



# Deemed to Comply Worked Solutions and Examples – Stormwater Quality Management (South East Queensland)

Version 1.0 - May 2010

**waterbydesign**

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Water by Design welcomes feedback on this publication which can be directed to:

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## Water by Design

The Water by Design program was established in 2005 and is a program of the South East Queensland Healthy Waterways Partnership. Water by Design builds the capacity of the water and urban development sectors to help successfully implement sustainable urban water management in South East Queensland. Sustainable management of the urban water cycle supports sustainable development, including protection of the natural water cycle. Water by Design is not limited to urban stormwater management — it also promotes integrated management of potable water, wastewater and stormwater.

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# 1 Deemed to Comply Worked Solutions and Examples

*The Deemed to Comply Worked Solutions and Examples – Stormwater Quality Management (South East Queensland)* provide 12 solutions for four (4) common development scenarios. To support this document, six (6) Worked Solutions and Examples have been developed to illustrate the implementation of the Solutions for different development scenarios using various climatic regions in South-East Queensland. These are represented in *Deemed to Comply Worked Solutions and Examples – Stormwater Quality Management (South East Queensland)* by four (4) “Worked Solutions” and two (2) “Worked Examples” as outlined below.

- **Worked Solutions:** Four (4) Worked Solutions have been developed for common development scenarios in accordance with the *Deemed to Comply Solutions* that illustrate the level of detail that would be required to be provided in order to deliver a compliant Solution to accompany a development application. These Worked Solutions demonstrate the application of Deemed to Comply Solutions to development scenarios that trigger the Department of Infrastructure and Planning’s (DIP) *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design*.

- WS1: Residential greater than 2 lots up to 20 lots – Deemed to Comply Solution R1 (Bioretention/ Rainwater Tanks)
- WS2: Residential greater than 2 dwellings (Townhouse style up to 2 storeys)  $\leq 12,500 \text{ m}^2$  – Deemed to Comply Solution R5 (Bioretention/ Rainwater Tanks)
- WS3: Residential High Density multiple dwelling apartments (flat, high rise)  $\leq 12,500 \text{ m}^2$  – Deemed to Comply Solution R9 (Bioretention)
- WS4: Industrial development  $\leq 12,500 \text{ m}^2$  – Deemed to Comply Solution I1 (Bioretention)

- **Worked Examples:** Two (2) Worked Examples have been developed to illustrate appropriate solutions for common development types which do not trigger the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009). These Worked Examples provide guidance on how water sensitive urban design (WSUD) could be practically delivered for common development types falling outside of the Deemed to Comply Solution development scenarios.

- WE1: Residential Subdivision 1 into 2 lots
- WE2: Rural Residential Subdivision

#### Notes:

1. The Worked Solutions are based on actual development applications.
2. The Local Government authorities and climatic regions which apply to the actual applications have been identified to demonstrate the practical application of the Solutions.
3. Where assessment authorities specify stricter triggers than those outlined in the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) those authorities may elect to apply the “Worked Examples” as “Worked Solutions”.
4. The Worked Solutions and Examples developed in this document have derived bioretention systems as the vegetated stormwater management elements. The scale of the Deemed to Comply Solutions developed here are such that for constructed wetlands to work in the urban design (given their larger footprint), highly innovative (and thus non-standard) designs would typically be required.

## 2 Deemed to Comply Worked Solutions

Four (4) Worked Solutions have been developed for common development scenarios in accordance with the *Deemed to Comply Solutions* that illustrate the level of detail that would be required to be provided in order to deliver a compliant Solution to accompany a development application. These Worked Solutions demonstrate the application of Deemed to Comply Solutions to development scenarios that trigger the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009)

WORKED SOLUTION	DEVELOPMENT SCENARIO	DEEMED TO COMPLY SOLUTION*		CLIMATIC REGION AND TREATMENT SIZE		SEQ RP IG7 TRIGGERED
		ID	DESCRIPTION	CLIMATIC REGION	TREATMENT AREA %**	
WS1	Residential greater than 2 lots up to 20 lots	R1	Bioretention / Rainwater Tanks	SEQ – South Coast	1.3	Yes
WS2	Residential greater than 2 dwellings (Townhouse style up to 2 storeys) ≤12,500 m <sup>2</sup>	R5	Bioretention / Rainwater Tanks	SEQ – South Coast	1.3	Yes
WS3	Residential high density multiple dwelling apartments (flat, high rise) ≤12,500 m <sup>2</sup>	R9	Bioretention	SEQ – North Coast	2.1	Yes
WS4	Industrial development ≤12,500 m <sup>2</sup>	CI1	Bioretention	SEQ - Central Region	1.6	Yes

\* refer *Deemed to Comply Solutions - Stormwater Quality Management (South East Queensland)* for further information

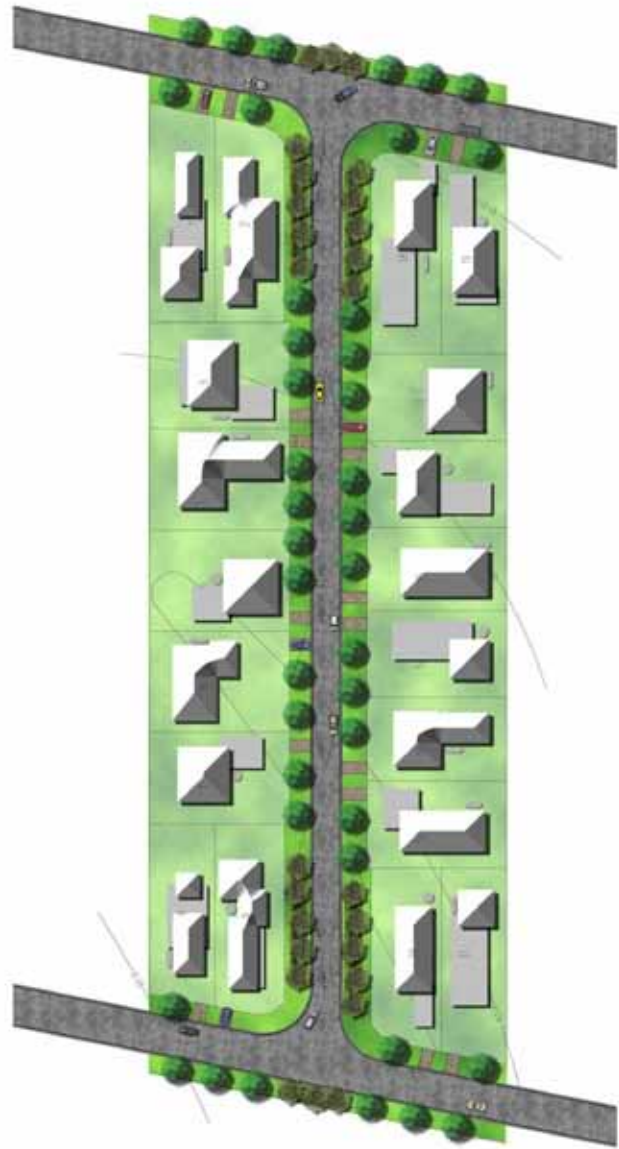
\*\* treatment area % refers to percentage of total developed catchment area

## 2.1 Worked Solution 1 (WS1)- Residential greater than 2 lots up to 20 lots

### 2.1.1 Description

The subject site is a small greenfield site located in the outer northern suburbs of the Gold Coast (Pimpama). The site comprises 1.62 ha of land with flat topography (typically <1% across the site). Land to the south of the site has already been developed into medium density allotments and the site is connected to this development with roads and existing stormwater pipes.

The subject site (Pimpama Road) is proposed to be subdivided into 19 residential lots and a new public road (Figure 1). As there are greater than 6 lots and the estimated impervious percentage for the proposed development is greater than 25%, the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) is triggered. Given that the site comprises less than 20 residential lots, the WSUD specialist has adopted a deemed to comply solution for the site in order to simplify the reporting and approvals process for the stormwater management component of the development application.



**Figure 1 - Proposed development layout for Pimpama Road**

## 2.1.2 WSUD Strategy and Deemed to Comply Solution

The site is not plumbed to a source of recycled water, therefore rainwater tanks are required to be delivered across the site in accordance with the *Queensland Development Code* (QDC) MP 4.2 (Water Savings Targets). In accordance with the requirements of the Deemed to Comply Solutions, overflows from rainwater tanks are to be delivered into the downstream treatment system (bioretention basins).

In terms of stormwater quality requirements, the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) is triggered and the stormwater pollutant load reduction objectives for South East Queensland (South Coast) apply to the site. The pollutant load reduction objectives for the South East Queensland (South Coast) climatic region are: 80% reduction in Total Suspended Solids, 60% reduction in Total Phosphorous and 45% reduction in Total Nitrogen.

Given the flat nature of the site and limited opportunity to deliver piped flows onto the surface of end-of-pipe treatment measures, two stormwater treatment options were considered: to intercept stormwater at-surface in shallow bioretention basins (Solution R1), or use constructed wetlands (Solution R3). Climatic conditions in South East Queensland (South Coast) dictate that for a development of this type, a constructed wetland would need to be sized at 5% of the catchment area or approximately 1,000 m<sup>2</sup> in order to comply with Solution R3. The design team opted for at-source bioretention treatment as the stormwater treatment measure for the site (Solution R1) in order to reduce the WSUD footprint on a space-constrained site.

In accordance with the Deemed to Comply Solutions, the filter media area of the bioretention pods were sized at 1.3% of the catchment area and integrated into the road reserve to accept runoff directly from the kerb (Figure 2).

There are a number of implications for urban and road design that need to be considered at the conceptual design stage. Figure 2 highlights some of the key urban and road design considerations when bioretention pods are employed in the streetscape. Refer "Best Planning Practice 2" (Flat Sites) in the *Concept Design Guidelines for Water Sensitive Urban Design* (Water by Design, 2009) for further guidance.

### Legend

- Rainwater Tanks
- Bioretention Basins
- Bioretention Batters

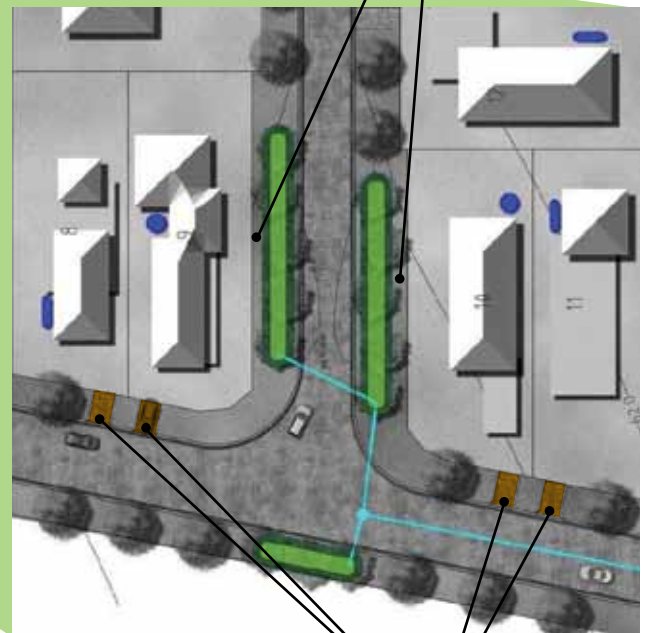
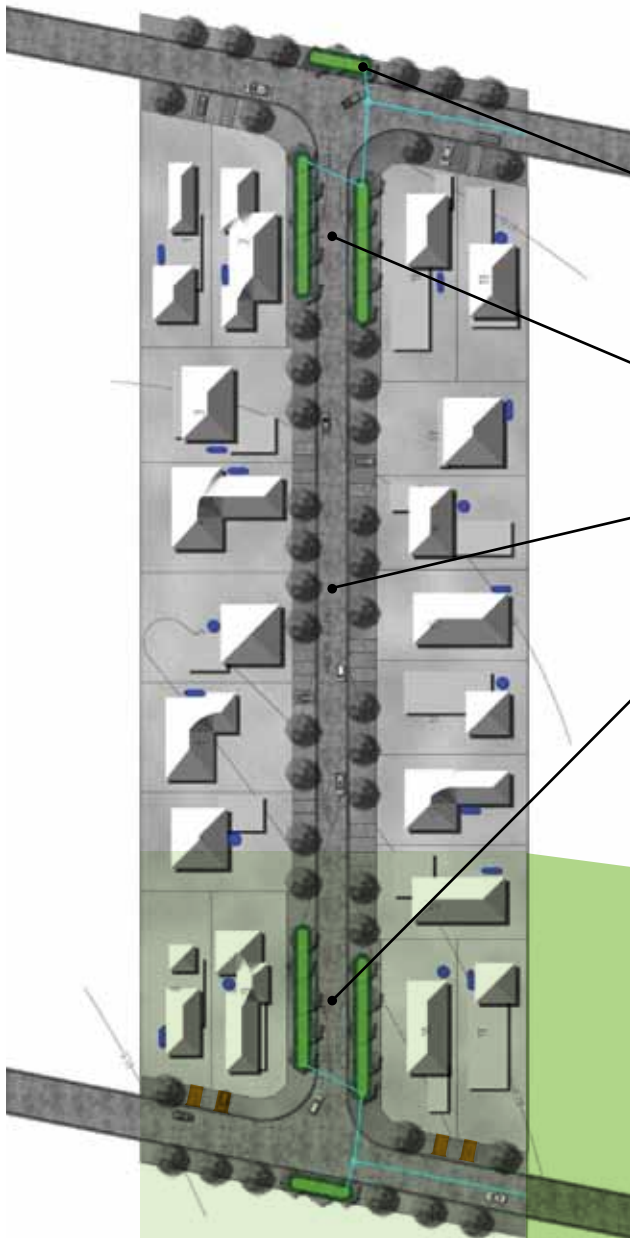
### Designing Bioretention Pods in Urban Streetscapes

In order for at-source bioretention systems ('bioretention pods') to work in the urban and road design, the design team needed to make a number of small modifications to a standard road and urban design.

**T-intersection pod:** End of street bioretention pod can be achieved by either locally widening the road reserve or using a curved T-intersection. This also has the advantage of providing traffic calming.

**Road Design:** sags and high points in the road need to be positioned to ensure that appropriate catchments are delivered to the pods (via the correctly located kerb inlet) while preserving flow depths/widths in the roads (refer QUDM)

**Services:** Adequate space needs to be provided for services and footpaths in the road reserves (in accordance with local standards). This can be achieved by locally widening the road reserve adjacent to the pods by narrowing the re-aligned lots by approx 0.5-1m on each side and aligning the adjacent lots parallel to the biopods.



**Access into end lots:** The lots at the ends of the streets are rotated so that the driveways are oriented towards the collector road to allow access.

### 2.1.3 Development Application Documentation

The following documents and drawings have been developed to support the development application for the Deemed to Comply Solution R1:

- Deemed to Comply Solutions Development Assessment Checklist for Queensland (DA-DTC-WS1)
- Site Details Plan (Drawing SDP-WS1)  
Development Details Plan (Drawing DDP-WS1)
- Stormwater Measure Conceptual Plan (Drawing SCP-WS1)
- Stormwater Measure Conceptual Sections (Drawing SCS-WS1)

# Development Assessment Checklist

## Summary of Development and Deemed to Comply Solution

### DEVELOPMENT ADDRESS

Development application ID	DA-DTC-S1
Project name	Pimpama Road
Applicant's name	Pimpama Developments
Street address	Pimpama-Jacobs Well Road
Suburb	Pimpama
Postcode	4209
Local Government Area	Gold Coast City Council
Climatic region	South East Queensland – South Coast

### DEVELOPMENT TYPE & DETAILS

Development type (e.g. residential detached dwellings)	Residential (detached dwellings) greater than 2 lots up to 20
Number of dwellings/buildings	19
Site area (m <sup>2</sup> )	16,200 m <sup>2</sup>
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	Typical 250m <sup>2</sup>

### DEEMED TO COMPLY SOLUTION

Deemed to Comply Solution ID	R1
Rainwater tank volume (kL) (for detached dwellings tank volume per dwelling kL/dwelling)	5kL/dwelling
Bioretention area* (m <sup>2</sup> )	211 m <sup>2</sup> (1.3%)
Constructed wetland area** (m <sup>2</sup> )	N/A
Total footprint of bioretention or wetland system(s) (m <sup>2</sup> )	680 m <sup>2</sup>

\* Refers to the bioretention system filter media area

\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Steps 1 to 3**

## STEP 1: DEVELOPMENT LOCATION AND CLIMATE REGION

Project name	Pimpama Road
Street address	Pimpama-Jacobs Well Road
Suburb	Pimpama
Postcode	4209
Local Government Area	Gold Coast City Council
Climatic region (Figure 2 and A-2, Appendix A)	South East Queensland – South Coast

## STEP 2: DETERMINE DEVELOPMENT TYPE

Development type (e.g. residential detached dwellings)	Residential (detached dwellings) greater than 2 lots up to 20
Number of dwellings/buildings	19
Site area (m <sup>2</sup> )	16,200 m <sup>2</sup>

## STEP 3: DEFINE SITE DETAILS

Site Details Plan (scaled annotated)	
Plan ID	SDP-S1
Existing topography (Yes/No)	YES
Existing drainage characteristics upstream, within, and downstream of site (including catchment areas)	YES – catchments, drainage paths and areas shown on SDP-001
Proposed discharge points and the downstream drainage size and invert levels (or ponded water levels) (Yes/No)	YES - Existing stormwater pipes and invert levels shown.
Existing vegetation and vegetation to be retained (Yes/No)	YES – As shown on SDP-001 there is no existing vegetation on the site.
Soil evaluation in accordance with AS/NZS 1547:2000 Clause 4.1.3 if necessary (Yes/No)	NO (exfiltration from base of system not proposed)

### General comments (where required)

**Topography:** The site has a ridge which runs from the SW to the NE at RL 62.0. The topography grades gently (approx 1%) from the ridge to the NW and SE corners of the site. Refer Site Details Plan (SDP-WS1) for details.

**Drainage:** Drainage occurs generally from the centre of the site to the NW and SE corners of the site via sheet flows. No formal channels, creeks or waterways are present on the site to convey stormwater flows. There are existing stormwater pipes that convey upstream stormwater flows to the southern site boundary (refer Drawing SDP-WS1 for details).

**Vegetation:** As shown on the Site Details Plan (SDP-WS1), there are a number of trees existing on the site. None of these have been noted as significant and will be removed.

# Development Assessment Checklist **Step 4**

## STEP 4: OUTLINE DEVELOPMENT DETAILS

Development area (m <sup>2</sup> )	16,200 m <sup>2</sup>
<b>Private land</b>	
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	4,750 m <sup>2</sup> (250 m <sup>2</sup> per dwelling assumed)
Road reserve, driveway or parking (m <sup>2</sup> )	380 m <sup>2</sup> (20 m <sup>2</sup> driveway per lot assumed)
Pavement area (m <sup>2</sup> ) *	760 m <sup>2</sup> (40 m <sup>2</sup> per lot assumed as patio/path)
Easements (services or drainage) (m <sup>2</sup> )	-
Landscape area (m <sup>2</sup> )	4,410 m <sup>2</sup> (approx 240 m <sup>2</sup> per lot assumed)
Other areas (m <sup>2</sup> )	-
Area available for stormwater treatment (may be part of landscape area) (m <sup>2</sup> ) *	-
<b>Public land (ultimately owned by local authority)</b>	
Road reserve (m <sup>2</sup> )	5,900 m <sup>2</sup>
Parkland (m <sup>2</sup> )	-
Easement (services or drainage) (m <sup>2</sup> )	-
Other areas (m <sup>2</sup> )	-
Space available for stormwater treatment (may be part of landscape area)* (m <sup>2</sup> )	Within road reserves.
<b>Development Details Plan (scaled annotated plan)</b>	
Plan ID	DDP-S1
Development layout clearly depicted with land type areas (Yes/No)	YES
Catchment areas defined with ID (Yes/No)	YES
Conceptual earthworks provided including finished levels (Yes/No)	YES
Conceptual drainage layout and inverts levels (Yes/No)	YES
Existing/proposed infrastructure layout and invert levels (required to demonstrate no conflict with treatment measures)** (Yes/No).	
<b>General comments</b>	

\* Designers should consult with the project landscape architect to check which landscape areas are available for stormwater treatment. Local government standards should also be checked to ensure areas proposed for treatment will not be required to feature incompatible plantings (e.g. large trees).

\*\* Infrastructure may include (sewer, power, water, gas etc). Any infrastructure which may impact on location or drainage of treatment measures should be considered. External infrastructure which has the potential to influence location or drainage of treatment measures should also be shown.

# Development Assessment Checklist **Step 5**

## STEP 5: CONFIRM RAINWATER TANK REQUIREMENTS (QUEENSLAND DEVELOPMENT CODE)

Are rainwater tanks to be installed (Yes/No)?	YES				
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	Min. 100m <sup>2</sup> per dwelling (min. 1,900m <sup>2</sup> total) as required by QDC				
Total rainwater tank volume (kL or kL per dwelling)	5kL per dwelling (min. 95kL total) as required by QDC				
Connections (i.e. toilets, external, washing machine, pool)	Toilets, cold laundry, external/pool				
Overflow from the rainwater tanks to be directed to stormwater treatment measures* (Yes/No)?	YES				
Rainwater tanks per catchment	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Number of tanks per catchment	10	9			
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	2,500 m <sup>2</sup> (100 m <sup>2</sup> per dwelling)	2,250 m <sup>2</sup> (100 m <sup>2</sup> per dwelling)			
Tank volume (kL or kL per dwelling)	50 kL total (5 kL per dwelling)	45 kL total (5 kL per dwelling)			
Confirm location of rainwater tanks on the scaled annotated plan (Yes/No)	No	No			

Comments: Locations of rainwater tanks not shown as individual home designs have not been confirmed for each lot. This should be conditioned as part of the development approval.

\* Compliance with the Deemed to Comply Solutions requires all overflow from the rainwater tanks to be directed to stormwater treatment measures.

# Development Assessment Checklist **Step 6**

## STEP 6: SELECT DEEMED TO COMPLY SOLUTION

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Selected Deemed to Comply Solution (include ID and full name)	R1 Residential greater than 2 lots up to 20 lots – rainwater tanks/ bioretention	R1 Residential greater than 2 lots up to 20 lots – rainwater tanks/ bioretention			
Bioretention system area (% of catchment area) **	1.3%	1.3%			
Constructed wetland area (% of catchment area)***	N/A	N/A			
Comments: Surface lot runoff, roads and overflows from tank treated at surface by small bioretention systems ('pods') located on both sides at either end of street					

\*\* Refers to the bioretention system filter media area

\*\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Step 7**

<b>STEP 7: DESIGN STORMWATER TREATMENT MEASURES</b>					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Catchment area (m <sup>2</sup> )	8,200 m <sup>2</sup>	8,000 m <sup>2</sup>			
Location of treatment measure (public/private)	Public (road reserve)	Public (road reserve)			
<b>Bioretention system</b>					
Filter media area (% of catchment area)	1.3%	1.3%			
Filter media area (m <sup>2</sup> )					
• required	107 m <sup>2</sup>	104 m <sup>2</sup>			
• provided in concept	108 m <sup>2</sup>	108 m <sup>2</sup>			
Total footprint* (m <sup>2</sup> )	340 m <sup>2</sup>	340 m <sup>2</sup>			
Media depth (m)					
• filter media	0.6 m	0.6 m			
• transition layer	0.1 m	0.1 m			
• drainage layer	0.2 m	0.2 m			
Extended detention (m above surface level)	0.15 m	0.15 m			
Coarse sediment management	Yes	Yes			
Coarse sediment management area (m <sup>2</sup> )	0.5 m <sup>2</sup> per biopod	0.5 m <sup>2</sup> per biopod			
<b>Constructed wetland</b>					
Macrophyte zone area (% of catchment area)	N/A	N/A			
Macrophyte zone area (m <sup>2</sup> )	N/A	N/A			
Coarse sediment management	N/A	N/A			
Coarse sediment management area (m <sup>2</sup> )	N/A	N/A			
High flow bypass method	N/A	N/A			
High flow bypass area (m <sup>2</sup> )	N/A	N/A			
Total footprint* (m <sup>2</sup> )	N/A	N/A			
Conceptual design drawings of any pipe and pit diversion structures or alternative high flow bypass flow paths					

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc

Conceptual design levels (m AHD) – These sections apply to both bioretention systems and wetlands

Inlet type	Kerb cutout	Kerb cutout
• upstream invert level	61.5 (A), 61.6 (B)	61.5 (A), 61.6 (B)
• downstream invert level	61.3 (A), 61.4 (B)	61.3 (A), 61.4 (B)
Receiving drainage invert or ponded water level	58.8 (A), 58.8 (B)	58.8 (A), 58.8 (B)
Outlet pipe level		
• upstream invert level	60.3 (A), 60.5 (B)	60.3 (A), 60.5 (B)
• downstream invert level	60.2 (A), 60.4 (B)	60.2 (A), 60.4 (B)
Surface or water level	61.3 (A), 61.4 (B)	61.3 (A), 61.4 (B)
Extended detention level (pit crest level)	61.45 (A), 61.55 (B)	61.45 (A), 61.55 (B)
Minimum bund/embankment level	61.8 (A), 61.9 (B)	61.8 (A), 61.9 (B)
Checks		
• Inlet at or above surface or water level?	✓	✓
• Outlet pipe DSIL above receiving drainage?	✓	✓
• Bund level minimum 150mm above extended detention level?	✓	✓
Comments	Lot and road runoff collected in kerb and delivered via cutout to pod surface. Drainage of pods to stormwater pit.	Lot and road runoff collected in kerb and delivered via cutout to pod surface. Drainage of pods to stormwater pit.

Conceptual Plan and Section – Checklist (mark with ✓ to indicate item has been shown on drawings)

Conceptual Plan (scaled and annotated plan view drawing)

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	CDP-WS1 (1 of 2)	CDP-WS1 (2 of 2)			
Inflow drainage arrangement	✓	✓			
Outlet pits and pipes	✓	✓			
Treatment areas (filter media and/ or macrophyte zone)	✓	✓			
Coarse sediment management	✓	✓			
High flow bypass	N/A	N/A			
Batters and embankments	✓	✓			
Functional and surrounding ground levels	✓	✓			

Conceptual Section (scaled and annotated section view drawing)		
Drawing ID	CDP-WS1 (1 of 2)	CDP-WS1 (2 of 2)
Conceptual design levels	✓	✓
Surround earthworks levels	✓	✓
Inflow and outlet pits and pipes	✓	✓
Coarse sediment management	✓	✓
Extended detention (crest or pit)	✓	✓
Batters and embankments	✓	✓
Media depths (bioretention only)	✓	✓

**Designer**

Signed by Designer .....

Print name .....

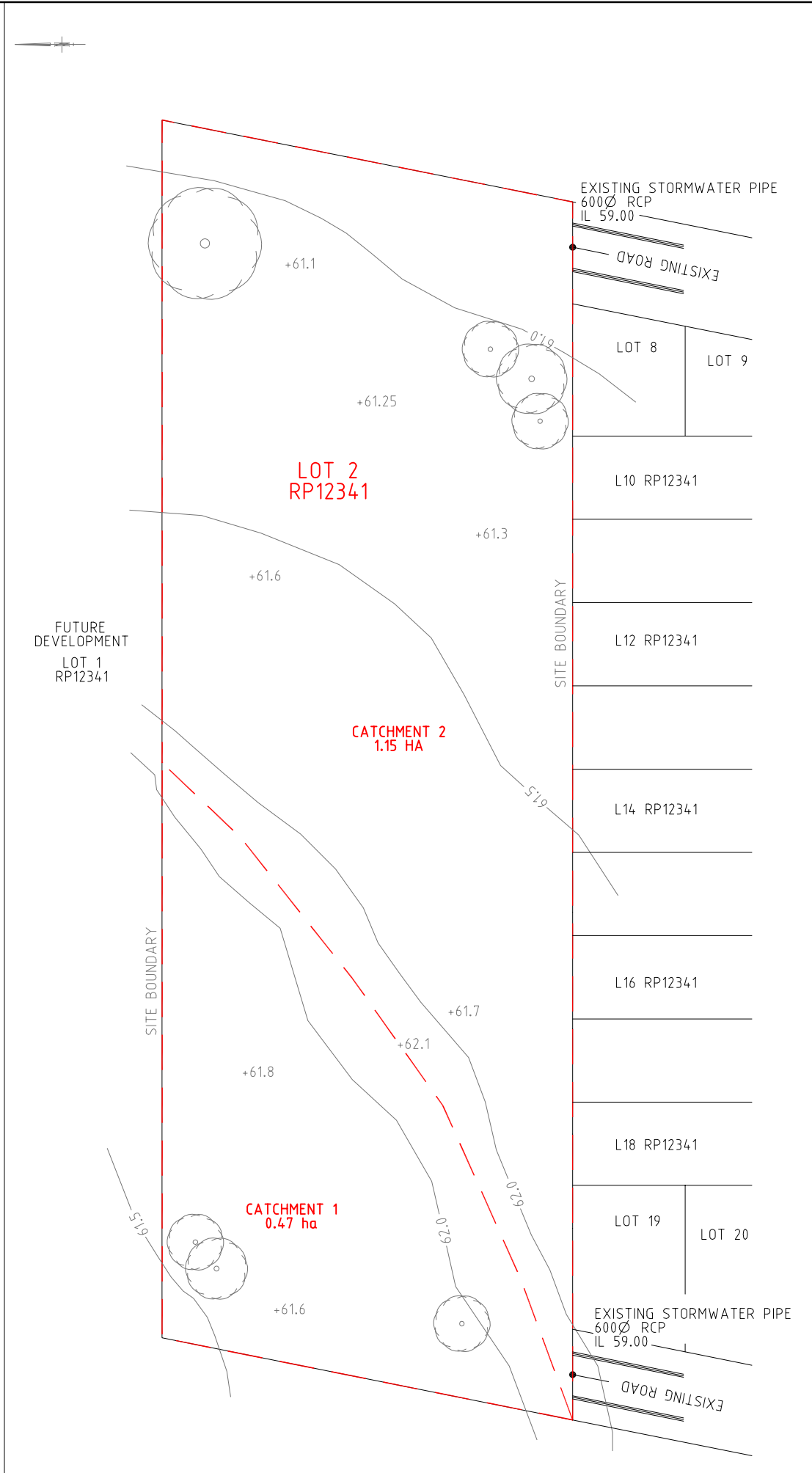
Date .....

**Development Assessment Officer**

Signed by officer .....

Print name .....

Date .....



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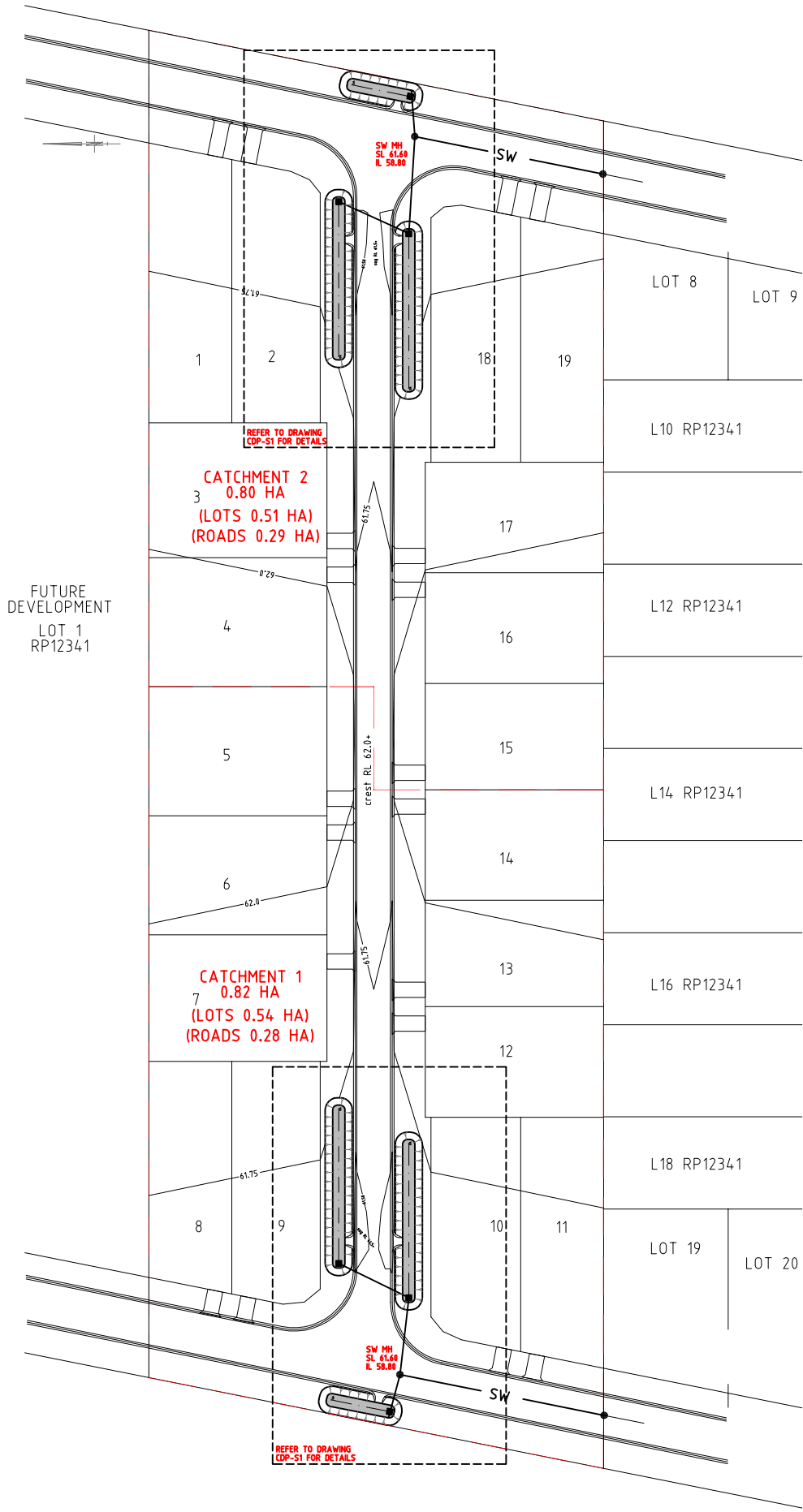
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Project  
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SITE DETAILS PLAN

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale	at A4 1:1000	<b>SDP-WS1</b>	<b>A</b>



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DEVELOPMENT DETAILS PLAN

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Date	26/08/09	Date
Scale	at A4 1:1000	Drawing No.
		Rev.

DDP-WS1 A

BIORETENTION BASIN 1  
 FILTER MEDIA AREA =45 sqm  
 TOTAL AREA INCLUDING BATTERS =62 sqm  
 SURFACE LEVEL =RL61.30

BIORETENTION BASIN 2  
 FILTER MEDIA AREA =45 sqm  
 TOTAL AREA INCLUDING BATTERS =62 sqm  
 SURFACE LEVEL =RL61.30

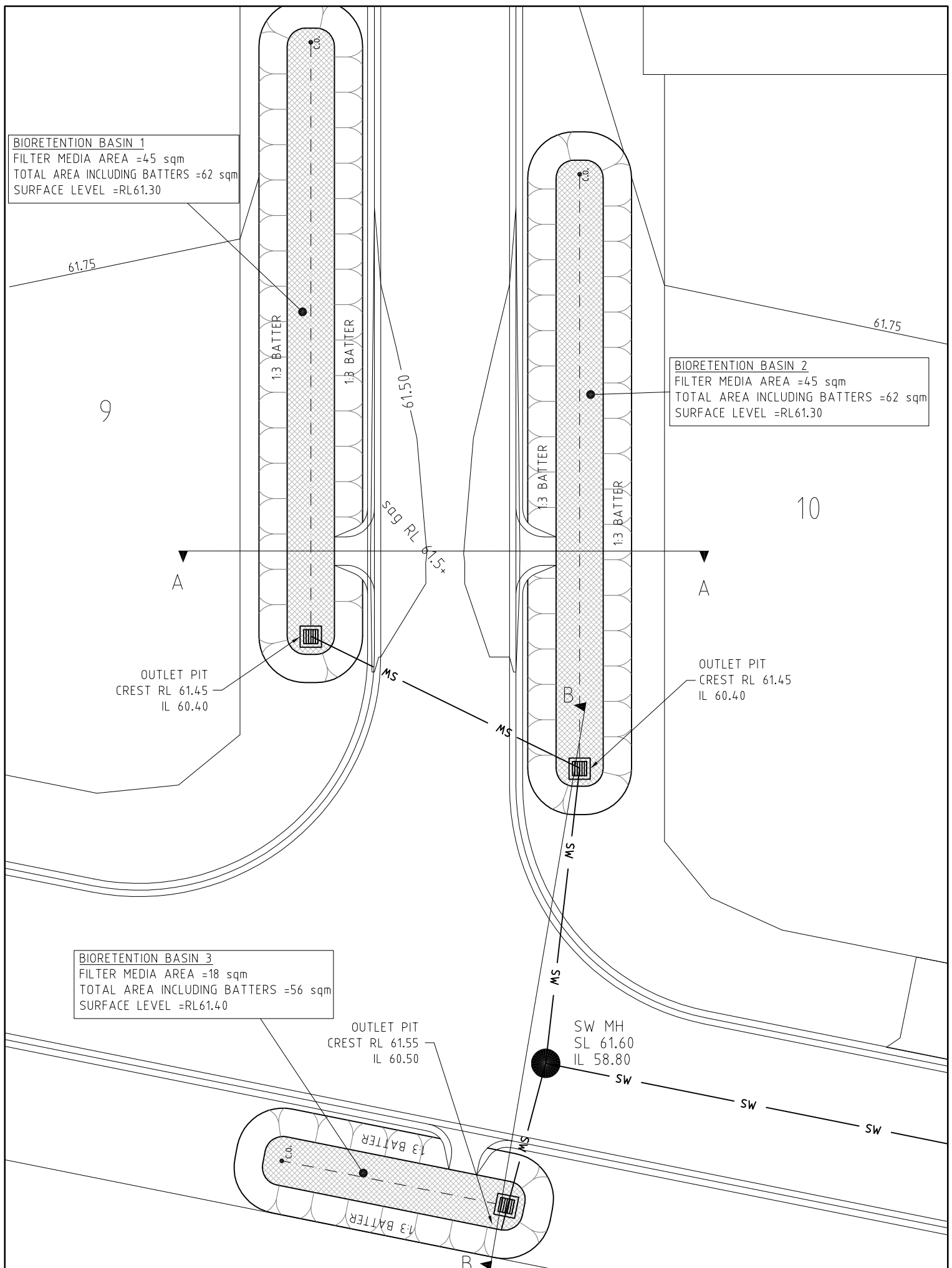
BIORETENTION BASIN 3  
 FILTER MEDIA AREA =18 sqm  
 TOTAL AREA INCLUDING BATTERS =56 sqm  
 SURFACE LEVEL =RL61.40

OUTLET PIT  
 CREST RL 61.45  
 IL 60.40

OUTLET PIT  
 CREST RL 61.45  
 IL 60.40

OUTLET PIT  
 CREST RL 61.55  
 IL 60.50

SW MH  
 SL 61.60  
 IL 58.80



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CONCEPT DETAILS PLAN  
 (1 OF 2)

Designed	AO	Approved
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Date	26/08/09	Drawing No.
Scale at A4	1:200	CDP-WS1 A

Original sheet size A4

**BIORETENTION BASIN 6**  
 FILTER MEDIA AREA =18 sqm  
 TOTAL AREA INCLUDING BATTERS =56 sqm  
 SURFACE LEVEL =RL61.40

OUTLET PIT  
 CREST RL 61.55  
 IL 60.50

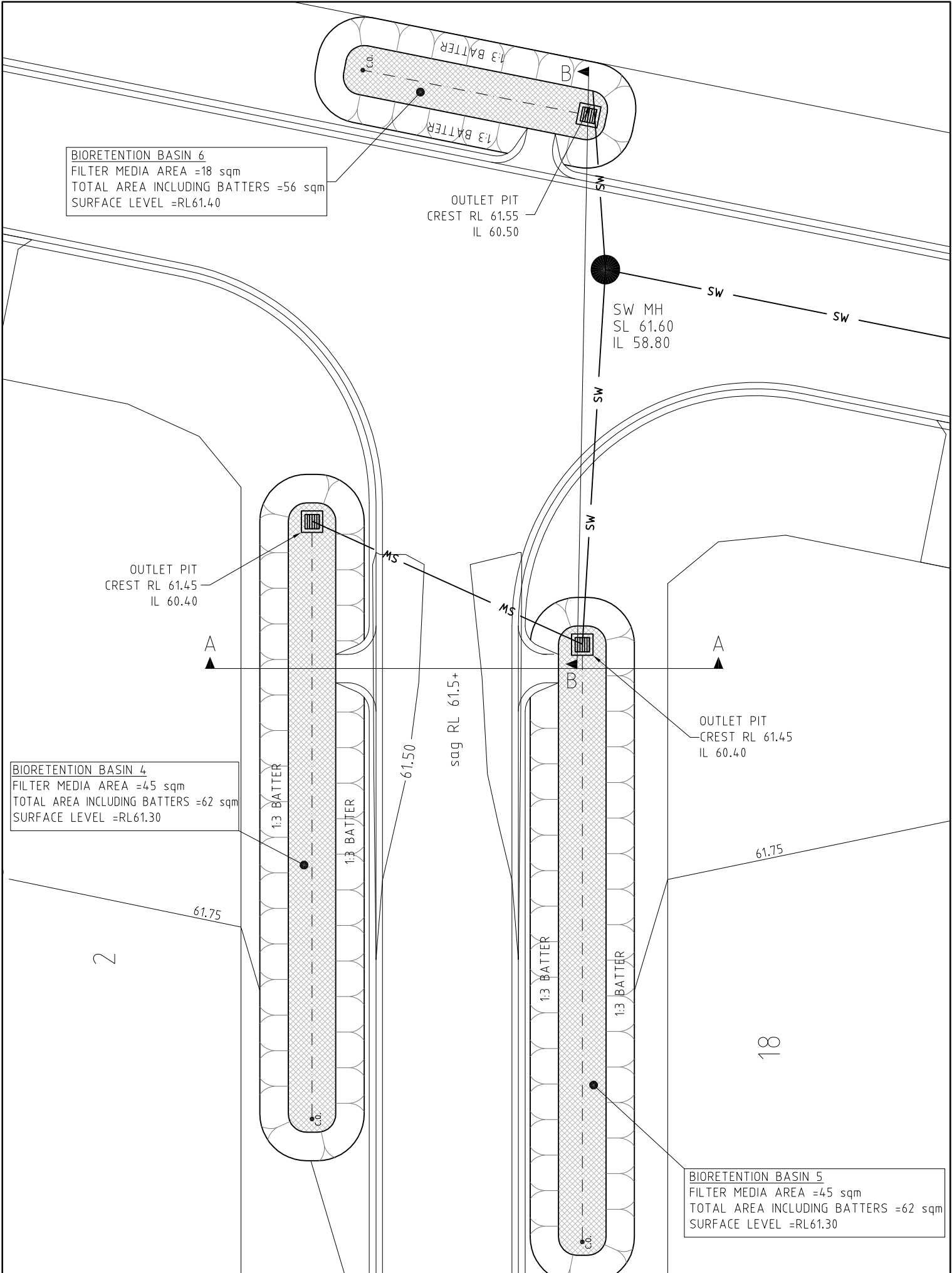
SW MH  
 SL 61.60  
 IL 58.80

OUTLET PIT  
 CREST RL 61.45  
 IL 60.40

OUTLET PIT  
 CREST RL 61.45  
 IL 60.40

**BIORETENTION BASIN 4**  
 FILTER MEDIA AREA =45 sqm  
 TOTAL AREA INCLUDING BATTERS =62 sqm  
 SURFACE LEVEL =RL61.30

**BIORETENTION BASIN 5**  
 FILTER MEDIA AREA =45 sqm  
 TOTAL AREA INCLUDING BATTERS =62 sqm  
 SURFACE LEVEL =RL61.30



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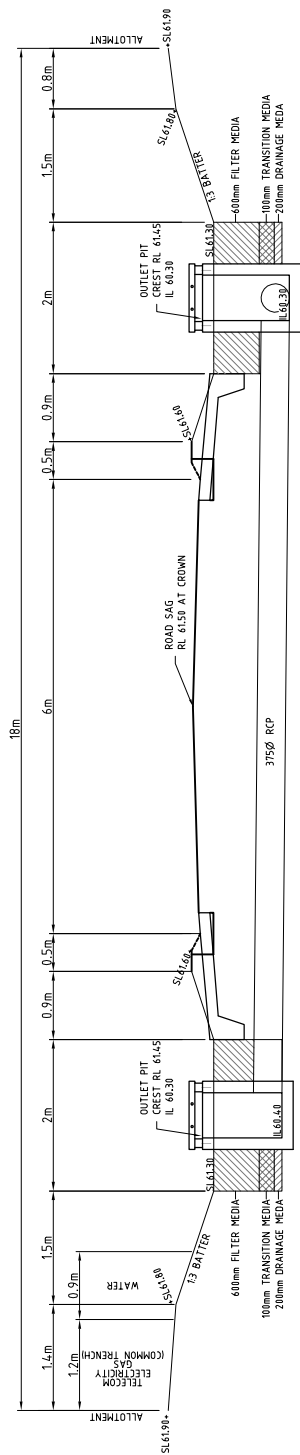
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Project  
**DEEMED TO COMPLY**  
**WORKED SOLUTION 1**

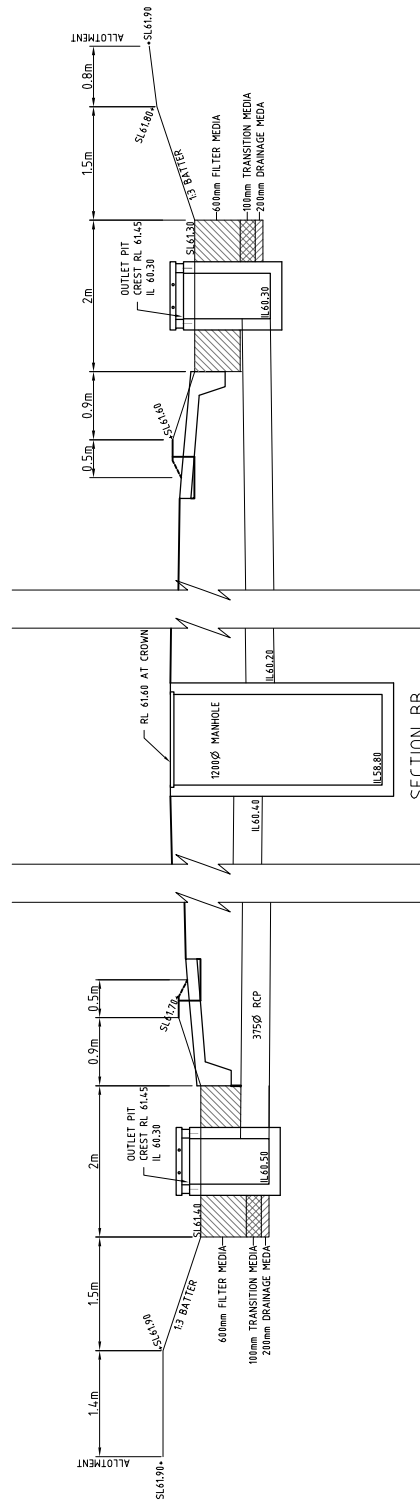
CONCEPT DETAILS PLAN  
 (2 OF 2)

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale at A4	1:200	CDP-WS1	A

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SECTION AA



SECTION BB

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Project  
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CONCEPT CROSS SECTIONS

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale	at A4 1:100	<b>CCS-WS1</b>	<b>A</b>

## 2.2 Worked Solution 2 (WS2) - Residential greater than 2 dwellings (Townhouse style up to 2 storeys) $\leq 12,500 \text{ m}^2$

### 2.2.1 Project Description

The subject site is a 0.28 ha block of land located at Saltwater Court on the Gold Coast (South East Queensland). The site grades from an existing road (RL 6.8) which bounds the northern edge of the site, and slopes down to the shore of an existing tidal lake. The site grades gently towards the tidal lake from the road at approximately 3-4% and steepens close to the edge giving an average grade across the site of approximately 7%.

The applicant is proposing to develop the subject site into 14 two-storey townhouses and associated open spaces and parking (Figure 3). Given that a Material Change of Use application is required for greater than six (6) dwellings the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) is triggered for stormwater quality management. The pollutant load reduction objectives for the South East Queensland (South Coast) climatic region are: 80% reduction in Total Suspended Solids, 60% reduction in Total Phosphorous and 45% reduction in Total Nitrogen. As the application involves greater than 2 townhouse-style dwellings up to 2 storeys in height and the site is less than 12,500 m<sup>2</sup> the applicant would like to adopt a deemed to comply solution in order to simplify the reporting and approvals process for the stormwater management component of the development application.



**Figure 3 - Proposed Development Layout for Saltwater Court**

## 2.2.2 WSUD Strategy and Adoption of a Deemed to Comply Solution

Rainwater tanks are being adopted on the site in accordance with the QDC MP4.2. In accordance with the requirements of the Deemed to Comply Solutions, overflows from rainwater tanks are to be delivered into the downstream treatment system (bioretention basin). The site is highly constrained for space, so the designers ruled out constructed wetlands as an alternative for stormwater management. Based on topography and other site constraints, the WSUD specialists opted to deliver stormwater from the catchment (0.28 ha) into an end-of-pipe bioretention basin (Solution R5) located adjacent to the receiving environment (Figure 4). As the development is located in the South East Queensland (South Coast) climatic region, the Solution requires that the bioretention basin be sized at 1.3% of the catchment area or 37 m<sup>2</sup> to achieve the required stormwater quality objectives.



**Figure 4 - Proposed WSUD Strategy for Saltwater Court**

## 2.2.3 Development Application Documentation

The following documents and drawings have been developed to support the development application for the Deemed to Comply Solution R5:

- Deemed to Comply Solutions Development Assessment Checklist for Queensland (DA-DTC-WS2)
- Site Details Plan (Drawing SDP-WS2)  
Development Details Plan (Drawing DDP-WS2)
- Stormwater Measure Conceptual Plan (Drawing SCP-WS2)
- Stormwater Measure Conceptual Sections (Drawing SCS-WS2)

# Development Assessment Checklist

## Summary of Development and Deemed to Comply Solution

DEVELOPMENT ADDRESS	
Development application ID	DA-DTC-S2
Project name	Saltwater Court
Applicant's name	Saltwater Court Developments Pty Ltd
Street address	25 Saltwater Street
Suburb	Robina
Postcode	4220
Local Government Area	Gold Coast City Council
Climatic region	South East Queensland – South Coast
DEVELOPMENT TYPE & DETAILS	
Development type (e.g. residential detached dwellings)	Residential greater than 2 townhouse style up to 2 storeys 12,500 m <sup>2</sup>
Number of dwellings/buildings	14
Site area (m <sup>2</sup> )	2,840 m <sup>2</sup>
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	Typical 85 m <sup>2</sup>
DEEMED TO COMPLY SOLUTION	
Deemed to Comply Solution ID	R5
Rainwater tank volume (kL) (for detached dwellings tank volume per dwelling kL/dwelling)	3kL / dwelling
Bioretention area* (m <sup>2</sup> )	37 m <sup>2</sup> (1.3%)
Constructed wetland area** (m <sup>2</sup> )	N/A
Total footprint of bioretention or wetland system(s) (m <sup>2</sup> )	75 m <sup>2</sup>

\* Refers to the bioretention system filter media area

\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Steps 1 to 3**

## STEP 1: DEVELOPMENT LOCATION AND CLIMATE REGION

Project name	Saltwater Court
Street address	25 Saltwater Street
Suburb	Robina
Postcode	4220
Local Government Area	Gold Coast City Council
Climatic region (Figure 2 and A-2, Appendix A)	South East Queensland – South Coast

## STEP 2: DETERMINE DEVELOPMENT TYPE

Development type (e.g. residential detached dwellings)	Residential greater than 2 townhouse style up to 2 storeys 12,500 m <sup>2</sup>
Number of dwellings/buildings	14
Site area (m <sup>2</sup> )	2,840 m <sup>2</sup>

## STEP 3: DEFINE SITE DETAILS

Site Details Plan (scaled annotated)	
Plan ID	SDP-WS2
Existing topography (Yes/No)	Yes – survey contours shown on SDP-WS2
Existing drainage characteristics upstream, within, and downstream of site (including catchment areas)	Yes – catchment area is 0.28ha, as shown on SDP-WS2. There are no upstream catchments.
Proposed discharge points and the downstream drainage size and invert levels (or ponded water levels) (Yes/No)	Yes – Tidal lake highest astronomical tide (HAT) levels shown.
Existing vegetation and vegetation to be retained (Yes/No)	Yes – As shown on SDP-S2 there are three existing trees on the site located near the existing road. The trees are not significant (vegetation management plan [VMP] has been conducted) and therefore will not be retained.
Soil evaluation in accordance with AS/NZS 1547:2000 Clause 4.1.3 if necessary (Yes/No)	No (not required – no exfiltration proposed)
General comments (where required)	
Topography: The site grades from the road at the northern boundary at RL 6.8 to the existing tidal lake at the southern boundary RL 0.6. Refer Site Details Plan (SDP-WS2) for details.	
Drainage: Drainage occurs generally from the north of the site to the south towards the tidal lake via sheet flows. No formal channels, creeks or waterways are present on the site to convey stormwater flows.	
Vegetation: As shown on the Site Details Plan (SDP-WS2), there are 3 non-significant trees on the site (refer VMP).	

# Development Assessment Checklist **Step 4**

## STEP 4: OUTLINE DEVELOPMENT DETAILS

Development area (m <sup>2</sup> )	2,840 m <sup>2</sup>
<b>Private land</b>	
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	1,400 m <sup>2</sup> (100m <sup>2</sup> per dwelling assumed)
Road reserve, driveway or parking (m <sup>2</sup> )	570 m <sup>2</sup>
Pavement area (m <sup>2</sup> ) *	140 m <sup>2</sup> (10m <sup>2</sup> per lot assumed as patio/path)
Easements (services or drainage) (m <sup>2</sup> )	-
Landscape area (m <sup>2</sup> )	600 m <sup>2</sup>
Other areas (m <sup>2</sup> )	Deck/Pool Area 130 m <sup>2</sup>
Area available for stormwater treatment (may be part of landscape area) (m <sup>2</sup> ) *	75 m <sup>2</sup>
<b>Public land (ultimately owned by local authority)</b>	
Road reserve (m <sup>2</sup> )	-
Parkland (m <sup>2</sup> )	-
Easement (services or drainage) (m <sup>2</sup> )	-
Other areas (m <sup>2</sup> )	-
Space available for stormwater treatment (may be part of landscape area)* (m <sup>2</sup> )	-
<b>Development Details Plan (scaled annotated plan)</b>	
Plan ID	DDP-S2
Development layout clearly depicted with land type areas (Yes/No)	Yes
Catchment areas defined with ID (Yes/No)	Yes
Conceptual earthworks provided including finished levels (Yes/No)	Yes
Existing/proposed infrastructure layout and levels have been considered (i.e. no conflict with treatment measures)** (Yes/No).	Yes
<b>General comments</b>	

\* Designers should consult with the project landscape architect to check which landscape areas are available for stormwater treatment. Local government standards should also be checked to ensure areas proposed for treatment will not be required to feature incompatible plantings (e.g. large trees).

\*\* Infrastructure may include (sewer, power, water, gas etc). Any infrastructure which may impact on location or drainage of treatment measures should be considered. External infrastructure which has the potential to influence location or drainage of treatment measures should also be shown.

# Development Assessment Checklist **Step 5**

## STEP 5: CONFIRM RAINWATER TANK REQUIREMENTS (QUEENSLAND DEVELOPMENT CODE)

Are rainwater tanks to be installed (Yes/No)?	Yes					
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	Min. 50 m <sup>2</sup> per dwelling (min. 900m <sup>2</sup> total)					
Total rainwater tank volume (kL or kL per dwelling)	3kL per dwelling (min. 42kL total)					
Connections (i.e. toilets, external, washing machine, pool)	Toilets, cold laundry, external					
Overflow from the rainwater tanks to be directed to stormwater treatment measures* (Yes/No)?	YES					
Rainwater tanks per catchment	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5	
Number of tanks per catchment	14					
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	700 m <sup>2</sup> (50 m <sup>2</sup> per dwelling)					
Tank volume (kL or kL per dwelling)	42 kL (3 kL per dwelling)					
Confirm location of rainwater tanks on the scaled annotated plan (Yes/No)	YES					
Comments: Locations of rainwater tanks not shown as individual home designs have not been confirmed for each lot. This should be conditioned as part of the development approval.						

\* Compliance with the Deemed to Comply Solutions requires all overflow from the rainwater tanks to be directed to stormwater treatment measures.

# Development Assessment Checklist **Step 6**

## STEP 6: SELECT DEEMED TO COMPLY SOLUTION

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Selected Deemed to Comply Solution (include ID and full name)	R5 Residential greater than 2 dwellings (Townhouse style up to 2 storeys) – rainwater tanks/ bioretention				
Bioretention system area (% of catchment area) **	1.3%				
Constructed wetland area (% of catchment area)***	N/A				
Comments: Surface lot runoff and overflows from allotment tanks treated collected in pits and conveyed to bioretention basin					

\*\* Refers to the bioretention system filter media area

\*\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Step 7**

<b>STEP 7: DESIGN STORMWATER TREATMENT MEASURES</b>					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Catchment area (m <sup>2</sup> )	2,840 m <sup>2</sup>				
Location of treatment measure (public/private)	Private				
<b>Bioretention system</b>					
Filter media area (% of catchment area)	1.3%				
Filter media area (m <sup>2</sup> )					
• required	37 m <sup>2</sup>				
• provided in concept	37 m <sup>2</sup>				
Total footprint* (m <sup>2</sup> )	60 m <sup>2</sup>				
Media depth (m)					
• filter media	0.6 m				
• transition layer	0.1 m				
• drainage layer	0.2 m				
Extended detention (m above surface level)	0.2 m				
Coarse sediment management	Forebay				
Coarse sediment management area (m <sup>2</sup> )	2 x 0.5 m <sup>2</sup> forebays				
<b>Constructed wetland</b>					
Macrophyte zone area (% of catchment area)	N/A				
Macrophyte zone area (m <sup>2</sup> )	N/A				
Coarse sediment management	N/A				
Coarse sediment management area (m <sup>2</sup> )	N/A				
High flow bypass method	N/A				
High flow bypass area (m <sup>2</sup> )	N/A				
Total footprint* (m <sup>2</sup> )	N/A				
Conceptual design drawings of any pipe and pit diversion structures or alternative high flow bypass flow paths					

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc.

Conceptual design levels (m AHD) – These sections apply to both bioretention systems and wetlands.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Inlet type	Pipe				
• upstream invert level	Min 2.80				
• downstream invert level	2.60				
Receiving drainage invert or ponded water level	1.0 (Highest Astronomical Tide [HAT])				
Outlet pipe level					
• upstream invert level	1.70				
• downstream invert level	1.60				
Surface or water level	2.60				
Extended detention level (pit crest level)	2.80				
Minimum bund/embankment level	3.00				
Checks					
• Inlet at or above surface or water level?	✓				
• Outlet pipe DSIL above receiving drainage?	✓				
• Bund level minimum 150mm above extended detention level?	✓				
Comments					

Conceptual Plan and Section – Checklist (mark with ✓ to indicate item has been shown on drawings)

Conceptual Plan (scaled and annotated plan view drawing)

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	CDP-S2				
Inflow drainage arrangement	✓				
Outlet pits and pipes	✓				
Treatment areas (filter media and/or macrophyte zone)	✓				
Coarse sediment management	✓				
High flow bypass	N/A				
Batters and embankments	✓				
Functional and surrounding ground levels	✓				

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Conceptual Section (scaled and annotated section view drawing)					
Drawing ID	CDP-S2				
Conceptual design levels	✓				
Surround earthworks levels	✓				
Inflow and outlet pits and pipes	✓				
Coarse sediment management	✓				
Extended detention (crest or pit)	✓				
Batters and embankments	✓				
Media depths (bioretention only)	✓				

**Designer**

Signed by Designer .....

Print name .....

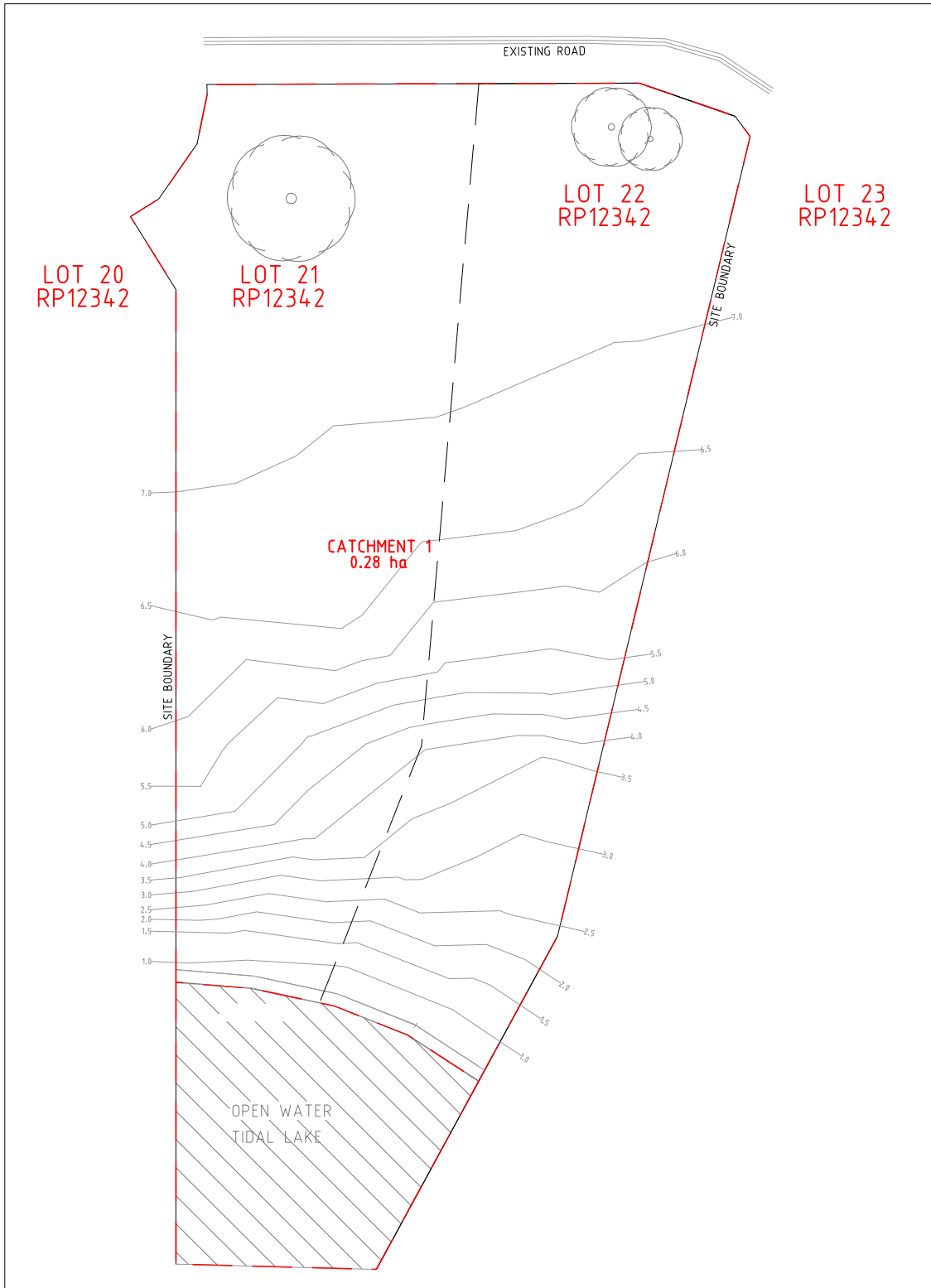
Date .....

**Development Assessment Officer**

Signed by officer .....

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Date .....



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
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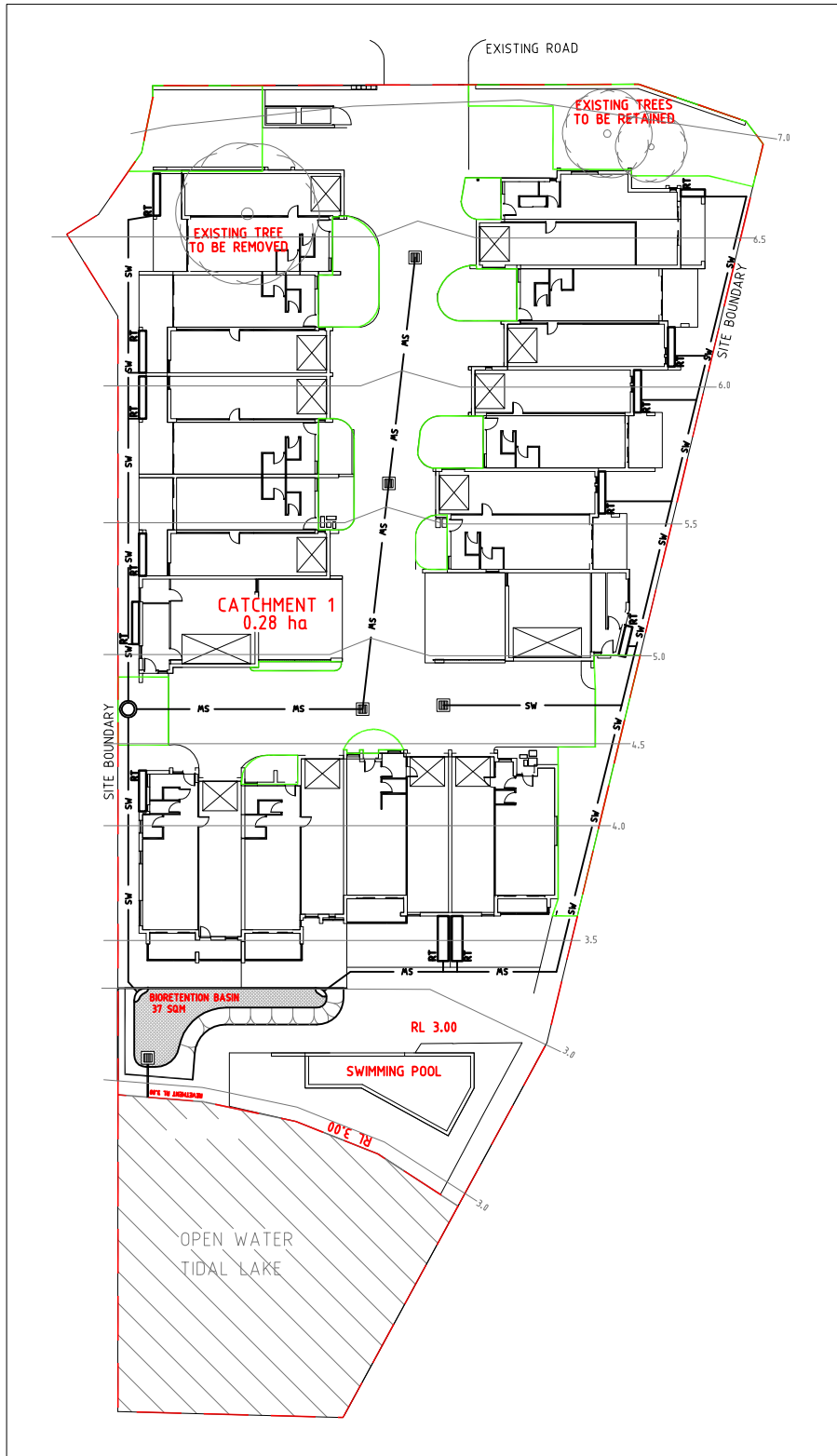
Project  
**DEEMED TO COMPLY  
WORKED SOLUTION 2**

SITE DETAILS PLAN

Designed <b>AO</b>	Approved
Drawn <b>DC</b>	Date
Date <b>26/08/09</b>	Drawing No. <b>SDP-WS2</b>
Scale at A4 <b>1:500</b>	Rev. <b>A</b>

**LEGEND**

- PROPOSED FIELD INLET 
- PROPOSED STORMWATER 
- BIORETENTION BASIN 
- RAINWATER TANK 



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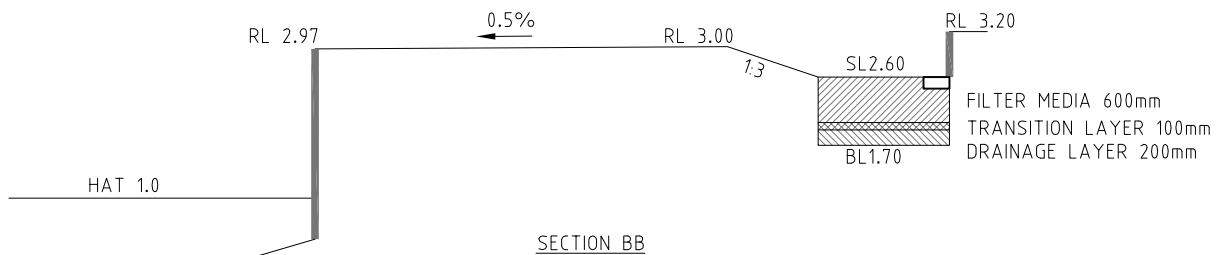
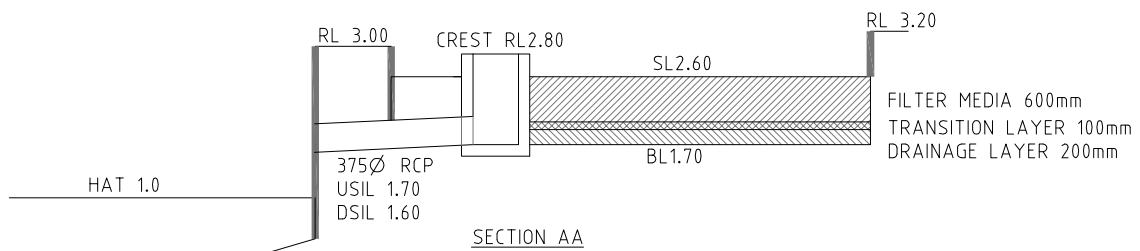
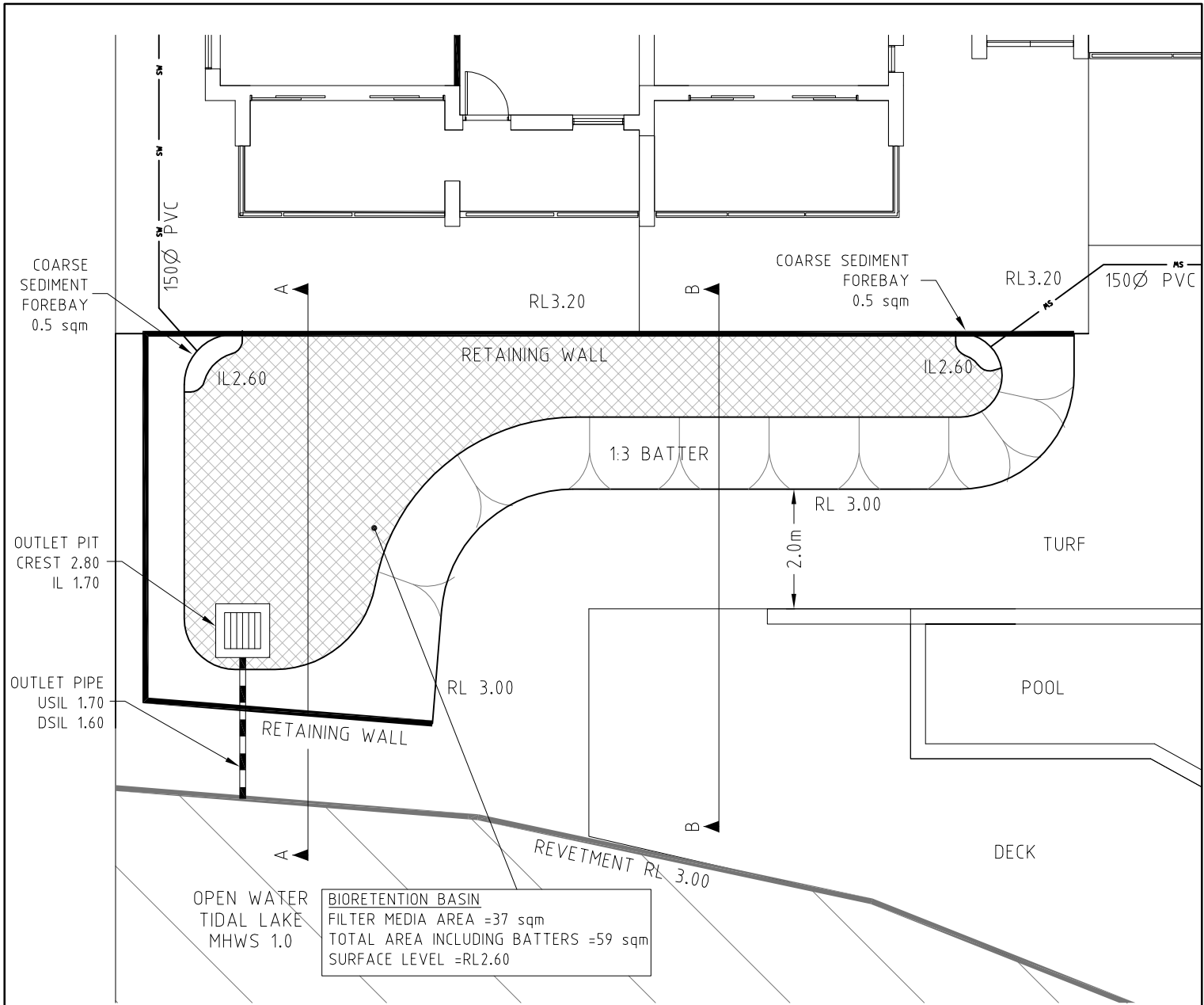
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DEVELOPMENT DETAILS PLAN

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Project  
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 WORKED SOLUTION 2**

CONCEPT DETAILS PLAN  
 AND CROSS SECTIONS

Designed	Approved
AO	
DC	RPEQ
Date	Drawing No.
26/08/09	CDP-WS2
Scale at A4	Rev.
1:100	A

## 2.3 Worked Solution 3 (WS3) - Residential High Density multiple dwelling apartments (flat, high rise) ≤12,500 m<sup>2</sup>

### 2.3.1 Project Description

The subject site is currently a vacant block of land on the Sunshine Coast in South East Queensland. The site comprises 0.24 ha of land which has very slight grades (less than 0.5%). The adjacent blocks of land are fully developed into high-rise buildings.

The applicant is proposing "Surf", a 20-storey high rise building with 3 levels of basement parking, 18 levels of residential apartments and 2 levels of administration,

offices, retail and communal facilities for the site (Figure 5). Given that a Material Change of Use application is required for greater than six (6) dwellings the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) is triggered for stormwater quality management. The pollutant load reduction objectives for the South East Queensland (North Coast) climatic region are: 80% reduction in Total Suspended Solids, 60% reduction in Total Phosphorous and 45% reduction in Total Nitrogen. As the application involves high rise development less than 12,500 m<sup>2</sup> the applicant has chosen to adopt a deemed to comply solution in order to simplify the reporting and approvals process for the stormwater management component of the development application.



**Figure 5 - Proposed Development Layout for "Surf"**

### 2.3.2 WSUD Strategy and Adoption of a Deemed to Comply Solution

The site is highly constrained for space so the design team ruled out constructed wetlands as the preferred stormwater treatment measure. The flat nature of the site and the demand for high amenity in the landscape, dictated the WSUD specialists to adopt Solution R9 and intercept and treat some of the stormwater at-surface, collecting the remainder in shallow pipes, including roof runoff, for delivery to shallow bioretention basins (Figure 6).

In accordance with Solution R9, the bioretention basins will be located on private land, to be maintained by the body corporate. The location of the development in the South East Queensland (North Coast) climatic region means that the bioretention basins are required to be 2.1% of the catchment area, which dictates that approximately 51 m<sup>2</sup> of bioretention (filter media area) is required for the development.



**Figure 6 - Proposed WSUD Strategy for "Surf"**

### 2.3.3 Development Application Documentation

The following documents and drawings have been developed to support the development application for the Deemed to Comply Solution R9:

- Deemed to Comply Solutions Development Assessment Checklist for Queensland (DA-DTC-WS3)
- Site Details Plan (Drawing SDP-WS3)
- Development Details Plan (Drawing DDP-WS3)
- Stormwater Measure Conceptual Details Plan (Drawing SCP-WS3)
- Stormwater Measure Conceptual Sections (Drawing SCS-WS3)

# Development Assessment Checklist

## Summary of Development and Deemed to Comply Solution

### DEVELOPMENT ADDRESS

Development application ID	DA-DTC-WS3
Project name	Surf
Applicant's name	Cottontree Developments
Street address	49 Beachfront Drive
Suburb	Maroochydore
Postcode	4558
Local Government Area	Sunshine Coast Regional Council
Climatic region	South East Queensland – North Coast

### DEVELOPMENT TYPE & DETAILS

Development type (e.g. residential detached dwellings)	Residential high density multiple dwelling apartments (flats, high-rise) less than 12,500 m <sup>2</sup>
Number of dwellings/buildings	84 apartments (2 and 3 bedroom)
Site area (m <sup>2</sup> )	2,436 m <sup>2</sup>
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	1,163 m <sup>2</sup>

### DEEMED TO COMPLY SOLUTION

Deemed to Comply Solution ID	R9
Rainwater tank volume (kL) (for detached dwellings tank volume per dwelling kL/dwelling)	N/A
Bioretention area* (m <sup>2</sup> )	51 m <sup>2</sup> (2.1%)
Constructed wetland area** (m <sup>2</sup> )	N/A
Total footprint of bioretention or wetland system(s) (m <sup>2</sup> )	87 m <sup>2</sup>

\* Refers to the bioretention system filter media area

\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Steps 1 to 3**

## STEP 1: DEVELOPMENT LOCATION AND CLIMATE REGION

Project name	Surf
Street address	49 Beachfront Drive
Suburb	Maroochydore
Postcode	4558
Local Government Area	Sunshine Coast Regional Council
Climatic region (Figure 2 and A-2, Appendix A)	South East Queensland – North Coast

## STEP 2: DETERMINE DEVELOPMENT TYPE

Development type (e.g. residential detached dwellings)	Residential high density multiple dwelling apartments (flats, high-rise) less than 12,500 m <sup>2</sup>
Number of dwellings/buildings	84 apartments (2 and 3 bedroom)
Site area (m <sup>2</sup> )	2,436 m <sup>2</sup>

## STEP 3: DEFINE SITE DETAILS

### Site Details Plan (scaled annotated)

Plan ID	SDP-WS3
Existing topography (Yes/No)	YES
Existing drainage characteristics upstream, within, and downstream of site (including catchment areas)	YES – catchments, drainage paths and areas shown on SDP-WS3
Proposed discharge points and the downstream drainage size and invert levels (or ponded water levels) (Yes/No)	YES - Existing stormwater pipes and invert levels shown on SDP – WS3
Existing vegetation and vegetation to be retained (Yes/No)	YES – As shown on SDP-WS3 there is no existing vegetation on the site
Soil evaluation in accordance with AS/NZS 1547:2000 Clause 4.1.3 if necessary (Yes/No)	No (Not required – no exfiltration proposed)

### General comments (where required)

**Topography:** The site has very flat topography with a high point (RL 5.1) located centrally in the site, and gentle grades (<1%) north and south to existing roads (RL 4.5). Refer Site Details Plan (SDP-WS3) for details.

**Drainage:** Drainage occurs generally from the centre of the site to the existing roads both north and south of the site via sheet flows. No formal channels, creeks or waterways are present on the site to convey stormwater flows.

**Vegetation:** As shown on the Site Details Plan (SDP-WS3), no existing vegetation is present on the site.

# Development Assessment Checklist **Step 4**

## STEP 4: OUTLINE DEVELOPMENT DETAILS

Development area (m <sup>2</sup> )	2,436 m <sup>2</sup>
Private land	
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	1,163 m <sup>2</sup>
Road reserve, driveway or parking (m <sup>2</sup> )	196 m <sup>2</sup>
Pavement area (m <sup>2</sup> ) *	395 m <sup>2</sup>
Easements (services or drainage) (m <sup>2</sup> )	-
Landscape area (m <sup>2</sup> )	423 m <sup>2</sup>
Other areas (m <sup>2</sup> )	Swimming Pool Area 259 m <sup>2</sup>
Area available for stormwater treatment (may be part of landscape area) (m <sup>2</sup> ) *	100 m <sup>2</sup> (part of the landscape area)
Public land (ultimately owned by local authority)	
Road reserve (m <sup>2</sup> )	-
Parkland (m <sup>2</sup> )	-
Easement (services or drainage) (m <sup>2</sup> )	-
Other areas (m <sup>2</sup> )	-
Space available for stormwater treatment (may be part of landscape area)* (m <sup>2</sup> )	-
Development Details Plan (scaled annotated plan)	
Plan ID	DDP-WS3
Development layout clearly depicted with land type areas (Yes/No)	Yes
Catchment areas defined with ID (Yes/No)	Yes
Conceptual earthworks provided including finished levels (Yes/No)	Yes
Conceptual drainage layout and inverts levels (Yes/No)	Yes
Existing/proposed infrastructure layout and levels have been considered (i.e. no conflict with treatment measures)** (Yes/No).	Yes
General comments	

\* Designers should consult with the project landscape architect to check which landscape areas are available for stormwater treatment. Local government standards should also be checked to ensure areas proposed for treatment will not be required to feature incompatible plantings (e.g. large trees).

\*\* Infrastructure may include (sewer, power, water, gas etc). Any infrastructure which may impact on location or drainage of treatment measures should be considered. External infrastructure which has the potential to influence location or drainage of treatment measures should also be shown.

# Development Assessment Checklist **Steps 5 & 6**

## STEP 5: CONFIRM RAINWATER TANK REQUIREMENTS (QUEENSLAND DEVELOPMENT CODE)

Are rainwater tanks to be installed (Yes/No)?	Yes				
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	1,200 m <sup>2</sup>				
Total rainwater tank volume (kL or kL per dwelling)	Not required as part of QDC requirements.				
Connections (i.e. toilets, external, washing machine, pool)	To be determined.				
Overflow from the rainwater tanks to be directed to stormwater treatment measures* (Yes/No)?	Yes				
Rainwater tanks per catchment	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Number of tanks per catchment	0	0	0		
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	0	715 m <sup>2</sup>	448 m <sup>2</sup>		
Tank volume (kL or kL per dwelling)	0	0	0		
Confirm location of rainwater tanks on the scaled annotated plan (Yes/No)	N/A	N/A	N/A		

Comments: Locations of rainwater tanks not shown as individual home designs have not been confirmed for each lot. This should be conditioned as part of the development approval.

## STEP 6: SELECT DEEMED TO COMPLY SOLUTION

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Selected Deemed to Comply Solution (include ID and full name)	R9 Residential High Density multiple dwelling apartments (flats, high rise) ≤12,500 m <sup>2</sup>	R9 Residential High Density multiple dwelling apartments (flats, high rise) ≤12,500 m <sup>2</sup>	R9 Residential High Density multiple dwelling apartments (flats, high rise) ≤12,500 m <sup>2</sup>		
Bioretention system area (% of catchment area) **	2.1%	2.1%	2.1%		
Constructed wetland area (% of catchment area)***	N/A	N/A	N/A		

Comments: Surface lot runoff and overflows from allotment tanks treated collected in pits and conveyed to bioretention basin

\* Compliance with the Deemed to Comply Solutions requires all overflow from the rainwater tanks to be directed to stormwater treatment measures.

\*\* Refers to the bioretention system filter media area

\*\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Step 7**

<b>STEP 7: DESIGN STORMWATER TREATMENT MEASURES</b>					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Catchment area (m <sup>2</sup> )	310 m <sup>2</sup>	1,110 m <sup>2</sup>	1,016 m <sup>2</sup>		
Location of treatment measure (public/private)	Private	Private	Private		
<b>Bioretention system</b>					
Filter media area (% of catchment area)	2.1	2.1	2.1		
Filter media area (m <sup>2</sup> )					
• required	7 m <sup>2</sup>	23 m <sup>2</sup>	21 m <sup>2</sup>		
• provided in concept	7 m <sup>2</sup>	23 m <sup>2</sup>	22 m <sup>2</sup>		
Total footprint* (m <sup>2</sup> )	27 m <sup>2</sup>	33 m <sup>2</sup>	27 m <sup>2</sup>		
Media depth (m)					
• filter media	0.6 m	0.6 m	0.6 m		
• transition layer	0.1 m	0.1 m	0.1 m		
• drainage layer	0.2 m	0.2 m	0.2 m		
Extended detention (m above surface level)	0.15	0.30	0.30		
Coarse sediment management	none	none	none		
Coarse sediment management area (m <sup>2</sup> )	0	0	0		
<b>Constructed wetland</b>					
Macrophyte zone area (% of catchment area)	N/A	N/A	N/A		
Macrophyte zone area (m <sup>2</sup> )	N/A	N/A	N/A		
Coarse sediment management	N/A	N/A	N/A		
Coarse sediment management area (m <sup>2</sup> )	N/A	N/A	N/A		
High flow bypass method	N/A	N/A	N/A		
High flow bypass area (m <sup>2</sup> )	N/A	N/A	N/A		
Total footprint* (m <sup>2</sup> )	N/A	N/A	N/A		
Conceptual design drawings of any pipe and pit diversion structures or alternative high flow bypass flow paths	N/A	N/A	N/A		

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc

Conceptual design levels (m AHD) – These sections apply to both bioretention systems and wetlands.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Inlet type	Surface flow	Pipe	Pipe		
• upstream invert level	N/A	Min 3.80	Min 3.80		
• downstream invert level	N/A	3.60	3.60		
Receiving drainage invert or ponded water level	Existing MH, IL 2.50	Proposed MH, IL 2.50	Proposed MH, IL 2.50		
Outlet pipe level					
• upstream invert level	3.80	3.60	3.60		
• downstream invert level	3.60	3.40	3.40		
Surface or water level	4.70	4.50	4.50		
Extended detention level (pit crest level)	4.80	4.80	4.80		
Minimum bund/embankment level	5.00	5.00	5.00		
Checks					
• Inlet at or above surface or water level?	✓	✓	✓		
• Outlet pipe DSIL above receiving drainage?	✓	✓	✓		
• Bund level minimum 150mm above extended detention level?	✓	✓	✓		
Comments					

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc

Conceptual Plan and Section – Checklist (mark with ✓ to indicate item has been shown on drawings)

Conceptual Plan (scaled and annotated plan view drawing)

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	CDP-WS3	CDP-WS3	CDP-WS3		
Inflow drainage arrangement	✓	✓	✓		
Outlet pits and pipes	✓	✓	✓		
Treatment areas (filter media and/ or macrophyte zone)	✓	✓	✓		
Coarse sediment management	✓	✓	✓		
High flow bypass	N/A	N/A	N/A		
Batters and embankments	✓	✓	✓		
Functional and surrounding ground levels	✓	✓	✓		

Conceptual Section (scaled and annotated section view drawing)					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	CDP-WS3	CDP-WS3	CDP-WS3		
Conceptual design levels	✓	✓	✓		
Surround earthworks levels	✓	✓	✓		
Inflow and outlet pits and pipes	✓	✓	✓		
Coarse sediment management	✓	✓	✓		
Extended detention (crest or pit)	✓	✓	✓		
Batters and embankments	✓	✓	✓		
Media depths (bioretention only)	✓	✓	✓		

**Designer**

Signed by Designer .....

Print name .....

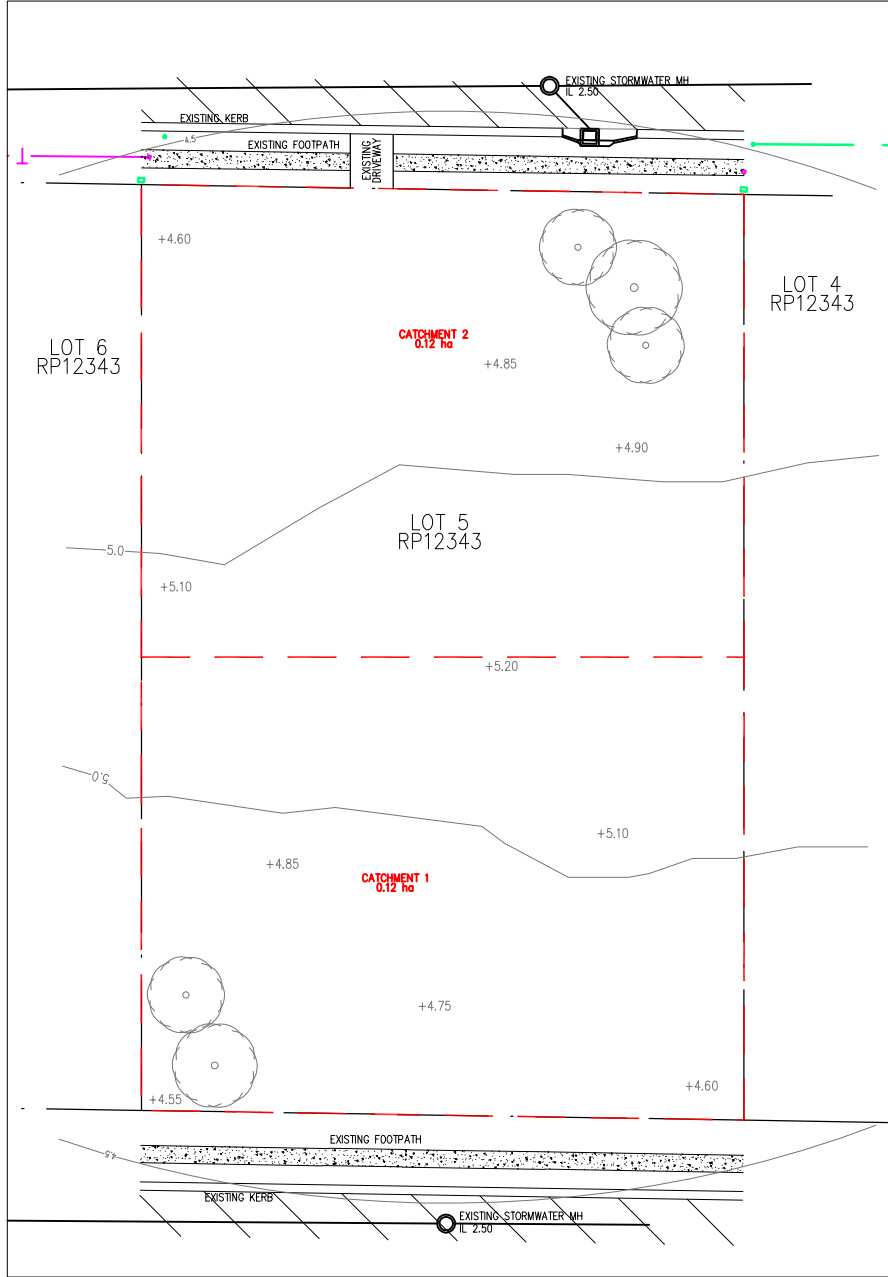
Date .....

**Development Assessment Officer**

Signed by officer .....

Print name .....

Date .....



REV.	DESCRIPTION	DATE	APP'D.
A	PRELIMINARY ISSUE	26/08/09	DC

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
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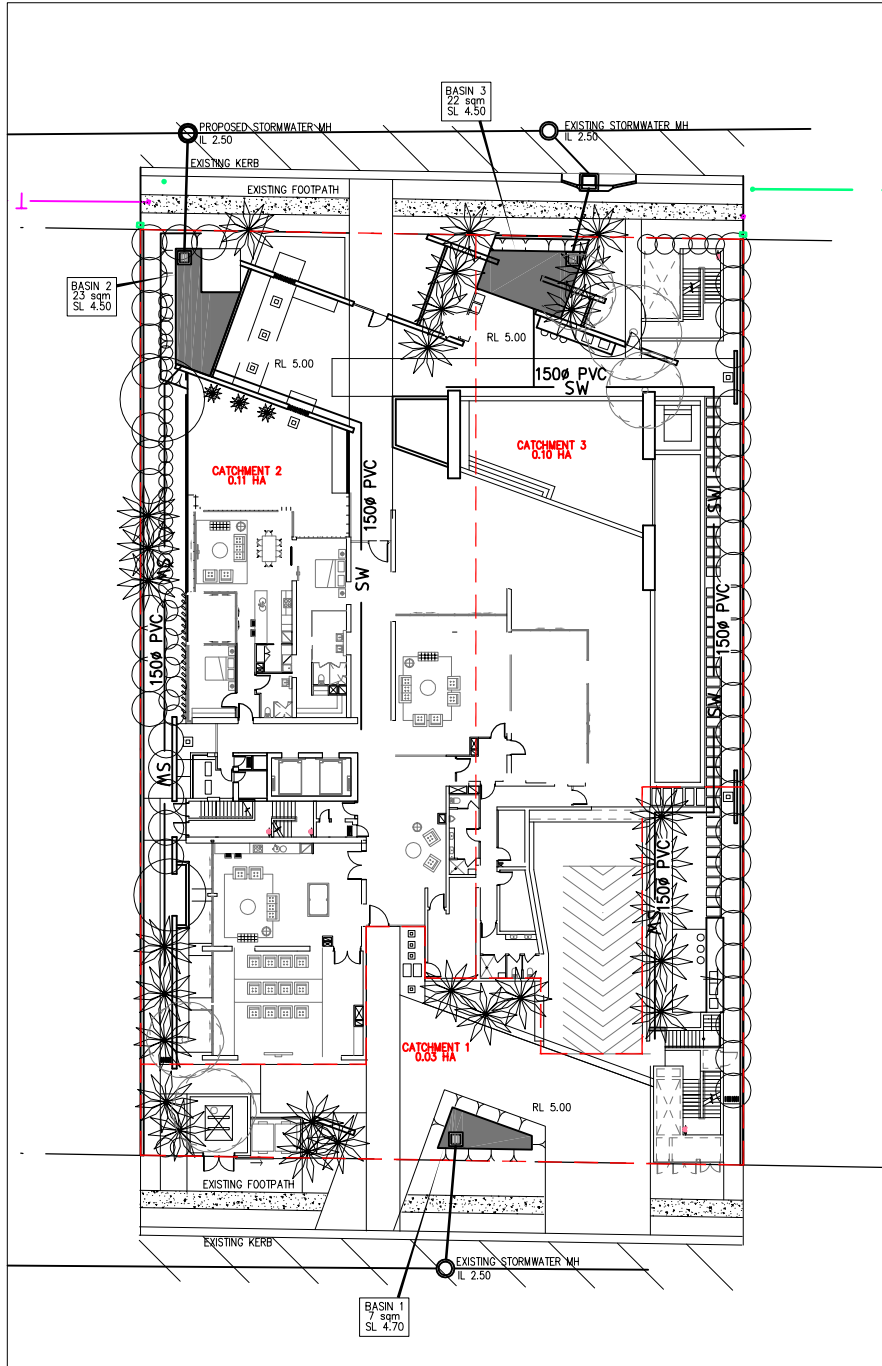
Project  
**DEEMED TO COMPLY**  
**CASE STUDY 3**

SITE DETAILS PLAN

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale at	A4	<b>SDP-WS3</b>	<b>A</b>
	1:500		

**LEGEND**

- PROPOSED FIELD INLET 
- PROPOSED STORMWATER 
- BIORETENTION BASIN 
- EXISTING PATH 
- EXISTING ROAD 



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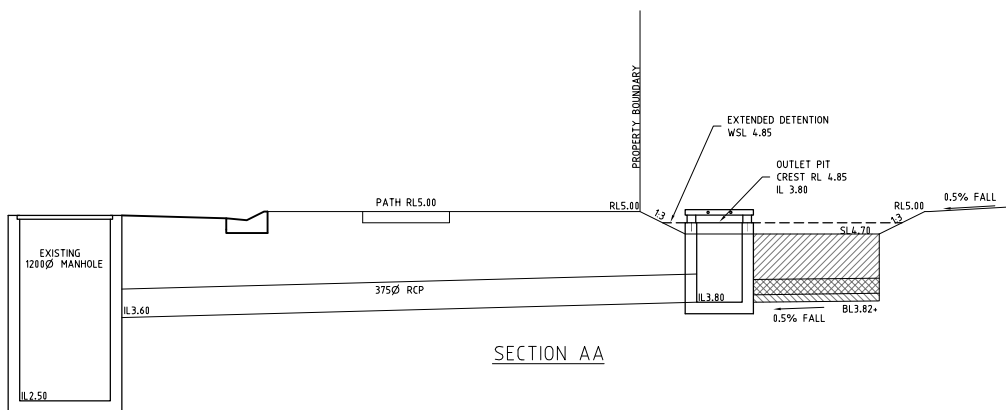
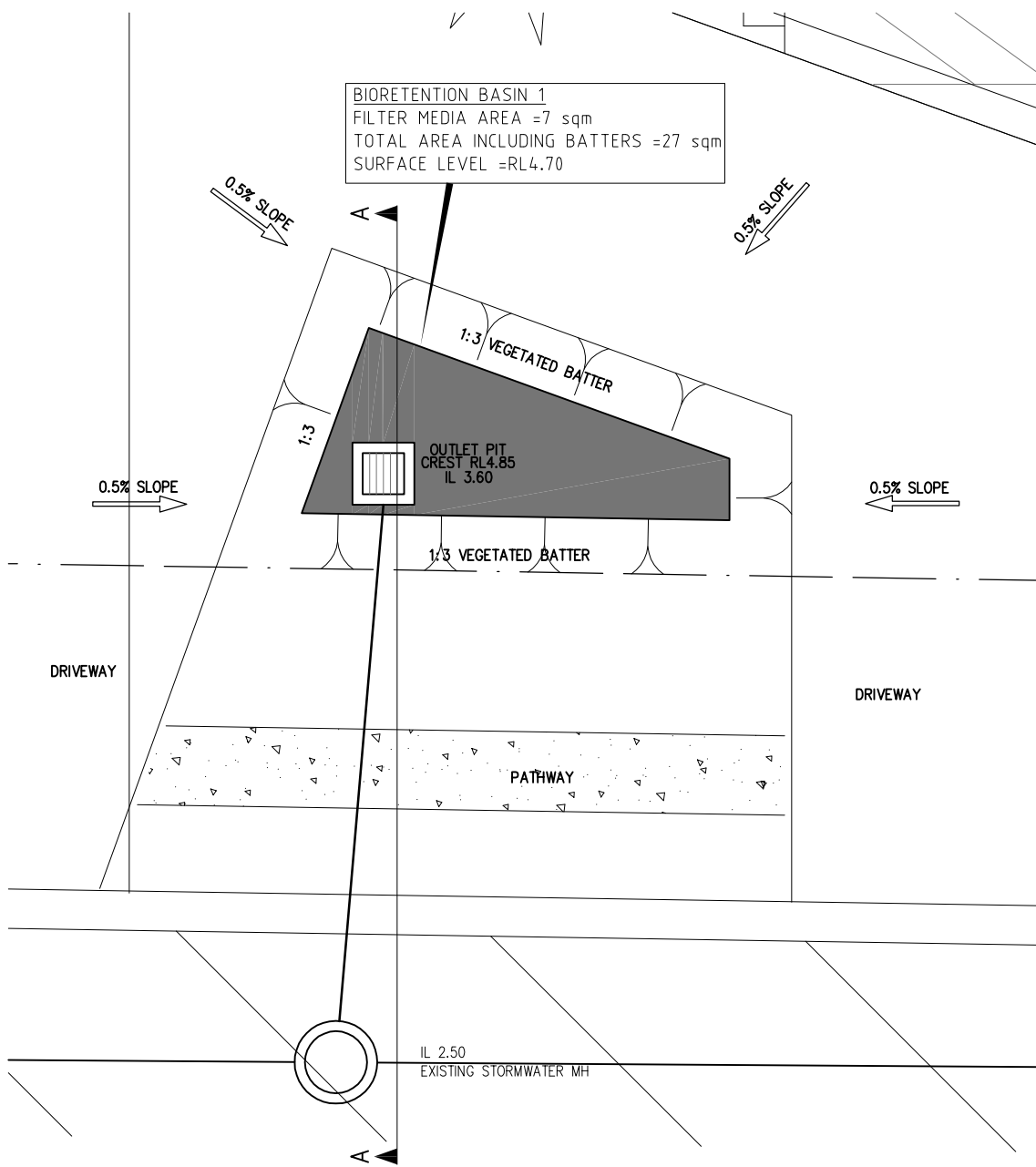
Project  
**DEEMED TO COMPLY  
 CASE STUDY 3**

DEVELOPMENT DETAILS PLAN

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale at A4	1:500	DDP-WS3	A

**LEGEND**

- PROPOSED FIELD INLET 
- PROPOSED STORMWATER 
- BIORETENTION BASIN 
- EXISTING PATH 
- EXISTING ROAD 



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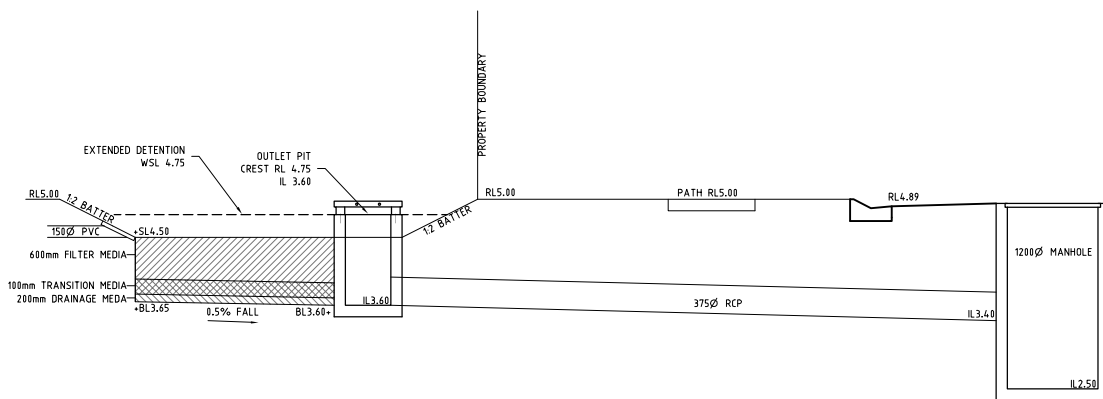
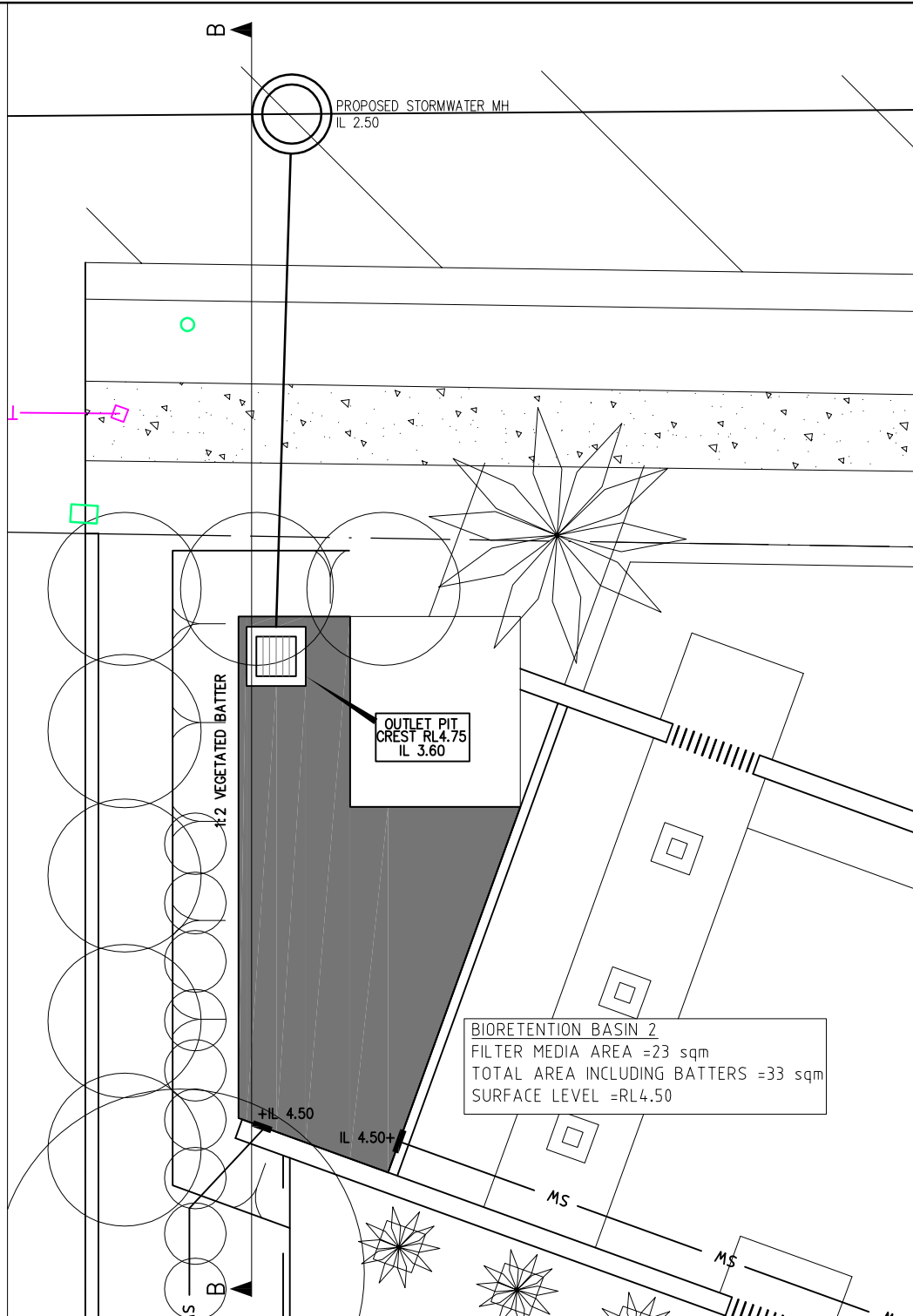
Project  
**DEEMED TO COMPLY**  
**CASE STUDY 3**

CONCEPT DETAILS PLAN  
 (1 OF 3)

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale	at A4 1:100	<b>CDP-WS3</b>	<b>A</b>

**LEGEND**

PROPOSED FIELD INLET	
PROPOSED STORMWATER	
BIORETENTION BASIN	
EXISTING PATH	
EXISTING ROAD	



SECTION BB

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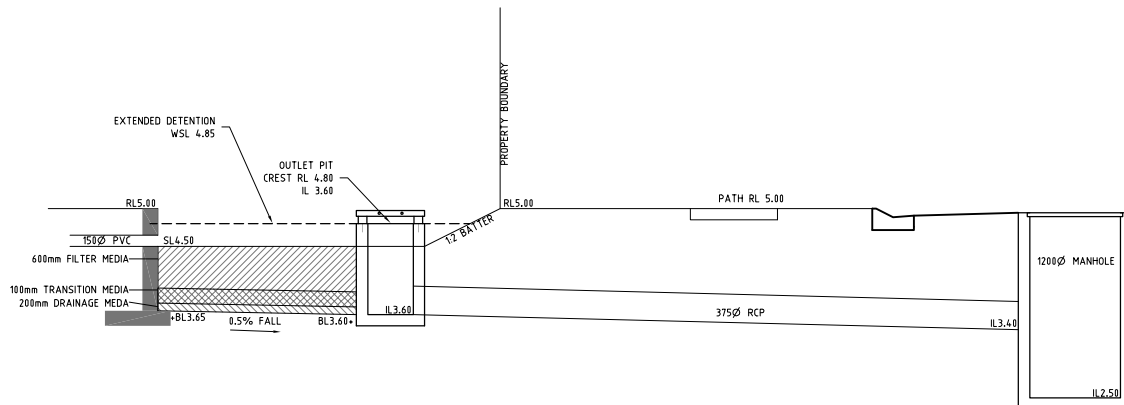
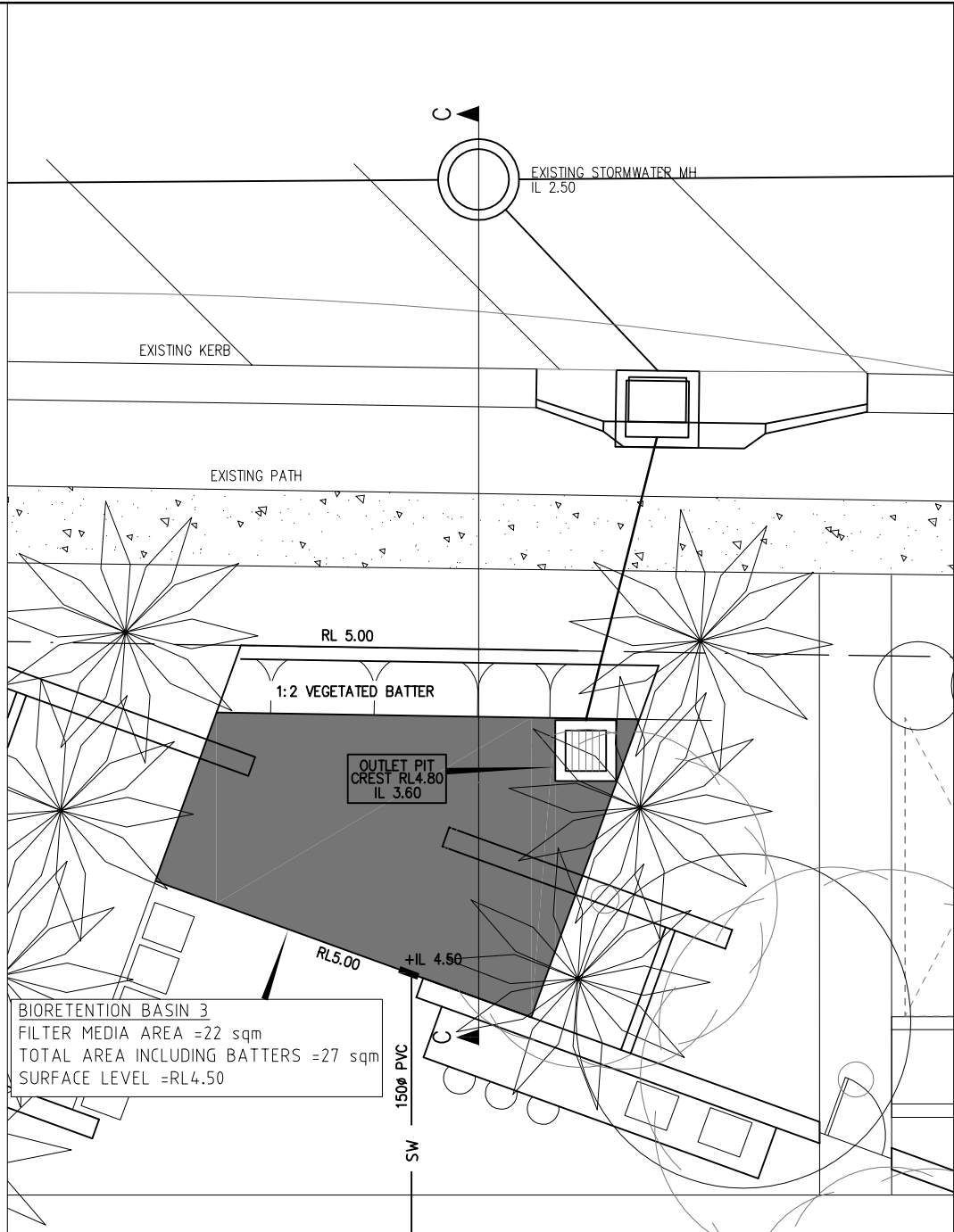
Project  
**DEEMED TO COMPLY**  
CASE STUDY 3

CONCEPT DETAILS PLAN  
(2 OF 3)

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale at A4	1:100	<b>CDP-WS3</b>	<b>A</b>

**LEGEND**

PROPOSED FIELD INLET	
PROPOSED STORMWATER	
BIORETENTION BASIN	
EXISTING PATH	
EXISTING ROAD	



SECTION CC

REV.	DESCRIPTION	DATE	APP'D.
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Project  
**DEEMED TO COMPLY**  
CASE STUDY 3

CONCEPT DETAILS PLAN  
(3 OF 3)

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale	at A4 1:100	CDP-WS3	A

## 2.4 Worked Solution 4 (WS4) - Industrial development $\leq 12,500 \text{ m}^2$

### 2.4.1 Project Description

Industry Park is a greenfield development site located in a new development area in the outer suburbs of Brisbane. The site has recently been subdivided into residential, commercial and industrial allotments. The subject site comprises a 1.0 ha allotment zoned industrial warehouse which has very slight grades (typically 0.5%).

The applicant has engaged a design team to develop a layout for the subject site that comprises a warehouse and associated light industry with a roof area of 0.4ha,

parking and driveway area of 0.39ha and the remainder (0.21 ha) is landscaped (Figure 7). All Material Change of Use applications for industrial uses trigger the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) for stormwater quality management. The pollutant load reduction objectives for South East Queensland are: 80% reduction in Total Suspended Solids, 60% reduction in Total Phosphorous and 45% reduction in Total Nitrogen. As the application involves industrial development less than 12,500 m<sup>2</sup> in area the applicant has chosen to adopt a deemed to comply solution in order to simplify the reporting and approvals process for the stormwater management component of the development application.

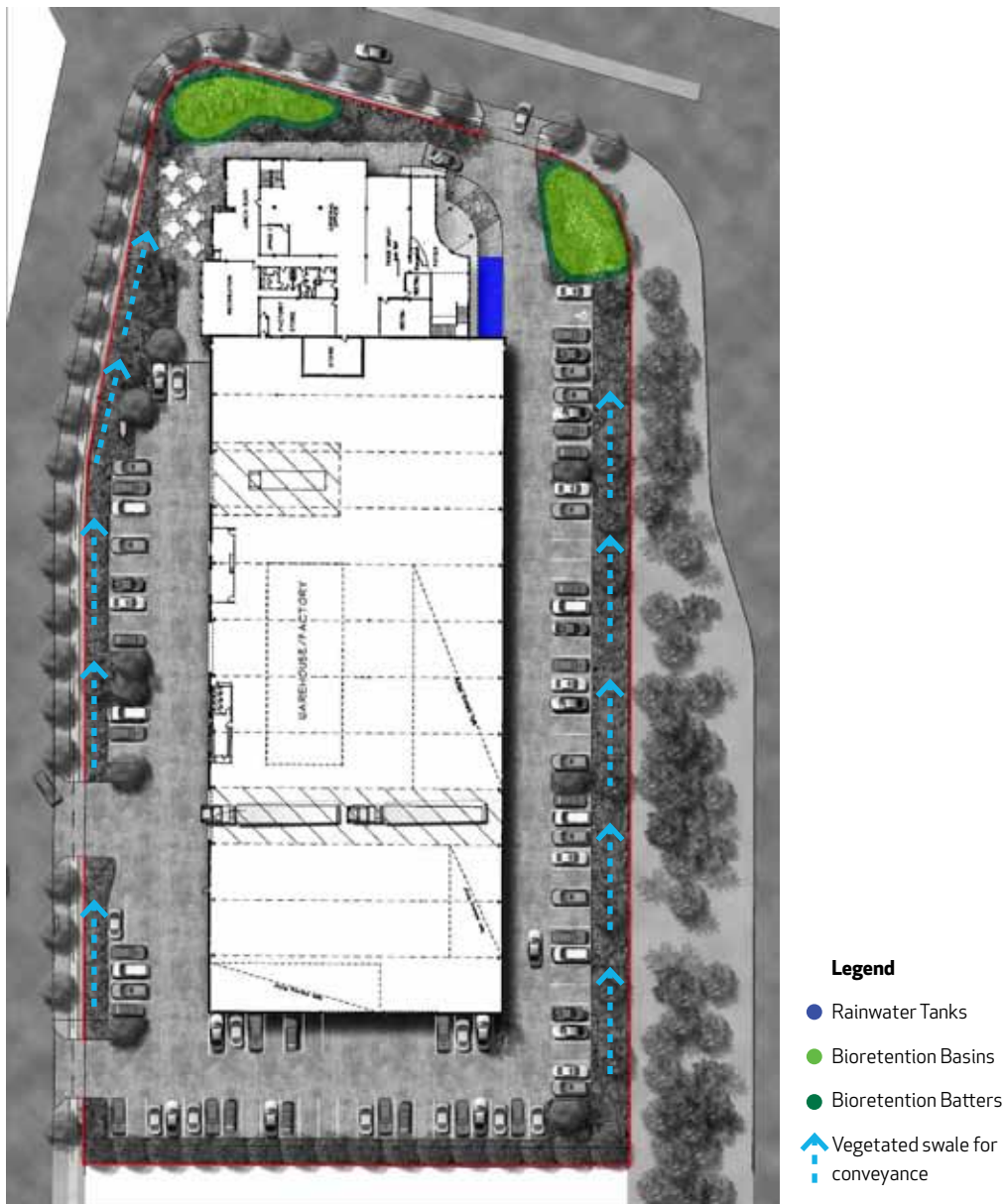


**Figure 7 - Proposed Development Layout for Industry Park**

## 2.4.2 WSUD Strategy and Adoption of a Deemed to Comply Solution

The site is not plumbed to a source of recycled water, therefore rainwater tanks are required to be delivered across the site in accordance with QDC MP4.3 (Alternative water sources – Commercial Buildings). As the site is highly constrained for space, constructed wetlands were ruled out as a stormwater treatment measure. Given the flat nature of the site, the WSUD specialists opted to intercept and treat some of the

stormwater at-surface and collect the remainder in a swale and underdrainage pipes and deliver near surface to shallow bioretention basins (Figure 8, DTC Solution C11). Overflows from the roofwater tank are also delivered to a bioretention basin via a shallow pipe (in accordance with the requirements of the Deemed to Comply Solutions). The bioretention basins are to be designed with a saturated zone which improves plant survival during the dry season.



**Figure 8 - Proposed WSUD Strategy for Industry Park**

### 2.4.3 Development Application Documentation

The following documents and drawings have been developed to support the development application for the Deemed to Comply Solution I1:

- Deemed to Comply Solutions Development Assessment Checklist for Queensland (DA-DTC-WS4)
- Site Details Plan (Drawing SDP-WS4)
- Development Details Plan (Drawing DDP-WS4)
- Conceptual Details Plan (Drawing SCP-WS4)
- Conceptual Sections (Drawing SCS-WS4)

# Development Assessment Checklist

## Summary of Development and Deemed to Comply Solution

### DEVELOPMENT ADDRESS

Development application ID	DA-DTC-WS4
Project name	Industry Park
Applicant's name	Mango Hill Properties
Street address	12345 Industrial Ave
Suburb	Mango Hill
Postcode	4509
Local Government Area	Brisbane City Council
Climatic region	South East Queensland - Central Region

### DEVELOPMENT TYPE & DETAILS

Development type (e.g. residential detached dwellings)	Industrial without new public road <12,500 m <sup>2</sup>
Number of dwellings/buildings	1
Site area (m <sup>2</sup> )	10,000 m <sup>2</sup>
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	4,000 m <sup>2</sup>

### DEEMED TO COMPLY SOLUTION

Deemed to Comply Solution ID	CI1
Rainwater tank volume (kL) (for detached dwellings tank volume per dwelling kL/dwelling)	12 kL (8 toilets at 1.5kl per toilet)
Bioretention area* (m <sup>2</sup> )	160 m <sup>2</sup> (1.6%)
Constructed wetland area** (m <sup>2</sup> )	N/A
Total footprint of bioretention or wetland system(s) (m <sup>2</sup> )	320 m <sup>2</sup>

\* Refers to the bioretention system filter media area

\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Steps 1 to 3**

## STEP 1: DEVELOPMENT LOCATION AND CLIMATE REGION

Project name	Industry Park
Street address	12345 Industrial Ave
Suburb	Mango Hill
Postcode	4509
Local Government Area	Brisbane City Council
Climatic region (Figure 2 and A-2, Appendix A)	South East Queensland - Central Region

## STEP 2: DETERMINE DEVELOPMENT TYPE

Development type (e.g. residential detached dwellings)	Industrial without new public road <12,500 m <sup>2</sup>
Number of dwellings/buildings	1
Site area (m <sup>2</sup> )	10,000 m <sup>2</sup>

## STEP 3: DEFINE SITE DETAILS

Site Details Plan (scaled annotated)	
Plan ID	SDP-WS4
Existing topography (Yes/No)	Yes
Existing drainage characteristics upstream, within, and downstream of site (including catchment areas)	Yes – catchments, drainage paths and areas shown on site details plan SDP-WS4.
Proposed discharge points and the downstream drainage size and invert levels (or ponded water levels) (Yes/No)	YES - Existing stormwater pipes and invert levels shown on site details plan SDP-WS4.
Existing vegetation and vegetation to be retained (Yes/No)	Yes – As shown on site details plan SDP-WS4 there is no existing vegetation on the site.
Soil evaluation in accordance with AS/NZS 1547:2000 Clause 4.1.3 if necessary (Yes/No)	No (Not required – no exfiltration proposed)

### General comments (where required)

Topography: The site has grades gently from approx RL 13.75 at the NW corner to 13.00 along the eastern boundary

Drainage: Drainage occurs generally from west to east via sheet flows. No formal channels, creeks or waterways are present on the site to convey stormwater flows.

Vegetation: As shown on the Site Details Plan (SDP-WS4), no existing vegetation is present on the site.

# Development Assessment Checklist **Step 4**

## STEP 4: OUTLINE DEVELOPMENT DETAILS

Development area (m <sup>2</sup> )	10,000 m <sup>2</sup>
<b>Private land</b>	
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	4,000 m <sup>2</sup>
Road reserve, driveway or parking (m <sup>2</sup> )	3,900 m <sup>2</sup>
Pavement area (m <sup>2</sup> ) *	0 m <sup>2</sup>
Easements (services or drainage) (m <sup>2</sup> )	0 m <sup>2</sup>
Landscape area (m <sup>2</sup> )	2,100 m <sup>2</sup>
Other areas (m <sup>2</sup> )	0 m <sup>2</sup>
Area available for stormwater treatment (may be part of landscape area) (m <sup>2</sup> ) *	1,000 m <sup>2</sup>
<b>Public land (ultimately owned by local authority)</b>	
Road reserve (m <sup>2</sup> )	0 m <sup>2</sup>
Parkland (m <sup>2</sup> )	0 m <sup>2</sup>
Easement (services or drainage) (m <sup>2</sup> )	0 m <sup>2</sup>
Other areas (m <sup>2</sup> )	0 m <sup>2</sup>
Space available for stormwater treatment (may be part of landscape area)* (m <sup>2</sup> )	0 m <sup>2</sup>
<b>Development Details Plan (scaled annotated plan)</b>	
Plan ID	DDP-WS4
Development layout clearly depicted with land type areas (Yes/No)	Yes
Catchment areas defined with ID (Yes/No)	Yes
Conceptual earthworks provided including finished levels (Yes/No)	Yes
Conceptual drainage layout and inverts levels (Yes/No)	Yes
Existing/proposed infrastructure layout and levels have been considered (i.e. no conflict with treatment measures)** (Yes/No).	Yes
<b>General comments</b>	

\* Designers should consult with the project landscape architect to check which landscape areas are available for stormwater treatment. Local government standards should also be checked to ensure areas proposed for treatment will not be required to feature incompatible plantings (e.g. large trees).

\*\* Infrastructure may include (sewer, power, water, gas etc). Any infrastructure which may impact on location or drainage of treatment measures should be considered. External infrastructure which has the potential to influence location or drainage of treatment measures should also be shown.

# Development Assessment Checklist **Steps 5 & 6**

## STEP 5: CONFIRM RAINWATER TANK REQUIREMENTS (QUEENSLAND DEVELOPMENT CODE)

Are rainwater tanks to be installed (Yes/No)?	Yes (as required by QDC MP 4.3)				
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	400 m <sup>2</sup> (min. 50 m <sup>2</sup> per toilet pedestal as required by QDC MP 4.3)				
Total rainwater tank volume (kL or kL per dwelling)	12 kL (8 pedestals assumed – may be subject to refinement; 1.5 kL per pedestal as required by QDC MP 4.3)				
Connections (i.e. toilets, external, washing machine, pool)	Toilets (3.3 adults assumed per 100m <sup>2</sup> gross floor area, and one toilet assumed per 17.5 persons [50:50 male: female split also assumed] which gives 7.5 toilets, rounded up to 8).				
Overflow from the rainwater tanks to be directed to stormwater treatment measures* (Yes/No)?	YES				
Rainwater tanks per catchment	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Number of tanks per catchment	1				
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	400				
Tank volume (kL or kL per dwelling)	12				
Confirm location of rainwater tanks on the scaled annotated plan (Yes/No)	Yes				

Comments: Locations of rainwater tanks not shown as individual home designs have not been confirmed for each lot. This should be conditioned as part of the development approval.

## STEP 6: SELECT DEEMED TO COMPLY SOLUTION

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Selected Deemed to Comply Solution (include ID and full name)	CI1 – Industrial without new public road 12,500m <sup>2</sup> – rainwater tanks/ bioretention	CI1 – Industrial without new public road 12,500m <sup>2</sup> – rainwater tanks/ bioretention			
Bioretention system area (% of catchment area) **	1.6%	1.6%			
Constructed wetland area (% of catchment area)***	0	0			

Comments:

\* Compliance with the Deemed to Comply Solutions requires all overflow from the rainwater tanks to be directed to stormwater treatment measures.

\*\* Refers to the bioretention system filter media area

\*\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Step 7**

<b>STEP 7: DESIGN STORMWATER TREATMENT MEASURES</b>					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Catchment area (m <sup>2</sup> )	6,500 m <sup>2</sup>	3,500 m <sup>2</sup>			
Location of treatment measure (public/private)	Private	Private			
<b>Bioretention system</b>					
Filter media area (% of catchment area)	1.6%	1.6%			
Filter media area (m <sup>2</sup> )					
• required	100 m <sup>2</sup>	60 m <sup>2</sup>			
• provided in concept	100 m <sup>2</sup>	60 m <sup>2</sup>			
Total footprint* (m <sup>2</sup> )	185 m <sup>2</sup>	135 m <sup>2</sup>			
Media depth (m)					
• filter media	0.6 m	0.6 m			
• transition layer	0.1 m	0.1 m			
• drainage layer	0.2 m	0.2 m			
Extended detention (m above surface level)	0.3 m	0.3 m			
Coarse sediment management	Swale	Swale			
Coarse sediment management area (m <sup>2</sup> )	50m swale (min)	50m swale (min)			
<b>Constructed wetland</b>					
Macrophyte zone area (% of catchment area)	N/A				
Macrophyte zone area (m <sup>2</sup> )	N/A				
Coarse sediment management	N/A				
Coarse sediment management area (m <sup>2</sup> )	N/A				
High flow bypass method	N/A				
High flow bypass area (m <sup>2</sup> )	N/A				
Total footprint* (m <sup>2</sup> )	N/A				
Conceptual design drawings of any pipe and pit diversion structures or alternative high flow bypass flow paths	N/A				

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc

Conceptual design levels (m AHD) – These sections apply to both bioretention systems and wetlands.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Inlet type	Swale / Pipe	Swale			
• upstream invert level					
• downstream invert level	12.0	12.0			
Receiving drainage invert or ponded water level	10.50	10.75			
Outlet pipe level					
• upstream invert level	11.25	10.75			
• downstream invert level	10.50	10.50			
Surface or water level	12.0	12.0			
Extended detention level (pit crest level)	12.3	12.3			
Minimum bund/embankment level	13.0	13.0			
Checks					
• Inlet at or above surface or water level?	✓	✓			
• Outlet pipe DSIL above receiving drainage?	✓	✓			
• Bund level minimum 150mm above extended detention level?	✓	✓			
Comments	Swale conveys flows from parking area to bioretention basin. Overflows from rainwater tank conveyed into bioretention basin via small pipe under pavement.	Swale conveys flows from parking area to bioretention basin.			

Conceptual Plan and Section – Checklist (mark with ✓ to indicate item has been shown on drawings)

Conceptual Plan (scaled and annotated plan view drawing)

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	CDP-WS4	CDP-WS4			
Inflow drainage arrangement	✓	✓			
Outlet pits and pipes	✓	✓			
Treatment areas (filter media and/ or macrophyte zone)	✓	✓			
Coarse sediment management	✓	✓			
High flow bypass	N/A	N/A			
Batters and embankments	✓	✓			
Functional and surrounding ground levels	✓	✓			

Conceptual Section (scaled and annotated section view drawing)					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	CDP-WS4	CDP-WS4			
Conceptual design levels	✓	✓			
Surround earthworks levels	✓	✓			
Inflow and outlet pits and pipes	✓	✓			
Coarse sediment management	✓	✓			
Extended detention (crest or pit)	✓	✓			
Batters and embankments	✓	✓			
Media depths (bioretention only)	✓	✓			

**Designer**

Signed by Designer .....

Print name .....

Date .....

**Development Assessment Officer**

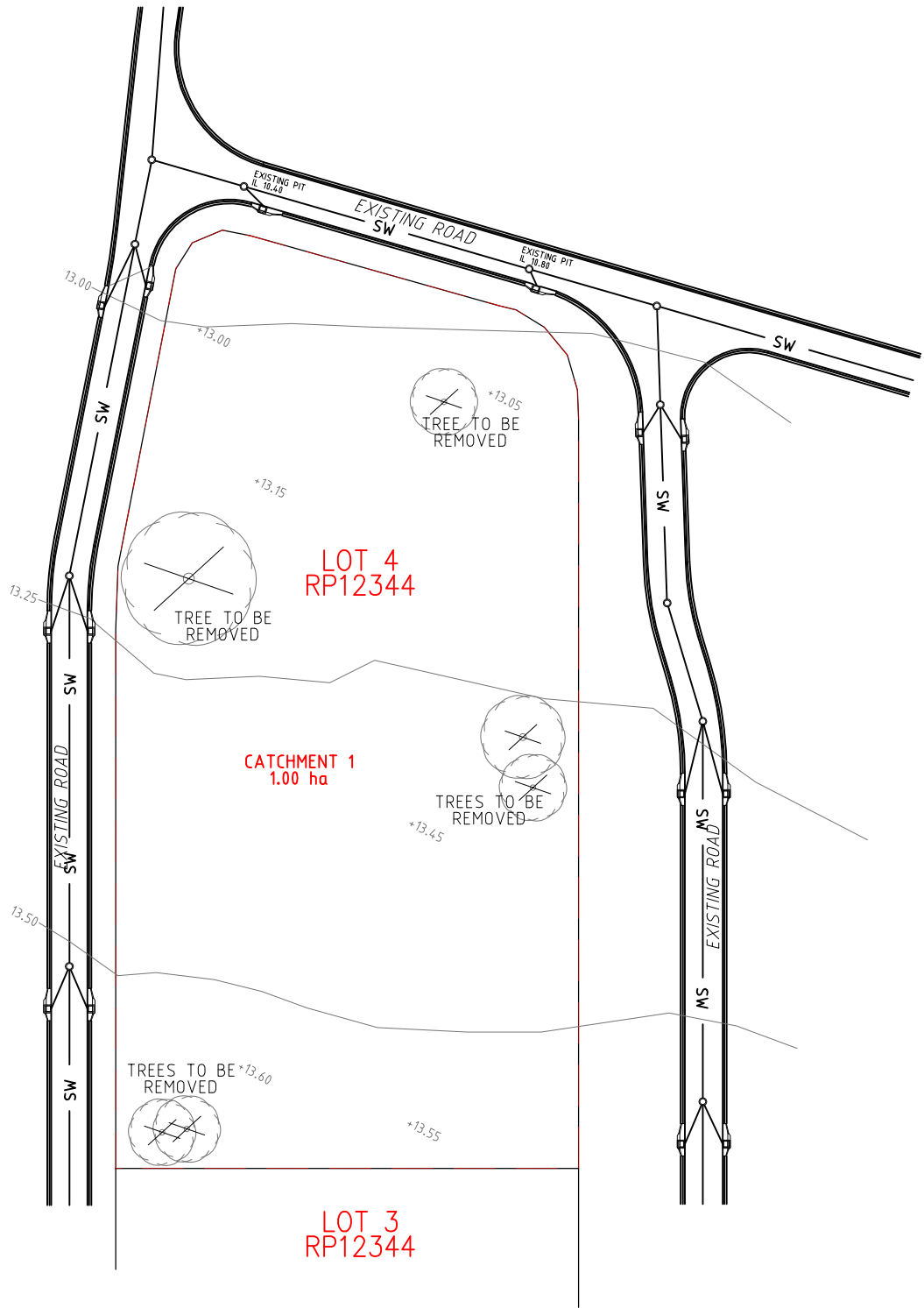
Signed by officer .....

Print name .....

Date .....

**LEGEND**

- PROPOSED FIELD INLET
- PROPOSED STORMWATER
- BIORETENTION BASIN
- RAINWATER TANK



A	PRELIMINARY ISSUE	26/08/09	DC
REV.	DESCRIPTION	DATE	APP'D.

ASSOCIATED CONSULTANTS

**DesignFlow**  
 2204/5 LARSON STREET SOUTHPORT QLD 4215  
 Ph: (07) 5528 1148  
 Mobile: 0414 948 087

**HEALTHY WATERWAYS**  
 Because we're all in the same boat





**waterbydesign**

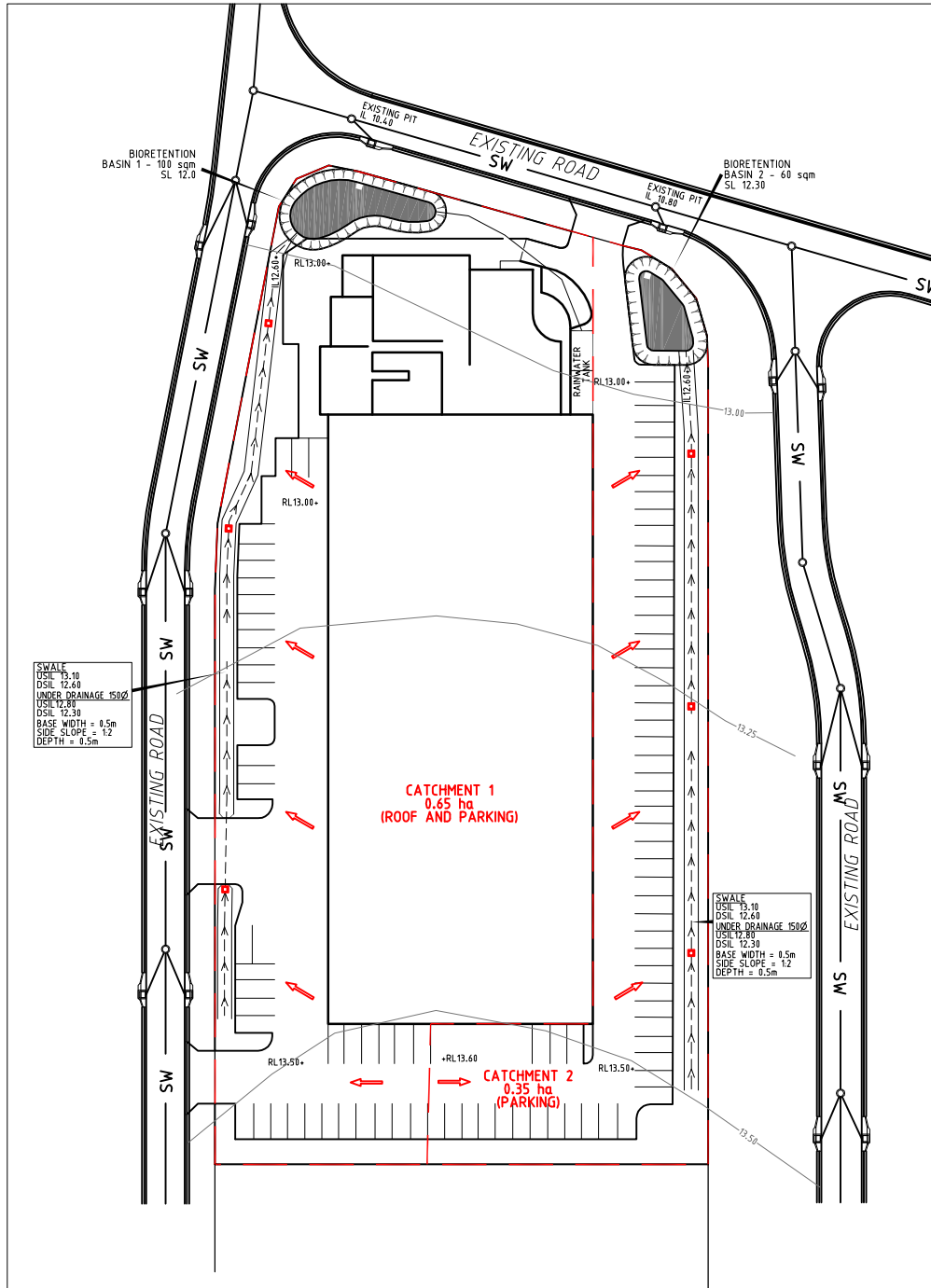
Project  
**DEEMED TO COMPLY WORKED SOLUTION 4**

Site DETAILS PLAN

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	
Scale	at A4 1:1000	SDP-WS4	A

**LEGEND**

- PROPOSED FIELD INLET 
- PROPOSED STORMWATER  SW
- BIORETENTION BASIN 
- RAINWATER TANK 



REV.	DESCRIPTION	DATE	APP'D.
A	PRELIMINARY ISSUE	26/08/09	DC

ASSOCIATED CONSULTANTS

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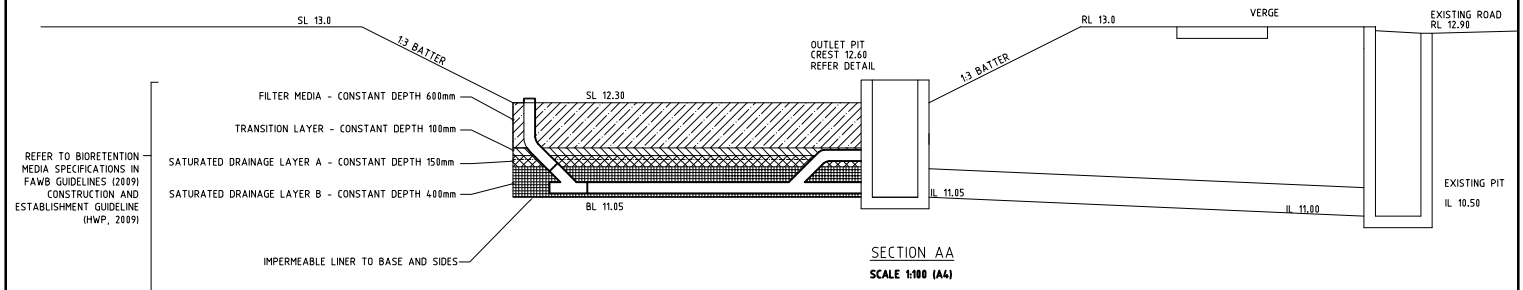
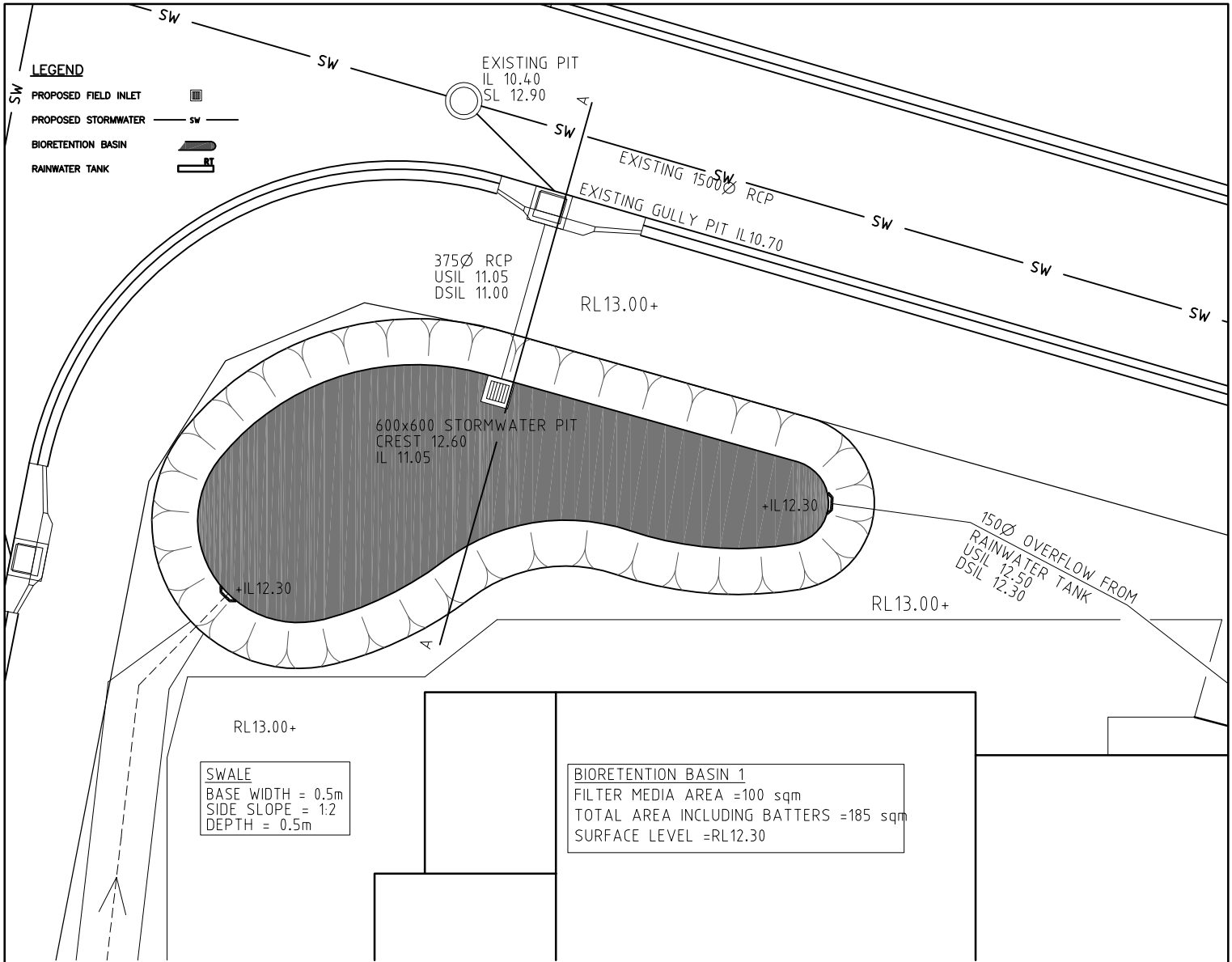
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**waterbydesign**

Project  
**DEEMED TO COMPLY WORKED SOLUTION 4**

DEVELOPMENT DETAILS PLAN

Designed	AO	Approved
Drawn	DC	RPEQ
Date	26/08/09	Drawing No.
Scale at A4	1:1000	Rev.
		DDP-WS4 A



REV.	DESCRIPTION	DATE	APP'D.
A	PRELIMINARY ISSUE	26/08/09	DC

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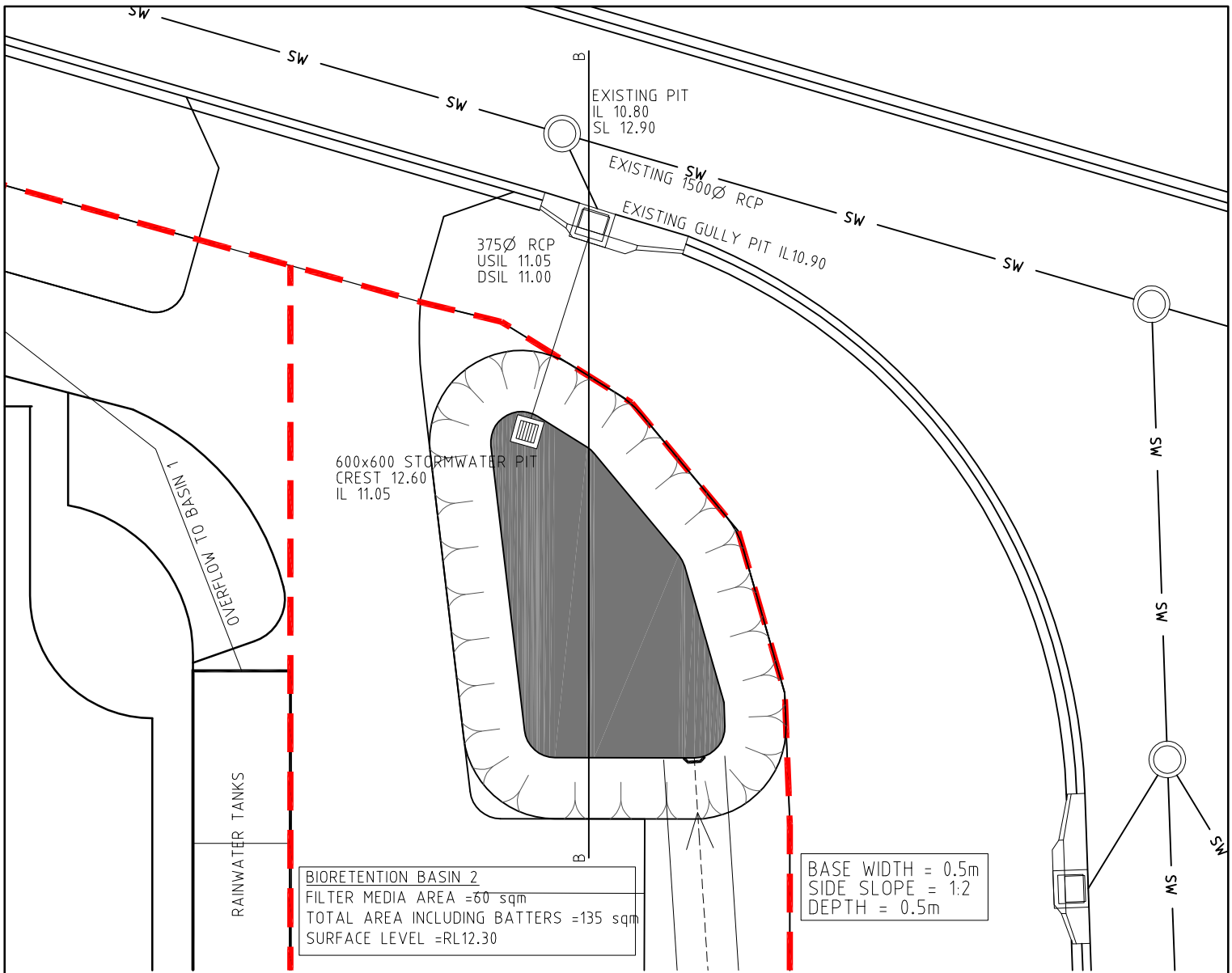
**HEALTHY WATERWAYS**  
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Project  
**DEEMED TO COMPLY WORKED SOLUTION 4**

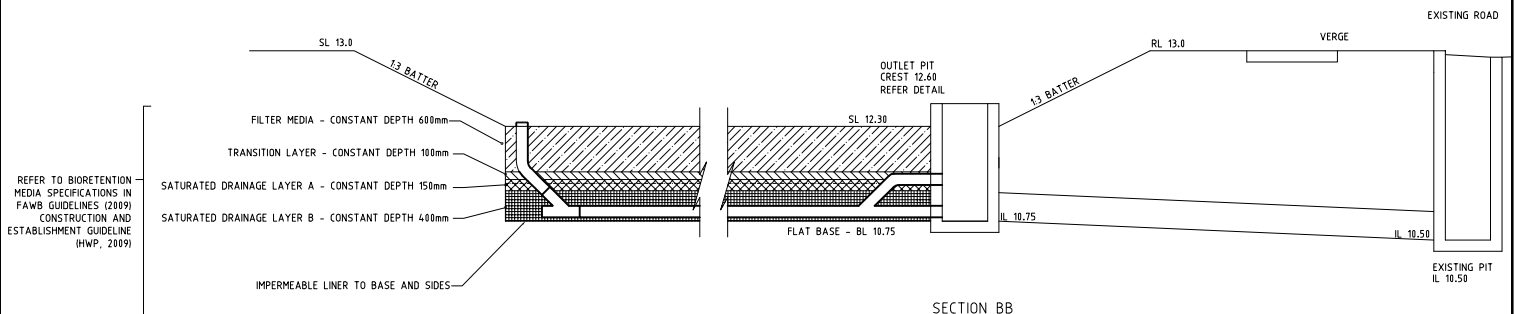
CONCEPT DETAILS PLAN  
(1 OF 2)

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale at A4	1:200	CDP-WS4	A



**BIORETENTION BASIN 2**  
 FILTER MEDIA AREA = 60 sqm  
 TOTAL AREA INCLUDING BATTERS = 135 sqm  
 SURFACE LEVEL = RL 12.30

BASE WIDTH = 0.5m  
 SIDE SLOPE = 1:2  
 DEPTH = 0.5m



REFER TO BIORETENTION MEDIA SPECIFICATIONS IN FAWB GUIDELINES (2009) CONSTRUCTION AND ESTABLISHMENT GUIDELINE (HWP, 2009)

REV.	DESCRIPTION	DATE	APP'D.
A	PRELIMINARY ISSUE	26/08/09	DC

ASSOCIATED CONSULTANTS

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 Mobile 0414 948 087

**HEALTHY WATERWAYS**  
 Because we're all in the same boat

Project  
**DEEMED TO COMPLY WORKED SOLUTION 4**  
 CONCEPT DETAILS PLAN  
 (2 OF 2)

Designed	Approved
AO	
DC	RPEQ
Date	26/08/09
Scale at A4	1:200
Drawing No.	CDP-WS4 A
Rev.	A

### 3 Deemed to Comply Worked Examples

Two (2) Worked Examples have been developed to illustrate appropriate solutions for common development types. These development types do not trigger the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) and the Deemed to Comply Solutions are not necessarily applicable. These Worked Examples provide guidance on how WSUD could be practically delivered for common development types falling outside of the Deemed to Comply Solution Development Scenarios.

WORKED SOLUTION	DEVELOPMENT SCENARIO	DEEMED TO COMPLY SOLUTION*		CLIMATIC REGION AND TREATMENT SIZE		SEQ RP IG7 TRIGGERED
		ID	DESCRIPTION	CLIMATIC REGION	TREATMENT AREA %**	
WE1	Residential Subdivision 1 into 2 lots	N/A	Rainwater Tanks	SEQ - Central Region	N/A	No (<6 lots)
WE2	Rural Residential subdivision	N/A	Rainwater Tanks / Bioretention	SEQ - Western Region	1.5**	No (<25% impervious)

\* although Deemed to Comply Solutions are not necessarily strictly applied to these development types, a local authority may utilise these as solutions where the planning scheme specifies stricter objectives than the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009).

\*\* treatment area % refers to percentage of road reserve area only

### 3.1 Worked Example 1 (WE1): Residential Subdivision – 1 into 2 lots

#### 3.1.1 Project Description

The subject site, located on Wilston Road in Brisbane’s inner northern suburbs (lot 38 on RP12345), is an existing 816 m<sup>2</sup> residential allotment. There is an existing worker’s cottage located centrally on the land. The site grades away from Wilston Road which forms the northern boundary of the site from NW to SE at approximately 6% (see inset).

The owner of the land has engaged an architect and town planner to develop a proposal to subdivide the allotment into two equal allotments of 408 m<sup>2</sup> each, and design

new homes for the allotments. The existing worker’s cottage is to be relocated to 38a and renovated / extended, whilst a new modern ‘small allotment home’ is to be constructed on 38b Wilston Rd (Figure 9).

Given that the proposal comprises a one into two lot subdivision the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) is not triggered for stormwater quality management. The landowner however wishes to deliver a sustainable outcome to the subdivision and has requested the town planner and architect to deliver best practice stormwater management to the development.



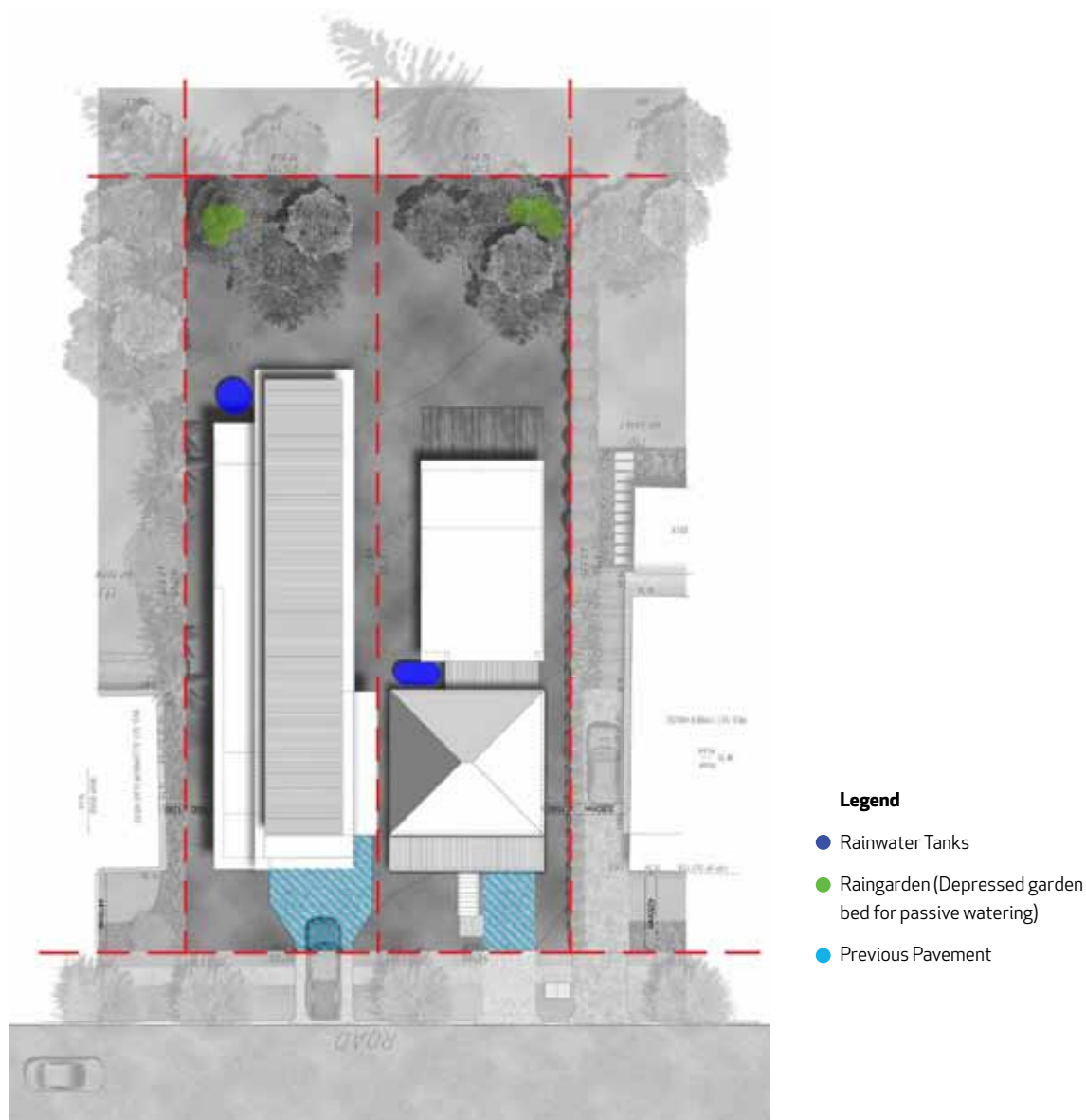
**Figure 9 - Proposed Development Layout for 38 Wilston Road**

### 3.1.2 WSUD Strategy and Proposed Solution

A rainwater tank is required for the new small allotment home at 38b Wilston Rd according to the QDC MP4.2. The home on lot 38a would require building approval as a major renovation under the QDC MP 4.1 (Sustainable Buildings) and would therefore only require water saving devices and not a rainwater tank. A rainwater tank however is recommended in the strategy to deliver water savings (and stormwater quality improvement) to the lot. Pervious pavement is to be employed in hardstand areas such as driveways and patios.

Overflows from rainwater tanks and sheet flows are collected via stormwater and daylighted into a depressed garden bed adjacent to rear allotment drainage (Figure 10).

Although the development type does not trigger the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009), a worked example has been documented to provide a stormwater quality management solution that is appropriate for the development type. The Worked Example provided here may apply as a Worked Solution where local government planning schemes specify stricter triggers than those outlined in the guideline.



**Figure 10 - Proposed WSUD Strategy for 38 Wilston Road**

### 3.1.3 Development Application Documentation

Based on the development scenario, the following documents and drawings have been developed to illustrate stormwater quality management options on a 1 into 2 lot subdivision that could be used to support a development application:

- Deemed to Comply Solutions Development Assessment Checklist for Queensland (DA-DTC-WE1)
- Site Details Plan (Drawing SDP-WE1) showing:
  - Existing structures, Development boundary and site contours/vegetation
- Development Details Plan (Drawing DDP-WE1) illustrating:
  - Locations of tanks (sufficiently large area nominated to fit a 5 kL (minimum) rainwater tank)
  - Conceptual roof catchments (showing connected areas – min 100 m<sup>2</sup>/dwelling)
  - Locations and extent of pervious pavements and infiltration zones

# Development Assessment Checklist

## Summary of Development and Deemed to Comply Solution

DEVELOPMENT ADDRESS	
Development application ID	DA-DTC-WE1
Project name	Wilston Street
Applicant's name	Douglas E. Wallace
Street address	38 Wilston Street
Suburb	Windsor
Postcode	4030
Local Government Area	Brisbane City Council
Climatic region	South East Queensland - Central Region
DEVELOPMENT TYPE & DETAILS	
Development type (e.g. residential detached dwellings)	1 into 2 lot subdivision
Number of dwellings/buildings	2
Site area (m <sup>2</sup> )	816 m <sup>2</sup>
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	150 m <sup>2</sup> per dwelling (typ.)
DEEMED TO COMPLY SOLUTION	
Deemed to Comply Solution ID	Not a deemed to comply solution
Rainwater tank volume (kL) (for detached dwellings tank volume per dwelling kL/dwelling)	5 kL per dwelling
Bioretention area* (m <sup>2</sup> )	0 m <sup>2</sup>
Constructed wetland area** (m <sup>2</sup> )	0 m <sup>2</sup>
Total footprint of bioretention or wetland system(s) (m <sup>2</sup> )	0 m <sup>2</sup>

\* Refers to the bioretention system filter media area

\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Steps 1 to 3**

## STEP 1: DEVELOPMENT LOCATION AND CLIMATE REGION

Project name	Wilston Street
Street address	38 Wilston Street
Suburb	Windsor
Postcode	4030
Local Government Area	Brisbane City Council
Climatic region (Figure 2 and A-2, Appendix A)	South East Queensland - Central Region

## STEP 2: DETERMINE DEVELOPMENT TYPE

Development type (e.g. residential detached dwellings)	1 into 2 lot subdivision
Number of dwellings/buildings	2
Site area (m <sup>2</sup> )	816 m <sup>2</sup>

## STEP 3: DEFINE SITE DETAILS

### Site Details Plan (scaled annotated)

Plan ID	SDP-WE1
Existing topography (Yes/No)	Yes
Existing drainage characteristics upstream, within, and downstream of site (including catchment areas)	Yes
Proposed discharge points and the downstream drainage size and invert levels (or ponded water levels) (Yes/No)	Yes
Existing vegetation and vegetation to be retained (Yes/No)	Yes
Soil evaluation in accordance with AS/NZS 1547:2000 Clause 4.1.3 if necessary (Yes/No)	No

### General comments (where required)

Topography: Site slopes from north-east to south-west from approximately RL 11.5 to RL 8.0 (approx 7%)

Drainage: Drainage of the lots occurs via rear of allotment drainage. Existing pits and stormwater pipe/easement exist.

Vegetation: There are presently no significant trees on the site (refer SDP-WE1).

# Development Assessment Checklist **Step 4**

## STEP 4: OUTLINE DEVELOPMENT DETAILS

Development area (m <sup>2</sup> )	816 m <sup>2</sup>
Private land	
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	Approx 150 m <sup>2</sup> per dwelling
Road reserve, driveway or parking (m <sup>2</sup> )	Approx 20 m <sup>2</sup> per dwelling
Pavement area (m <sup>2</sup> ) *	Approx 10 m <sup>2</sup> per dwelling
Easements (services or drainage) (m <sup>2</sup> )	Approx 20 m <sup>2</sup> per dwelling
Landscape area (m <sup>2</sup> )	Approx 50 m <sup>2</sup> per dwelling
Other areas (m <sup>2</sup> )	
Area available for stormwater treatment (may be part of landscape area) (m <sup>2</sup> ) *	30 m <sup>2</sup> per dwelling (part of this will be in the stormwater easement)
Public land (ultimately owned by local authority)	
Road reserve (m <sup>2</sup> )	0 m <sup>2</sup>
Parkland (m <sup>2</sup> )	0 m <sup>2</sup>
Easement (services or drainage) (m <sup>2</sup> )	0 m <sup>2</sup>
Other areas (m <sup>2</sup> )	0 m <sup>2</sup>
Space available for stormwater treatment (may be part of landscape area)* (m <sup>2</sup> )	
Development Details Plan (scaled annotated plan)	
Plan ID	DDP-DTC-WE1
Development layout clearly depicted with land type areas (Yes/No)	Yes
Catchment areas defined with ID (Yes/No)	Yes
Conceptual earthworks provided including finished levels (Yes/No)	Yes
Conceptual drainage layout and inverts levels (Yes/No)	Yes
Existing/proposed infrastructure layout and levels have been considered (i.e. no conflict with treatment measures)** (Yes/No).	Yes
General comments	

\* Designers should consult with the project landscape architect to check which landscape areas are available for stormwater treatment. Local government standards should also be checked to ensure areas proposed for treatment will not be required to feature incompatible plantings (e.g. large trees).

\*\* Infrastructure may include (sewer, power, water, gas etc). Any infrastructure which may impact on location or drainage of treatment measures should be considered. External infrastructure which has the potential to influence location or drainage of treatment measures should also be shown.

# Development Assessment Checklist **Steps 5 & 6**

## STEP 5: CONFIRM RAINWATER TANK REQUIREMENTS (QUEENSLAND DEVELOPMENT CODE)

Are rainwater tanks to be installed (Yes/No)?	Yes
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	100 m <sup>2</sup> per dwelling (min. as per QDC MP 4.2)
Total rainwater tank volume (kL or kL per dwelling)	5 kL per dwelling
Connections (i.e. toilets, external, washing machine, pool)	Toilets, external and cold laundry
Overflow from the rainwater tanks to be directed to stormwater treatment measures* (Yes/No)?	Yes (connected to raingarden adjacent to rear-allotment drainage)

Rainwater tanks per catchment	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Number of tanks per catchment	1	1			
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	100 m <sup>2</sup>	100 m <sup>2</sup>			
Tank volume (kL or kL per dwelling)	5 kL	5 kL			
Confirm location of rainwater tanks on the scaled annotated plan (Yes/No)	Yes	Yes			

Comments: 100 m<sup>2</sup> of roof area from each dwelling drains to a rainwater tank which is fitted to provide rainwater for internal and external uses. Overflows from rainwater tanks are directed by a small diameter pipe to a raingarden located adjacent to the rear allotment drainage pit. Flows in excess of the infiltration capacity of the raingarden will be collected in the pit and conveyed to trunk stormwater.

## STEP 6: SELECT DEEMED TO COMPLY SOLUTION

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Selected Deemed to Comply Solution (include ID and full name)	N/A	N/A			
Bioretention system area (% of catchment area) **	0	0			
Constructed wetland area (% of catchment area)***	0	0			

Comments:

\* Compliance with the Deemed to Comply Solutions requires all overflow from the rainwater tanks to be directed to stormwater treatment measures.

\*\* Refers to the bioretention system filter media area

\*\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Step 7**

<b>STEP 7: DESIGN STORMWATER TREATMENT MEASURES</b>					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Catchment area (m <sup>2</sup> )	408	408			
Location of treatment measure (public/private)	Private/public	Private/public			
<b>Bioretention system</b>					
Filter media area (% of catchment area)	N/A	N/A			
Filter media area (m <sup>2</sup> ) <ul style="list-style-type: none"> <li>• required</li> <li>• provided in concept</li> </ul>					
Total footprint* (m <sup>2</sup> )					
Media depth (m) <ul style="list-style-type: none"> <li>• filter media</li> <li>• transition layer</li> <li>• drainage layer</li> </ul>					
Extended detention (m above surface level)					
<b>Coarse sediment management</b>					
Coarse sediment management area (m <sup>2</sup> )					
<b>Constructed wetland</b>					
Macrophyte zone area (% of catchment area)					
Macrophyte zone area (m <sup>2</sup> )					
<b>Coarse sediment management</b>					
Coarse sediment management area (m <sup>2</sup> )					
<b>High flow bypass method</b>					
High flow bypass area (m <sup>2</sup> )					
Total footprint* (m <sup>2</sup> )					
Conceptual design drawings of any pipe and pit diversion structures or alternative high flow bypass flow paths					

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc

Conceptual design levels (m AHD) – These sections apply to both bioretention systems and wetlands.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Inlet type	N/A				
<ul style="list-style-type: none"> <li>• upstream invert level</li> <li>• downstream invert level</li> </ul>					
Receiving drainage invert or ponded water level					
Outlet pipe level					
<ul style="list-style-type: none"> <li>• upstream invert level</li> <li>• downstream invert level</li> </ul>					
Surface or water level					
Extended detention level (pit crest level)					
Minimum bund/embankment level					
Checks					
<ul style="list-style-type: none"> <li>• Inlet at or above surface or water level?</li> <li>• Outlet pipe DSIL above receiving drainage?</li> <li>• Bund level minimum 150mm above extended detention level?</li> </ul>					
Comments					

Conceptual Plan and Section – Checklist (mark with ✓ to indicate item has been shown on drawings)

Conceptual Plan (scaled and annotated plan view drawing)

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	N/A				
Inflow drainage arrangement					
Outlet pits and pipes					
Treatment areas (filter media and/or macrophyte zone)					
Coarse sediment management					
High flow bypass					
Batters and embankments					
Functional and surrounding ground levels					

Conceptual Section (scaled and annotated section view drawing)					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	N/A				
Conceptual design levels					
Surround earthworks levels					
Inflow and outlet pits and pipes					
Coarse sediment management					
Extended detention (crest or pit)					
Batters and embankments					
Media depths (bioretention only)					

**Designer**

Signed by Designer .....

Print name .....

Date .....





**Development Assessment Officer**

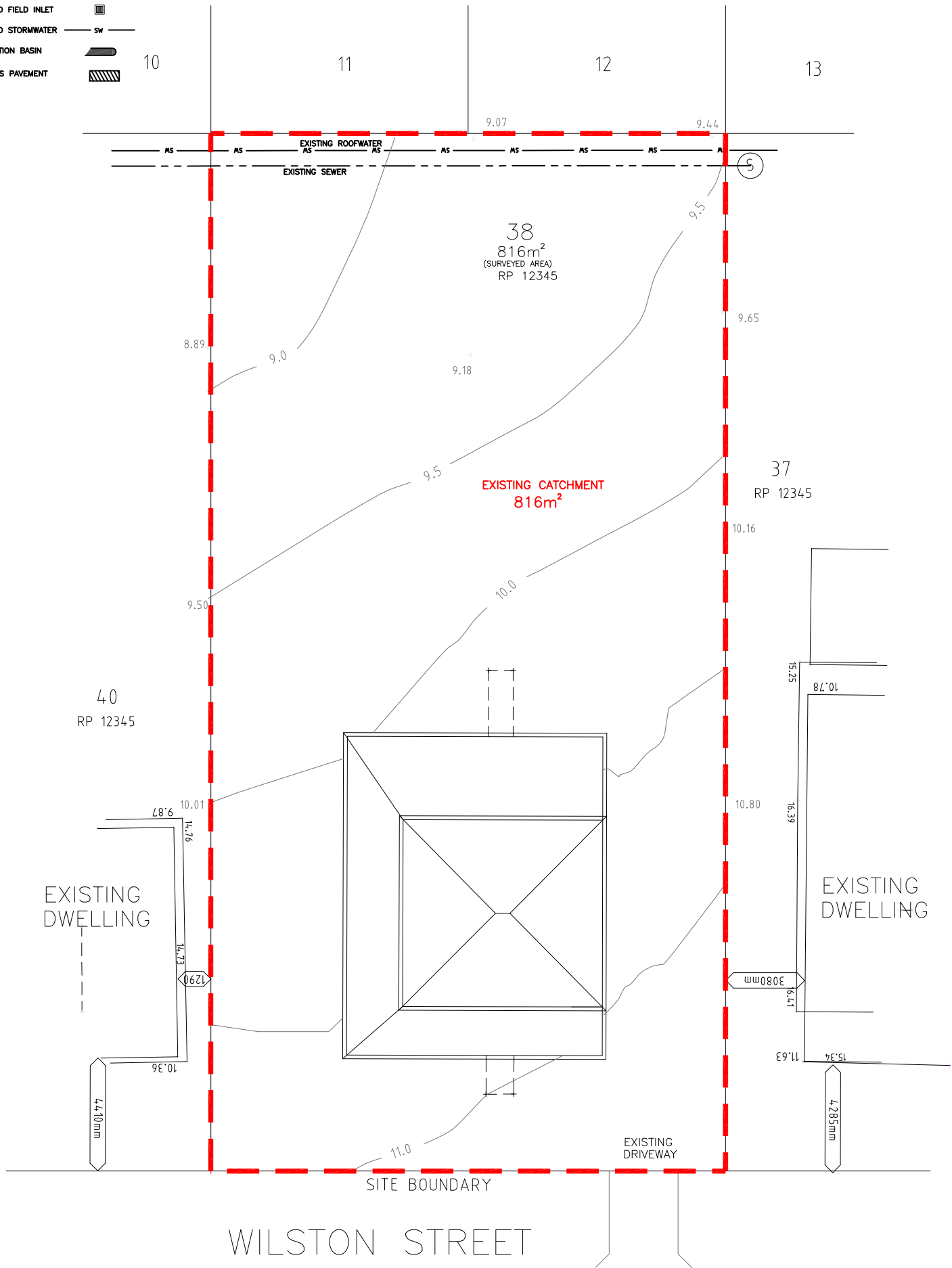
Signed by officer .....

Print name .....

Date .....

**LEGEND**

- PROPOSED FIELD INLET 
- PROPOSED STORMWATER 
- BIORETENTION BASIN 
- PERVIOUS PAVEMENT 



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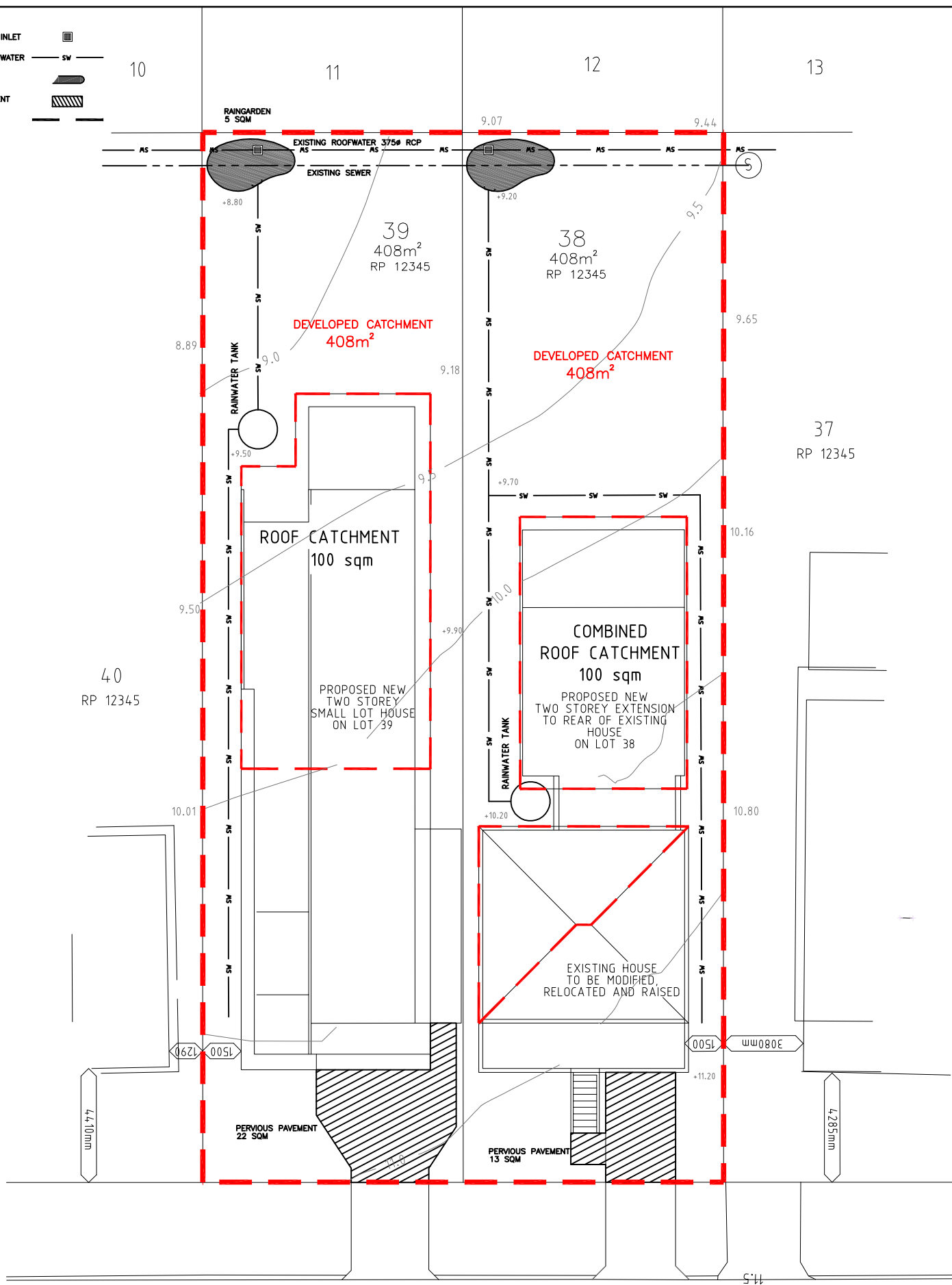
SITE DETAILS PLAN

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale at	A4 1:200	<b>SDP-WE1</b>	<b>A</b>

Original sheet size A4

**LEGEND**

- PROPOSED FIELD INLET
- PROPOSED STORMWATER
- RAINGARDEN
- PERVIOUS PAVEMENT
- ROOF CATCHMENT



WILSTON STREET

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DEVELOPMENT DETAILS PLAN

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Date	26/08/09	Drawing No.	Rev.
Scale at A4	1:200	DDP-WE1	A

Original sheet size A4

## 3.2 Worked Example 2 (WE2): Rural Residential Subdivision

### 3.2.1 Project Description

The subject site is one stage of a greenfield development site comprising 18.4 ha undulating to steep land in a new land release area south west of Ipswich, in the western region of South East Queensland.

The topography of the site generally grades from the north-west which has a high point of approximately RL 56.0 to south-east towards an existing gully at approx RL 16.0 (approx 8% average grade). There are 3 ridgelines running north-west to south-east towards the gully that delineate the existing catchments (Figure 11).

The applicant is in the process of delivering a very large development called Ripley Vale. A design team has been

engaged to develop an urban design for a low density stage of the development that comprises 27 rural residential lots ( $> 2,000 \text{ m}^2$ ) and associated connecting roads. The lots have been oriented with the rear of the lots to the ridgelines in order to drain the lots to the roads. In accordance with local government policy, the applicant is preserving the existing gully as an environmental corridor. Because of the low density, the overall imperviousness of the development is less than 25% so the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009) has not been triggered for the site. The applicant wishes to deliver a sustainable outcome to the subdivision and has requested the WSUD specialist to deliver best practice stormwater management to the development.



Figure 11 - Proposed Development Layout for Ripley Vale

### 3.2.2 WSUD Strategy and Proposed Solution

Rainwater tanks are required to be delivered across the site in accordance with the QDC MP4.2. Overflows from rainwater tanks are to be distributed to garden areas for infiltration in accordance with local government policy and where no adverse impact on local flooding can be demonstrated. Best practice stormwater management is to focus on road runoff using vegetated stormwater management measures such as bioretention or wetlands. The WSUD specialist and the rest of the design team decided that an end-of-pipe bioretention basin located at the natural low point of all the roads was the optimal solution for stormwater treatment.

The bioretention basin has been sized to treat road runoff only (to limit the size of the basin and to focus on the areas with highest pollutant generating potential) although runoff from the lots will also enter the basin.

The filter media area of the basin has been sized at 310 m<sup>2</sup>, which delivers best practice load reductions for the road reserves only (1.5% of road reserve area) (Figure 12). The bioretention basin has been designed with a saturated zone which improves plant survival over the long dry periods experienced in the western parts of South-East Queensland such as Ipswich.

Although the development type does not trigger the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009), a worked example has been documented to provide a stormwater quality management solution that is appropriate for the development type. The worked example provided here may apply as a worked solution where local government planning schemes specify stricter triggers than those outlined in the *SEQ Regional Plan Implementation Guideline No. 7: Water Sensitive Urban Design* (DIP, 2009.)



**Figure 12 - Proposed WSUD Strategy for Ripley Vale**

### 3.2.3 Development Application Documentation

Based on the development scenario, the following documents and drawings have been developed to illustrate stormwater quality management options for rural residential subdivision that could be used to support a development application:

- Deemed to Comply Solutions Development Assessment Checklist for Queensland (DA-DTC-WE2)
- Site Details Plan (Drawing SDP-WE2)
- Development Details Plan (Drawing DDP-WE2)
- Stormwater Measure Conceptual Details Plan (Drawing SCP-WE2)
- Stormwater Measure Conceptual Sections (Drawing SCS-WE2)

# Development Assessment Checklist

## Summary of Development and Deemed to Comply Solution

DEVELOPMENT ADDRESS	
Development application ID	DA-DTC-WE2
Project name	Ripley Vale
Applicant's name	Ripley Vale Holdings
Street address	1234 Ripley Road
Suburb	Ripley
Postcode	4306
Local Government Area	Ipswich City Council
Climatic region	South East Queensland – Western Region
DEVELOPMENT TYPE & DETAILS	
Development type (e.g. residential detached dwellings)	Rural Residential (min 2000 m <sup>2</sup> , typ. 0.5 ha blocks)
Number of dwellings/buildings	27
Site area (m <sup>2</sup> )	18.4 ha
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	200 m <sup>2</sup> typical
DEEMED TO COMPLY SOLUTION	
Deemed to Comply Solution ID	No deemed to comply solution applicable
Rainwater tank volume (kL) (for detached dwellings tank volume per dwelling kL/dwelling)	5 kL per dwelling (min)
Bioretention area* (m <sup>2</sup> )	310 m <sup>2</sup>
Constructed wetland area** (m <sup>2</sup> )	0 m <sup>2</sup>
Total footprint of bioretention or wetland system(s) (m <sup>2</sup> )	1,200 m <sup>2</sup>

\* Refers to the bioretention system filter media area

\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Steps 1 to 3**

## STEP 1: DEVELOPMENT LOCATION AND CLIMATE REGION

Project name	Ripley Vale
Street address	1234 Ripley Road
Suburb	Ripley
Postcode	4306
Local Government Area	Ipswich City Council
Climatic region (Figure 2 and A-2, Appendix A)	South East Queensland – Western Region

## STEP 2: DETERMINE DEVELOPMENT TYPE

Development type (e.g. residential detached dwellings)	Rural Residential (typ. 0.5 ha blocks)
Number of dwellings/buildings	27
Site area (m <sup>2</sup> )	18.4 ha

## STEP 3: DEFINE SITE DETAILS

Site Details Plan (scaled annotated)	
Plan ID	SDP-WE2
Existing topography (Yes/No)	Yes
Existing drainage characteristics upstream, within, and downstream of site (including catchment areas)	Yes
Proposed discharge points and the downstream drainage size and invert levels (or ponded water levels) (Yes/No)	Yes
Existing vegetation and vegetation to be retained (Yes/No)	Yes
Soil evaluation in accordance with AS/NZS 1547:2000 Clause 4.1.3 if necessary (Yes/No)	Yes
General comments (where required)	
Topography:	
Drainage:	
Vegetation:	

# Development Assessment Checklist **Step 4**

## STEP 4: OUTLINE DEVELOPMENT DETAILS

Development area (m <sup>2</sup> )	18.4 ha
Private land	
Roof area (m <sup>2</sup> ) (for detached dwellings typical roof area per dwelling m <sup>2</sup> /dwelling)	200 m <sup>2</sup> per dwelling
Road reserve, driveway or parking (m <sup>2</sup> )	100 m <sup>2</sup> per dwelling
Pavement area (m <sup>2</sup> ) *	50 m <sup>2</sup> per dwelling
Easements (services or drainage) (m <sup>2</sup> )	0 m <sup>2</sup>
Landscape area (m <sup>2</sup> )	200 m <sup>2</sup> per dwelling
Other areas (m <sup>2</sup> )	Preserved Vegetation (typ. 2,000 m <sup>2</sup> per lot)
Area available for stormwater treatment (may be part of landscape area) (m <sup>2</sup> ) *	N/A
Public land (ultimately owned by local authority)	
Road reserve (m <sup>2</sup> )	21,900 m <sup>2</sup>
Parkland (m <sup>2</sup> )	0
Easement (services or drainage) (m <sup>2</sup> )	0
Other areas (m <sup>2</sup> )	0
Space available for stormwater treatment (may be part of landscape area)* (m <sup>2</sup> )	3,000 m <sup>2</sup> (estimated)
Development Details Plan (scaled annotated plan)	
Plan ID	DDP-WE2
Development layout clearly depicted with land type areas (Yes/No)	Yes
Catchment areas defined with ID (Yes/No)	Yes
Conceptual earthworks provided including finished levels (Yes/No)	Yes
Conceptual drainage layout and inverts levels (Yes/No)	Yes
Existing/proposed infrastructure layout and levels have been considered (i.e. no conflict with treatment measures)** (Yes/No).	Yes
General comments	

\* Designers should consult with the project landscape architect to check which landscape areas are available for stormwater treatment. Local government standards should also be checked to ensure areas proposed for treatment will not be required to feature incompatible plantings (e.g. large trees).

\*\* Infrastructure may include (sewer, power, water, gas etc). Any infrastructure which may impact on location or drainage of treatment measures should be considered. External infrastructure which has the potential to influence location or drainage of treatment measures should also be shown.

# Development Assessment Checklist **Steps 5 & 6**

## STEP 5: CONFIRM RAINWATER TANK REQUIREMENTS (QUEENSLAND DEVELOPMENT CODE)

Are rainwater tanks to be installed (Yes/No)?	Yes				
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	100 m <sup>2</sup> (min as required by Queensland Development Code MP 4.2)				
Total rainwater tank volume (kL or kL per dwelling)	135 kL				
Connections (i.e. toilets, external, washing machine, pool)	Toilets, external tap, cold laundry				
Overflow from the rainwater tanks to be directed to stormwater treatment measures* (Yes/No)?	Yes (directed to infiltration areas and landscape buffer via level spreader)				
Rainwater tanks per catchment	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Number of tanks per catchment	4	6	17		
Roof area draining to tank (m <sup>2</sup> or m <sup>2</sup> per dwelling)	100 m <sup>2</sup> per dwelling	100 m <sup>2</sup> per dwelling	100 m <sup>2</sup> per dwelling		
Tank volume (kL or kL per dwelling)	5kL per dwelling	5kL per dwelling	5kL per dwelling		
Confirm location of rainwater tanks on the scaled annotated plan (Yes/No)	No	No	No		

Comments: 100 m<sup>2</sup> of roof area from each dwelling drains to a rainwater tank which is fitted to provide rainwater for internal and external uses. Overflows from rainwater tanks are directed by a small diameter pipe to a raingarden located adjacent to the rear allotment drainage pit. Flows in excess of the infiltration capacity of the raingarden will be collected in the pit and conveyed to trunk stormwater.

## STEP 6: SELECT DEEMED TO COMPLY SOLUTION

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Selected Deemed to Comply Solution (include ID and full name)	N/A	N/A	N/A		
Bioretention system area (% of catchment area) **	0	0	0		
Constructed wetland area (% of catchment area)***	0	0	0		

Comments:

\* Compliance with the Deemed to Comply Solutions requires all overflow from the rainwater tanks to be directed to stormwater treatment measures.

\*\* Refers to the bioretention system filter media area

\*\*\* Refers to the constructed wetland macrophyte zone area

# Development Assessment Checklist **Step 7**

<b>STEP 7: DESIGN STORMWATER TREATMENT MEASURES</b>					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Catchment area (m <sup>2</sup> )	21,900 m <sup>2</sup> (roads only)				
Location of treatment measure (public/private)	Public				
<b>Bioretention system</b>					
Filter media area (% of catchment area)	1.5%				
Filter media area (m <sup>2</sup> )	310 m <sup>2</sup>				
• required	310 m <sup>2</sup>				
• provided in concept	310 m <sup>2</sup>				
Total footprint* (m <sup>2</sup> )	1,200 m <sup>2</sup>				
Media depth (m)	0.6m				
• filter media					
• transition layer					
• drainage layer					
Extended detention (m above surface level)					
Coarse sediment management	Forebay				
Coarse sediment management area (m <sup>2</sup> )	0.8 m <sup>2</sup>				
<b>Constructed wetland</b>					
Macrophyte zone area (% of catchment area)	0				
Macrophyte zone area (m <sup>2</sup> )	0				
Coarse sediment management	N/A				
Coarse sediment management area (m <sup>2</sup> )	0				
High flow bypass method	N/A				
High flow bypass area (m <sup>2</sup> )	0				
Total footprint* (m <sup>2</sup> )	0				
Conceptual design drawings of any pipe and pit diversion structures or alternative high flow bypass flow paths					

\* Total footprint to include all relevant design requirements including batters, high flow bypass, sediment forebay etc

Conceptual design levels (m AHD) – These sections apply to both bioretention systems and wetlands.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Inlet type	Pipe				
• upstream invert level	19.30				
• downstream invert level	19.20				
Receiving drainage invert or ponded water level	19.20				
Outlet pipe level					
• upstream invert level	18.30				
• downstream invert level	18.20				
Surface or water level	18.00				
Extended detention level (pit crest level)	19.50				
Minimum bund/embankment level	20.00				
Checks					
• Inlet at or above surface or water level?	Yes				
• Outlet pipe DSIL above receiving drainage?	Yes				
• Bund level minimum 150mm above extended detention level?	Yes				

Comments

Conceptual Plan and Section – Checklist (mark with ✓ to indicate item has been shown on drawings)

Conceptual Plan (scaled and annotated plan view drawing)

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID	SCS-WE2				
Inflow drainage arrangement	✓				
Outlet pits and pipes	✓				
Treatment areas (filter media and/ or macrophyte zone)	✓				
Coarse sediment management	✓				
High flow bypass	✓				
Batters and embankments	✓				
Functional and surrounding ground levels	✓				

Conceptual Section (scaled and annotated section view drawing)					
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	Catchment 5
Drawing ID					
Conceptual design levels	✓				
Surround earthworks levels	✓				
Inflow and outlet pits and pipes	✓				
Coarse sediment management	✓				
Extended detention (crest or pit)	✓				
Batters and embankments	✓				
Media depths (bioretention only)	✓				

**Designer**

Signed by Designer .....

Print name .....

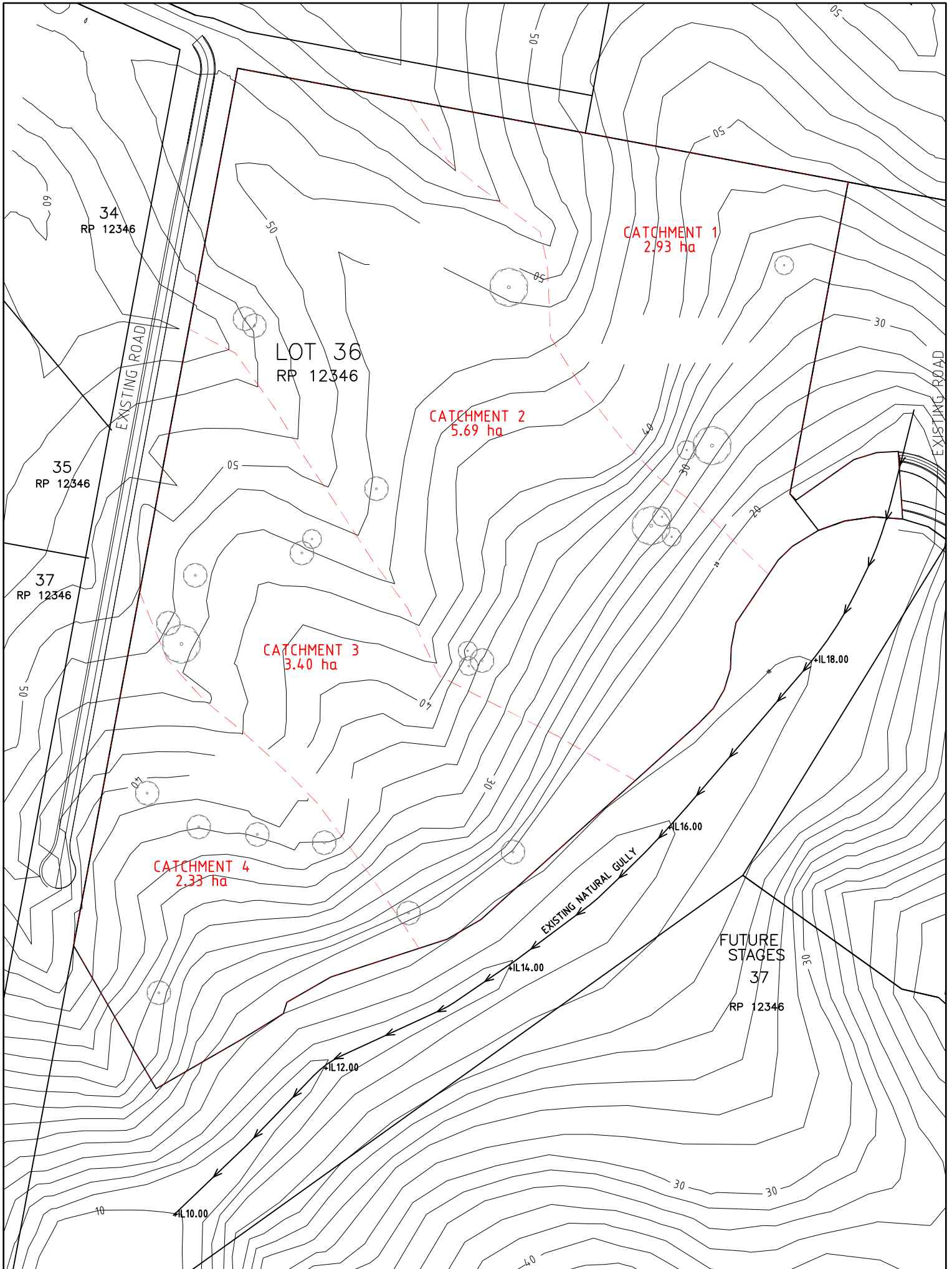
Date .....

**Development Assessment Officer**

Signed by officer .....

Print name .....

Date .....



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SITE DETAILS PLAN

Designed	AO	Approved	
Drawn	DC	RPEQ	Date
Date	26/08/09	Drawing No.	Rev.
Scale	at A4 1:2500	<b>SDP-WE2</b>	<b>A</b>

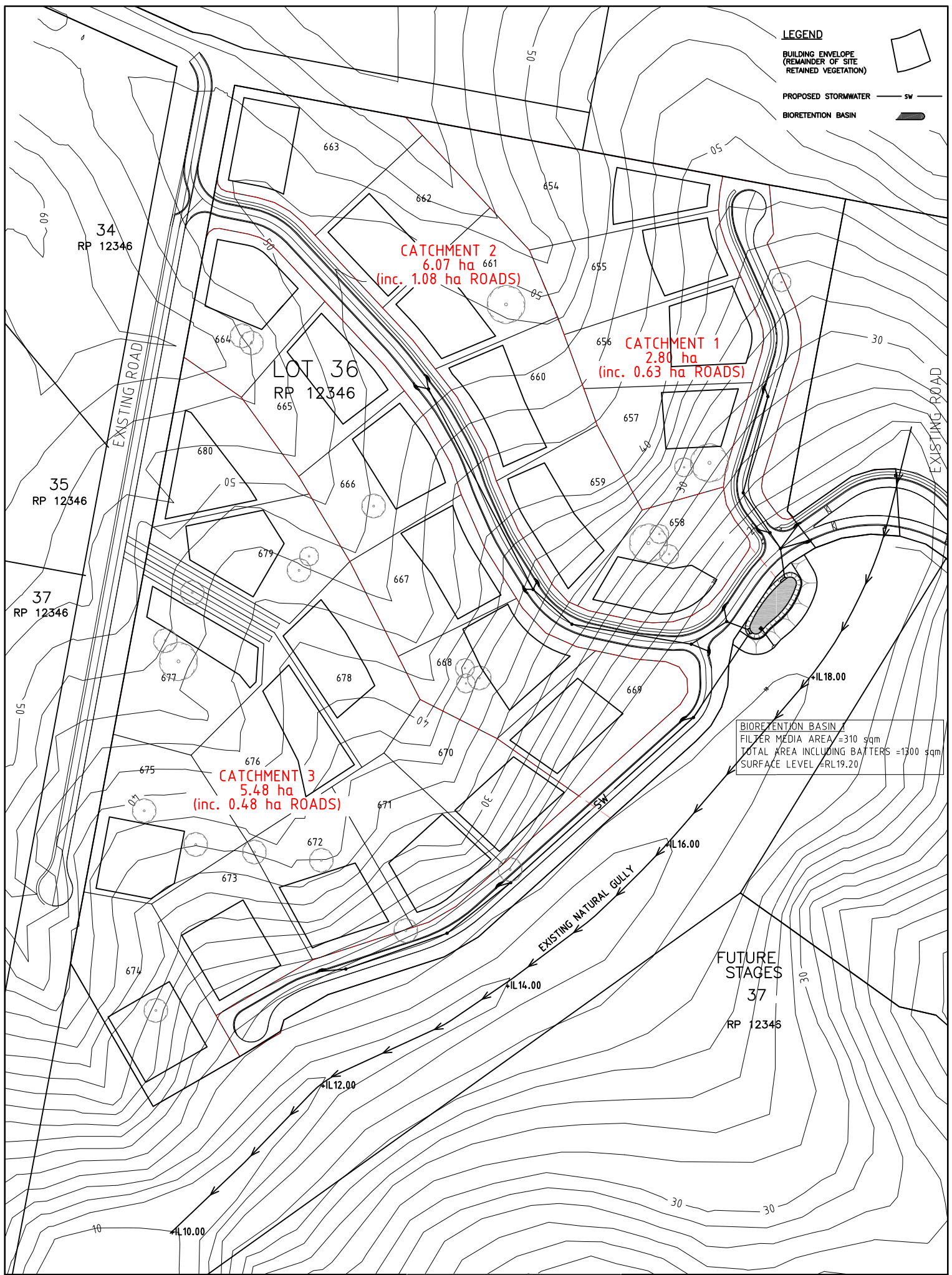
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**LEGEND**

BUILDING ENVELOPE (REMAINDER OF SITE RETAINED VEGETATION)

PROPOSED STORMWATER SW

BIORETENTION BASIN



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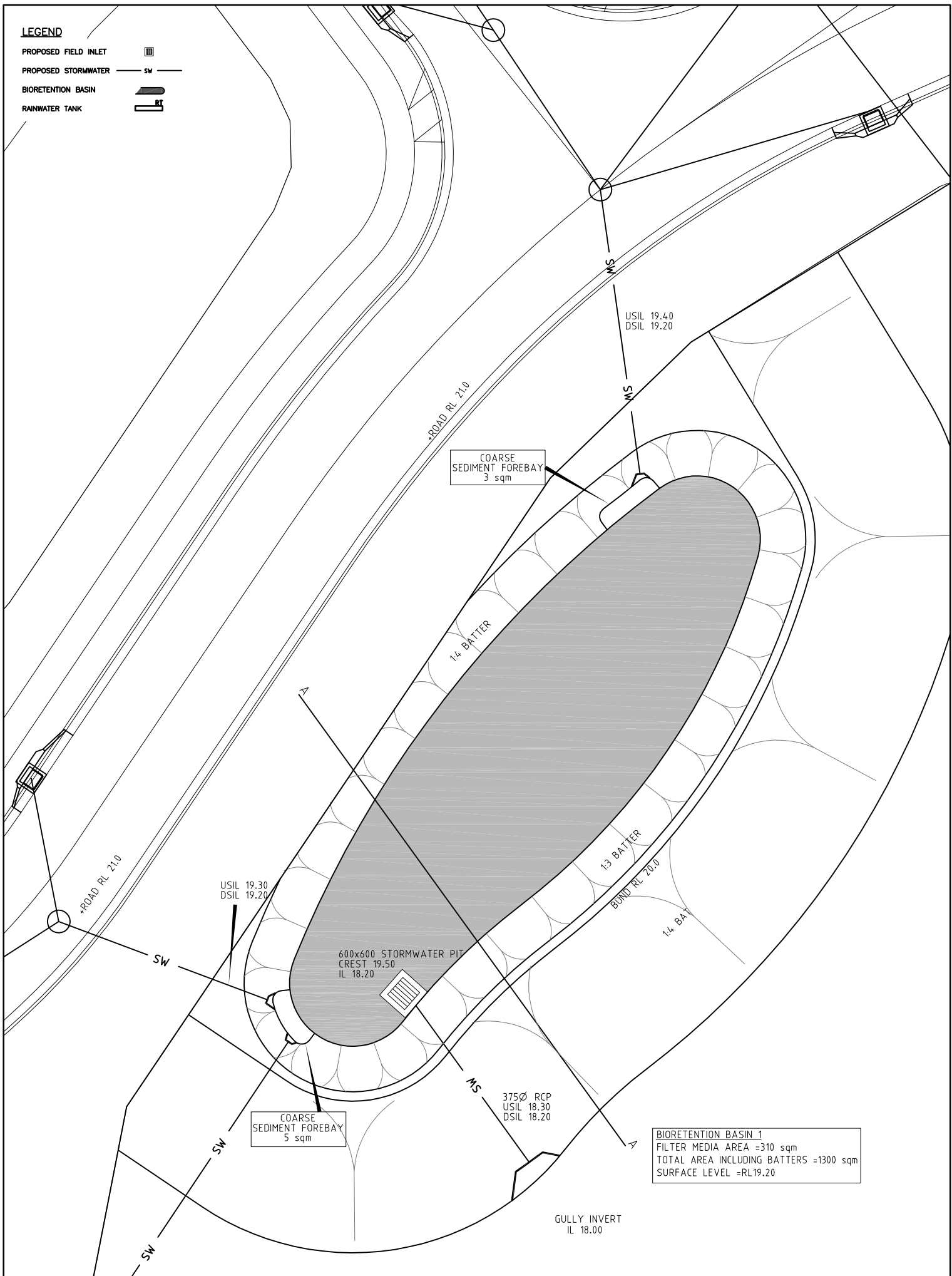
**DEVELOPMENT DETAILS PLAN**

Designed	AO	Approved	
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Date	26/08/09	Drawing No.	Rev.
Scale	at A4 1:2500	<b>DDP-WE2</b>	<b>A</b>

Original sheet size A4

**LEGEND**

- PROPOSED FIELD INLET
- PROPOSED STORMWATER SW
- BIORETENTION BASIN
- RAINWATER TANK RT



COARSE  
SEDIMENT FOREBAY  
3 sqm

COARSE  
SEDIMENT FOREBAY  
5 sqm

**BIORETENTION BASIN 1**  
 FILTER MEDIA AREA =310 sqm  
 TOTAL AREA INCLUDING BATTERS =1300 sqm  
 SURFACE LEVEL =RL19.20

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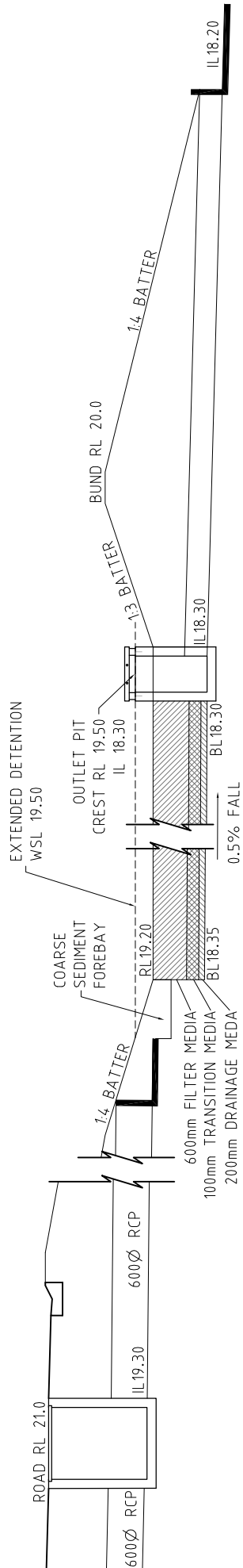
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CONCEPT DETAILS PLAN

Designed	AO	Approved	
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Scale	at A4 1:250	<b>SCP-WE2</b>	<b>A</b>

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SECTION AA

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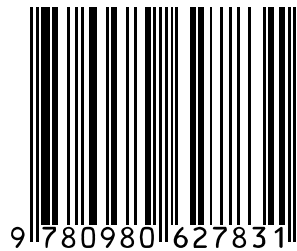
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Project  
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CROSS SECTION

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