AJ Whipps Consulting Group

Where ingenuity flows

2/101 Union St, McMahons Point
NSW 2060 Australia
ABN: 11 077 989 158
t 61 2 8923 8444
f 61 2 8923 8484
sydney@ajwhipps.com.au

ajwhipps.com.au

Our Ref: 20150648

9 May 2016

Ecove Group
Cnr Australia Avenue and Herb Elliott Avenue
Sydney Olympic Park, NSW 2127

Attention: Michael Azar,

Dear Michael,

Re: Site 9, 3 Olympic Boulevard cnr Sarah Durack Avenue, Olympic Park
Water Cycle Management Report

Site Description

The site is located at 3 Olympic Boulevard, Olympic Park on the corner of Sarah Durack Avenue within the Sydney Olympic Park precinct and is known as Site 9. Sydney Olympic Park is located within Auburn Council's Local Government Area and is also governed by the Sydney Olympic Park Authority (SOPA) which outlines the water cycle management requirements.

The subject site is approximately 3,185.8m² in area and is bounded by an existing carpark structure to the north-east , an existing on-grade carpark to the south east, Olympic Boulevard to the south-west and Sarah Durack Avenue to the north-west.

Currently there exists an on-grade carpark and landscaping areas as presented in Figure 1 below.

Figure 1: Site Aerial Image (Source: Google Maps 08/05/16)

Sediment and Erosion Control

The objectives of sediment and erosion control for the development site are to ensure that adequate measures are implemented prior to the commencement of construction and are maintained throughout the construction period to control sediment and erosion within the site. The sediment and erosion control measures are to be in accordance with:

- Auburn Council's Stormwater Drainage Development Control Plan
- Requirements of Sydney Olympic Park Authority
- NSW Department of Housing Manual, "Managing Urban Stormwater, Soils and Construction", 4th Edition, March 2004 ("Blue Book").

Sediment and Erosion Control Measures

The concept sediment and erosion control measures and details are documented on AJ Whipps Consulting development application drawings and H03. Prior to any demolition or earthworks commencing on site, erosion and sediment control measures will be implemented generally in accordance with the design drawings. These measures are intended to be a minimum treatment only, as the contractor will be required to modify the measures to suit the construction program, sequencing and techniques. These measures will include but are not limited to:

- Temporary construction access
- Sediment fencing
- Dust control hessian
- Mesh and gravel inlet filters
- Geotextile inlet filters
- Diversion swales

Due to the size of the development construction activities can be restricted to below 2500m^2 and hence no sediment basin will be required. Stormwater collected in the basement excavation will be directed to a sump protected by a sediment fence prior to pumping to Council's drainage system.

Construction Sequencing

To minimise the risk of sediment runoff, the works should generally be undertaken in the following sequence:

1. A temporary site fence is to be constructed around the site with a security gate at the site access
2. Construct stabilised construction access
3. Installation of sediment fencing to downstream boundaries, and large disturbed areas, including any earthworks stockpiles
4. Use of dust control measures including covering stockpiles, hessian to site fences and watering of exposed areas

5. Placement of mesh and gravel inlet filters to the downstream gutter and around all directly downstream kerb inlet pits
6. Placement of geotextile inlet filters to all stormwater inlets as constructed as part of the works.

Stormwater Management

The stormwater management measures have been designed to comply with the following guidelines:

- Australian Rainfall and Runoff 2001
- Auburn Council's Stormwater Drainage Development Control Plan
- Sydney Olympic Park Authority – Stormwater Management and Water Sensitive Urban Design policy

The key design objective of stormwater management is to control and treat stormwater discharge from the development site using the following measures:

- On-site Detention (OSD) facilities
- On-site Stormwater Retention (reuse tanks)
- Water quality treatments

Existing Drainage System

The existing site drainage system currently consists of a conventional pit and pipe system and discharges to Olympic Boulevard towards the southern end of the site.

Proposed Stormwater Drainage System

The proposed stormwater drainage system will consist of a conventional roof and building drainage system that will discharge to a rainwater tank for reuse within the building and landscaping irrigation. It will overflow into an on-site stormwater detention tank which incorporates water quality treatment filtration devices. The site is not located within the WRAMS stormwater harvesting catchment which requires more stringent water quality treatment.

On-site Stormwater Detention

The OSD for the proposed development has been calculated using DRAINS to limit post-developed runoff to the pre-developed 5 year ARI runoff. The OSD will restrict the runoff by incorporating a reduced dia. orifice plate to the outlet pipe. The DRAINS model inputs are presented in Table 1 below.

Table 1: DRAINS Parameters

Parameter	Value
Catchment time of concentration	5min
Paved area initial loss	1 mm
Grassed area initial loss	5 mm
Soil type	3
Antecedent moisture content	3.0
Colebrook White roughness	0.6mm
100 year Outlet Tailwater Level	10.8 m AHD
Existing Impervious Area	1,714m2, 53.8%
Proposed Impervious Area	3,185.8m2, 100%

The DRAINS model was firstly run for the 5 year storm event to determine the pre-developed runoff. This then set the permissible site discharge for the post-developed condition.

- Pre-Developed 5 year ARI runoff = 112L/s

The model was then run for the 5, 20 and 100 year ARI events for the post-developed scenario. The results are presented in Table 2.

Table 2: Post-Developed DRAINS Results

Storm Event (ARI)	Storage Provided (m3)	PSD (L/s)	Site Discharge (L/s)
5	18	112	86
20	32	112	102
100	60	112	112

The modeling results shows that by incorporating OSD into the design the post-developed flow for all storm events up to and including the 100 year ARI event the runoff can be limited to the pre-developed 5 year ARI event.

Stormwater Retention

The rainwater tank will collect all roof water from the development which will pass through a first flush system prior to capture. The rainwater tank will be located in the basement carpark and incorporate an overflow to the OSD tank.

The collected water will be used for outdoor irrigation, hose taps and toilet flushing. The tank will be equipped with the following:

- Solid access lid and step irons
- High level overflow to the detention tank
- Duty and standby pump configured for alternative operation
- Mains water top-up

- Associated float valves and control panels

The mandatory rainwater tank requirements defined in SOPA's guidelines are to achieve a 90% reuse efficiency. MUSIC has been used to undertake the water balance modelling. A water balance model was created to determine the reduction in runoff days as a result of the rainwater tank. The flowing inputs were adopted:

- Rainfall data – Station 66124 PARRAMATTA
- Rainfall period: 2000-2010 (10 years)
- Roof area draining to tank = 874 m^2
- Initial tank volume: 25,000L

The reuse demand was calculated by adopting the Blacktown City Council MUSIC modelling guideline of 0.08kL/day per unit (203 units in total) which equates to 16.24kL/day. This number is based on an average 1-2 person unit.

The MUSIC results showed that a 25,000L rainwater tank will achieve a 10% reuse efficiency. This is due to the large reuse demand and small, inaccessible roof catchment. The design of the rainwater tank can be reassessed at the detailed design stage to incorporate media filtration for the accessible roof portion of the site. This will improve the reuse efficiency of the site.

Stormwater Quality

The water quality modelling software MUSIC v5 was used to analyse the performance of the treatment train. MUSIC uses source pollutant loads and treatment removal efficiencies to determine the percentage reduction of pollutants within a catchment as a result of the treatment.

The following water quality measures have been implemented:

- First flush system for Roof drainage system (not included in MUSIC model)
- Rainwater reuse tank
- Enviropod (Stormwater 360) filter baskets for all surface runoff inlet pits
- 460mm PSorb StormFilter (Stormwater 360) cartridges (1L/s) within the OSD tank
- Trash Screen and silt trap to the OSD Discharge Control Pit (not included in MUSIC model)

Stormwater 360 proprietary devices were chosen for the following reasons:

- Site constraints and limited opportunity for natural treatment devices due to large building footprint and minimal landscaping area
- Minimal head loss
- Long term operation
- Stringent testing data
- Maintenance simplicity for the strata
- Incorporation of treatment devices into the OSD tank to save infrastructure costs

Figure 2 presents the MUSIC node and link schematic, which comprises the catchments, water quality treatments and receiving node. The model has been built to predict the adequacy of the proposed stormwater treatment measures proposed and whether they meet the water quality objectives prior to stormwater runoff leaving the site.

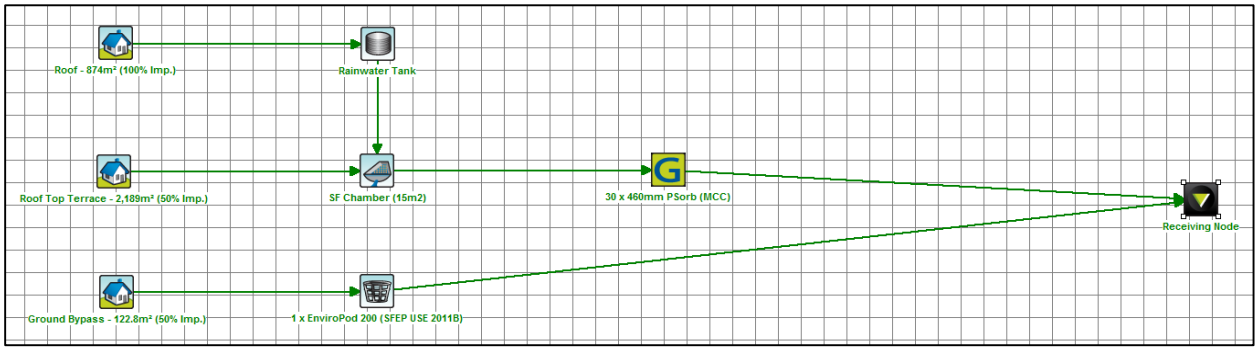

Figure 2: MUSIC nodes and links schematic

Water Quality Targets

In accordance with Sydney Olympic Park Authority's guidelines the following targets have been set in relation to stormwater quality:

Table 3: Water Quality Target

Pollutant	Pollutant Reduction Criteria
Gross Pollutants (GP)	95%
Total Suspended Solids (TSS)	90%
Total Phosphorus (TP)	85%
Total Nitrogen (TN)	65%
Hydrocarbons	90%

Hydrocarbon removal has not been considered as there are no uncovered vehicular driveways as part of this development.

Modelling Inputs

Catchments

The MUSIC model adopts three catchments as described below:

Catchment 1 (inaccessible roof): Runoff from the entire roof area is collected by the rainwater reuse tank located at the basement level which overflows directly to StormFilter treatment within the OSD tank;
Catchment 2 (accessible roof): This catchment contains landscaping areas and impermeable surface areas which discharge directly to the OSD tank and is treated by the StormFilter treatment within the OSD tank

Catchment 3 (ground bypass): Discharges to the surface pit and pie system through an Enviropod filter basket pit insert and bypasses the OSD and StormFilter treatment. Table 4 summarised the catchment areas used in the model.

Table 4: Catchment summary

Catchment	Total Area (m^2)	Impervious (%)	Land Use Category
1	874	100	Roof
2	2189	50	Urban General
3	122.8	50	Urban General
Total	3185.8		

Rainfall Data

For the analysis of the MUSIC modelling, historical rainfall records were obtained from the Bureau of Meteorology Station No. 66124 PARRAMATTA.

Evapotranspiration

The evapotranspiration values adopted are presented in Table 5.

Table 5: Evapotranspiration Values

Month	Areal Potential Evapotranspiration (mm)
January	180
February	135
March	128
April	85
May	58
June	43
July	43
August	58
September	88
October	127
November	152
December	163

Rainfall Runoff Parameters

The rainfall runoff parameters adopted are presented in Table 6.

Table 6: Soil Characteristics

Rainfall Threshold (mm/day)	0.3
Soil Storage Capacity (mm)	120
Initial Storage (% of Capacity)	30
Field Capacity (mm)	80
Infiltration Capacity Coefficient – a	200
Infiltration Capacity Exponent – b	1
Initial Depth (mm)	10

Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	5
Daily Deep Seepage Rate (%)	0

Pollutant Concentration Parameters

The pollutant concentration parameters adopted are presented in Table 7.

Table 7: Pollutant Concentration Parameters

Land-use Category		Log10 TSS (mg/L)		Log10 TP (mg/L)		Log10 TN (mg/L)	
		Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow
General Urban	Mean	2.15	1.2	-0.6	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Roofs	Mean	1.3	0	-0.89	0	0.30	0
	Std Dev	0.32	0	0.25	0	0.19	0

Treatment Devices

Various treatment devices have differing removal efficiencies, therefore a 'treatment train' has been adopted to target the full range of pollutants required. The OSD facility has not been included in the MUSIC model. Table 9 summarises the removal efficiencies for the various treatment measures proposed.

Table 8: Proposed water quality treatment parameters

Treatment Device	Design Parameters
Rainwater Tank	• 25,000L with 12.5m² base area • 150mm overflow pipe • No low flow bypass • Stored water to be used for irrigation, hose taps and toilet flushing (16.24kL/day) • The tank is particularly effective at Nitrogen reduction

Envirpod Filter Baskets (Stormwater 360)	• Number of units specified: 1
	• Treatable flowrate: 20L/s
	• Low flow bypass: 0L/s
	• Pollutant reduction efficiency:
	  ○ Gross Pollutants – 100%*
	  ○ Total Suspended Solids (TSS) – 30%*
	  ○ Total Phosphorus (TP) – 15%*
	  ○ Total Nitrogen (TN) – 7%*

PSorb StormFilter Cartridge (Stormwater 360)	• Number and type of unit specified: 30 x 460mm
	• Treatable flowrate: 0.46L/s each
	• Low flow bypass: 0L/s
	• High flow bypass: 5.5L/s
	• Pollutant reduction efficiency:
	  ○ Gross Pollutants – 100%*
	  ○ Total Suspended Solids (TSS) – 93.4%*
	  ○ Total Phosphorus (TP) – 86.1%*
	  ○ Total Nitrogen (TN) – 55.9%*

*The adopted removal efficiencies are consistent with the product brochure produced by the manufacturer.

The proposed water quality devices can be substituted for alternate products provided the water quality treatment is maintained at the detailed design phase.

Water Quality Modelling Results

The results of the MUSIC simulation is presented in Table 9 below:

Table 9: MUSIC modeling results

	Source Load (kg/yr)	Residual Load (kg/yr)	Reduction (%)	SOPA Reduction Objective (%)	Compliance
Gross Pollutants	50.3	0	100	95	OK
Total Suspended Solids (TSS)	171	14.5	91.5	90	OK
Total Phosphorus (TP)	0.358	0.0507	85.8	85	OK
Total Nitrogen (TN)	3.38	0.997	70.5	65	OK

The MUSIC modelling indicates that the proposed water quality treatment measures meet SOPA's water quality objectives.

Monitoring and Maintenance

The rainwater tank, water quality treatment devices and on-site stormwater detention shall be monitored and maintained in accordance with the below:

Table 10: Water quality measures monitoring and maintenance requirements

Stormwater Element	Monitor	Maintain
Rainwater reuse tank	3 months	6 months
OSD tank	6 months	12 months
Enviropod filter baskets	As per manufacturer specification	As per manufacturer specification
PSorb filter cartridges	As per manufacturer specification	As per manufacturer specification

Site Stormwater Discharge

Discharge from the site that has passed through the rainwater tank, water quality chamber and OSD tank will discharge to the existing stormwater pit located in the southern corner of the site within the existing driveway as per the stormwater drainage concept plans.

Conclusion

AJ Whipps Consulting Group, has prepared this report and corresponding drawings to provide information to Auburn Council and the Sydney Olympic Park Authority on the stormwater management requirements for the development to assist Council in assessing the Development Application.

The findings of this report and associated concept designs indicates effective stormwater management measures can be integrated into the proposed development, in accordance with authority engineering standards, and that no major factors relating to stormwater management would preclude the proposed development of the site.

Yours Faithfully
AJ Whipps Consulting Group

Anthony Whipps
Director