GRAYTHWAITE SYDNEY CHURCH OF ENGLAND GRAMMAR SCHOOL (SHORE)

INTEGRATED WATER MANAGEMENT PLAN EXISTING SITE CONDITIONS AND INFRASTRUCTURE MANAGEMENT, IN RELATION TO THE CONCEPT APPLICATION (STAGE 1, 2 & 3)

6 OCTOBER 2010
UPDATED 26 NOVEMBER 2010

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1.0 INTRODUCTION

Shore School is proposing to develop the Graythwaite site situated between the existing Senior School site and Preparatory School sites in North Sydney. The historic buildings on the site will be substantially renovated and areas of existing gardens restored. New Buildings and hard and soft landscaped areas are also proposed.

The development will be carried out in three stages:

Stage 1

Conservation and refurbishment of the Graythwaite House (the house), Coach House, Tom O'Neill Centre and associated garden area (the house will not be used for school classes but rather for administrative support and other activities, including perhaps the School archives)

Drainage and Stormwater improvements, site levelling and landscaping of the site (significantly on the middle and lower terraces)

Transport, traffic, parking and access improvements to the Graythwaite and Shore sites (spread over Stages 1 to 3)

Miscellaneous works including site fencing

No anticipated increase in student or staff population

Stage 2

Development of a new building to the north of the house which may be used for education or administration purposes

Demolition of the Ward building to the east of the house

Construction of two new buildings to the east of the house for classrooms, teaching or other educational facilities

Capacity or potential to accommodate approximately 100 students and 10 staff

Stage 3

Construction of two new buildings to the west of the house for classrooms, teaching or other educational facilities.

Capacity or potential to accommodate approximately 400 students and 40 staff

Acor Consultants have been engaged to generally review the site and existing survey information, to investigate existing site drainage, locate existing hydraulic services and prepare a report and drawings analysing the issues and provide recommendations for remedial action, for consideration by school. Acor Consultants have also been engaged to provide proposed stormwater drainage and groundwater treatment design for both, project application and concept application, stages of the project.

The Scope of Work for this report includes the following as provided in the Tender Brief:

- **1.0 Existing Site and Buildings**
  Investigate existing site drainage, with particular regard to the following issues:

- middle terrace area which is currently waterlogged
- groundwater drainage underneath the Graythwaite house, which is causing damage to the sandstone footings
- location of existing wells and underground springs on the site, typical to the North Sydney area
- generally review site and existing survey information to locate existing hydraulic services

- **2.0 Proposed buildings and landscaped areas**
  - Preparation of overland flow diagrams to cater for specific storm events, indicating the location and proposed floor levels of the new and existing buildings and landscaped areas, garden walls etc.
  - Concept stormwater diagrams in relation to proposed and existing buildings, including subsoil drainage, downpipes, flow analysis, treatment and pollution control, siltation and sedimentation control. Rainwater collection and storage including OSD and Water Harvesting. (see Item 3 below).

- **3.0 Water Harvesting**
  - The school in previous projects has shown their commitment to sustainability through the construction of large scale water harvesting devices in addition to or integrated with OSD. The topography and size of this site lends itself to water harvesting, and your scope of work should include consideration of and design for this.
  - Possible uses for the harvested water include irrigation of landscaped areas, toilet flushing and showers.
  - The school in the past has not considered the re-use of black water but this option should also be investigated and presented to the school for their consideration.
  - Compliance with Basix requirements and those outlined in ESD report (yet to be prepared)

2.0 SITE DESCRIPTION

The site is located in North Sydney between Union Street to the south and Edward Street to the north, existing residential allotments along Bank Street to the west and the School Site to the east. The site falls from the north-east to the south-west. The north-eastern corner of the site is relatively flat and is occupied by the Graythwaite House, Coach House, Tom O'Neill Centre and associated garden area, parking and access driveway. The central and the south-western portions of the site are steep to moderately steep and covered with dense bushland and some grassed areas.

3.0 METHODOLOGY

We have inspected the site, together with the School and Mayoh Architects on Wednesday 11 of August 2010. We have discussed the groundwater issues and identified location of waterlogged areas, existing wells and underground springs on site. We have reviewed existing information about the site, such as:

- information from the heritage report related to sewer disposal, roof water drainage in the past
- three historic plans received from P.D. Mayoh Pty Ltd and the School,
- site survey

- obtained information about site services and existing services in the vicinity of the site from 'Dial Before you Dig' information service.

4.0 SECTION 1 – EXISTING SITE CONDITIONS AND INFRASTRUCTURE MANAGEMENT

4.1 Stormwater Drainage:

The existing Stormwater Drainage System for Graythwaite House, Tom O'Neill Centre and Coach House and Ward Building consists of roof downpipes discharging into an underground drainage system with a number of stormwater drainage pits and dish drains along the access driveway and parking area. The existing underground stormwater drainage system extends only across the access driveway and discharges into the vegetated area on the southern side of the driveway. Currently, no existing site stormwater drainage drawings have been found.
The site can be divided into three distinct stormwater drainage catchments, as shown on drawing No C1.01. Approximately 1/3 of the site, area located in the north-western corner, currently drains to the west and the majority of the stormwater runoff will continue into the Railway Corridor. The central portion of the site currently drains into the south-western corner of the site and stormwater runoff will continue into residential allotments located along the southern and western site boundaries. The remaining area along the site eastern boundary, including the access driveway drains towards Union Street.

4.2 Ground Water:

Site inspection and investigation identified a number of waterlogged areas and underground springs, as shown on drawing No C1.01. It is expected that the waterlogged areas and underground springs are the result of the rainwater infiltrating into the soil at the upper portion of the site and finding its way downhill as a groundwater and upwelling in the lower areas. Since the north-eastern corner of the site is located at the top of the hill it is expected that it would be substantially unaffected by groundwater from any adjacent sites on either the Main School or the Preparatory.

However, the basement of the Graythwaite house is affected by ground water in the locality which is causing damage to sandstone footings via rising damp.

4.3 Sewerage System:

A historic map provided by the School and a current Sydney Water diagram show an internal sewerage system draining towards the north–western corner of the site and connecting to the Sydney Water 225mm dia. sewer line (As shown on drawing no C1.01).

Based on current and proposed works, there appears to be sufficient capacity in the sewer main to service the site up to the intended completion of all the 3 stages of the proposed building works.

Upon Project Application approval, application for the Sydney Water Section 73 certificate requirements will be made.

The age and condition of the existing Graythwaite house drainage system is unknown. The system will be inspected and pipe works replaced if necessary.

4.4 Water Reticulation:

The proposed site is currently serviced via a 150mm Sydney Water main located in Union Street. Application to Sydney Water will be made for available supply pressure and flows, however, it has been assumed, based on previous use of the house as a hospital, that existing system has sufficient capacity to service the site up to the intended completion of the proposed all 3 stages of building works.

A Section 73 certificate will be applied for in later Project Applications, to enable Sydney Water to further assess the impact of the proposed development on its existing services.

5.0 SECTION 2 – CONCEPT APPLICATION (STAGES 1, 2 AND 3) INTEGRATED WATER MANAGEMENT PLAN

5.1 Proposed Stormwater Drainage and Ground Water Treatment for Stage 1, 2 and 3.

Generally rainwater collection systems shall be designed in accordance with North Sydney Council and Australia Rainfall and Runoff, and based on the following minimum criteria:

- Box Gutters – 1 in 100 year storm event
- Eaves Gutters – 1 in 20 year storm event
- Roads and Carparks – 1 in 20 year storm event
- Overland Flowpaths – 1 in 100 year storm event less capacity of the pipe system

Storm water will drain via conventional underground piped systems for minor storm events and controlled overland flowpaths in designated areas will manage major storm events.

All new stormwater drainage system will be designed in accordance with the Water Sensitive Urban Design Guidelines.

An underground stormwater drainage system is recommended to be constructed during Stage 1 of the development (Refer to drawing C1.02). This system should include an underground stormwater drainage line running under the western side of the current access driveway and connecting to the existing stormwater drainage pit in Union Street. This drainage system will provide immediate connection for the downpipes from Graythwaite House, the Tom O'Neill Building and the Coach House and will include surface drainage pits along the access driveway.

The system will also provide connections for the two proposed new buildings constructed to the east of the house and the two new buildings constructed to the west of the house. Rainwater tanks have been notionally located in association with these new buildings for capture and reuse with surplus water overflowing into the stormwater system (Stages 2 & 3).

It is proposed to construct a subsoil drainage system on the northern side of Graythwaite house to capture groundwater and prevent inundation of the basement. New downpipes and a drainage pit, within the internal courtyard, will be constructed to prevent any surface stormwater entering the basement level (Stage 1).

A Basement Drain will also be constructed to prevent any build up of groundwater in the basement of the House (Stage 1).

In order to better manage water logging of local areas on the site, it is also proposed to construct, during Stage 1 of the development, networks of subsoil drains to allow drainage of the waterlogged areas and management of any underground springs. Examples of potential locations are shown on Figure C1.02. The sizing and location of these networks will be designed in conjunction with the Landscape Architect and the Arborist to ensure that the existing heritage planting and any new plantings will be able to be sustained without the need for an artificial watering system (if possible).

5.2 Rainwater Reuse:

It is proposed to construct a rainwater tank for the proposed two new buildings to be constructed to the east of the Graythwaite house in Stage 2 of development, and a rainwater tank for the proposed two new buildings to be constructed to the west of the House, in Stage 3 of the development. Collected roof water will be reused on site for toilet flushing and irrigation, to minimize use of potable water.

The design of the stormwater capture and reuse system will be undertaken in conjunction with the future Project Applications for Stages 2 and 3.

5.3 Reuse of Grey Water:

The adoption of a grey water re-use system for any project would need to be based on water balance calculations and a cost benefit analysis report. A grey water system will not be included in the Stage 1 works.

Water balance calculations will determine the amount of waste received from basins and showers that can be treated and determine what the treated waste water can be used for. (i.e. Water closet flushing, irrigation).

Such systems are typically installed in multistorey residential or office buildings, where the loads are high and consistent.

In most cases rainwater reuse is a much simpler and effective way of reducing potable water consumption.

The pros and cons for grey water systems are:

Pro's

- Recycling of waste water and thus reducing potable water consumption.

Con's

- Duplicate drainage pipes required.
- Grey water becomes "black water" if it is stored for more than 24 hours, and therefore requires higher level of treatment to ensure public health and safety.
- Health approved systems are expensive to purchase.(relatively new industry)
- Treatment plant and storage is bulky and requires plant space.
- Treatment plant requires high maintenance and ongoing testing
- Treatment plant has relatively high electrical loadings

- Not effective where available waste water discharge is low (school output would be very low)
- Not effective where rainwater re-use systems are proposed.

The reuse of grey or black water on this project is not recommended due to the magnitude of flows to be generated and the limited opportunity for reuse.

Due to the recommendation for not including a grey water system, a black water system is similarly not recommended for the School.

APPENDIX A

Drawing SY100450 C1.01

Existing Site and Buildings

SURVEY PLAN PREPARED BY:
RYGATE & COMPANY PTY LTD SURVEYORS.

CONCEPT APPLICATION

Issue	Description	Date	Drawn	Chkd
B	RE-ISSUE FOR CONCEPT APPLICATION	27.09.10	AM	GK
A	ISSUE FOR CONCEPT APPLICATION	07.09.10	JRC	GK

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Project
SHORE GRAYTHWAITE PROJECT

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Drawing Title
EXISTING SITE AND BUILDINGS

Drawn	Date	Scale	B1	Q.A. Check	Date
AM	AUG 10	1:500			
Designed	Project No.			Dwg. No.	Rev.
GK	SY100450			C1.01	B

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APPENDIX B

Drawing SY100450 C1.02

Concept Stormwater Management Plan

CIVIL LEGEND PROPOSED

	WATER LOGGED AREA
FFL 71.23	FINISHED FLOOR LEVEL
	GRATED DRAIN
	FLOW ARROW
	OVERFLOW
DP	DOWNPIPE CONNECTION Ø100 UNO
,	PIT: GRATED COVER, SOLID COVER
GP 450x450 CL 18.80 IL 18.25	GRATED PIT AND SIZE PIT COVER LEVEL PIT INVERT LEVEL
Ø225 RCP	STORMWATER DRAINAGE WITH SIZE AND MATERIAL
CO	SUBSOIL DRAIN Ø100 UNO WITH CLEANOUT POINT
+71.23	PROPOSED SURFACE LEVEL
	CATCHMENT BOUNDARY

NOTE:
FINAL LOCATION OF PIPES AND PITS TO BE COORDINATED WITH THE LANDSCAPE ARCHITECT AND THE ARBORIST DURING THE PROJECT APPLICATION STAGES OF EACH PROJECT.

CONCEPT APPLICATION

Issue	Description	Date	Drawn	Chkd
D	RE-ISSUE FOR CONCEPT APPLICATION	06.10.10	RG	GK
C	RE-ISSUE FOR CONCEPT APPLICATION	28.09.10	AM	GK
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Project
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Drawing Title
CONCEPT STORMWATER MANAGEMENT PLAN

Drawn	Date	Scale	Q.A. Check	Date
AM	AUG 10	1:500 B1		
Designed	Project No.	Dwg. No.	Rev.	
GK	SY100450	C1.02	D	

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APPENDIX C

Drawing SY100450 C1.03

Soil Erosion and Sediment Control Plan

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

E1. THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, AND ANY OTHER PLANS OR WRITTEN INSTRUCTIONS THAT MAY BE ISSUED AND RELATING TO DEVELOPMENT AT THE SUBJECT SITE.

E2. THE SITE SUPERINTENDENT WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS INSTRUCTED IN THIS SPECIFICATION.

E3. ALL BUILDERS AND SUB-CONTRACTORS WILL BE INFORMED OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS.

CONSTRUCTION SEQUENCE

E4. THE SOIL EROSION POTENTIAL ON THIS SITE SHALL BE MINIMISED. HENCE WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE :

a. INSTALL SEDIMENT FENCES, STRAW BALE SEDIMENT FILTERS, TEMPORARY CONSTRUCTION EXIT AND SANDBAG KERB INLET SEDIMENT TRAP.
b. UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

EROSION CONTROL

E5. DURING WINDY CONDITIONS, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.

E6. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

FENCING

E7. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.

E8. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.

E9. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.

E10. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

OTHER MATTERS

E11. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.

E12. RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER ARE TO BE EMPTIED AS NECESSARY. DISPOSAL OF WASTE SHALL BE IN A MANNER APPROVED BY THE SITE SUPERINTENDENT.

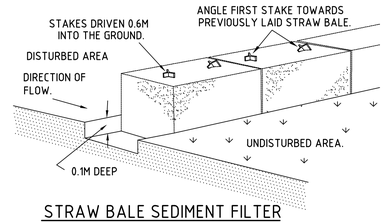
SITE INSPECTION & MAINTENANCE

E13. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AFTER RAINFALL EVENTS TO ENSURE THAT THEY OPERATE EFFECTIVELY. REPAIR AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED.

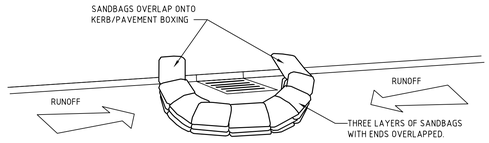
NOTE:
THE LOCATION OF THE SEDIMENT CONTROL WORKS SHOWN ON THIS PLAN, ARE DIAGRAMMATIC ONLY. THE FINAL LOCATIONS SHALL BE DETERMINED ON SITE BY THE SUPERINTENDENT.

LEGEND

- GEOFABRIC "SILT" FENCE
- SANDBAG SEDIMENT TRAP
- PROPOSED STORMWATER LINE
- PROPOSED SUBSOIL LINE

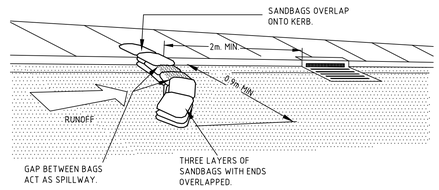


STRAW BALE SEDIMENT FILTER



SANDBAG SEDIMENT TRAP - AT KERB SAG PIT

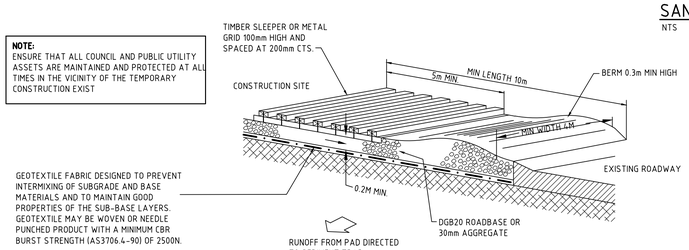
NTS

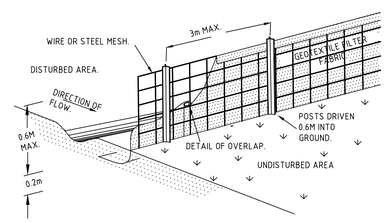


SANDBAG KERB INLET SEDIMENT TRAP.

NTS

NOTE:
ENSURE THAT ALL COUNCIL AND PUBLIC UTILITY ASSETS ARE MAINTAINED AND PROTECTED AT ALL TIMES IN THE VICINITY OF THE TEMPORARY CONSTRUCTION EXIST





SEDIMENT CONTROL FENCE

NTS

CONSTRUCTION NOTES

1. STRIP TOPSOIL AND LEVEL SITE.
2. COMPACT SUBGRADE.
3. COVER AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
4. CONSTRUCT 200MM THICK PAD OVER GEOTEXTILE USING ROADBASE OR 30MM AGGREGATE.
5. CONSTRUCT HUMP IMMEDIATELY WITHIN BOUNDARY TO DIVERT WATER TO A SEDIMENT FENCE OR OTHER SEDIMENT TRAP WHERE THE SEDIMENT IS COLLECTED AND REMOVED.

MAINTENANCE NOTES

THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH PREVENTS TRACKING OR FLOWING OF SEDIMENT OFF THE CONSTRUCTION SITE. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL GRAVEL AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED OFF THE CONSTRUCTION SITE MUST BE REMOVED IMMEDIATELY.

TEMPORARY STABILISED CONSTRUCTION EXIT

CONCEPT APPLICATION

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C	RE-ISSUE FOR CONCEPT APPLICATION	06.10.10	RG	GK
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Drawing Title
SOIL EROSION AND SEDIMENT CONTROL PLAN

Drawn	Date	Scale	B1	Q.A. Check	Date
RG	AUG 10	1:500			
Designed	Project No.	Dwg. No.	Rev.		
GK	SY100450	C1.03	C		

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