Appendix E

SEEC Addendum to Water Cycle Management

SEEC

Strategic Environmental & Engineering Consulting

Addendum to Water Cycle Management Study

for Proposed Goulburn Health Hub

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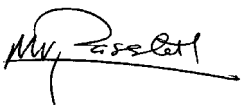
Document Certification

This report has been developed based on agreed requirements as understood by SEEC at the time of investigation. It applies only to a specific task on the nominated lands. Other interpretations should not be made, including changes in scale or application to other projects.
Any recommendations contained in this report are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation, subject to the limited scope and resources available. Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.



Mark Passfield
SEEC

21st May 2014

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1 INTRODUCTION

SEEC have been commissioned by Sophie Ashton of Goulburn Health Hub Pty Ltd to prepare this addendum to a previous Water Cycle Management Study (WCMS) prepared by SEEC on 14th September 2012. It is required to accompany a Section 96 Application to make changes to the development.

This addendum is required to show that a neutral or beneficial effect (NorBE) can be achieved at both stages of the development that are the subject of the Section 96 application. Note, Stage 3 is not part of the Section 96 Application and so is not discussed in this addendum.

2 PROJECT DESCRIPTION

The proposed development is shown in Carroll and Carroll Architect's un-numbered drawing dated 20th February 2014. The proposed changes to the original proposal are:

- Removal of the childcare centre (it will be Stage 3);
- Expansion of the pharmacy and a cafeteria;
- Relocation of the day surgery from Building 2 (now Building 1) to Building 4 (now Building 2);
- Addition of the Allied Health Facility and dental services to the medical centre;
- Increases to the parking area; and
- Staging of the development into three stages, two of which are the subject of the Section 96 Application.

Other modifications include minor layout changes such as a connection between Building 1, Building 2 and the Doctor's Accommodation (now all part of Building 1), connection between Buildings 3 and 4 (now all Building 2).

3 Effect of the Changes on Water Cycle

The proposed changes would affect the Water Cycle described in the previous WCMS as:

- The proposed development is now smaller than before; the community health building is now replaced with a child care centre but that is now Stage 3 and not part of this application;
- The remaining development is now to be staged in two stages;
- There are changes to the total areas of roofs and car parking;

- The internal building layouts are changed and so the total number of staff and visitors would also change. There is also a café proposed in Stage 1. Together, these would affect the demand on the rainwater tanks.
- It is now not proposed to use rainwater to supply the hot water systems.
- There is now only one Doctor's residence.

4 Revised Modelling

4.1 Modelling Assumptions

The following assumptions are made in the revised MUSIC modelling. Two models are done; one for each stage of the development.

4.1.1 Pre-Existing

The whole site (1.979 ha) is modelled with two nodes; an urban node and an agricultural node of about equal area. This is to simulate the fact that although the land not zoned agricultural it has, and is, being used to graze cattle.

4.1.2 Stage 1

(i) Stage 1 comprises 2,000 m^2 of roof and 4,900 m^2 of surrounding urban lands with 850 m^2 pervious surfaces.

(ii) The remainder of the site is now modelled with only an urban node (100% pervious); no cattle would be allowed on the property.

(iii) At least 80% of the new roof drains to two 50 kL rainwater tanks from which water is drawn for internal use in toilet flushing and for external irrigation.

(iv) The total internal demand for water is calculated using data supplied in the Statement of Environmental Effects (SEE) and adopting/adapting figures given in NSW Health (2001). It is as follows:

- 38 Staff using 27L/day = 1,026 L/d
- A 40 seat café using 10L/seat = 400 L/day plus a dishwashing allowance of 500 L = total 900 L/d
- 340 Visitors a day using 14 L = 4,760 L/d
- Doctor's accommodation (a single bedroom) at 720 L/d
- Total internal demand is therefore 7,400 L/d but only 25% of that would be for toilet flushing = 1,850 L/d.
- External irrigation = 40kL/year, based on about 2,000 m^2 of outside area, (SCA, 2012).

(v) All Stage 1 lands drain to a gross pollutant trap with a high flow by-pass set to 0.06 m^3/s. High flows are by-passed to receiving waters; low flows are directed to a Bioretention Basin 2[1] as described in the original Water Cycle Management

[1] Note Bioretention Basin 1 will not be built until Stage 3.

Study (surface area = 356 m^2, extended detention = 0.3 m and filter area = 258 m^2).

4.1.3 Stage 2

(i) Stage 2 comprises 1,740 m^2 of roof and 3,660 m^2 of surrounding urban lands with 1,300 m^2 pervious surfaces.

(ii) The Stage 1 lands remain unchanged.

(iii) The remainder of the site (0.749 ha) is now modelled with only an urban node (100% pervious); no cattle would be allowed on the property.

(iv) At least 80% of the new roof drains to two 50 kL rainwater tanks from which water is drawn for internal use in toilet flushing and external irrigation.

(v) The total internal demand for water is calculated using data supplied in the Statement of Environmental Effects (SEE) and adopting/adapting figures given in NSW Health (2001). It is as follows:

- 27 Staff using 27L/day = 729 L/d
- 174 Visitors a day using 14 L = 2,400 L/d
- Five patient beds at 80 L/d = 400 L/d
- Total demand is 3,529 L/d but only 25% of that would be for toilet flushing = 880 L/d
- External irrigation = 40kL/year based on about 2,000 m^2 of outside area, (SCA, 2012).

(vi) All Stage 1 and Stage 2 lands drain to a gross pollutant trap with a high flow by-pass set to 0.06 m^3/s. High flows are by-passed to receiving waters; low flows are directed to the Bioretention Basin 2 built in Stage 1.

4.2 Modelling Results

4.2.1 Mean Annual Loads

The results of the modelling for Stages 1 and 2 for mean annual loads are given in Table 1. They show reductions in the exported quantities of phosphorous, nitrogen and sediment at both stages.

Table 1: MUSIC results for mean annual loads

Stage 1	Pre	Pre	Post	Post	Change %
	Flow (ML/yr)	1.69	Flow (ML/yr)	3.55	110
	Total Suspended Solids (kg/yr)	288.00	Total Suspended Solids (kg/yr)	143.00	-50
	Total Phosphorus (kg/yr)	0.68	Total Phosphorus (kg/yr)	0.48	-30
	Total Nitrogen (kg/yr)	5.04	Total Nitrogen (kg/yr)	3.57	-29
	Gross Pollutants (kg/yr)	0.00	Gross Pollutants (kg/yr)	0.26	
Stage 2	**Pre**	**Pre**	**Post**	**Post**	**Change %**
	Flow (ML/yr)	1.69	Flow (ML/yr)	5.3	214
	Total Suspended Solids (kg/yr)	288	Total Suspended Solids (kg/yr)	107	-63
	Total Phosphorus (kg/yr)	0.677	Total Phosphorus (kg/yr)	0.58	-14
	Total Nitrogen (kg/yr)	5.04	Total Nitrogen (kg/yr)	4.43	-12
	Gross Pollutants (kg/yr)	0	Gross Pollutants (kg/yr)	1.44	

4.2.2 Pollutant Concentrations

To fully show NorBE is met, the pollutant concentrations post development must be lower than pre development. To show this, MUSIC exports a series of pollutant concentration graphs. The 50th to 98th percentile concentrations of phosphorous and nitrogen for the post-development scenarios must be less than the pre-development scenarios. The graphs are given in Figures 1 to 4 and show NorBE is met.

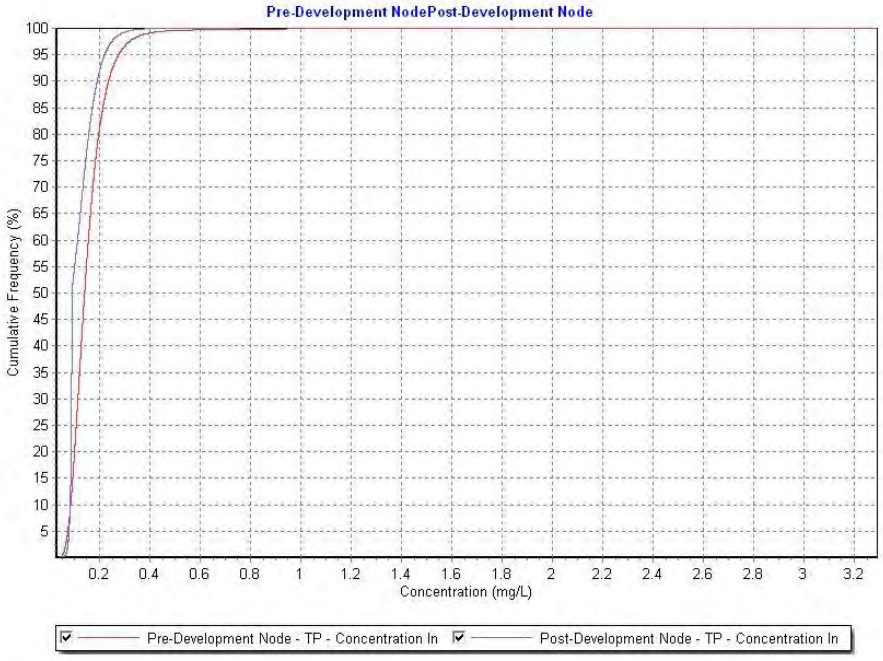

Figure 1 – Total phosphorous comparison: Stage 1

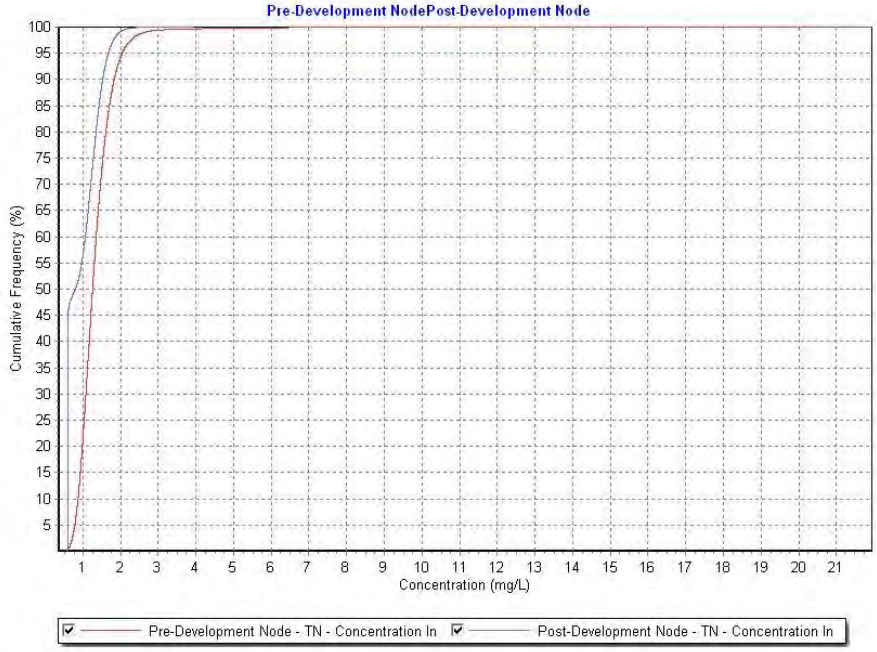

Figure 2 - Total nitrogen comparison: Stage 1

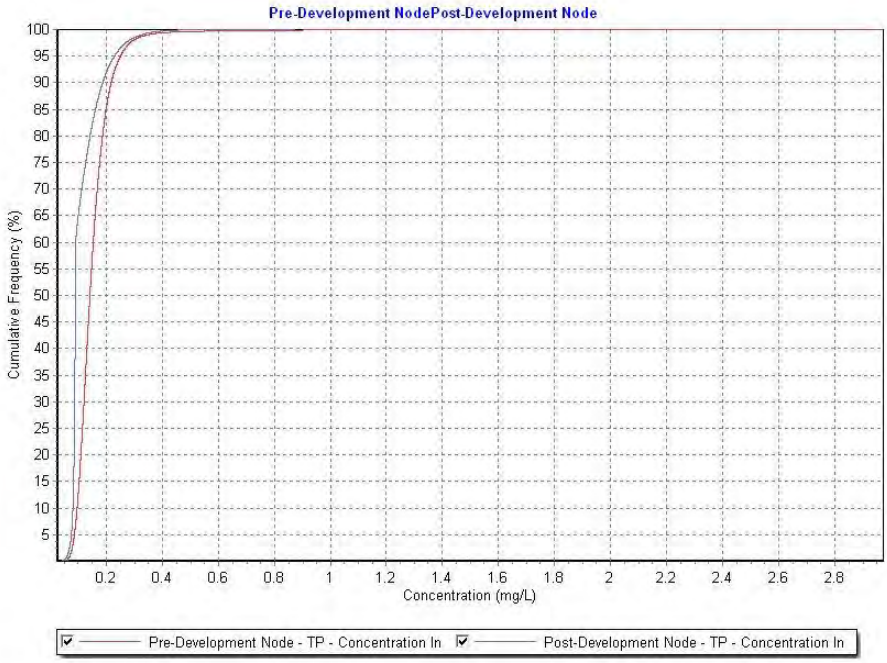

Figure 3 - Total phosphorous comparison: Stage 2

Figure 4 - Total nitrogen comparison: Stage 2

The MUSIC model schematic diagrams are given in Figures 5 and 6 for Stage 1 and Stage 2 respectively.

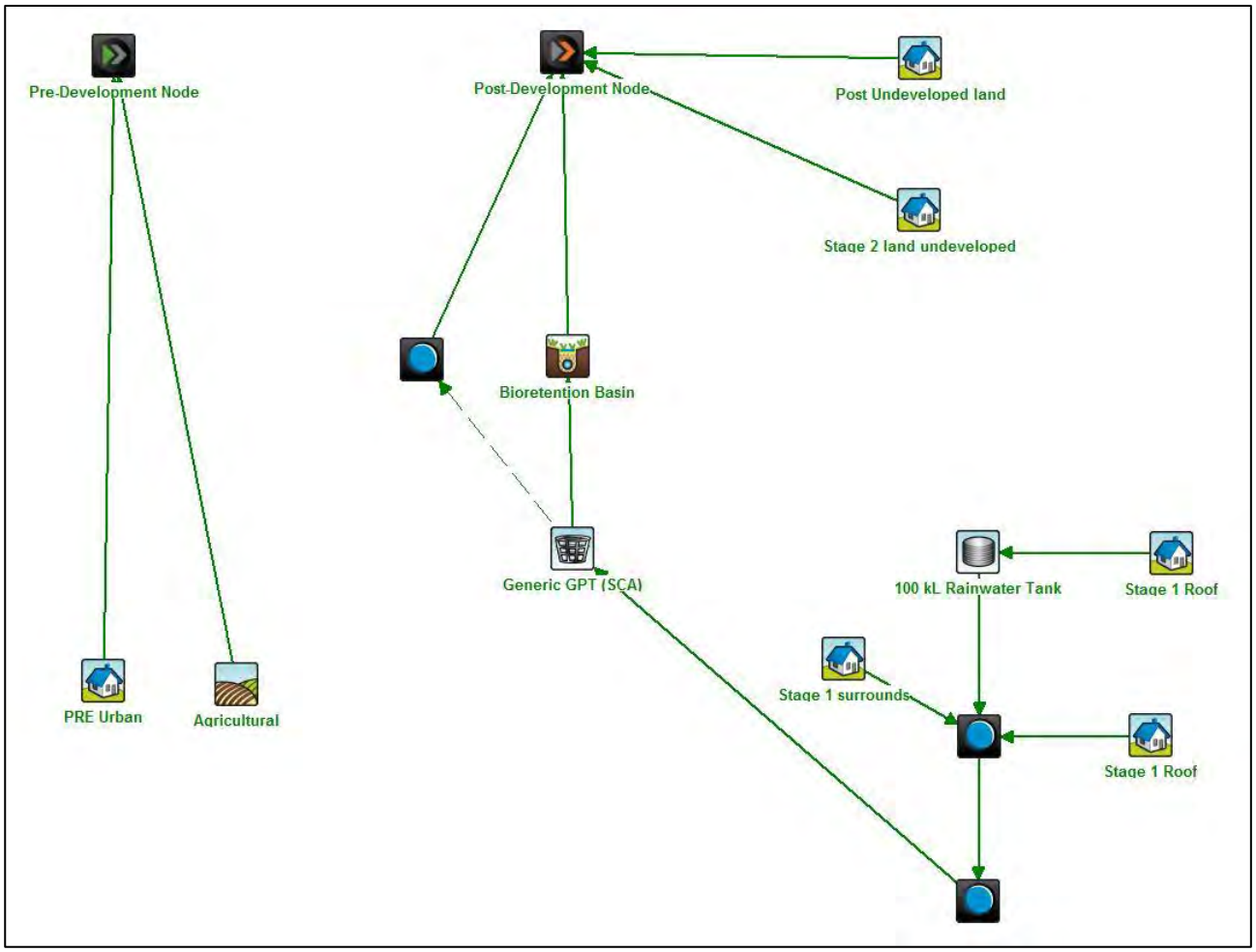

Figure 5 - Stage 1 MUSIC Schematic

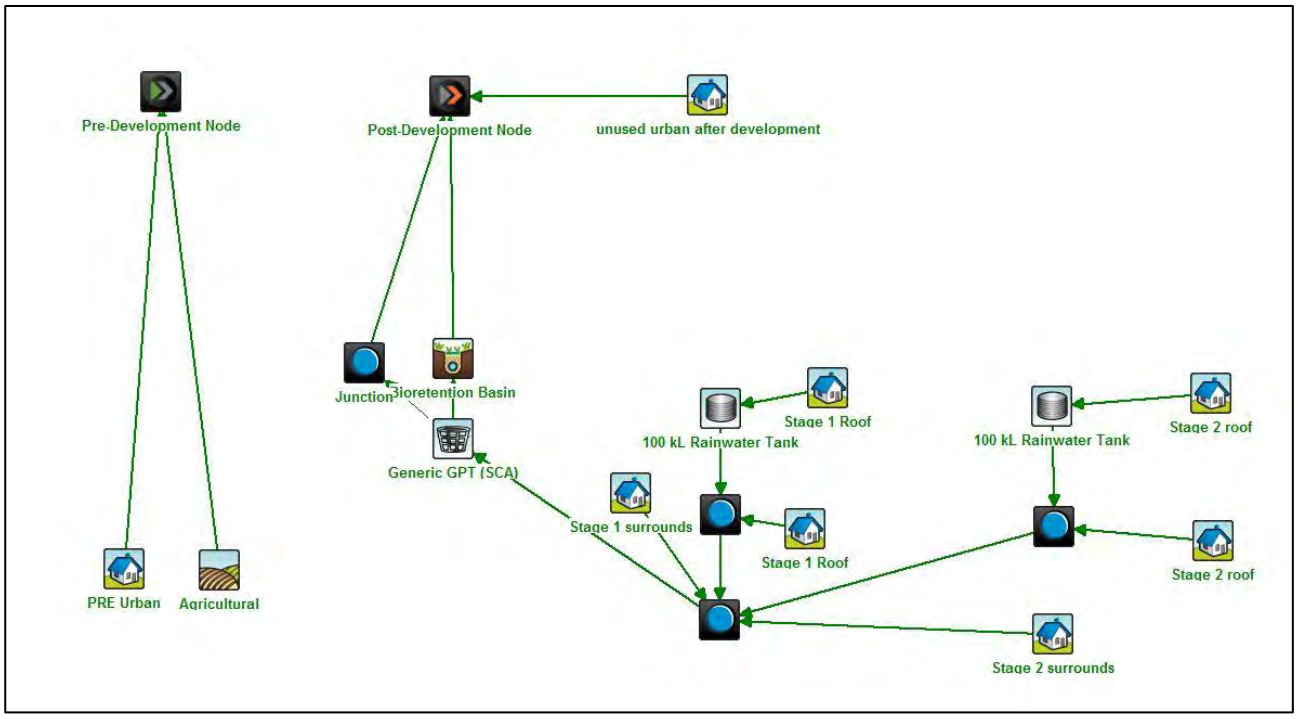

Figure 6 - Stage 2 MUSIC schematic