APPENDIX M

Integrated Water Management Plan

The Northern Beaches Hospital
State Significant Infrastructure Application SSI_6792 (Stage 2)
Environmental Impact Statement Appendix M: Integrated Water Management Plan

November 2014
Revision EX

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1 EXECUTIVE SUMMARY

This report addresses overall the waste water, potable and non-potable systems for the Hospital, carpark building and provisions for future expansion.
This report is based on Director General Requirements (DGR's) for application number SSI_5982 (Stage 2), Healthscope requirements, architectural Schematic Design drawings, Health Infrastructure briefing documents and subsequent ancillary information provided.

Scope of services covered within the hydraulic services water management report includes:

- Sanitary and trade waste discharge
- Roof water plumbing and drainage systems connecting to civil trunk stormwater
- Domestic potable water supply systems and water supply security measures
- Alternative non-potable water supply systems and reclaimed rainwater
- Demonstration of water conservations measures

Other related DGR's covered in other reports:-

- Provisions for hydraulic services systems utilities for Stage 2 development works including existing capacity and augmentation requirements via consultation with the relevant agencies is contained in Appendix L of The Northern Beaches Hospital (Stage 2) Environmental Impact Statement.
- Stormwater Management Strategy and Plan provided in Appendix O of the Northern Beaches Hospital (Stage 2) Environmental Impact Statement.
- Ecologically Sustainable Development (ESD) Design measures provided in Appendix D of The Northern Beaches Hospital (Stage 2) Environmental Impact Statement.

The hydraulic services water management can be summarised as follows:

- Consultation with relevant utility supply agencies has commenced to verify the condition, capacity, compliance reliability and efficiency of the existing Sydney Water sewer mains and water mains infrastructure and have found them to be acceptable for connection.
  (Refer Hydraulic Services Utility supply report)
- Sewer and trade waste water from the site to discharge to Sydney Water sewer main in accordance with AS3500 2003 and Sydney Water requirements.
- Sydney Water pressure/flow computer model on 10th March 2014, confirming suitability for the proposed development works
- 100,000 litres water storage and booster pumps are included to ensure adequate hospital water supply security.
- Sydney Water confirmation that water supply provided will be in accordance with Australian drinking water guidelines
- Rain water from designated roof areas will be collected, stored (40,000 litres), filtered and re-used for landscape sub surface irrigation purposes.
- Environmental sensitive design (ESD) principles as nominated in the ESD Report will be incorporated within the hydraulic services design.

Health Infrastructure has determined that rainwater will not be used as non-potable water supply for water closet flushing, given the additional requirements associated with the disinfection of water. As such the only feasible option is for the rainwater to be stored and used for sub surface landscape irrigation purposes.

2 KEY DESIGN AND PERFORMANCE PRINCIPLES

A major element of this report is to outline the minimum building services design criteria to deliver compliance with Healthscope, NSW Department of Health Engineering guidelines (TS11-2007), NSW Department of Health, Northern Beaches Hospital briefing documents, user groups and all relevant statutory authority requirements, so that the most cost effective and energy efficient, maintainable solutions are achieved for the NBH Stage 2 Project, with patient care and safety the main priority.
This report is to be read in conjunction with the Hydraulic Services Schematic Design drawings and will consider:

- Statutory building code compliance
- Health Infrastructure requirements
- Effective use and waste minimization of limited water resource.
- Authority infrastructure availability and capacity
- ESD principles

The hydraulic services systems currently documented will:

1. Reduce site potable water consumption
2. Ensure the safety of building occupants and patients
3. Minimise water wastage
4. Minimise initial capital cost and ongoing maintenance and energy costs.
5. Contribute to maintaining landscape areas to ensure attractive grounds can be enjoyed by surrounding properties and patients within the building.

3 INTRODUCTION

The DGRs for the Northern Beaches Hospital (Stage 2) Environmental Impact Statement require the preparation of an Integrated Water Management Plan detailing any proposed alternative water supply, proposed end users of potable and non-potable water, demonstration of water sensitive urban design and water conservation measures.

AXIS Plumbing Group / ACOR Consultants Pty Ltd has been engaged by Healthscope to design, document and construct building hydraulic engineering services for the proposed new building works within the Northern Beaches Hospital campus.

4 THE DEVELOPMENT SITE

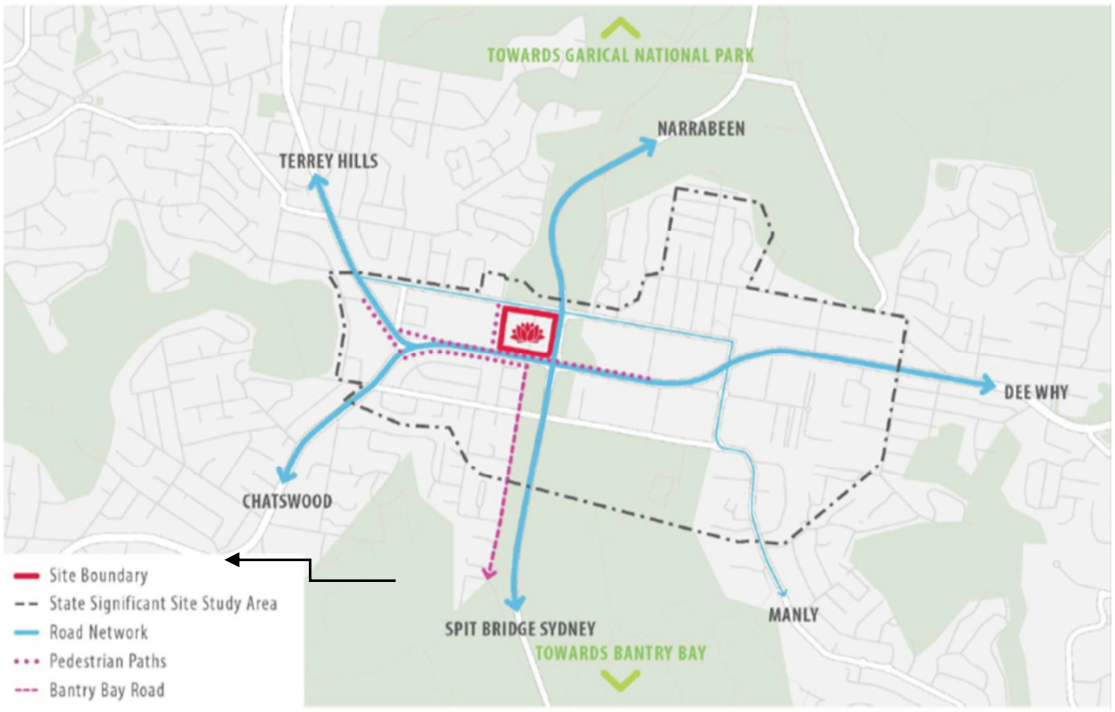
The site is located at Frenchs Forest bounded by Warringah Road, Wakehurst Parkway and French's Forest Road.

An existing section of Bantry Bay Road within the site (containing authority infrastructure services) will be removed prior to commencement of Stage 2 works.

4.1 SCOPE OF WORK

The proposed Stage 2 NBH development includes:

- Bulk excavation works
- Construction of an nine (9) storey Hospital building
- Staff, patient and visitor car parking, including construction of a eight (8) storey multi-deck Car Park
- Site works including internal roads, pathways and landscaping
- Utility amplification works.



Design Standards
All building services will be designed in compliance with the Building Code of Australia (prescriptive or performance based requirements), all relevant Australian Standards and local Authority requirements.

Hydraulic Services Systems will be designed and documented in accordance and fully comply with the requirements of the following client engineering briefing documents, guidelines and statutory bodies:

- NSW Health Department Engineering Guidelines (TS-11 2007)
- Department of Energy, Utilities and Sustainability
- NSW Health Department policy directive PD2005_344 (Requirements for the provision of cold and heated water)
- Warringah Council
- Department of Environment and Climate Change (DECC)
- Environment Protection Authority
- Building Code of Australia / National Construction Code
- Statutory Australian Standards
- WorkCover Authority
- Roads and Maritime Services
- Building services engineering design and performance brief SNBH-0103 (dated April 2014), prepared by Umow Lai.

5 CONSULTATION

Consultation has been undertaken with Sydney Water. See the Infrastructure Management Plan (Appendix L to the Northern Beaches Hospital (Stage 2) Environmental Impact Statement).

6 OUTLINE OF PROPOSED WATER MANAGMENT SYSTEMS

Potable Water
Potable water systems for human consumption, hygiene purposes, cistern flushing and process equipment for the site will be supplied directly from Sydney Water main reticulation and designed and constructed in accordance with AS3500.1:2003, AS3500.4 2003:2003, Sydney Water requirements and Australian Drinking Water Guidelines.

Refer also “additional ESD initiatives” section for incorporated waste minimisation measures.

Sanitary and Trade Waste Drainage
Sanitary waste generated by the site will be designed and constructed in accordance with AS3500.2 2003, Sydney Water requirements and industry best practice and discharge directly to Sydney Water sewer infrastructure.

Refer also “additional ESD initiatives” section for incorporated waste minimisation measures.

Designated hydraulic trade waste (Commercial kitchens, laboratories and alike) will be pre-treated in accordance with AS3500.2:2003, Sydney Water requirements and industry best practice and discharge directly to internal house sewer reticulation system.

Roof Water Drainage
Generally rainwater collection systems will interconnect with the proposed civil stormwater system and will be designed in accordance withAS3500.3:2003 State Office of Water, Warringah Council requirements, and Australia Rainfall and Runoff, based on the following minimum criteria:

- eaves gutters – 1 in 20 year 5 minute storm event (230mm/hr)
- eaves gutters (Collection for re-use) – 1 in 100 year 5 minute storm event (300mm/hr)
- podium areas – 1 in 20 year 5 minute storm event (230mm/hr)
- box gutters – 1 in 100 year 5 minute storm event (300mm/hr).
- Helipad – 1 in 5 year 5 minute storm event (150mm/hr)

Rain water collection and re-use for non-potable purposes has been investigated and incorporated based on community expectations, capital cost, ESD initiative analysis and building occupants and patient safety.

Rainwater used for sub surface landscape 'drip' irrigation systems will be filtered, with no proposal for disinfection to grade A quality.

Generally rainwater is collected from the following:
1. Roof water collection area – 2000 m² (approx.) roof area
2. Total roof area is in the vicinity of 8000 m² (Including Helipad). It is important to note that surface water from the helipad is not collected and reused. Discharged to civil stormwater via purpose made flame arrestor / oil separation pit)

According to the Bureau of Meteorology (BOM), the average annual rainfall expected in Sydney Northern Beaches area is approximately 1100mm. Refer to appendix A for monthly rainfall data.

Rainwater Storage Tanks
Rainwater storage comprises 4 x prefabricated 10kL RWTs all interconnected, equalling a total of 40kL, located in the basement plant room (Grid 9/A).

A single 225 mm diameter inlet pipe is provided, complete with a first flush device to minimise silt and debris entering the RWTs.

Each RWT has a 150 mm diameter overflow which is combined into a 225 mm diameter pipe conveyed to the civil infrastructure. The RWTs are provided with a balancing pipe at low level, external to the tanks.

The inclusion of the rainwater reuse system is based on the ESD initiative, as agreed during the course of the project's design consultation sessions. The main objective for rainwater reuse is to reduce the demand on the mains water supply network.

Rainwater Reuse Water Supply Reticulation
The intended use, as described above is for the rainwater to be reticulated to landscape irrigation points. The current design allows for:
1. a variable speed driven, electrically operated pressure pumps (duty and stand-by),
2. bag filter (20 micron)
3. dual automatic backwash screen filter
4. externally mounted tank level sensors
5. control panel
6. water meters
7. backflow prevention device and;
8. mains water back-up.

Downstream of this equipment, the external ring main reticulation with capped isolation valves is for extension by the landscape irrigation contractor.

The ring main supply is proposed to serve designated formed soft landscaped areas

The BOM statistics indicate that the Sydney Northern Beaches area experiences approx. 91.6 mm of rainfall every month. Refer to Appendix A for graphical data.

* Denotes - An industry standard for calculating the water consumption for landscaped areas (Using drip irrigation) is known as 1 L/mm deep/m²/day. Ie; 1 litre of water is required to irrigate 1mm deep in 1 m² of landscaped area per day.

It is likely that this demand will reduce once the plants are established. On this basis the catchment and

demand graphs in Appendix B use a water demand of 2 L/m²/day.

Refer to Appendix C which shows the rainwater schematic.

Advantages of current design

1. Community expectation to include rainwater re-use.
2. Assists to maintain landscape areas for community and patient enjoyment.
3. Effective use of available capture rain water
4. Contributes to overall building environmentally sustainable design.
5. Capital construction expenditure minimised
6. On-going maintenance costs minimised
7. Items associated with any Safety in Design risks are eliminated (possible spraying of non-potable water on public / staff/ patients).

6.1 FIXTURES, FITTINGS AND TAP WARE

Sanitary fixtures, fittings and tap ware, where nominated on architectural plans and room data sheets, will be in accordance with NSW Department of Health requirements. Final selections will be based on whole of life cost, water/energy efficiency, W.E.L.S registration (4-star minimum except showers to be minimum 3 star), availability, ease of maintenance, aesthetic appearance and durability.

6.2 ADDITIONAL ESD INITIATIVES

The design and installation of the hydraulic and fire protection services will be designed to ensure:

- effective use of energy and resources
- waste minimisation
- recyclable construction materials with low embodied energy and environmentally friendly manufacture.
- reduction in ongoing life cycle costs

ESD options to be included:

- water flow monitoring of the main water meter and sub meters to monitor excessive wastage or leakage - these meters are to be pulse type meters wired back to the BMS system.
- selection of local manufacturers for pipe material and fittings.
- minimum 4-star equivalent fixtures and fitting selections (showers minimum 3 star)
- Recycling of the fire test water back into fire water storage tank.

Appendix A – Rainfall Data

Australian Government
Bureau of Meteorology

Climate statistics for Australian locations

Monthly climate statistics

All years of record

Site information

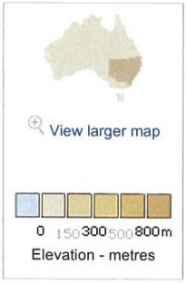
Site name: MACQUARIE PARK (WILLANDRA VILLAGE)
Site number: 066156
Latitude: 33.78 °S **Longitude:** 151.11 °E
Elevation: 65 m
Commenced: 1970 **Status:** Open
Latest available data: 28 Feb 2014

Additional information

Additional site information

Nearest alternative sites

1. 066047 PENNANT HILLS (YARRARA ROAD) (6.1km)
2. 066131 RIVERVIEW OBSERVATORY (6.5km)
3. 066124 PARRAMATTA NORTH (MASONS DRIVE) (8.8km)



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Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	27.7	27.4	25.9	23.4	20.3	17.4	17.1	18.5	21.1	23.3	24.8	27.1	22.8	24	1971 1995
Mean minimum temperature (°C)	16.9	16.9	15.2	12.0	9.2	6.5	4.9	5.7	7.8	10.8	13.0	15.6	11.2	24	1971 1995
Rainfall															
Mean rainfall (mm)	117.2	144.0	131.1	110.8	86.0	117.7	56.3	53.9	60.1	84.5	93.7	84.6	1142.7	35	1970 2014
Decile 5 (median) rainfall (mm)	87.6	106.0	101.0	78.6	84.8	89.2	41.3	27.4	42.4	47.5	80.4	64.8	1096.4	35	1970 2014
Mean number of days of rain ≥ 1 mm	9.0	8.4	9.3	7.3	7.3	7.8	5.1	5.2	5.3	7.3	8.9	7.2	88.1	35	1970 2014
Other daily elements															
Mean daily sunshine (hours)															
Mean number of clear days	5.6	3.8	6.4	10.6	10.2	8.7	12.5	14.3	9.0	8.6	6.6	7.5	103.8	12	1971 1995
Mean number of cloudy days	11.3	12.7	12.9	7.8	9.9	11.1	6.3	6.3	7.4	11.8	11.5	11.2	120.2	12	1971 1995
9 am conditions															
Mean 9am temperature (°C)	22.4	22.0	21.3	18.4	15.0	12.1	11.3	13.0	15.8	18.5	19.6	21.9	17.6	19	1971 1995
Mean 9am relative humidity (%)														9	1982 1995
Mean 9am wind speed (km/h)	7.2	6.3	6.5	6.5	6.5	7.6	8.0	9.0	9.3	10.2	8.6	8.9	7.9	17	1971 1995
3 pm conditions															
Mean 3pm temperature (°C)	26.1	25.0	24.3	21.6	18.9	15.9	15.1	17.2	19.9	20.6	22.7	25.4	21.1	13	1971 1995
Mean 3pm relative humidity (%)														2	1982 1995
Mean 3pm wind speed (km/h)	15.7	14.7	12.1	11.6	9.3	10.2	10.9	12.3	15.0	14.9	15.6	18.5	13.4	12	1971 1995

red = highest value blue = lowest value

Appendix B – Rainwater Catchment and Demands

Roof Area viable for rain water harvesting	2,000	m^2
Irrigation	6,000	m^2
Toilet Flushing Demand	0	m^3
System Efficiency	80	%

RAINFALL DATA

Rainfall	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Median Rainfall (mm/month)	87.6	106.0	98.2	72.6	84.0	85.5	38.5	28.5	41.8	47.8	80.0	64.8
Rain Days per Month	9.0	8.4	9.3	7.3	7.3	7.5	5.1	5.2	5.3	7.3	8.9	7.2
Rain Periods per Month	3	3	3	2	2	3	2	2	2	2	3	2

IRRIGATION REQUIREMENTS

Irrigation Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Turfed Area	16	15	16	18	19	18	23	22	21	19	15	19

Non Irrigation Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Turfed Area	15	14	16	12	12	13	9	9	9	12	15	12
Irrigation Period	Peak		Shoulder		Low			Shoulder		Peak		
Water Demand for Turfed Area (mm/day)	2.1	2.1	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.1	2.1	2.1

Irrigation Required (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Turfed Area	33.6	31.5	23.3	26.8	28.3	26.3	33.8	33.5	31.8	39.6	31.9	39.9

Irrigation Volume Required (m^3)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Turfed Area	201.6	189.0	139.5	160.5	169.5	157.5	202.5	201.0	190.5	237.3	191.1	239.4
Total	201.6	189.0	139.5	160.5	169.5	157.5	202.5	201.0	190.5	237.3	191.1	239.4

Irrigation Volume Available (m^3)	140.2	169.6	157.1	116.2	134.4	136.8	61.6	45.6	66.9	76.5	128.0	103.7

Irrigation Volume Surplus (m^3)	-61.4	-19.4	17.6	-44.3	-35.1	-20.7	-140.9	-155.4	-123.6	-160.8	-63.1	-135.7

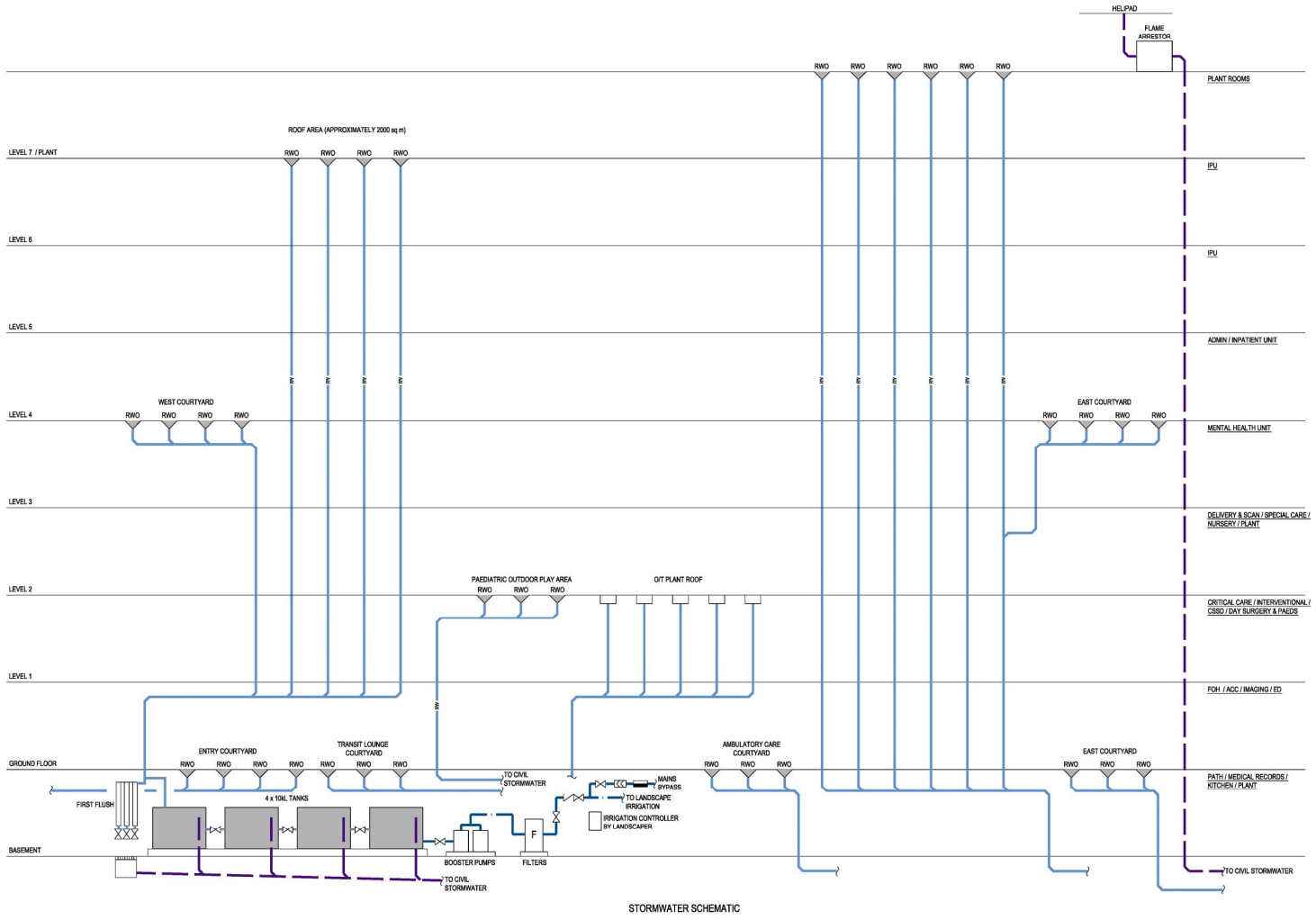
MAXIMUM TANK VOLUME REQUIRED (m^3)

TANK CAPACITY (m^3)	40.0	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL (SUM)
Tank Start Volume (m^3)	0.0	0.0	0.0	0.0	17.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.6
Tank Inflow (m^3/month)		140.2	169.6	157.1	116.2	134.4	136.8	61.6	45.6	66.9	76.5	128.0	103.7	1336.5
Tank Usage Landscape (m^3/month)		201.6	189.0	139.5	160.5	169.5	157.5	202.5	201.0	190.5	237.3	191.1	239.4	2279.4
Tank Usage Toilets (m^3/month)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Balance (m^3/month)		-61.4	-19.4	17.6	-44.3	-35.1	-20.7	-140.9	-155.4	-123.6	-160.8	-63.1	-135.7	-942.9
Tank Finish Volume (m^3)		-61.4	-19.4	17.6	-26.7	-35.1	-20.7	-140.9	-155.4	-123.6	-160.8	-63.1	-135.7	-925.3
Tank Overflow Occurs?		No	No	No	No	No	No	No	No	No	No	No	No	
External Sourcing Occurs?		Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Tank Overflow (m^3/month)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Top Up (m^3/month)		61.4	19.4	0.0	26.7	35.1	20.7	140.9	155.4	123.6	160.8	63.1	135.7	942.9

RW SUPPLY 59 %

The calculations are based on the following information/assumptions:
Weather data was obtained from the Bureau of Meteorology for Terrey Hills

Appendix C - Rainwater Schematic



STORMWATER SCHEMATIC

Healthscope	Design & Construction Contractor: THIESS	Designer	North	Project: THE NORTHERN BEACHES HOSPITAL	GRAPHIC SCALE	SCALE: 1:200	DRAWINGS: HYDRAULIC SERVICES HOSPITAL - STORMWATER SCHEMATIC	PURPOSE: RFP	DATE: 30/09/14	DRAWING NO: SSS.HSP.HYD. SW.ALL.00.001	REVISION: SN