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WESTERN SYDNEY STADIUM

Stormwater Management Plan (SMP)

Lend Lease

3 February 2017
Revision: D
Reference: 253451

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Executive Summary

This report details the flooding, water quality and drainage considerations for the site and proposes a design intent that shall be carried through to construction. This report addresses the requirements placed upon the stadium team by The Department of Planning & Environment. The report details the drainage system for this site and demonstrates that the design adheres to the following three-tier stormwater management system:

a. Flows for the 1% AEP event and above must be conveyed via overland flow paths modelled with 100% pipe blockage. This is to be demonstrated using 2D modelling.
b. 5% AEP stormwater flows must be carried within the roads and road pipe drainage network.
c. 3 month storm (4 EY) 'first flush' low flow must be separated and treated using water sensitive urban design measures.

The overland flow strategy directs run-off away from the superstructure and directs in two directions, towards O'Connell Street and Parramatta River. The site drains almost 50:50 in either direction.

The stadium superstructure and habitable substructures have been placed above the 1% AEP flood line throughout the site boundary. A minimum free-board of 500mm above the 1% AEP has been adopted throughout.
Surface run-off is directed away from habitable structures should in-ground stormwater infrastructure if blocked, or in the case of more intense rainfall due to climate change.

Water sensitive urban design (WSUD) principles where appropriate have been incorporated into the design intent with more conventional means adopted elsewhere. The introduction of WSUD has greatly increased the water quality leaving site when compared to the existing conditions where no WSUD principles exist.

The proposed remediation for the site with respect to stormwater is suitable for the Section 96.

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1 Project Overview

1.1 Introduction

This report supports an application made under section 96(2) of the Environmental Planning and Assessment Act 1979 (EP&A Act) to modify Development Consent, SSD 16_7534 relating to the Stage 1 concept proposal and demolition works approval for the redevelopment of the Western Sydney Stadium.

Development Consent SSD 16_7534 was granted on 7 December 2016 by the Minister for Planning for the following components of the development:

- **Concept Proposal** for the Western Sydney Stadium, including building envelopes, a new 30,000 seat stadium, 500 surface car parking spaces, access, ancillary infrastructure and landscaping; and
- **Detailed works** for staged demolition and removal of the existing stadium and associated infrastructure and the Parramatta Swimming Centre

This section 96 application (the Modification Application) constitutes the first modification to the consent.

1.1.1 Overview of Proposed Modifications

The modification application seeks to expand the approved range of site preparation works to include piling and remediation, as outlined below:

- Remediation works comprising the excavation and storage of contaminated materials and bulk excavation. Contaminated materials will be stored on site and capped below ground in accordance with the recommendations outlined in the Remedial Action Plan.
- Piling works which will comprise the driving and drilling of concrete piles to establish foundations for the construction of a stadium located within the Stage 1 building envelope

1.1.2 Site Description

The Western Sydney Stadium is located at 11-13 O'Connell Street, within the Parramatta Park on the north-western edge of the Parramatta CBD. It is bound to the south and west by the Parramatta Park and the Parramatta River, the Parramatta Rugby Leagues Club to the north and O'Connell Street to the east. The Site is located within the City of Parramatta local government area (LGA).

A locational context plan and location plan are provided at Figure 1 and 2 below.

1.2 Purpose of this Stormwater Management Plan

Aurecon Australia Pty Ltd has been commissioned by Lend Lease to prepare a Stormwater Management Plan (SMP) in support of the Development Application. This report will provide the stormwater strategy that involves developing the concept design for the proposed stormwater drainage whilst at the same time mitigates the flood risk.

The report addresses the criteria set out within the Section F6 STORMWATER of the RFT.

The report takes largely from the previously issued AECOM Engineers working paper which addresses the majority of issues usually associated with a Stormwater Management plan.

The report addresses the criteria set out in the Stage 1 DA requirements, Stormwater Management Section B8 items, a), b), c), d), e), and f) as well as the Department of Planning and the Environment SEAR. The stormwater incorporates local council standards such Blacktown City Council Engineering Guidelines for Development and City of Parramatta Development Guidelines.

2 New Stadium Site Development

2.1 Site location

The Site is located at 11-13 O'Connell Street Parramatta, approximately 25 kilometres west of Sydney Central Business District (CBD) (refer to Figure 1). The Site is situated within the broader context of Parramatta Park, approximately one kilometre North West of Parramatta Station and the Parramatta central business district (CBD). The Site is shown in detail in Figure 1, and comprises the existing stadium and stadium complex, surface car parking facilities (to the north and west of the stadium), Parramatta Swimming Centre to the east of the stadium (located on Crown Land), and a training field to the south of the stadium.

A key feature of the local area is Parramatta River, which is located to the west and south of the Site and eventually flows into Sydney Harbour approximately 20 kilometres south east of the Site. Parramatta Park extends across Parramatta River to the west of the Site and includes the world heritage listed Old Government House, approximately 200 metres south west of the Site boundary.

Other land uses surrounding the Site include the Parramatta Park Trust car park to the south east on Parramatta Park land, the Old Kings Oval to the south west and the Parramatta Leagues Club and associated surface car park immediately adjacent to the north.

Land use to the east of the Site across O'Connell Street is predominantly comprised of low density residential development, as well as mixed use and public recreation. Notable uses include schools and places of worship (our Lady of Mercy College and St Patricks Cathedral), and the Old Kings School site.

2.2 The Proposed Development

The Development includes:

- Proposed design for the Western Sydney Stadium, including parking and access facilities, ancillary infrastructure and landscaping
- Staged demolition and removal of the existing above ground structures, including the existing stadium and the associated hardstand areas where required (footpaths, roads, car parks etc.) as well as the Parramatta Swimming Centre.

The Western Sydney Stadium Development provides for:

- a Gross Floor Area (GFA) of circa 65,000 m^2 for the stadium development,
- a GFA of circa 12,000 m^2 for community uses,
- transport accessibility and parking facilities,
- landscaping and public domain elements throughout the Site.

Figure 1 - Western Sydney Site Location

3 Existing Environment

3.1 Site topography

The Site is located on the eastern side of a bend in the Parramatta River. The Site has a ground surface which ranges from 9 mAHD to 16 mAHD. Historically, the land would have been graded from the north eastern corner of the site down to the Parramatta River along the north western and southern boundaries.

The pre-urban terrain would appear to have been considerably modified to incorporate the existing stadium facilities, playing surface and surrounding ovals. The existing stadium pitch has an elevation of approximately 9 mAHD and is the lowest elevation within the Site.

3.2 Local drainage network

The runoff generated outside of the Site is conveyed by the Parramatta City Council stormwater network to the Parramatta River.

Surface runoff on O'Connell Street is collected by road side pits and conveyed by pipes southward to the Parramatta River. During larger runoff events, it is likely some runoff which exceeds the capacity of the pipe network would flow into the Site via the road entrance at Victoria Road (Hyder, 2014). This water would likely flow south through the Parramatta Swimming Centre and into the Parramatta River for internal and external drainage flow paths. This is the only location where external runoff may flow into the Site. In all other locations, the existing site is elevated above the surrounding land and this prevents runoff entering the site from external catchments.

3.3 Parramatta River

The Parramatta River conveys runoff from the upstream 103 km^2 catchment past the eastern and southern side of the Site. The catchment includes Blacktown City, Baulkham Hills, Holroyd City and Parramatta City Councils (Bewsher, 2003).

Since the 1970s, the catchment has undergone flood mitigation works to reduce the flood risk to many parts of the catchment. In 1989 the Upper Parramatta River Catchment Trust was established to provide a cohesive flood mitigation strategy for the four councils, which included a flood inundation model (Bewsher, 2003).The original 2003 flood study had calculated that during a 100yr ARI event, the north-western area of the Site would be inundated. During a Probable Maximum Flood (PMF), the majority of the Site would be inundated. The new stadium development would not be fully protected against the PMF.

4 Basis of Design

4.1 Design Objectives

The Parramatta Council specifies stormwater design objectives for new developments in Section 3 of the Parramatta Development Control Plan (DCP) 2011. However, under the State Environmental Planning Policy 2011, the Site is excluded from development control plans. Nonetheless, these objectives have been adopted and expanded for this Project and assessment to aim for maximum sustainable triple bottom line (3BL) benefits to the Site which may not be as prevalent otherwise.

A summary of these design objectives are presented below:

4.1.1 Stormwater Quantity Objectives:

- Minimise the post-development volume and rate of stormwater runoff to equal or less than the pre-development.
- No increase in flood risk to adjoining or downstream properties.
- Minimise flooding.
- Minimise disturbance to existing drainage system.
- Utilise distributed stormwater control and treatment measures.
- Utilise Water Sensitive Urban Design (WSUD) measures.
- Stormwater infrastructure to visually integrate with the landscape.
- The site is not flood affected by the 100 year flood envelope but can be affected by the PMF flood envelope.
- Stormwater system designed for a minimum of 100 years ARI where there is no overland flow path or 20yr ARI where an overland flow path is provided.
- Provision of flood evacuation routes from the Stadium and Stadium Precinct.
- Assess the Bureau of Meteorology (BoM) release of the 2013 Intensity Frequency Duration (IFD) design rainfall to the design.

4.1.2 Stormwater Quality Objectives

- Treatment and control measures implemented and used during construction and operation of the stadium.
- Minimise contamination of stormwater.
- Minimise erosion and sedimentation, nutrient and seed dispersal due to stormwater discharge.
- Ensure no adverse environmental impacts on the Parramatta River system.
- The stormwater treatment system MUSIC is used to model the required pollution reduction loads presented here in Table 1.

Table 1 - Stormwater Treatment Targets for Development

Pollutant	Performance Target Reduction Loads[1]
Gross Pollutants (GP)	90% reduction in the post development mean annual load of total gross pollutant load (greater than 5mm)
Total Suspended Solids (TSS)	85% reduction in the post development mean annual load of Total Suspended Solids (TSS)
Total Phosphorus (TP)	60% reduction in the post development mean annual load of Total Phosphorus (TP)
Total Nitrogen (TN)	45% reduction in the post development mean annual load of Total Nitrogen (TN)
Hydrocarbons, motor oils, oil and grease	No visible oils for flows up to 50% of the one-year ARI peak flow specificfor service stations, depots, vehicle body repair workshops, vehicle repair stations, vehicle sales or hire premises, car parks associated with retail premises, places of public worship, tourist and visitor accommodation, registered clubs and pubs

4.2 Stormwater Strategy Objectives

- The site stormwater drainage system (minor system) has been designed for the 20 Year Average Recurrence Interval (ARI) in accordance with AS/NZS 3500.3.2015 - Stormwater drainage.
- The overland flow routes throughout the precinct have been design to cater for the 20 to 100yr ARI event with safe passage for emergency vehicles and patrons during high rainfall events with safe flow depth/velocities. The route nominated is the existing O'Connell – Victoria Road junction that is not inundated during the 100yr ARI storm event.
- Roof drainage for the 100yr ARI storm event.
- The design Intensity-Frequency-Duration (IFD) has been derived from the Bureau of Meteorology in accordance with the Australian Rainfall & Runoff 2013.
- Site discharge from the proposed development is limited to a pre-development flow as established by the AECOM Engineers Drainage and Flooding Working Paper 2016 presented as part of the RFT.

5 Current Flood Assessment Results

5.1 Quantitative assessment of flooding related risks

The following presents the modelling calculations that were completed by AECOM Engineers and Others to enable an assessment of the water related risks for the development and to enable mitigation strategies to be established.

5.1.1 Regional flood inundation modelling

The flood inundation modelling of the Parramatta River by Bewsher Consulting Pty Ltd in 2003, determined that portions of the existing site may be at risk of flood inundation during a 100yr ARI event. To assess this risk, a flood model was developed which included the surface elevation and new stadium location.

A two dimensional rain-on-grid TUFLOW model was developed for the Parramatta River Catchment. A 10m gridded model of the entire regional catchment was run for all storm durations for the 100yr ARI event. The critical storm was determined to be the 9 hr event. This produced a peak flow rate at Charles Street Weir of 916 m^3/s at a peak flood elevation of 5.5 mAHD. This is comparable to the modelling investigation by SKM Engineers who calculated a critical storm of 9 hours with a peak flow rate of 847m^3/s at a peak flood elevation of 5.4 mAHD. Since there is close correlation with the SKM investigation, which has been calibrated to historical events, the model produced previously is deemed suitable for use in this site assessment. A presentation of the flood inundation for the catchment is provided by AECOM in Figure 3.

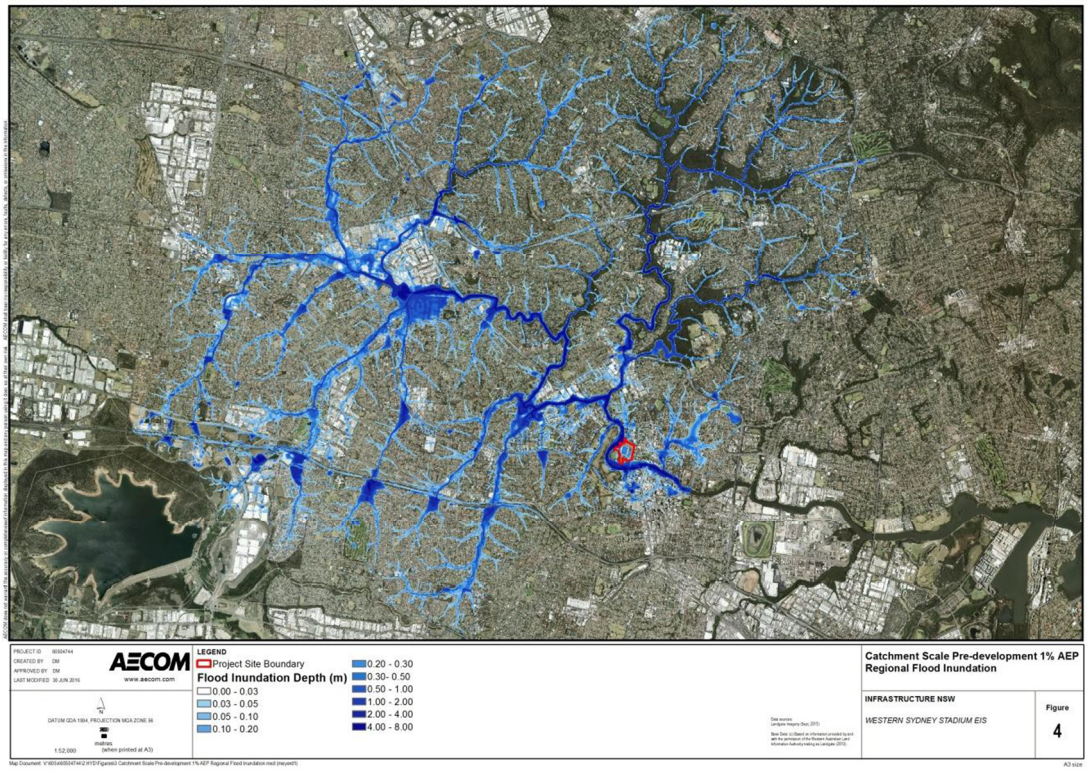

Figure 2 - Catchment Scale Pre-development 1% AEP Regional Flood Inundation

5.1.2 Existing Local flood inundation modelling

5.1.2.1 Pre-developed (existing) Site Conditions

The local flood inundation model (prepared by others) was prepared for the immediate site using the regional model for inflows within the Parramatta River. The local flood inundation model had a reduced model domain and an increased model grid resolution to 1.5 m. This enabled increased accuracy and definition in the flood extent. The local flood inundation for the existing Site conditions model is presented in Figure 4.

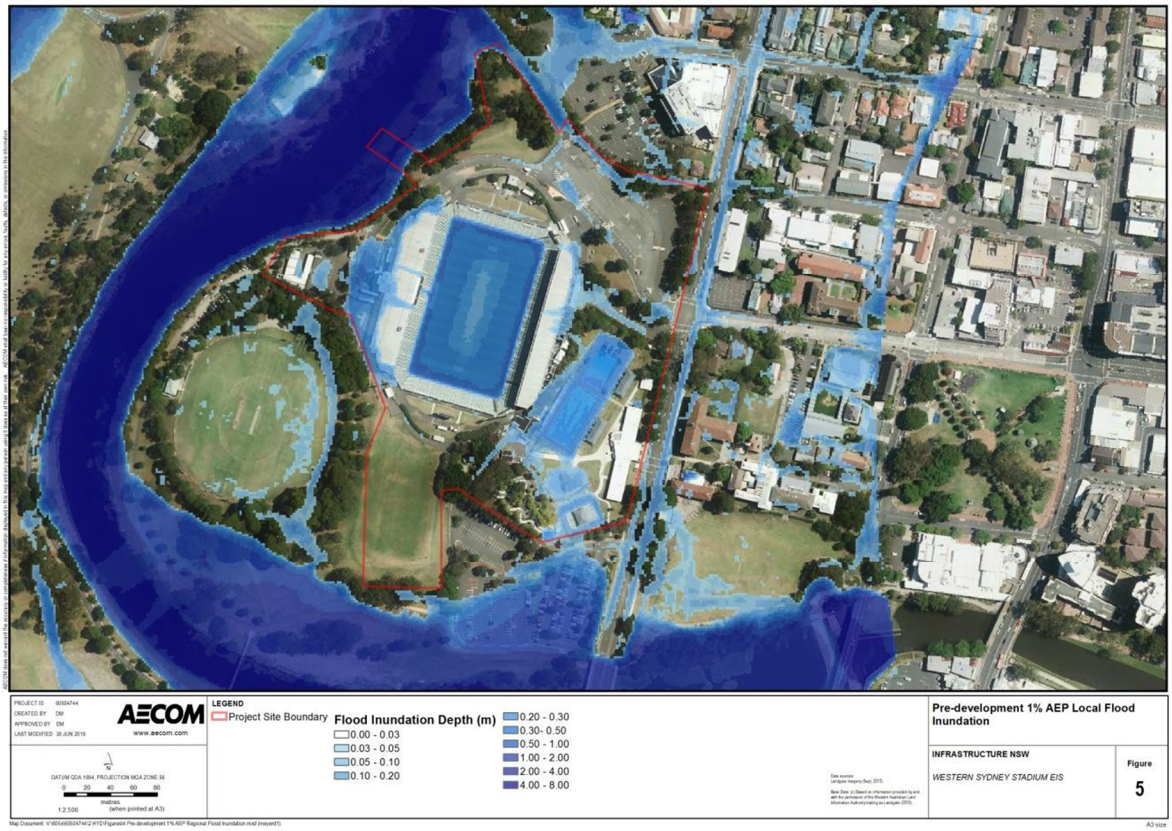

Figure 3 - Pre-development 1% AEP Local Flood Inundation

The results indicate that the flood extent of the Parramatta River does not overlap the existing Site. The minor inundation of the existing Site presented in Figure 4 is due to excess runoff generated from the Site's impervious surfaces and detained within low points in the topography.

5.1.2.2 Post-developed Site Conditions

The design surface levels for the playing field is 9m AHD with the surrounding concourse of 14m AHD. Outside the stadium superstructure, reduced levels will vary across the site to match existing topographical levels around the site boundary and in particular O'Connell Street. The new stadium precinct will have large car parks to the west and north of the superstructure with a paved/landscaped patron entertainment area parallel to O'Connell Street as shown in Figure 5.

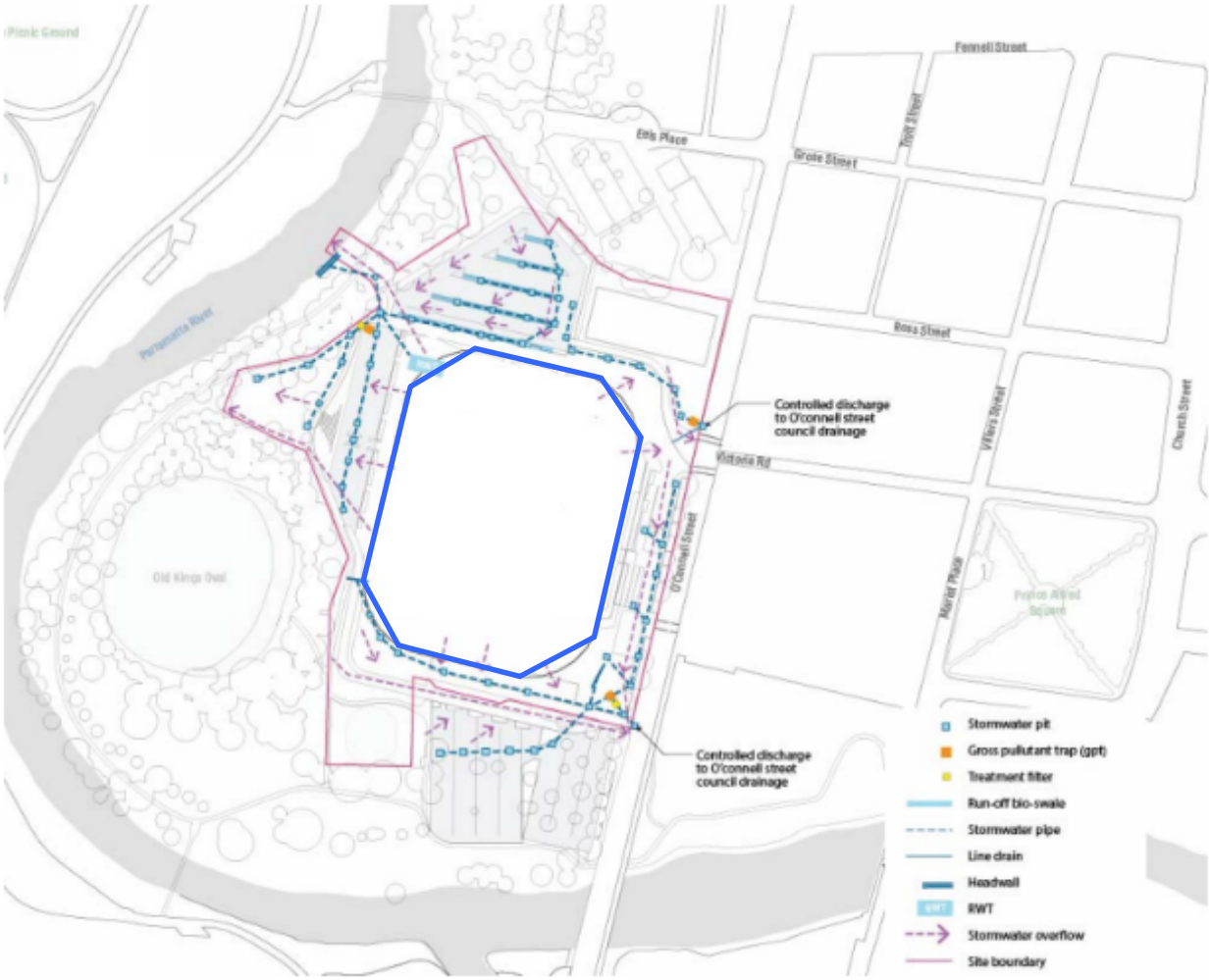

Figure 4 - Proposed Site Drainage Flow Paths

The Parramatta River flood levels do not overlap the post-development Site for the 100yr ARI flood event. The playing surface reduced level remains at 9 mAHD with the surrounding concourse at 14 mAHD. Therefore, the 100 year ARI Parramatta River flood levels will not impact the new stadium and the development is subsequently unlikely to have any impact on the flood risk of adjoining properties. The playing field has an overland flow path through the lower stadium bowl which couples as the entry for large Pantech vehicles during concert events.

5.1.3 Local stadium precinct drainage network modelling

The local drainage reticulation has been simulated in DRAINS. The model was applied to calculate stormwater runoff flows through and off the Site for the pre- and post-development scenarios. The pre-development flow was established independently by AECOM engineers.

The AECOM Engineers assessment of the as-built information for the Site did not identify all drainage line configurations. The assessment did reveal a single point of discharge, for the main stadium facilities, into Parramatta River. Therefore, where drainage line configurations could not be identified,

the sub-catchments were assumed to connect into the nearest identified drainage pit or junction and subsequently into the outfall pipe.

The DRAINS model configuration of the pre-developed (existing conditions) drainage system for the stadium facilities is shown in Figure 6.

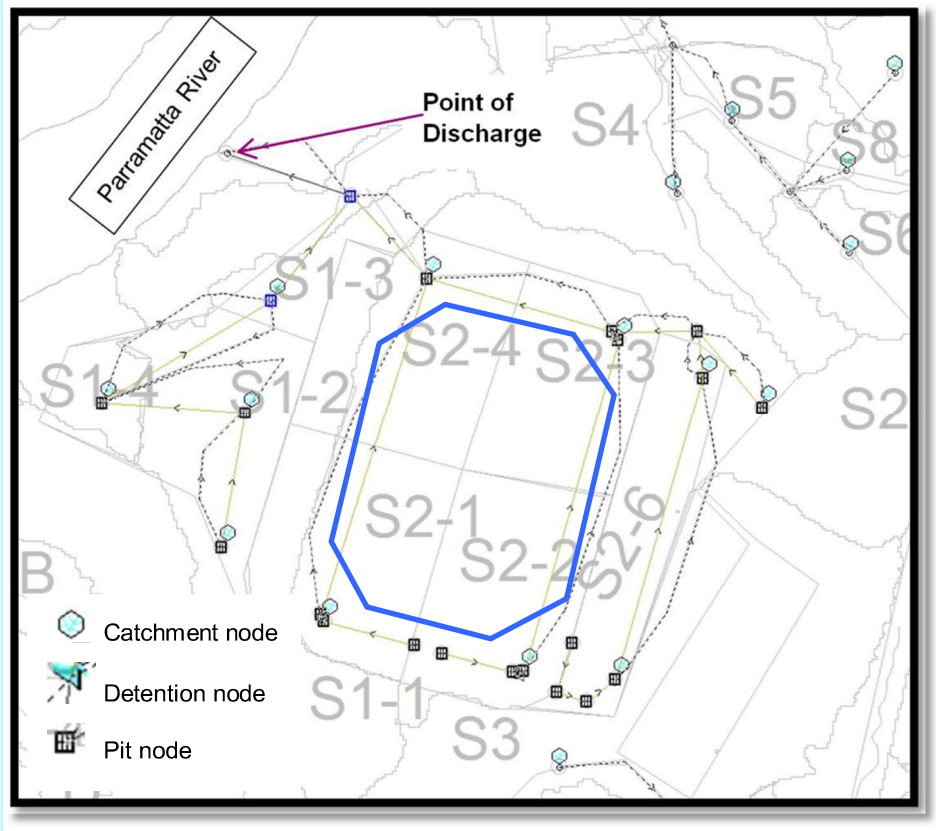

Figure 5 - Pre-Development DRAINS model (source AECOM Engineers)

The DRAINS model configuration of the post-development (design conditions) drainage system for the stadium facilities is shown in Figure 7.

Catchment node

Pit node

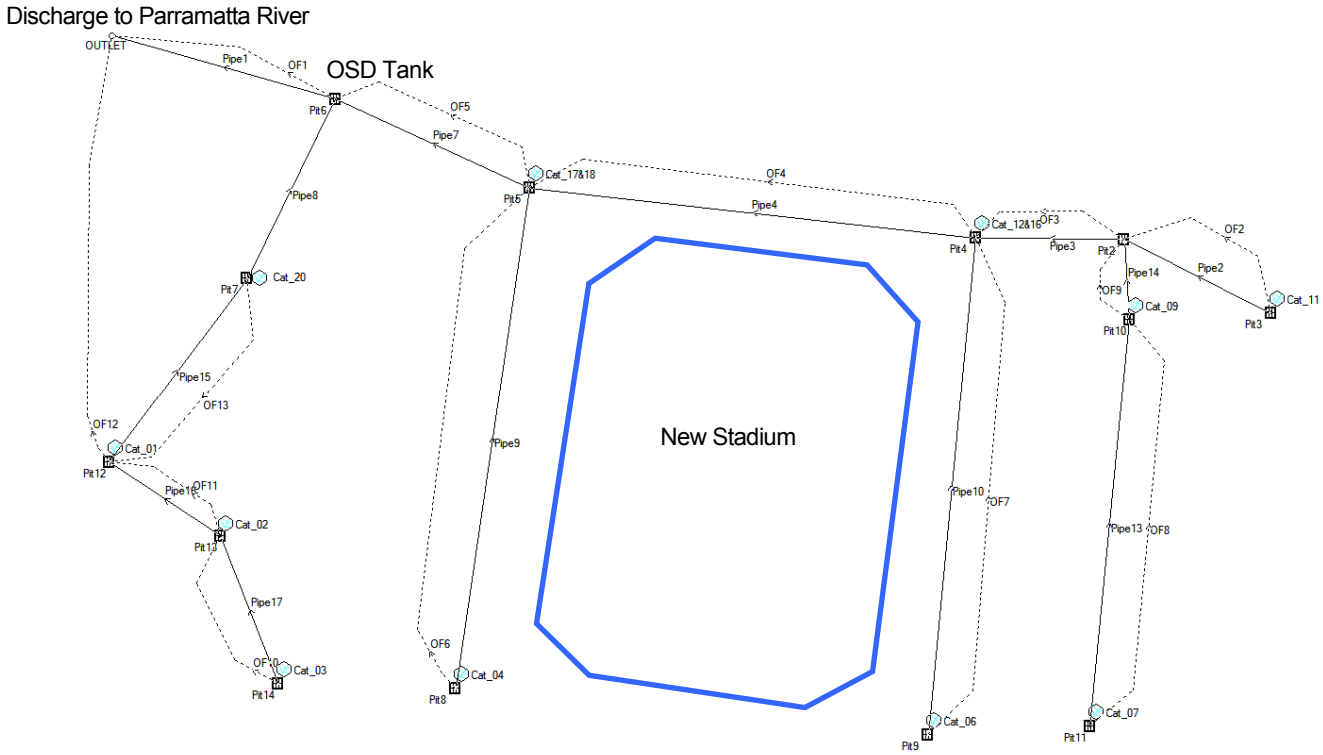

Figure 6 - Post-Development DRAINS model

The DRAINS model was used to simulate storm durations from five minutes to three hours for the 10 year and 100 year ARI storm events, respectively. Analysis of the DRAINS model results indicate that for the pre-development system, the 25 minute and 20 minute rainfall duration is the critical duration for the 10 year and 100 year storm events respectively. For the post-development system, the 25 minute duration is the critical duration for both storm events. The resulting discharge flow rates into Parramatta River are listed in Table 2 and Table 3 for the 10 year ARI and 100 year ARI storm events, respectively.

Table 2 - 10 year ARI

Storm Duration	AECOM Engineers Pre Development Discharge (m^3/s)	Developer Post Development Discharge (m^3/s)- Unmitigated
5 minutes	0.743	0.248
10 minutes	0.837	0.248
15 minutes	0.907	0.485
20 minutes	0.930	0.847
25 minutes	0.961	0.893
30 minutes	0.915	0.858
1 hour	0.804	0.953
3 hours	0.612	1.029

Table 3 - 100 year ARI

Storm Duration	AECOM Engineers Pre Development Discharge (m^3/s)	Developer Post Development Discharge (m^3/s)- Unmitigated
5 minutes	1.10	0.494
10 minutes	1.35	0.981
15 minutes	1.38	0.494
20 minutes	1.42	0.981
25 minutes	1.40	1.305
30 minutes	1.37	1.303
1 hour	1.27	1.368
3 hour	0.98	1.411

The results indicate that there is some correlation between the AECOM Engineers and Developers DRAINS models. Peak discharge figures are similar where the durations do vary.

There will be two minor connections to the municipal council system along O'Connell Street – the north entrance and south entrance.

5.2 Water Quality

5.2.1.1 Water quality modelling

The water quality modelling is concurrent with the water quality modelling undertaken by AECOM Engineers who used the MUSIC 6.2 software program. Input parameters for source and treatment nodes have been obtained from Sydney Catchment Authority MUSIC modelling manual (NSW Govt, 2012) as well as the NSW MUSIC modelling guidelines (BMT WBM, 2010).

The source nodes in the MUSIC model have been configured based on the DRAINS catchment nodes for both the pre- and post-development scenarios.

- Average potential evapo-transpiration (PET) data for the Parramatta North station has been adopted.
- Music version 6.1.0 has been used.

The pre-development (existing conditions) site MUSIC model configuration is shown in Figure 8.

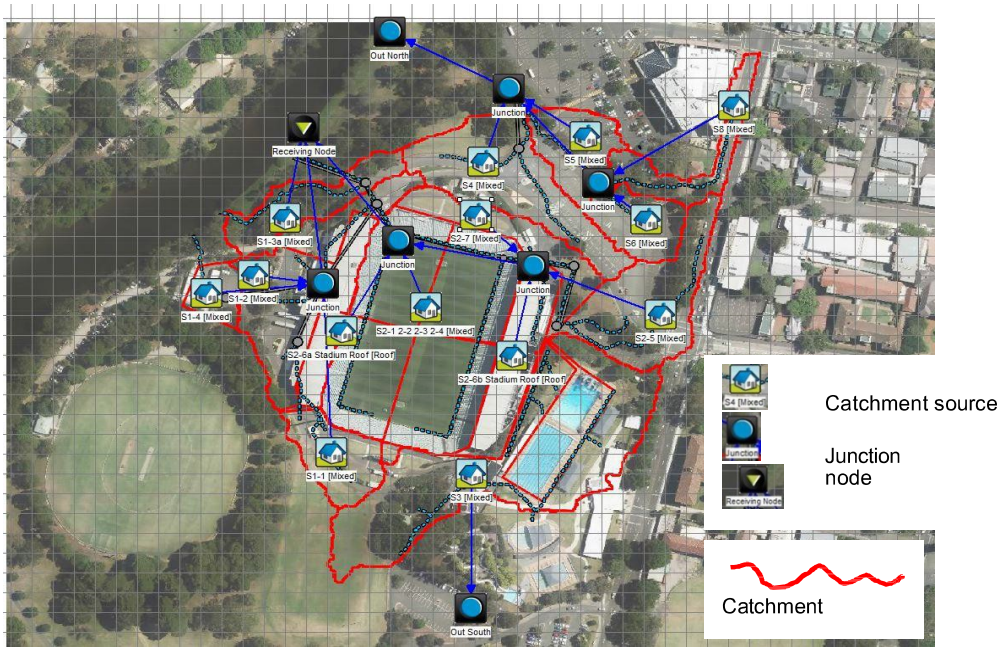

Figure 7 - Pre-Development (Existing Conditions) MUSIC Model Configuration

The pre-development stormwater pollutant constituents calculated for the existing main stadium facilities and discharging into Parramatta River are shown in Table 4.

Table 4 - Pre-Development Stormwater Quality Statistics

Pollutant	Estimated annual pollutant reduction efficiencies (%)	Pollutant Reduction Targets (%)
Total Suspended Solids (TSS)	84.3	85
Total Phosphorus (TP)	55.8	65
Total Nitrogen (TN)	33.6	45
Gross Pollutants (GP)	55.8	90

The post-development (design conditions) site MUSIC model configuration is shown in Figure 9.

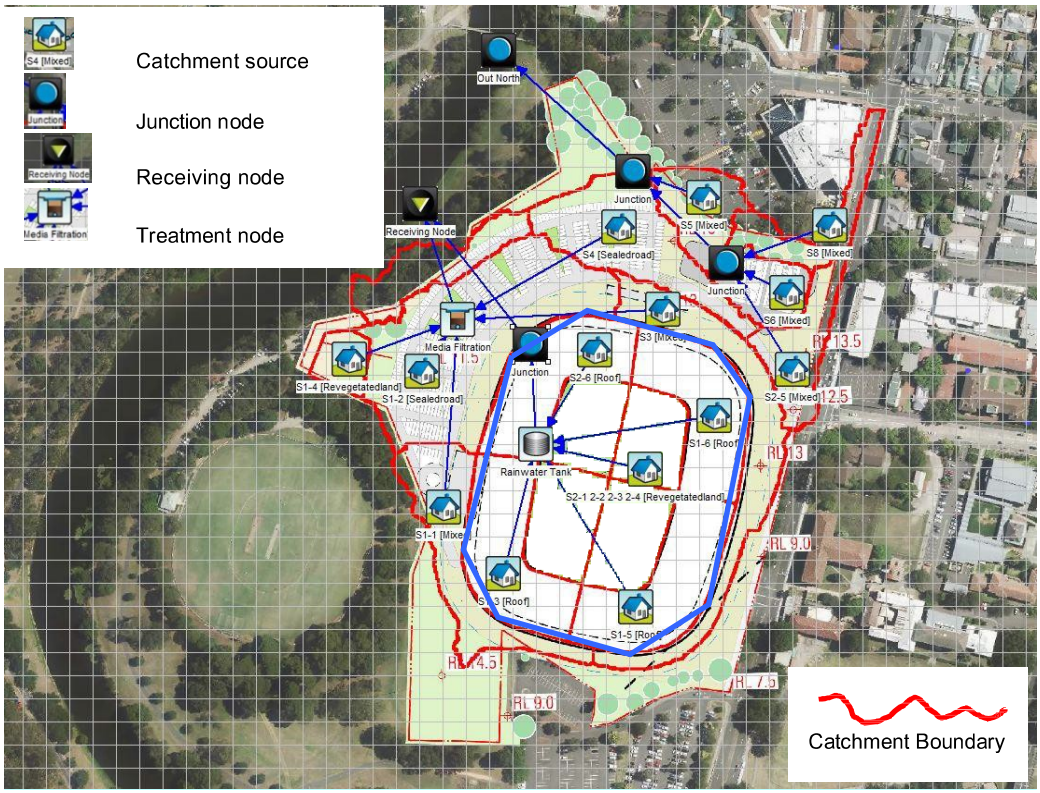

Figure 8 - Post-Development (Design Conditions) MUSIC Model Configuration

The treatment nodes incorporated into this model include a rainwater tank for stormwater harvesting of both the proposed stadium roof and playing field, and a bio-swale filtration system for the car park facilities.

The post-development stormwater pollutant constituents calculated for the main stadium facilities for total water demand reuse, discharging from the point of discharge are shown in Table 5.

Table 5 - Post-Development Stormwater Quality Statistics – Total Water Demand Reuse

Pollutant	Estimated annual pollutant reduction efficiencies (%)	Pollutant Reduction Targets (%)
Total Suspended Solids (TSS)	85.9	85
Total Phosphorus (TP)	64.2	65
Total Nitrogen (TN)	48.6	45
Gross Pollutants (GP)	94.9	90

As shown in Table 5 the stormwater quality management objectives can be achieved through a combined WSUD and integrated water cycle management (IWCM) philosophy utilising the maximum volume of non-potable water supplies for reuse.

5.2.1.2 Water quality treatment train

The stormwater environment flow (6 month ARI rainfall event) will be treated through two primary means. Run-off from car parks will predominantly flow into bio-swales that will capture, detain and filter/treat the environmental flow. For rainfall events greater than the environmental flow, pits located within the swales will convey the greater run-off flows into a conventional pit and pipe system. The figure below is a typical example of a bio-swale integrated into a car park.

Figure 9 - Integrated Car Park Bio-Swale

All other catchments that do not enter the bio-swale system will be treated by a Humes JellyFish filtration unit (or equivalent). Humes JellyFish membrane filter system is an underground, precast concrete stormwater tertiary treatment device. It incorporates an efficient up-flow design that facilitates influent flow over the entire surface area of the filters. It provides pollutant removal, with a smaller treatment flow footprint. Hydraulic pressure forces water through the filter media — causing a constant velocity throughout the filter area realising a consistent media contact time and therefore treatment.

Upon completion of a treatment cycle, the filter backwashes and effectively dislodges particulates from the filtration layers. This re-establishes filter media interstitial porosity. The dislodged particles then accumulate away from the filter media allowing easy removal during maintenance.

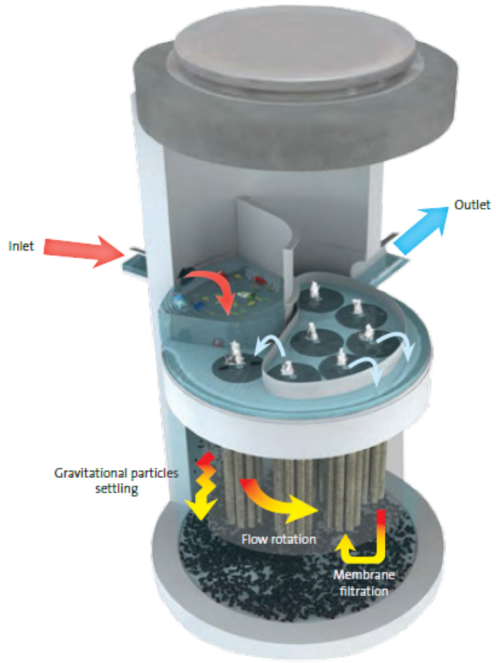

Figure 10 - Typical Humes JellyFish Filter

Typical pollutant removal efficiencies are:

Table 6 - JellyFish filter performance summary (Humes, 2014)

Pollutant	Median reduction
TSS	89%
TP	65%
TN	55%
Cu	61%
Zn	91%
Total oil and grease	62%

Reference: University of Florida (2011) and West Ipswich (2014).

Appendix A – Council Correspondence

Hi Michael

What you have written below is in good accord with Council's views on the implementation of WSUD at this site.

Council would emphasise maximising rainwater harvesting, not just for toilet flushing but for other uses, notably irrigation.
We had looked before at the possibility of providing water to Parramatta Park via a submerged pipe across the river - although this may be difficult to implement legally.

Also Council would seek to maximise integration of stormwater management into the landscape for a long term water quality benefit.

Kind regards

Paul Clark

Paul Clark | A/Team Leader Technical Specialists & Senior Development Engineer
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PO Box 32, Parramatta NSW 2124
(02) 9806 5050

From: Michael O'Rourke [mailto:Michael.O'Rourke@aurecongroup.com]
Sent: Wednesday, 7 September 2016 4:35 PM
To: Paul Clark
Subject: Western Sydney Stadium - Stormwater Treatment and Disposal

Paul,

I hope this finds you well?

Apart from the Public Domain, I'm helping out Lendlease on their bid for the new Western Sydney Stadium.
I was advised by one of the stormwater asset engineers that my questions regarding stormwater within the precinct should be directed to the Development Section in the first instance and your name popped up. The Engineer I spoke to Aziz, I didn't get a second name I'm afraid.

I've been charged with looking into, flooding protection, run-off treatment and stormwater discharge.

Flooding
From a flood protection aspect, I've advised Lendlease that we should be above the RL of 8.50m AHD as a minimum, this level is 500mm above the 100 yr ARI. The lowest point of the new stadium is 9.00m AHD.

Run-Off Treatment
At present, there is no water treatment undertaken on the stadium site, the State has advised that we should meet the following treatment levels as a minimum.

Water Quality Parameters	Greenfield developments Large developments (% reduction)
Gross Pollutants	90
Total Suspended Solids (TSS)	85
Total Phosphorus (TP)	60
Total Nitrogen (TN)	45

Water Re-Use
Roof run-off will be captured and re-used for toilet flushing.

Stormwater Discharge
The State have advised that they do not require OSD on the site but this will be subject to Local Council Approval. The position taken so far is that OSD is redundant considering the proximity of the Stadium to Parramatta River. The existing stadium currently discharges to the river with no treatment or OSD. Flood studies of the Upper Parramatta River Catchment indicate that the critical storm event is the 100 yr 9hr event. Our philosophy is to discharge to the river (post treatment) prior to the peak flow thus not to contribute to the flood.

We consider this to be a realistic and practical solution but in-put from Parramatta Council would be most welcome. Do you consider our approach to be a measured one?

On the opposite end of the site (low end), some run-off is expected to flow into the existing O'Connell Street drainage system. This is in line with the existing Parramatta Swimming Complex (which unfortunately will be demo'd) which discharges into the street, again, no OSD or treatment. As-Built information indicates a 300mm diameter pipe. Preliminary design indicates a similar pipe size discharging into O'Connell Street (with treatment).

Please find attached two sketches that document our philosophy to date, again, we welcome any feedback.

Should you wish to discuss further, or require additional information, please do not hesitate to contact me.

Kind regards,

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Appendix A – Development Consent Requirements

The following is the minimum basis of for development (Stormwater & Flooding)

Development consent

Section 89E of the *Environmental Planning and Assessment Act 1979*

Stormwater Management

B8. Prior to the commencement of works, a Stormwater Management Plan (SMP) is to be prepared and submitted to the Certifying Authority. The SMP is to detail the proposed stormwater disposal and drainage from the development, designed in accordance with, but not limited to the Australian and Council's Stormwater Management Code as follows:

a) Australian Rainfall and Runoff – A Guide to Flood Estimation, Volumes 1 and 2 (1987);

b) SA/NZS 3500.3.2 National Plumbing and Drainage Part 3.2: Stormwater Drainage – Acceptable Solutions;

c) On-Site Stormwater Detention Handbook (Fourth Edition, December 2005) – Upper Parramatta River Catchment Trust;

d) Managing Urban Stormwater – Soils and Construction Volume 1 (4th Edition March 2004) – NSW Department of Housing;

e) Blacktown City Council Engineering Guidelines for Development – 2015;

f) Blacktown City Council Development Control Plan 2015 Part J Water Sensitive Urban Design and Integrated Water Cycle Management;

g) loading and unloading, including construction zones;

h) predicted traffic volumes, types and routes; and

i) pedestrian and traffic management methods.

All approved details for the disposal of stormwater and drainage are to be implemented in the development.

Erosion and Sedimentation Control

B11. Soil erosion and sediment control measures shall be designed in accordance with the document *Managing Urban Stormwater–Soils & Construction Volume 1* (2004) by Landcom. Details are to be submitted to the satisfaction of the Certifying Authority prior to commencement of above ground works involving vegetation removal or soil disturbance.

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