Sydney WATER

Appendix F Addendum to Surface Water Assessment

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Date	24/02/2022	Pages (including this page)	4		
Subject	AWRC EIS – Surface Water – Wianamatta South Creek Stormwater Management Targets				

1 Introduction

The following technical note provides validation that the USC AWRC EIS MUSIC modelling of the reference design complies with the DPE EES Wianamatta-South Creek Stormwater Management Targets for construction and operation which are now included in the draft Phase 2 Aerotropolis DCP.

The USC AWRC reference design stormwater management facilities (described in the Surface Water Impact Assessment (Aurecon Arup, 2021) has been modelled using the DPIE EES MUSIC Toolkit provided by DPE BCD in August 2021 and the results compared with DPIE EES construction and operational stormwater management targets to confirm effectiveness reported in the Surface Water Impact Assessment (Aurecon Arup, 2021). The MUSIC Toolkit provides flow duration targets and pollution reduction targets and construction phase sediment targets. Achieving these targets specified in the Toolkit will demonstrate the project can achieve the DPIE EES Wianamatta-South Creek stormwater management targets and therefore also achieves the Wianamatta South Creek water quality objectives in Table 1 below.

The assessment in this memo considers flow duration curves, pollution reduction targets, and construction sediment targets compared against the modelled results.

Since the AWRC EIS surface water modelling (Aurecon Arup, 2021) was completed prior to the MUSIC Toolkit being available, the EIS used a modelling approach that directly related MUSIC model results with draft Wianamatta South Creek flow objectives that have been updated and shown in Table 1.

Table 1 Receiving waterway flow objectives for Wianamatta-South Creek

FLOW RELATED OBJECTIVES					
	Pre development	Post development			
Median Daily Flow Volume (L/ha)	71.8 ± 22.0	1095.0 ± 157.3			
Mean Daily Flow Volume (L/ha)	2351.1 ± 604.6	5542.2 ± 320.9			
High Spell (L/ha) ≥ 90th Percentile Daily Flow Volume	2048.4 ± 739.2	10091.7 ± 769.7			
High Spell - Frequency (number/y)	6.9 ± 0.4	19.2 ± 1.0			
High Spell - Average Duration (days/y)	6.1 ± 0.4	2.2 ± 0.2			
Freshes (L/ha) ≥ 75th and ≤ 90th Percentile Daily Flow Volume	327.1 to 2048.4	2642.9 to 10091.7			
Freshes - Frequency (number/y)	4.0 ± 0.9	24.6 ± 0.7			
Freshes - Average Duration (days/y)	38.2 ± 5.8	2.5 ± 0.1			
Cease to Flow (proportion of time/y)	0.34 ± 0.04	0.03 ± 0.007			

1.1 Flow Duration Curves

The DPE EES Wianamatta-South Creek Stormwater Management Targets and MUSIC toolkit provides two options for demonstrating compliance to flow targets and Alternative 2 includes the flow duration curve targets presented in Table 2. Both Alternative 1 and Alternative 2 targets are applicable but Alternative 2 has been adopted for this assessment.

Flow results from the Flow Duration Curve tool provided by DPE EES are summarised in Table 2 and Figure 1 below.

Table 2 Stormwater flow duration target – Alternative 2

Indices	Reference Design Performance (L/Ha/day)	Complies?	Target
95%ile	5871	Yes	3000 to 15000 L/ha/day
90%ile	1518	Yes	1000 to 5000 L/ha/day
75%ile	398	Yes	100 to 1000 L/ha/day
50%ile	90	Yes	5 to 100 L/ha/day
Cease to Flow	28%	Yes	10-30%



Figure 1 Flow duration curve (black line) and target ranges (green lines)

As shown in Table 2 and Figure 1, the resulting modelled flow duration curve and flow indices fit within each target range and this demonstrates that the proposed stormwater management approach detailed in the AWRC EIS reference design can be configured to achieve the target flows shown in Table 2.

1.2 Pollution Reduction Targets

Using the MUSIC Toolkit, modelled results show that the proposed stormwater management approach detailed in the AWRC EIS reference design meets the load reduction targets set by DPE EES and Penrith Council. It is noted that both targets may apply and that the DPE EES targets are the more stringent. Modelling results and a comparison to the targets are shown in Table 3.

Parameter	Ultimate design loads without mitigation	Residual loads with mitigation (WSUD)	Load reduction (%)	EES Target reduction target (%)	EES Target Met	Penrith Council Ioad reduction target (%)	Penrith Council Target Met
TSS (kg/yr)	12800	841	93	90	Yes	85	Yes
TP (kg/yr)	24.7	4.76	81	80	Yes	60	Yes
TN (kg/yr)	179	42.9	76	65	Yes	45	Yes
Gross Pollutants (kg/yr)	2090	4.75	100	90	Yes	90	Yes

Table 3 Pollution load reduction targets for both DPE EES and Penrith City Council

1.3 Construction Phase Sediment Targets

The Wianamatta South Creek Stormwater Targets requires that sediment basin storage volume is provided at a rate of 196 m³/Ha and be operated as a high efficiency sediment basin type to meet construction phase sediment targets.

The reference design proposes that flood detention basins can be configured to provide the sediment management basin target volume during construction. This assessment demonstrates the proposed reference design management measures will meet the DPE EES Wianamatta South Creek Stormwater Targets on site by utilising the proposed stormwater detention basins as high efficiency sediment basins during construction with the target volumes indicated in Table 4 below. Table 4 provides a summary of the three detention basin volumes, catchment areas and compliance notes.

Table 4 Construction phase stormwater quality

Surface Area	North (ha)	South (ha)	Total (ha)
Total Area	12.373	9.898	22.27
Target sediment basin volume (196m³/Ha) for high efficiency sediment basin types	2425	1940	4365
50% AEP detention storage volume	1146	1322	2468
10% AEP detention storage volume	2494	2840	5334
1% AEP detention storage volume	3745	4180	7925
Target sediment	Yes	Yes	Yes
volume supplied	(at the equivalent depth to the 10% AEP flood detention storage volume)	(between 50% and 10% AEP flood detention storage volume)	(between 50% and 10% AEP flood detention storage volume)

The assessment demonstrates that the target detention storages can achieve 50 mg/L of sediment for at least 80% of the average annual runoff volume from the construction areas which meets the construction phase stormwater targets.

1.4 Conclusion

USC AWRC EIS MUSIC model results using the EES toolkit shows that the reference design:

1. Complies with EES's stormwater flow targets in the draft Phase 2 Aerotropolis DCP

2. Complies with EES water quality objectives prescribed by load reduction targets in the draft Phase 2 Aerotropolis DCP

Flood detention basins provide sufficient volume that can provide sediment controls during construction. The flood detention volumes provide the required 196 m³/Ha of storage to achieve the sediment management approach when operated as high efficiency sediment basins. This demonstrates that the detention storages can achieve 50 mg/L of sediment for at least 80% of the average annual runoff volume from the construction areas and construction phase stormwater targets are met.

The AWRC EIS reference design provides a treatment train with sufficient footprints, volumes and allowance to achieve the construction and operation stormwater quality targets established in the Wianamatta-South Creek Stormwater Management Targets.





