total Nitrogen (kg/yr)	99.1	58.0	41.5%
Gross Pollutants (kg/yr)	1,324.5	-	100.0%

### FLOOD ATTENUATION

Flood attenuation is provided by the bioretention systems and flood detention through the site.

### INFORMATION SOURCES

Interview with Nino Bambini, Mirvac

JW Prince (2004). Stormwater Management Strategy Southern Hoxton Park Aerodrome Precinct release area.

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
1	Park Bridge	3-10201	Separate	4	333	163	49%	143	43%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
2	Park Bridge	4-10301	Separate	4	398	163	41%	189	47%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
3	Park Bridge	5-10302	Separate	4	391	162	41%	144	37%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
4	Park Bridge	6-10303	Separate	4	391	173	44%	154	39%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
5	Park Bridge	7-10304	Separate	4	391	167	43%	181	46%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
6	Park Bridge	8-10305	Separate	4	410	167	41%	194	47%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
7	Park Bridge	9-10306	Separate	4	599	250	42%	270	45%	0	3	3	3	4	-	Retic	-	√	√	-	-	46
8	Park Bridge	10-10307	Separate	4	536	250	47%	226	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	47
9	Park Bridge	11-10308	Separate	4	625	179	29%	330	53%	0	3	3	3	4	-	Retic	-	√	√	-	-	45
10	Park Bridge	25-10401	Separate	4	385	163	42%	180	47%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
11	Park Bridge	26-10402	Separate	4	410	173	42%	168	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
12	Park Bridge	27-10403	Separate	4	411	162	39%	192	47%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
13	Park Bridge	28-10404	Separate	4	411	173	42%	171	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
14	Park Bridge	29-10405	Separate	4	470	250	53%	180	38%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
15	Park Bridge	30-10406	Separate	4	470	252	54%	180	38%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
16	Park Bridge	31-10407	Separate	4	520	162	31%	144	28%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
17	Park Bridge	32-10408	Separate	4	560	173	31%	275	49%	0	3	3	3	4	-	Retic	-	√	√	-	-	46
18	Park Bridge	33-10409	Separate	4	513	165	32%	260	51%	0	3	3	3	4	-	Retic	-	√	√	-	-	46
19	Park Bridge	34-10410	Separate	4	378	157	42%	168	44%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
20	Park Bridge	35-10411	Separate	4	356	161	45%	150	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
21	Park Bridge	45-10601	Separate	4	424	160	38%	229	54%	0	3	3	3	4	-	Retic	-	√	√	-	-	47
22	Park Bridge	46-10602	Separate	4	369	160	43%	192	52%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
23	Park Bridge	47-10603	Separate	4	358	161	45%	150	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
24	Park Bridge	70-10901	Separate	4	375	153	41%	168	45%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
25	Park Bridge	71-10902	Separate	4	300	134	45%	132	44%	0	3	3	3	4	-	Retic	-	√	√	-	-	49
26	Park Bridge	72-10903	Separate	4	300	134	45%	132	44%	0	3	3	3	4	-	Retic	-	√	√	-	-	49
27	Park Bridge	73-10904	Separate	4	300	134	45%	132	44%	0	3	3	3	4	-	Retic	-	√	√	-	-	49
28	Park Bridge	74-10905	Separate	4	375	153	41%	168	45%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
29	Park Bridge	76a-10203	Separate	4	223	129	58%	76	34%	0	3	3	3	4	-	Retic	-	√	√	-	-	51
30	Park Bridge	76b-10202	Separate	4	219	124	57%	75	34%	0	3	3	3	4	-	Retic	-	√	√	-	-	51

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
31	Park Bridge	77a-11001	Separate	4	281	125	44%	119	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
32	Park Bridge	77b-11002	Separate	4	266	123	46%	109	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
33	Park Bridge	77c-11003	Separate	4	266	127	48%	110	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
34	Park Bridge	77d-11004	Separate	4	257	124	48%	103	40%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
35	Park Bridge	77e-11005	Separate	4	248	123	50%	96	39%	0	3	3	3	4	-	Retic	-	√	√	-	-	51
36	Park Bridge	77f-11006	Separate	4	263	125	48%	107	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
37	Park Bridge	78a-11007	Separate	4	256	127	50%	103	40%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
38	Park Bridge	78b-11008	Separate	4	253	124	49%	100	40%	0	3	3	3	4	-	Retic	-	√	√	-	-	51
39	Park Bridge	78c-11009	Separate	4	259	124	48%	104	40%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
40	Park Bridge	78d-11010	Separate	4	265	128	48%	108	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
41	Park Bridge	78e-11011	Separate	4	265	127	48%	109	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
42	Park Bridge	78f-11012	Separate	4	265	124	47%	108	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
43	Park Bridge	78g-11013	Separate	4	265	123	46%	108	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
44	Park Bridge	78h-11014	Separate	4	280	125	45%	118	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
45	Park Bridge	Lot 5	Separate	5	391	162	41%	178	46%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
46	Park Bridge	Lot 16	Separate	4	450	274	61%	126	28%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
47	Park Bridge	Lot 17	Separate	3	375	213	57%	128	34%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
48	Park Bridge	Lot 18	Separate	3	375	215	57%	97	26%	0	3	3	3	4	-	Retic	-	√	√	-	-	49
49	Park Bridge	Lot 26	Separate	5	410	173	42%	168	41%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
50	Park Bridge	Lot 33	Separate	5	513	201	39%	260	51%	0	3	3	3	4	-	Retic	-	√	√	-	-	46
51	Park Bridge	Lot 47	Separate	5	356	161	45%	150	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
52	Park Bridge	Lot 70	Separate	4	375	153	41%	168	45%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
53	Park Bridge	Lot 74	Separate	4	375	189	50%	177	47%	0	3	3	3	4	-	Retic	-	√	√	-	-	48
54	Park Bridge	Lot 77A	Separate	4	281	124	44%	119	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
55	Park Bridge	Lot 78C	Separate	3	259	138	53%	104	40%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
56	Park Bridge	Lot 78H	Separate	4	280	125	45%	118	42%	0	3	3	3	4	-	Retic	-	√	√	-	-	50
				4.0	363.0	160.4		154.4		0.0	3.0	3.0	3.0	4.0								48.6

## 8.8 PARK CENTRAL

Park Central is located in the heart of Campbelltown CBD within the Campbelltown LGA. The site has a total area of approximately 37 ha with a lot equivalent of 404. The site is bounded by Macarthur shopping centre, the Campbelltown Hospital and the Campbelltown Catholic Club. The site is relatively steep with slopes of up to 14% and elevations ranging from RL 109 in the south west corner to RL77 in the north east of the site adjacent the parkland. In 2008-09 the civil works for stage 5 was completed with a total area of 6.2ha, including a Buffer zone / bushland of 1.5ha, residential area of 3.2ha, and roads of 1.5ha.



### WSUD STRATEGY

A hydrology and hydraulics report was prepared by PPK in 2001, and the scheme includes the construction of a series of wetlands within Marsden Park to treat both the upstream catchment as well as the development. Ecological Engineering has developed a WSUD Strategy for Precincts 4-6, so that that portion of the development meets best practice targets.

### POTABLE DEMAND MANAGEMENT

15 allotments with 20 dwellings were constructed in the 2008-09 year, as outlined in the table below.

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
1	Park Central	Wincrest 409	Separate	4	368	245	67%	105	29%	25	3	3	3	3	-	2500	245	√	√	-	-	40
2	Park Central	Wincrest 410	Separate	3	376	268	71%	105	28%	105	3	3	3	3	-	2500	268	√	√	-	-	44
3	Park Central	Wincrest 411	Separate	4	376	268	71%	105	28%	105	3	3	3	3	-	2500	268	√	√	-	-	43
4	Park Central	Wincrest 412	Separate	4	376	268	71%	105	28%	105	3	3	3	3	-	2500	268	√	√	-	-	43
5	Park Central	Lot 426	Separate	4	333	155	47%	179	54%		3	4	3	3	-	6000	155	√	√	√	-	42
6	Park Central	Lot 444/1	Separate	4	458	219	48%	161	35%	48	3	3	3	3	-	4000	218	√	√	√	-	41
7	Park Central	Lot 444/2	Separate	1				11		11	3	3	3	3	-						√	√
8	Park Central	Lot 445	Separate	3	450	196	44%	190	42%	10	3	3	3	3	-	4000	196	√	√	√	-	40
9	Park Central	Lot 446	Separate	3	450	196	44%	190	42%	10	3	3	3	3	-	4000	196	√	√	√	-	41
10	Park Central	Lot 447	Separate	4	450	218	48%	155	34%	0	3	3	3	3	-	3000	217	√	√	-	-	40
11	Park Central	Lot 451/1	Separate	4	508	244	48%	179	35%	179	3	3	3	3	-	2500	218	√	√	-	-	46
12	Park Central	Lot 451/2	Separate	1				38		38	3	3	3	3	-						√	√
13	Park Central	Lot 453	Separate	4	476	164	34%	286	60%	268	3	3	3	3	-	6000	55	√	√	√	-	40
14	Park Central	Lot 454	Separate	4	476	194	41%	271	57%	271	3	3	3	3	-	4500	55	√	√	√	-	40
15	Park Central	Lot 455/1	Separate	4	649	243	37%	280	43%	280	3	3	3	3	-	2500	267	√	√	-	-	40
16	Park Central	Lot 455/2	Separate	2				80		80	3	3	3	3	-						√	√
17	Park Central	Lot 416	Separate	4	437	257	59%	172	39%	0	3	3	3	3	-	3000	257	√	√	√	-	40
18	Park Central	Lot 448	Separate	4	450	166	37%	171	38%	0	3	3	3	3	-	4000	166	√	√	√	-	40
19	Park Central	Lot 450/1	Separate	4	497	244	49%	55	11%	0	3	3	3	3	-	2500	154	√	√	√	-	40
20	Park Central	Lot 450/2	Separate	2				6		0	3	3	3	3	-						-	-
	Park Central			3	446	222	1	142	0	81	3	3	3	3		3500	200					41.4

## STORMWATER MANAGEMENT

The overall water cycle management scheme concept was conceived through PPK's 2001 report. The stormwater management on-site is complex, with a series of wetlands and ponds built to treat runoff both from the development and from the 250ha upstream catchment. Stormwater run-off from stage 4 is treated by a linear bioretention-swale system located along the road downhill of the site. These swales were designed to meet best practice and Landcom targets of pollutant removal. Treated water from the bioretention-swale is discharged to the wetland and additional further treatment is provided downstream by this wetland. Removal rates are reported in the following table.

Park Central	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	6,846.4	1,615.8	76%
Total Phosphorus (kg/yr)	13.9	6.5	53%
Total Nitrogen (kg/yr)	100.4	76.8	24%

## FLOW ATTENUATION

The wetland / pond system acts as an effective flow attenuation system.

## INFORMATION SOURCES

Communication with Bill Mutton

PPK Environment and Infrastructure (2001) Link Area Stormwater Strategy Campbelltown – Final Hydrology/Hydraulics Report – Business Land Group.

Storm Consulting (2002) Campbelltown Link Area – Wetland Strategy Review – Final Report.

## 8.9 REDGUM

Landcom have partnered with Cosmopolitan developers to develop the Red Gum site at St Mary's. A feature of the development is the preservation and enhancement of the natural environment, including the retention of mature red gum trees on site. Civil works were completed for the development in 2008-09. 12 houses were constructed in the 2008-09 year, and are reported below.



### WSUD STRATEGY

No civil works undertaken in 2008-09.

### STORMWATER MANAGEMENT

No civil works undertaken in 2008-09.

### FLOW ATTENUATION

No civil works undertaken in 2008-09.

### INFORMATION SOURCES

Communication with Cara Peterie.

## POTABLE WATER MANAGEMENT

12 dwellings were constructed during the 2008-09 year. The BASIX Certificates are summarised in the following table.

No	Development	Project Name	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
1	Redgum	Lot 6	Separate	3	210	121	58%	110	52%	20	3	4	5	5	-	3000	120	√	√	-	-	41
2	Redgum	Lot 36	Separate	3	220	121	55%	130	59%	0	3	4	3	3	-	3000	121	√	√	√	-	40
3	Redgum	Lot 34	Separate	3	435	177	41%	220	51%	50	3	3	3	3	-	3000	176	√	√	√	-	41
4	Redgum	Lot 35	Separate	3	259	121	47%	103	40%	0	3	4	3	3	-	3000	121	√	√	√	-	41
5	Redgum	Lot 33	Separate	4	438	163	37%	230	53%	50	3	30	3	3	-	3000	160	√	√	√	-	41
6	Redgum	Lot 7	Separate	3	396	121	31%	260	66%	50	3	4	5	5	-	3000	120	√	√	√	-	40
7	Redgum	Lot 26	Separate	4	354	112	32%	203	57%	59	3	4	5	5	-	3000	84	√	√	√	-	40
8	Redgum	Lot 8	Separate	2	230	84	37%	100	43%	20	3	3	3	3	-	3000	84	√	√	√	-	40
9	Redgum	Lot 27	Separate	4	294	83	28%	136	46%	42	3	4	5	5	-	3000	62	√	√	√	-	40
10	Redgum	Lot 25	Separate	4	377	106	28%	217	58%	83	3	4	5	5	-	3000	80	√	√	√	-	40
11	Redgum	Lot 24	Separate	4	376	112	30%	220	59%	77	3	4	5	5	-	3000	84	√	√	√	-	40
12	Redgum	Lot 23	Separate	4	294	83	28%	173	59%	76	3	4	5	5	-	3000	62	√	√	√	-	40
				3	324	117	36%	175	54%	44	3	6	4	4		3000	106					40

## 8.10 ROUSE HILL

The New Rouse Hill is a masterplanned community being developed in the Baulkham Hills Shire, 39 km north-west of the Sydney CBD. The 122 ha site will accommodate 1800 dwellings. 34 ha of the site has been allocated to parks and open space, which much of this located near Caddies Creek, a central focus of the community. The civil works for 120 lots in the Southern Precinct were completed in the 2007 - 08 TBL reporting year and 120 dwellings were built.

The New Rouse Hill is a collaboration between GPT, Lend Lease, The Department of Planning and Landcom.

### WSUD STRATEGY

A WSUD strategy has been developed for the site by Patterson Britten and Partners (2005).

### STORMWATER MANAGEMENT

No civil works were undertaken in 2008-09 with all civil works completed in 2007-08. Stormwater runoff from the New Rouse Hill development is treated by bioretention systems, wetland sand residual treatment in ponds prior to Caddies Creek. The water quality results relate to the benefits from the Rouse Hill Southern Precinct. Results of the modelling shown in the table below indicate that the mean annual reduction of TSS and TP meets best practice while that of TN is below best practice.

Rouse Hill Southern Residential Precinct			
Parameter	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	23,490.9	1,879.3	92
Total Phosphorus (kg/yr)	49.2	15.2	69
Total Nitrogen (kg/yr)	341.1	201.2	41

### FLOW ATTENUATION

No civil works were completed in 2008-09. Flow attenuation is facilitated by bioretention systems and detention basins.

### INFORMATION SOURCES

Communication with Nick Lennon and Cara Peterie (Landcom),

BASIX certificates

Patterson Britton and Partners (2005) Rouse Hill Regional Centre Southern Residential Precinct Plan Water Sensitive Urban Design Report. Issue No. 1. October 2005. For Lend lease.

## POTABLE WATER MANAGEMENT

The average BASIX score for the 7 dwellings built was 42. All of the New Rouse Hill dwellings have dual reticulation plumbing to allow for the supply of recycled wastewater from the Rouse Hill wastewater treatment facility. The recycled water is used to supply water for toilet flushing in the apartments and also irrigation where dwellings have a garden. BASIX data is summarised in the following tables.

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score Coastal
1	Rouse Hill	Lot 51/1	Attached	3	1299	682	53%	104	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
2	Rouse Hill	Lot 51/2	Attached	3				57	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
3	Rouse Hill	Lot 51/3	Attached	3				53	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
4	Rouse Hill	Lot 51/4	Attached	3				57	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
5	Rouse Hill	Lot 51/5	Attached	3				53	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
6	Rouse Hill	Lot 51/6	Attached	3				57	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
7	Rouse Hill	Lot 51/7	Attached	3				89	0%	0	3	4	3	3	-	Retic GW	0	√	√	-	-	42
				3	1299	682	1	67	0	0	3	4	3	3								42

## 8.11 THE PONDS - SECOND PONDS CREEK STAGE 1 AND STAGE 2

Landcom has partnered with Australand to develop an area known as The Ponds near Kellyville Ridge in north-western Sydney. A prominent feature of the site is the nature corridor winding through the middle of the development. This corridor makes up 80 ha of the 390 ha site.



The area of civil works developed in 2008-09 includes:

Precinct	Lots	Residential (m <sup>2</sup> )	Roads (m <sup>2</sup> )	Open Space (m <sup>2</sup> )	Total (m <sup>2</sup> )
Stage 1 - Precinct 1E	34	16,908	4,142	5,241	26,291
Stage 1 - Precinct 1D	11	5,424	0	0	5,424
Stage 1 - Precinct 3	117	74,698	0	0	74,706
Stage 2 - Precinct 2	12	253,317	45,700	21,640	320,657
Stage 2 - Precinct 3	80	41,095	14,020	0	55,115
TOTAL	263	391,442	63,862	26,881	482,193

### WSUD STRATEGY

There is a WSUD strategy that has been developed for the site. The WSUD strategy for the site was developed by Ecological Engineering

### POTABLE WATER MANAGEMENT

No dwellings were constructed in 2008-09.

## STORMWATER MANAGEMENT

Civil works for 48.2Ha of developed areas, including 10.6ha in Stage 1 and 37.6ha in Stage 2, is treated by swales, and bioretention systems. Although water quality in stormwater for the whole site was modelled, the results presented here comprise the loads from the 2007-08 civil works area only, related to the performance of the whole system. Results of the modelling shown in the table below indicate that the mean annual reduction of all pollutants (TSS, TP, TN) meets best practice.

The Ponds Stage 1			
Parameter	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	4,700.3	658	86
Total Phosphorus (kg/yr)	9.8	3.5	64
Total Nitrogen (kg/yr)	68.6	26.1	62

The Ponds Stage 2			
Parameter	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	16,761.4	3,352.3	80
Total Phosphorus (kg/yr)	35.1	19.3	45
Total Nitrogen (kg/yr)	246.7	135.7	45

## FLOW ATTENUATION

Flow attenuation is provided by source control, swales, bioretention systems and detention basins

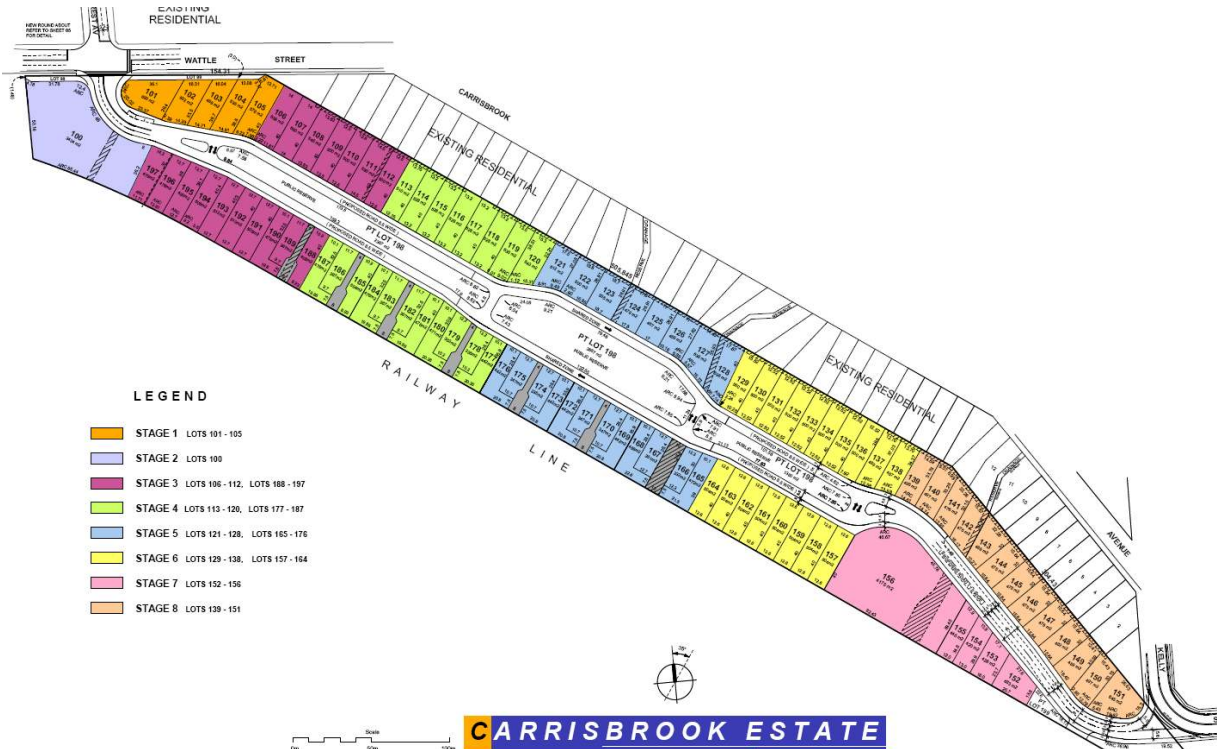
## INFORMATION SOURCES

Communication with Paul Neville, Jey Mahendra, and Cara Peterie BASIX certificates.

## 8.12 WATERFORD

The Waterford site is located adjacent to the Bankstown railway line in Punchbowl, in the Bankstown LGA. The 8ha site has a development of 119 lots, of which 24 are attached, 72 detached and 23 townhouses. Consent for the Master Plan for Waterford was received in March 2002, to operate from August 2003. This led to the civil works, which were completed in 2004-05. Landcom is constructing the housing with AV Jennings.

15 dwellings were completed in 2008-09.



### WSUD STRATEGY

No civil works undertaken in 2008-09.

### STORMWATER MANAGEMENT

Not reported for the 2008-09 TBL Reporting. Stormwater Management for the entire site was determined through the 2004-05 TBL reporting, when the civil works were completed.

### FLOW ATTENUATION

No civil works undertaken in 2008-09.

### INFORMATION SOURCES

Connell Wagner (2003), Carrisbrook Estate Punchbowl, Civil Works, for construction. A3 plans of civil works on site.

BASIX Certificates for Waterford.

### POTABLE WATER MANAGEMENT

Fifteen houses were built in 2008-09. These houses had an average BASIX score of 40.3. All houses were fitted with 3A and 4A rated fittings for showers, toilets and taps and all houses have rainwater tanks to supply water to be used for toilet flushing, clothes washing and irrigation. BASIX data is summarised in the following table.

No	Development	Lot	Dwelling Type	Beds	Site Area (m <sup>2</sup> )	Roof Area (m <sup>2</sup> )	Roof Area (%)	Garden & Lawn (m <sup>2</sup> )	Garden & Lawn (%)	Indigenous Vegetation (m <sup>2</sup> )	Shower heads	Toilets	Kitchen Taps	Bathroom Taps	CW / DW	Supplementary Supply	Roof Area (m <sup>2</sup> ) to tank	Garden & Lawn	Toilets	Laundry	All Hot	BASIX Score - Coastal
1	Waterford	Lot 603	Separate	5	610	183	30%	382	63%	0	3	4	3	3	-	3000	1200	√	√	√	-	45
2	Waterford	Lot 604	Separate	5	610	183	30%	381	62%	0	3	4	3	3	-	3000	120	√	√	√	-	40
3	Waterford	Lot 605	Separate	5	576	178	31%	361	63%	0	3	4	3	3	-	3000	120	√	√	√	-	40
4	Waterford	Lot 606	Separate	5	610	183	30%	383	63%	0	3	4	3	3	-	3000	120	√	√	√	-	40
5	Waterford	Lot 607	Separate	5	572	178	31%	352	62%	0	3	4	3	3	-	3000	100	√	√	√	-	40
6	Waterford	Lot 608	Separate	5	568	183	32%	328	58%	0	3	4	3	3	-	3000	100	√	√	√	-	40
7	Waterford	Lot 609	Separate	5	532	183	34%	307	58%	0	3	4	3	3	-	3000	90	√	√	√	-	40
8	Waterford	Lot 610	Separate	4	499	172	34%	305	61%	0	3	4	3	3	-	3000	100	√	√	√	-	40
9	Waterford	Lot 611	Separate	4	500	161	32%	330	66%	0	3	4	3	3	-	3000	100	√	√	√	-	40
10	Waterford	Lot 612	Separate	4	470	143	30%	296	63%	0	3	4	3	3	-	3000	100	√	√	√	-	40
11	Waterford	Lot 613	Separate	4	500	143	29%	323	65%	0	3	4	3	3	-	3000	100	√	√	√	-	40
12	Waterford	Lot 614	Separate	4	500	148	30%	308	62%	0	3	4	3	3	-	3000	100	√	√	√	-	40
13	Waterford	Lot 615	Separate	4	470	143	30%	298	63%	0	3	4	3	3	-	3000	100	√	√	√	-	40
14	Waterford	Lot 616	Separate	4	500	161	32%	331	66%	0	3	4	3	3	-	3000	100	√	√	√	-	40
15	Waterford	Lot 617	Separate	4	501	172	34%	306	61%	0	3	4	3	3	-	3000	100	√	√	√	-	40
				4	535	168	0	333	1	0	3	4	3	3		3000	177					40.3

### 8.13 VANTAGE - CORLETTE

Vantage, Corlette is surrounded by bushland, and within the thriving Nelson Bay's CBD. The development is close to Bagnalls Beach, and brings a new standard of community living to Port Stephens, integrating a unique blend of housing with open public reserves, cycleways and meandering walking tracks.

In the 2008-09 year civil works for precincts 22 and 29 were completed, comprised of 4.1ha residential, 1.4ha of open space and 3ha of roads, for a total of 8.6ha.



#### WSUD STRATEGY

There is a WSUD strategy that has been developed for the site. The WSUD strategy for the site was developed by Ecological Engineering.

#### POTABLE WATER MANAGEMENT

No dwellings were completed by Landcom for the development and therefore there are no BASIX certificates for assessment.

#### STORMWATER MANAGEMENT

The stormwater management strategy was developed to meet the Landcom targets and is being implemented now. The results of the modelling for the bioretention swales, wetland and detention basin are in the following table.

Vantage	Inflow	Outflow	% Reduction
Total Suspended Solids (kg/yr)	9,322.0	1,864.4	80%
Total Phosphorus (kg/yr)	21.4	11.8	60%
Total Nitrogen (kg/yr)	156.0	85.8	45%

#### FLOW ATTENUATION

Flow attenuation is provided detention basins, wetlands and bioretention systems.

#### INFORMATION SOURCES

Communication with John Sorby (Landcom) and Paul Mather (DMS Survey).