Report

Tranche 22 – Stormwater Management Report

Prepared for Greenfields Development Company

11 March 2020

Calibre Professional Services Pty Ltd
55 070 683 037

QUALITY ASSURANCE STATEMENT

TASK	NAME	SIGNATURE
Project Manager	Enrique Franco	
Prepared by	Matthew Cowcher	
Reviewed by	Troy Eyles	
Approved for Issue by	Enrique Franco	

DOCUMENT CONTROL

ISSUE	DATE	ISSUE DETAILS	AUTHOR	CHECKED	APPROVED
01	03/09/18	DA Submission Report	DD	TE	
02	01/08/19	Catchment Details Amended	MC		
03	11/03/20	Adjusted to suit RFI details	MC	TE	EF

Contents

Tables

Figures

Appendices

1. Site Description

The Tranche 22 development site is ~15 hectares in size, located in the North West development area in Oran Park as shown in Figure 1.1.

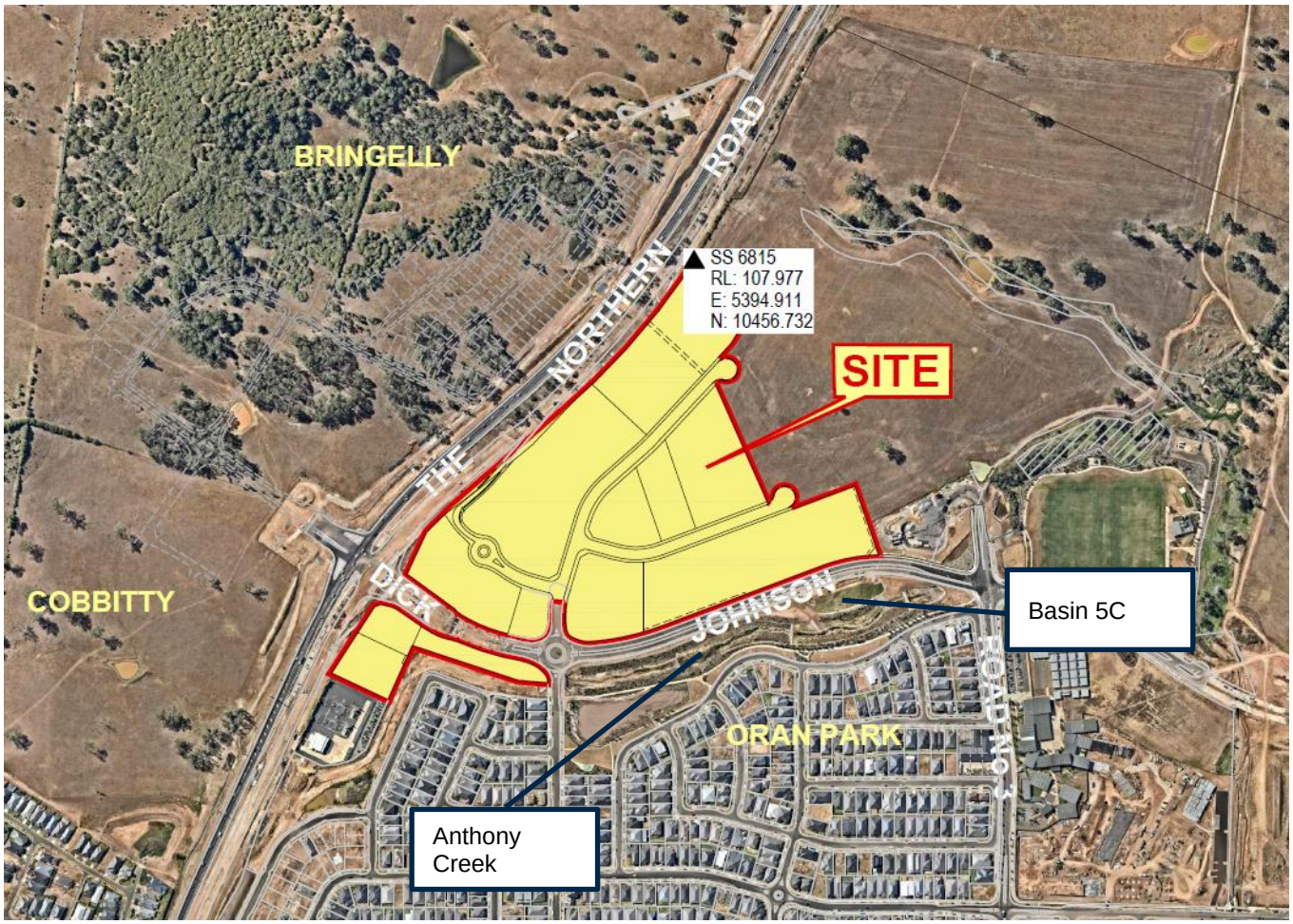

Figure 1.1 T22 catchments and attributing Basins.

The proposed area is bounded by Dick Johnson Drive and Anthony Creek in the south, The Northern Road in the north-west and Tranche 23 in the east as shown in Figure 1.1.

2. Stormwater Management Objectives

This report presents a stormwater and trunk drainage strategy based on WSUD principles set out in the Integrated Water Cycle Management Study (Ecological Engineering, 2007) and *Stormwater Quantity Management & Flooding Report* (Brown Consulting, 2007) which underwent a major revision in 2013. The strategies were developed as part of the master-planning process to support future development applications in Oran Park. The key objectives of this study include:

- Link water infrastructure effectively to minimise impact of the development upon the water cycle.
- Attenuate peak storm flows from 2 year events to existing flows.
- Provide water quality management.
- Meet relevant stormwater policies and guidelines outlined in this report.

2.1 Camden Council Requirements

The site is located within the Camden Council local government area (LGA).

- *Engineering Design Specification* (Camden Council, 2009)

This specification contains technical design data for the calculation of flows, flood elevations and velocities along with technical standards for the design of drainage infrastructure. The hydrologic parameters include rainfall intensity charts and runoff parameters for flow estimation. The document also outlines hydraulic parameters and design requirements for pits, culverts and pipes.

- *Camden Local Environmental Plan 2010* (Camden Council, 2014)

Local Environmental Plans (LEPs) guide planning decisions for local government areas (NSW Department of Planning & Environment, 2014). LEPs were standardised in 2006 to create a common format and content across councils and other consent authorities.

The *Camden Local Environmental Plan 2010* was gazetted in 2010. The LEP applies to all land within the Camden LGA, with the exception of land at Oran Park, Turner Road (Gregory Hills) and Catherine Field which falls under *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*.

- *Camden Development Control Plan 2011* (Camden Council, 2011)

A Development Control Plan (DCP) is a non-legal document that supports the LEP with more detailed planning and design guidelines.

The Camden DCP applies to all land within the Camden LGA. The DCP also applies to Growth Centre precincts gazetted under *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* which are subject to the Growth Centre specific DCPs which contain additional provisions.

- *Flood Risk Management Policy* (Camden Council, 2006)

The *Flood Risk Management Policy* establishes flood risk management planning and development for all flood prone land within the Camden LGA. Flood prone land is susceptible to flooding by the Probably Maximum Flood (PMF) event. The policy has regard to the requirements of the *New South Wales Government Floodplain Development Manual – April 2005*.

2.2 Oran Park Indicative Layout Plan (ILP) (2013)

In 2007, a master planning process coordinated by the Growth Centres Commission was used to develop an Indicative Layout Plan (ILP) for the Oran Park Precinct, Brown Consulting and Ecological Engineering jointly undertook the water cycle management assessment as part of the ILP development. Ecological (now AECOM) undertook the WSUD aspects and Brown Consulting developed the flooding and trunk drainage component of the water cycle management. The stormwater management strategies proposed in the masterplan included:

- Public detention and bio-retention systems proposed at various locations to manage the quantity and quality of stormwater flows.

- On-site detention devices proposed at non-residential lands such as light industrial, employment, educational and commercial areas which are required by the Oran Park DCP to be treated prior to discharge into public systems.

The masterplan has been revised multiple times and the most recent revision was produced in 2013. This report is based on the Oran Park Water Cycle Masterplan and the revised stormwater Master Plan (Brown Consulting, 2013) developed for the Indicative Layout Plan (Brown Consulting, 2013).

2.3 Integrated Water Cycle Management Study – Wsud Component (Ecological Engineering, 2007)

The *Integrated Water Cycle Management strategy* (Ecological Engineering, 2007) for the Oran Park Precinct outlines the overall strategy for water management with the design component describing features for WSUD. The key principles of WSUD for Oran Park are aimed at achieving integrated water cycle management of the three urban water streams potable water, wastewater and stormwater by:

- Reducing potable mains water consumption through demand management and substitution with treated reclaimed water and stormwater.
- Treating urban stormwater to meet water quality objectives for reuse or discharge to waterways.
- Using stormwater in the urban landscape to maximise visual and recreational amenity of developments, and where appropriate influence the micro-climate of the area.

2.4 Water Management Act 2000

The key NSW legislation governing the management of the state's water resources are the *Water Management Act 2000* and the *Water Act 1912*. The *Water Management Act 2000* is progressively replacing the *Water Act 1912* which represented outdated principles in water management.

The objective of the *Water Management Act 2000* is to provide sustainable and integrated management of water resources for the benefit of both present and future generations (NSW Office of Water, 2014). The NSW Office of Water administers the *Water Management Act 2000* and regulates controlled activities carried out around and on waterfront land.

Amendments have been made to the legislation since it was passed by NSW parliament in December 2000. In 2012, the *Guidelines for Riparian Corridors on Waterfront Land* (NSW Office of Water, 2012) allowed construction of online detention basins in riparian corridors. The revision also streamlined the categorisation of streams and permitted activities around the riparian corridors.

2.5 Growth Centres Development Code (Growth Centres Commision, 2006)

The *Growth Centres Development Code* was released by the Department of Environment and Conservation in 2006. The department no longer exists and the Growth Centres Commission formally took over planning for the Growth Centres.

The *Growth Centres Development Code* provides the basis for the planning and design of precincts and neighbourhoods in the Growth Centres. It is intended to be a reference work, to stimulate ideas and provide a guide to best practice. Sections of the *Growth Centres Development Code* that provide guidance relevant to the design are:

- B-2 Water Sensitive Urban Design and Stormwater Management

This section provides an introduction to WSUD which encompasses all aspects of urban water cycle management, including water supply, wastewater and stormwater management. It emphasises the importance of linking water infrastructure, landscape design and the urban built form, in a manner that is more attuned to natural hydrological and ecological processes than conventional design.

- B-3 Riparian Corridors

The development guide provides guidance for the management of riparian corridors. These guidelines are considered to be superseded by the *Guidelines for Riparian Corridors on Waterfront Land* (NSW Office of Water, 2012).

2.6 Oran Park Development Control Plan 2007 (Department of Planning and Environment, 2007)

The *Oran Park Precinct Development Control Plan 2007* (Department of Planning and Environment, 2007) applies specifically to the Oran Park development. The most recent revision was released in 2014. The purpose of this DCP is to communicate the planning, design and environmental objectives and controls against which Camden Council will assess future DAs. Sections of the DCP specifically relevant to the design are:

- Environmental management
- Riparian corridors
- Flooding and water cycle management
- Salinity and soil management.

3. Stormwater Quantity Management Strategy

In accordance to the Master Plan (2013), the stormwater quantity management strategy aims to match post-development peak runoff to the permissible site discharge (PSD) in storm events up to and including 2 year ARI to meet the requirements as outlined in Section 2. Any higher flows are managed in the existing farm dam (to be formalised as Basin B1 in future).

3.1 Catchment

The total catchment of the site is approximately 15 Ha and divided into three sub catchments (refer to Figure 3.1). The site is covered entirely with short grass in the existing condition. Under this DA application the entire site will be developed. It is to be developed as industrial land.

Two sub-catchments will be draining into Anthony Creek. One set is located at the intersection of Dick Johnson drive and The Northern Rd, and are as shown in Figure 3.1 as the orange catchments. The surrounding catchments in green (10.33 Ha), will drain to Basin 5C, while the catchments in blue will drain to via a swale to Anthony Creek. The swale shown in Figure 3.1 will provide treatment for the blue catchment; hence only the green catchment will require treatment and attenuation.

Figure 3.1 Sub-catchment plan

3.2 Water Quantity Management Design

Because of changes in the land use, there will be a significant increase in the imperviousness of the surface, which will produce an increased volume of surface flows and the peak flows. The design will use onsite detention storage basins to attenuate the peak flows from both sub catchments to the pre development condition. This is in line with the stormwater master plan for the Oran Park as shown in Figure 3.2.

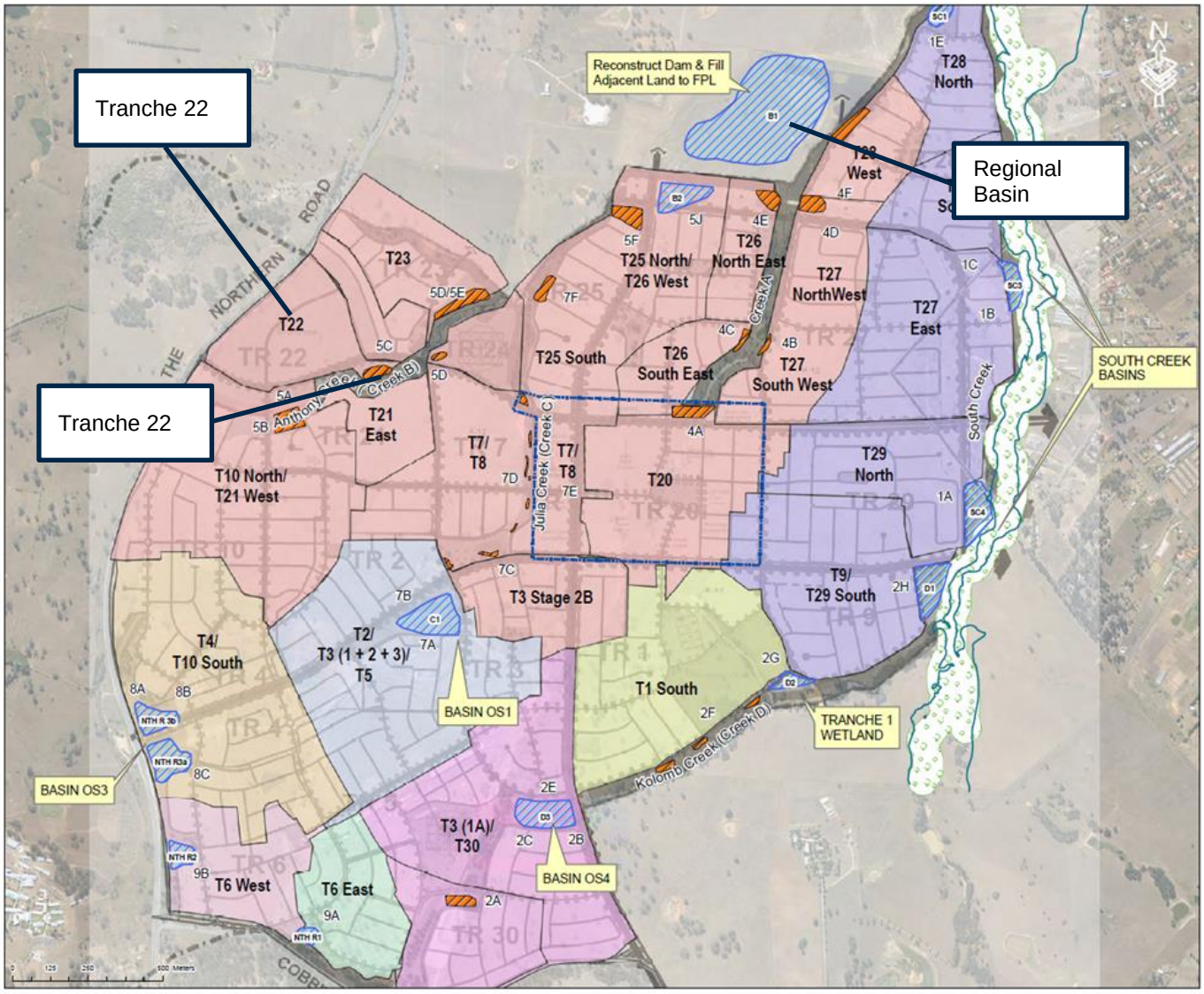

Figure 3.2 Stormwater Masterplan

The storage required for the surface runoff generated from T22-A (10.33 Ha) site up to 2-year ARI storm event has been provided by Basin 5C (2800 m^3), which was constructed under Tranche 21 Stage 2 DA (DA757/2014). The basin provides OSD requirement for this portion of Tranche 22 (T22-A) and section of Dick Johnson Drive (DA02). (Ref: L06002.135W – Stormwater Management – Dick Johnson Drive DA02).

The current configuration of Basin 5C is shown in Table 3.1 below, which is detailed on plan set L06002.69 Rev 6.

Table 3.1 Basin 5C configuration

Attribute	Value
Filter Bed Level	SL 89.75
Extended Detention Depth Level	SL 90.05
Outlet Controls	1200 x 1200 grated pit at RL 90.05, DN600 pit at IL 88.45
High flow weir	10m wide @ RL 90.95
Basin Storage at Weir (excl. EDD)	1980m^3

These basin details were determined as part of a precinct wide model for Oran Park. At the time, the development catchment which drained to this basin was treated as residential land, not industrial. Residential land has a lower impervious area compared to industrial, hence the runoff flows from the site for minor and major storms which formed the design of this basin were not truly indicative of what would be developed.

The basin configuration and performance has been reviewed as per Council's RFI dated September 2019. An *XP-RAFTS 2016* model was prepared for the industrial based catchment and Basin 5C. It has been found that if a 300mm orifice is installed over the DN600 pipe outlet in the pit, then the flows can be reduced to pre-existing levels for the 2yr storm event. The results from implementing a 300mm orifice is shown in Table 3.2 below.

Table 3.2 Basin 5C results for industrial catchment

Orifice Size	Pre developed flow (PSD) (m^3/s)	Developed flow (un-attenuated) (m^3/s)	Basin Outflow	Max water level	Live Storage (m^3)
DN300	0.905	2.461	0.358	90.914	1930

Table 3.2 indicates that the addition of a 300mm orifice to the DN600 outlet pipe will attenuate the post-development flow from Tranche 22 to existing flows. It should be noted that the basin configuration in report 'L06002.70 – Tranche 22 and 23 Stormwater Report' the outlet pipe size was specified to be DN300.

The detention storage listed on the masterplan for Basin 5C was $800m^3$. This has been increased to $1930m^3$ as the preliminary model was based off residential land use, not industrial. It also was not broken into sub-catchments. The current basin storage at the weir (2800 m^3) is sufficient to attenuate and safely discharge the 2yr storm for this updated land use: there are no proposed amendments to the basin earthworks or weir, the only intended amendment is the placement of the 300mm orifice over the DN600 pipe.

Storm events greater than 2 year ARI bypass the basin and discharge directly into Anthony Creek. Peak flows exceeding 2 year ARI and up to 100 year are attenuated by existing in line farm dam in the Anthony Creek. This farm dam will be upgraded and formalised in the stormwater system as permanent basin - Basin B1 under the Pondicherry stormwater management scheme. The existing farm dam has sufficient storage capacity to attenuate flows from Oran Park and will be utilised prior to formalising as Basin B1. The details for Basin B1 are shown below.

Table 3.3 Basin B1 Performance

Storm Event (ARI)	Pre-development peak flow at Oran Park (m^3/s)	Developed peak flow rate (un-attenuated) (m^3/s)	Existing dam storage (m^3)	Developed peak outflow from existing dam (m^3)
2	15.68	32.63	82,500 at RL 81.49	11.52
5	24.89	44.13	107,300 at RL 81.56	16.26
20	39.99	65.05	140,300 at RL 81.65	23.21
100	58.82	88.36	176,200 at RL 81.75	31.54

The table indicates that Basin B1 will provide attenuation for the external catchments draining to it, which includes Tranche 22.

4. Stormwater Quality Management Strategy

4.1 Water Quality Targets

The stormwater quality management strategy aims to meet targets outlined in the *Engineering Design Specification* (Camden Council, 2009). Table 4.1 summarises the required pollution retention targets by Council.

Table 4.1 Water Quality Objectives

Pollutant	Reduction target
Total suspended solids	85 %
Total phosphorus	65 %
Total nitrogen	45 %
Gross pollutants	90 %

4.2 Water Quality Management Design

The design includes a treatment train consisting of two Gross Pollutant Traps (GPT) and the Bio-Retention Basin. These water quality treatment devices have been constructed under Tranche 21 Stage 2 DA (DA757/2014) for treating surface water from Tranche 22 (10.33 Ha). The bio-retention basin consisting of 1800 m^2 of filter area and it is constructed within Basin 5C. The GPTs have been installed at the basin inlets, with a splitter pit to divert the two year flow from the catchment through the GPTs. No amendments are proposed for this design.

The two GPTs installed are Rocla Cleansall 900 and Continuous Deflection Separation 1518. The former will cater for 4.54 Ha and the latter for the remaining 5.79 Ha. The MUSIC model layout is presented in Figure 4.1.

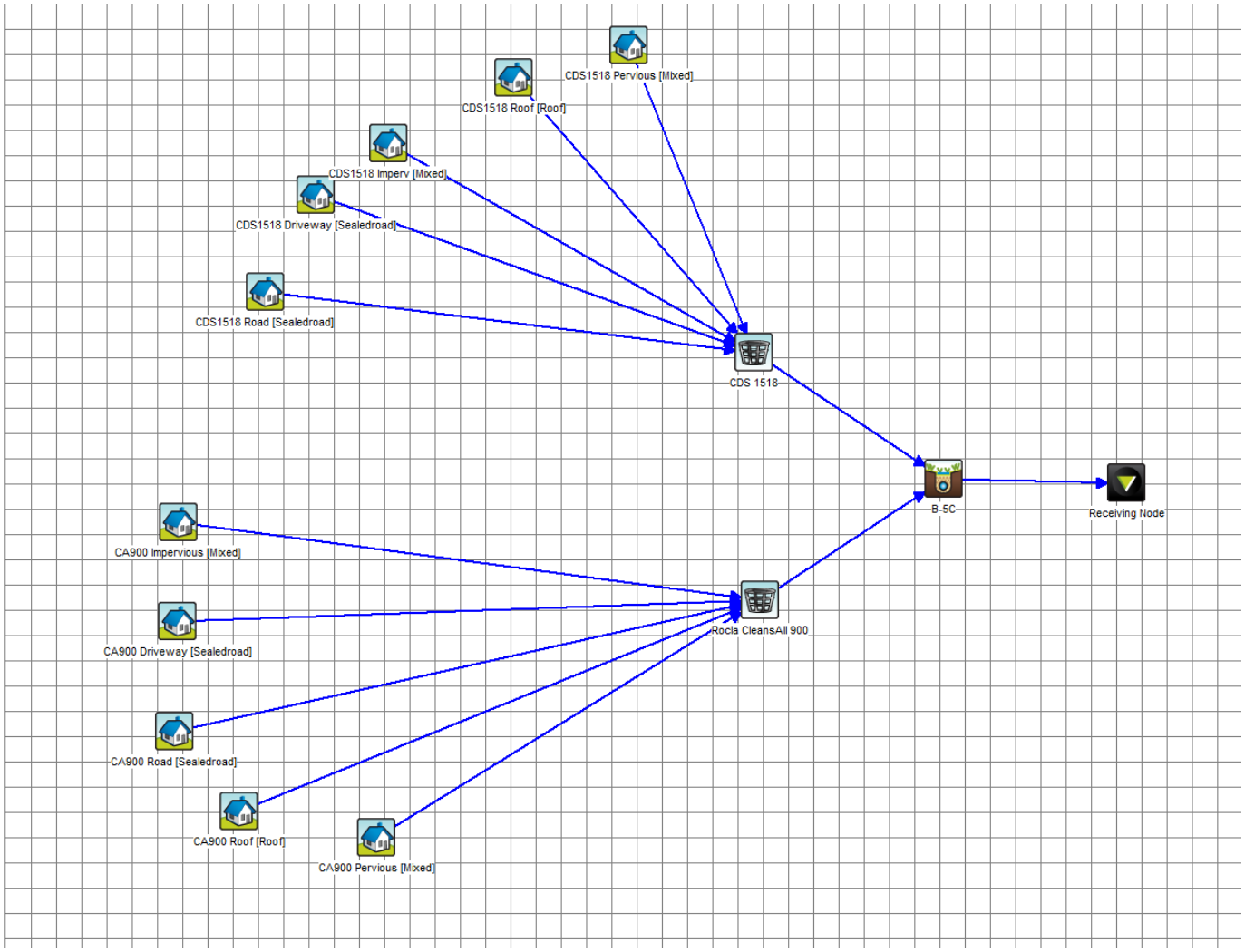

Figure 4.1 MUSIC Model Layout

The sources nodes are based from Camden Council's MUSIC link data, and sized for 90% impervious area, in accordance with industrial land use. The results from this MUSIC model is shown in Table 4.2.

Table 4.2 Bio-retention Basin 5C Performance

Source	Source Level	Residual	% Removed
Total Suspended Solids (kg/yr.)	9790	687	93
Total Phosphorus (kg/yr.)	21.2	5.49	74.1
Total Nitrogen (kg/yr.)	161	64.9	59.7
Gross Pollutants (kg/yr.)	1780	10.9	99.4

The results from Table 4.2 show that the filter area of 1800m^2 and two Rocla GPTs will provide sufficient treatment for the Tranche 22 catchment. The node details and results are provided in Appendix A.

5. Flood Management

Anthony Creek has been designed to convey 100-year flows within the channel. The hydraulic assessment was carried out in HECRAS model and the results show that structures and the development lots have sufficient flood immunity. The flood level at the outlet Basin 5C is RL 89.83. The flood levels between the two culverts that bridge Anthony Creek vary from 93.45 – 89.62; the culverts have been sized by the hydraulic modelling in HEC-RAS to provide the minimum 500mm freeboard for Tranche 22 (refer to Figure 5.1 below). The details on the flood levels have been provided in the Report-L06002.135W- Stormwater Management – Dick Johnson Drive DA02.

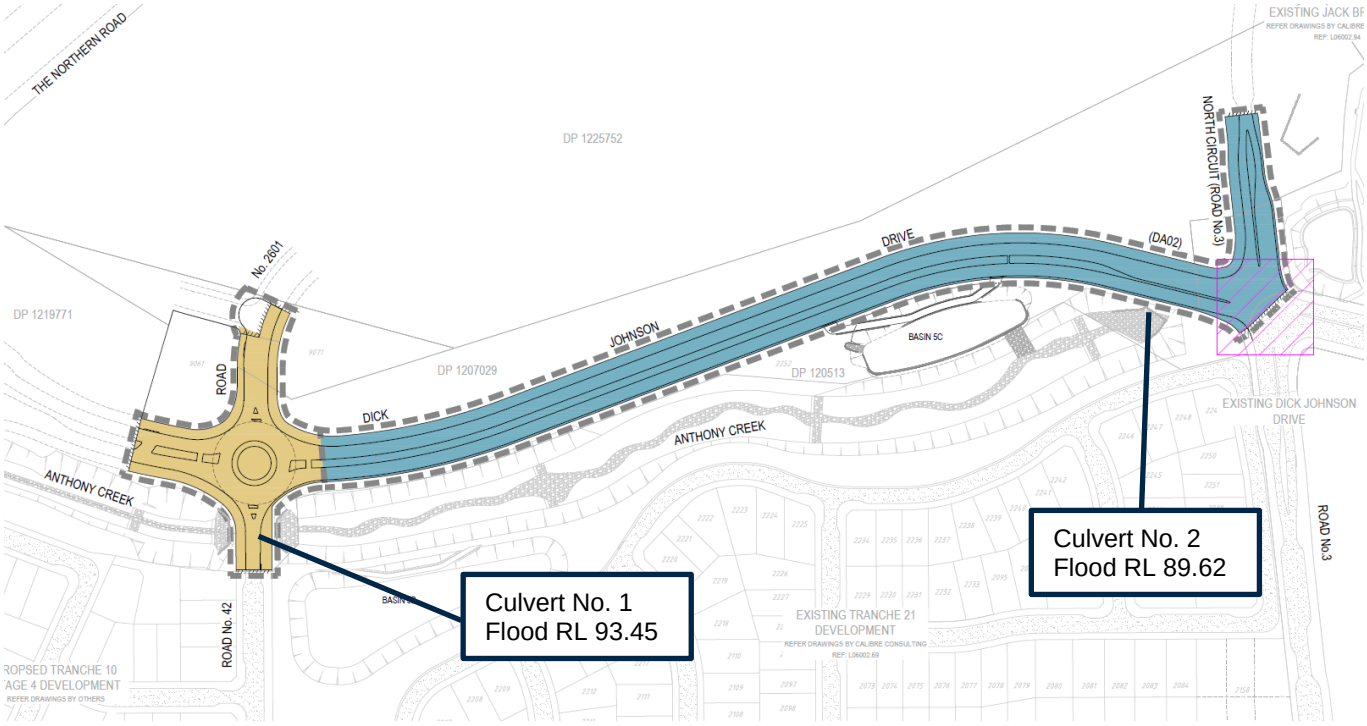

Figure 5.1 Anthony Creek Layout

6. Conclusions

The stormwater management strategies have been developed to protect the receiving waters from both water quantity and quality impacts from the industrial development in Tranche 22. The design includes an onsite detention storage basin, a bio-retention basin, and two GPTs which were built under Tranche 21 Stage 2 DA (DA757/2014). The detention basin and bio-retention basin is named Basin 5C.

Storm events up to and including the 2 year ARI minor storms will be attenuated and controlled via Basin 5C. Storm events exceeding this level will bypass and overflow from Basin 5C to the existing farm dam, which will be upgraded and formalised in the system as permanent basin - Basin B1. The existing farm dam has sufficient storage capacity and will be utilised prior to formalising as Basin B1.

Anthony Creek has been designed to convey the 100 year storm event within the channel; the proposed Tranche 22 development has sufficient flood immunity.

7. References

Camden Council. (2006). *Flood Risk Management Policy.* Sydney, Australia: Camden Council.

Camden Council. (2009). *Engineering Design Specification.* Sydney, Australia: Camden Council.

Camden Council. (2011). *Camden Development Control Plan 2011.* Sydney, Australia: Camden Council.

Camden Council. (2014, September 19). *Camden Local Environmental Plan 2010.* Retrieved October 22, 2014, from http://www.legislation.nsw.gov.au/maintop/view/inforce/epi+514+2010+cd+0+N

Department of Planning and Environment. (2007). *Oran Park Development Control Plan 2007.* Sydney, Australia: Department of Planning and Environment.

Ecological Engineering. (2007). *Integrated Water Cycle Management Study.* Sydney, Australia: Ecological Engineering.

Growth Centres Commision. (2006, October). *Growth Centres Development Code.* Retrieved October 21, 2014, from http://growthcentres.planning.nsw.gov.au/Portals/0/Planning%20Tools/Growth%20Centres%20Development%20Code.pdf

NSW Department of Planning & Environment. (2014). *Standard Instrument Local Environmental Plan (LEP) Program* . Retrieved October 22, 2014, from http://www.planning.nsw.gov.au/en-us/planningyourlocalarea/standardinstrument.aspx

NSW Office of Water. (2012, July). *Guidelines for riparian corridors on waterfront land.* Retrieved October 21, 2014, from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCQQFjAA&url=http%3A%2F%2Fwww.water.nsw.gov.au%2FArticleDocuments%2F35%2Flicensing_approvals_controlled_activities_riparian_corridors.pdf.aspx&ei=k6hFVPGnO4LRmwW6sIHwAg&usg=AFQjCNE6c73qcU

Appendix A MUSIC-Link Report

MUSIC-*link* Report

Project Details		Company Details	
Project:		**Company:**	
Report Export Date:	6/03/2020	**Contact:**	
Catchment Name:	Basin 5C Industrial	**Address:**	
Catchment Area:	10.329ha	**Phone:**	
Impervious Area*:	90.25%	**Email:**	
Rainfall Station:	67035 LIVERPOOL(WHITLAM		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1985 - 31/12/1994 11:54:00 PM		
Mean Annual Rainfall:	783mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Camden City Council		
Scenario:	Camden City Council		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Receiving Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	6.2%	Bio Retention Node	1	Urban Source Node	10
TSS	92.9%	GPT Node	2		
TP	74.1%				
TN	59.8%				
GP	99.4%				

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	B-5C	Hi-flow bypass rate (cum/sec)	None	None	0.8
Bio	B-5C	PET Scaling Factor	2.1	2.1	2.1
GPT	CDS 1518	Hi-flow bypass rate (cum/sec)	None	99	0.35
GPT	Rocla CleansAll 900	Hi-flow bypass rate (cum/sec)	None	99	0.928
Receiving	Receiving Node	% Load Reduction	None	None	6.2
Receiving	Receiving Node	GP % Load Reduction	90	None	99.4
Receiving	Receiving Node	TN % Load Reduction	45	None	59.8
Receiving	Receiving Node	TP % Load Reduction	65	None	74.1
Receiving	Receiving Node	TSS % Load Reduction	85	None	92.9
Urban	CA900 Driveway	Area Impervious (ha)	None	None	0.374
Urban	CA900 Driveway	Area Pervious (ha)	None	None	0.018
Urban	CA900 Driveway	Total Area (ha)	None	None	0.393
Urban	CA900 Impervious	Area Impervious (ha)	None	None	0.983
Urban	CA900 Impervious	Area Pervious (ha)	None	None	0
Urban	CA900 Impervious	Total Area (ha)	None	None	0.983
Urban	CA900 Pervious	Area Impervious (ha)	None	None	0
Urban	CA900 Pervious	Area Pervious (ha)	None	None	0.393
Urban	CA900 Pervious	Total Area (ha)	None	None	0.393
Urban	CA900 Road	Area Impervious (ha)	None	None	0.574
Urban	CA900 Road	Area Pervious (ha)	None	None	0.031
Urban	CA900 Road	Total Area (ha)	None	None	0.606
Urban	CA900 Roof	Area Impervious (ha)	None	None	2.164
Urban	CA900 Roof	Area Pervious (ha)	None	None	0
Urban	CA900 Roof	Total Area (ha)	None	None	2.164
Urban	CDS1518 Driveway	Area Impervious (ha)	None	None	0.469
Urban	CDS1518 Driveway	Area Pervious (ha)	None	None	0.025
Urban	CDS1518 Driveway	Total Area (ha)	None	None	0.495
Urban	CDS1518 Imperv	Area Impervious (ha)	None	None	1.237
Urban	CDS1518 Imperv	Area Pervious (ha)	None	None	0
Urban	CDS1518 Imperv	Total Area (ha)	None	None	1.237
Urban	CDS1518 Pervious	Area Impervious (ha)	None	None	0
Urban	CDS1518 Pervious	Area Pervious (ha)	None	None	0.495
Urban	CDS1518 Pervious	Total Area (ha)	None	None	0.495
Urban	CDS1518 Road	Area Impervious (ha)	None	None	0.797
Urban	CDS1518 Road	Area Pervious (ha)	None	None	0.043
Urban	CDS1518 Road	Total Area (ha)	None	None	0.841
Urban	CDS1518 Roof	Area Impervious (ha)	None	None	2.722
Urban	CDS1518 Roof	Area Pervious (ha)	None	None	0
Urban	CDS1518 Roof	Total Area (ha)	None	None	2.722

Only certain parameters are reported when they pass validation

Contact Us

Calibre Professional Services Pty Ltd
55 070 683 037

Level 2, 2 Burbank Place Norwest, NSW 2153
PO Box 8300, Baulkham Hills BC, NSW 2153
+61 2 8808 5000

calibregroup.com