

30 – Stormwater Basis of Design

30



NSW Department of Education

Waitara Public School Civil and Stormwater Basis of Design

October 2017

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1. Introduction

1.1 Introduction

The Waitara Public School is within the Hornsby Shire Council (Council) Local Government Area. The NSW Department of Education has identified the addition of new school facilities in a new building within the existing school property as part of a proposed school upgrade. As part of the planning and development of the design for the new building, concept designs have been prepared including associated infrastructure to support the use of the new building.

The management of stormwater around the new building is integral to not only providing a suitable environment for operation of the building but also to mitigate any downstream impacts on neighbouring properties from this new development. Also, the construction of the new building will require modification of the existing site land use and conditions. This report presents the basis of the schematic design and supports the design drawings prepared for the civil construction aspects of earthworks and erosion and sediment control for the new building as well as the strategy and features that make up the management of stormwater across the site.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and throughout the Report.

1.2 Purpose of this report

The information presented herein is to support the design of the proposed building within the existing site. This document describes the Civil and Stormwater management design scope of works including:

- Site Preparation / Bulk Earthworks / Remediation;
- Sediment and Erosion Control – Construction Phase;
- Drainage and Flooding.

1.3 Scope and limitations

The information presented herein is based around the Schematic Design details for the Civil design aspects only. Where information is unknown or is to be prepared as part of later design stages, this has been indicated herein.

This report: has been prepared by GHD for the NSW Department of Education and may only be used and relied on by the NSW Department of Education for the purpose agreed between GHD and the NSW Department of Education as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than the NSW Department of Education arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Design inputs

2.1 Existing site conditions

The proposed location for Waitara's new building is in the northwest corner of the existing school yard. This area currently contains existing buildings, an asphalt roofed area and play areas, which can be seen on Figure 2-1 below.

Figure 2-1: Proposed location of new Building



Topographically the proposed section of the site slopes to the northwest corner, as shown by the yellow arrows on Figure 2-1.

2.1.1 Existing Stormwater Management

The landuse of the proposed development area, surrounding the existing buildings, is predominantly asphalt. Therefore, the stormwater runoff potential from this area is high.

The stormwater runoff across the site is currently managed by cut-off drains and grated pits discharging into a piped network. The pipe network discharges directly to Myra Street via a kerb outlet.

Local stormwater management within the school site is predominantly through a pit and pipe system that captures flow from the roof downpipes of the existing buildings and runoff from the hardstand areas throughout the school grounds.

As the school is toward the top of the catchment, the overland flowpaths across the site are limited to runoff directly from the school itself. The existing buildings within the site are located around the southern and eastern sides of the proposed building location and therefore any overland flow from the higher portions of the school site is generally diverted toward Myra St.

3. Design Outputs

3.1 Earthworks

The design of the Waitara Public School site intends to utilise the existing topography of the site as much as possible. Therefore, the earthworks requirements for the site are being developed around this plan. Reference can be made to the earthworks plan for this project, Drawing No. 2126108-WA-SD-CI-1030.

The general intent for the Waitara Public School is to locate the new buildings in the northwestern corner of the site, adjacent to Edgeworth David Ave and Myra Street.

The earthworks are expected to be minimal for the construction of the new building as this building foot print is on a high point in the site and replaces existing buildings. However, any earthworks design required will aim to reuse material as much as practical / allowable depending on soil conditions as determined by the geotechnical investigation.

The earthworks requirements are:

- The provision of flat areas upon which the buildings are to be constructed.

The earthworks volumes that have been calculated on the basis of the proposed Schematic Design are presented in Table 3-1. These calculations are based on information from a detailed site survey of the existing site levels and the proposed Landscape Design levels that take into consideration the constraints identified above.

Table 3-1: Summary of earthworks required

Description	Volume
Cut	3,060 m ³ (Excluding stripping layer)
Fill	347 m ³
Net	2,713 m ³ (cut)

As seen in Table 3-1 above, the amount of cut material is significantly higher than the amount of fill needed. This is due to the change in surfacing on site specified by the landscape architects.

As the design develops the accuracy of the cut and fill volume will improve.

Any comment on the management/disposal of contaminated material will be provided in conjunction with the recommendations of the contaminated land investigation team/report.

The earthworks design will be undertaken in accordance with the following standards and requirements:

- AS3798 – Guidelines on earthworks for commercial and residential development;
- Soil Erosion and Sediment Control (“The Blue Book”) – Institute of Engineers, Australia.

3.2 Erosion and sediment control

During construction, one of the highest risks to surface water quality either in or around a site is from the exposure of soils during earthworks (including stripping of topsoil, excavation, stockpiling and materials transport). The exposure of the soils may result in soil erosion and off-site movement of eroded sediments by wind and/or stormwater to receiving waterways, resulting in increased levels of nutrients and other pollutants.

The general approach to erosion and sediment control has been prepared on the basis of the Schematic Design, however, this plan should be re-assessed and updated by the construction contractor once the construction methodology has been established. Reference can be made to the Erosion and Sediment Control plan for this project, Drawing No. 2126108-WA-SD-CI-1035.

The erosion and sediment control required for this site during construction is to be implemented prior to undertaking any earthworks. The design has been undertaken in conjunction with the following standards:

- AS3798 – Guidelines on earthworks for commercial and residential development;
- Soil Erosion and Sediment Control (“The Blue Book”) – Institute of Engineers, Australia.

The following material characteristics were used in determining the site has no need for a sediment basin as per the “Blue book” mentioned above:

- Percentage of Silt and very fine sand in the soil = 65%;
- Percentage of organic matter in the soil = 3%;
- The type of soil structure = Fine granular soil;
- Permeability of the soil = Slow to moderate permeability;
- Soil-erodibility Factor = 0.04.

The basis of the management of erosion and sediment control is to prevent sediment from entering the downstream stormwater network having been eroded or washed from the site during storm events. Therefore, the general approach to any earthworks by the construction contractor is to minimise the size of the area left bare from vegetated cover during construction.

The installation of silt fences around the site, cutoff drains and bunding around stockpiles and a shaker grid at the entrance/exit from the site are intrinsic to the management of erosion and sediment control within the site. The stockpile of stripped material is not to exceed 2.0 m in height. Allowance is also included for temporary diversion drains and erosion protection around the stockpiles when required.

3.3 Stormwater management

As described previously, the Waitara school site has a general slope toward the west of the site. The design intent with the school is to locate the new buildings in the northwestern corner. Therefore, the management of stormwater across the site is facilitated by this general fall through a gravity stormwater system.

The key features that form part of the stormwater management design for this site are as follows:

- Collection of stormwater runoff from pavements, pathways and hardstand areas within the new school building areas;
- The stormwater pipe network has been designed to manage flows from the proposed impervious areas up to the 20 Year ARI storm event. The pipes have been sized accordingly. Reference can be made to Civil and Stormwater Drawing No. 2126108-WA-SD-CI-1010 for pipe sizes and classification;
- The existing land use of the new building site is predominantly impervious with existing buildings and hardstand to make way for the new building. However, there is a small area of pervious land use that will make way for new hardstand areas. Therefore, pre and post development flow balance as part of the stormwater management for the site is required. The concept design includes an on-line stormwater detention tank (OSD)

situated in the southwestern corner of the site (as indicated on the Stormwater Drainage Plan 2126108-WA-SD-CI-1010). The size of the storage required on the basis of the schematic design is 100 m³. As the design develops, the size of the detention tank may be revised;

- The new building is to be located in place of an existing one and therefore it is expected that the existing overland flowpaths will generally be retained and managed;
- As the site is located on a watershed between two catchments (see Section 3.4) any overland flow of relevance will be minimal. Overland flow from the eastern side of the new building will be managed with the use of cutoff drains to intercept flows. These cutoff drains will be ACO style drains with heel safe grates that are DDA compliant;
- Stormwater captured from the school site will be discharged to the Hornsby Shire Council network in Myra St. It is assumed that the Council network is sized to cater for runoff from the site currently and as the balance between pre and post development runoff is to be managed by an OSD, the existing Council network will have sufficient capacity for the proposed development;
- Collection of stormwater runoff from buildings (building hydraulics dealt with by the hydraulics engineers);
- Provision of a raintank overflow point (raintank requirements designed by building hydraulics). The harvesting of rainwater from the buildings for use in toilet flushing and general use around the site will be the predominant means to manage the runoff from the new buildings;
- The water quality treatment has been designed in accordance with Hornsby Shire Council's treatment requirements. The design includes a Stormwater 360 treatment chamber, with 22 x 690mm Stormfilter cartridges in the southwestern corner of the site.

The stormwater network will be designed in accordance with the following standards and requirements:

- AS 3500.3-2003 – Plumbing and drainage part 3 – Stormwater Drainage;
- AS/NZS 4058 – Precast Concrete Pipe;
- AS/NZS 3725 (2007) Design for installation of buried concrete pipes;
- AS/NZS 2566.1 (1998) – Buried Flexible pipelines – structural design;
- AS3996 (2006) – Access cover and grates;
- AR&R – Australian Rainfall and Runoff;
- Hornsby Development Control Plan 2013.

3.4 Flooding

The Waitara Public School site is located on a watershed between two catchments. The eastern side of the school is located at the top of a tributary catchment of Cockle Creek and the western side at the top of the catchment of Hornsby Creek. Hornsby Creek discharges into Cockle Creek further down the catchment. The Cockle Creek catchment drains toward the east and the site is separated from Cockle Creek by predominantly residential housing and the M1 motorway. The western side of the school drains toward the northwest and the site is separated from Hornsby Creek by predominantly residential housing. With reference to the LPI topographic map (refer Figure 3-1), there are no defined watercourses that impinge on this site.

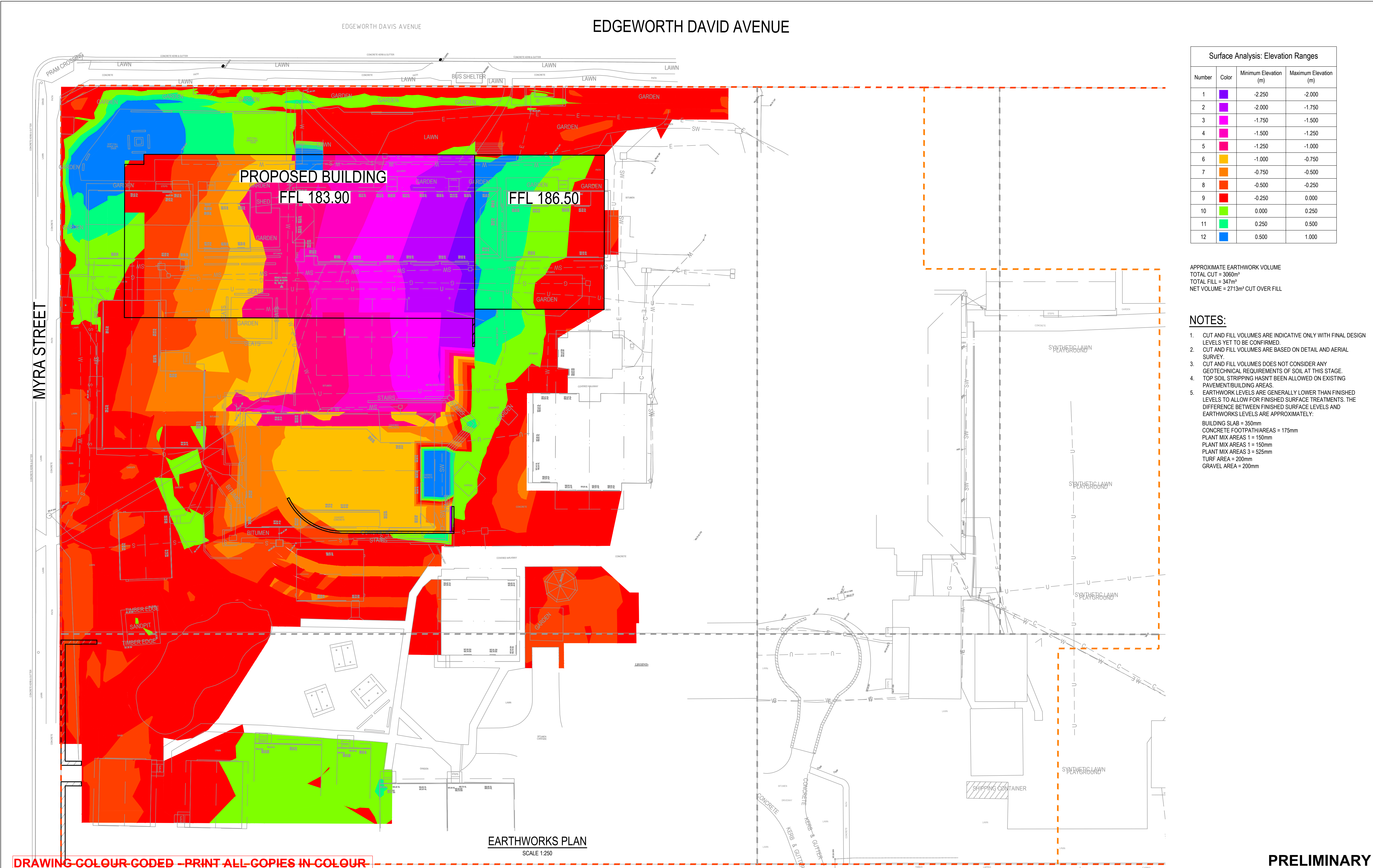
Therefore, it has been determined that the site is not subject to flooding and no further assessment has been undertaken.

Figure 3-1: Contours and general topography of the site



Appendices

Appendix A - Cut and Fill Plan



Surface Analysis: Elevation Ranges			
Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-2.250	-2.000
2		-2.000	-1.750
3		-1.750	-1.500
4		-1.500	-1.250
5		-1.250	-1.000
6		-1.000	-0.750
7		-0.750	-0.500
8		-0.500	-0.250
9		-0.250	0.000
10		0.000	0.250
11		0.250	0.500
12		0.500	1.000

APPROXIMATE EARTHWORK VOLUME
TOTAL CUT = 3050m³
TOTAL FILL = 347m³
NET VOLUME = 2713m³ CUT OVER FILL

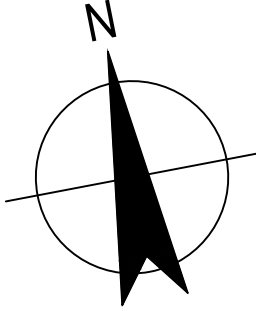
- NOTES:**
- CUT AND FILL VOLUMES ARE INDICATIVE ONLY WITH FINAL DESIGN LEVELS YET TO BE CONFIRMED.
 - CUT AND FILL VOLUMES ARE BASED ON DETAIL AND AERIAL SURVEY.
 - CUT AND FILL VOLUMES DOES NOT CONSIDER ANY GEOTECHNICAL REQUIREMENTS OF SOIL AT THIS STAGE.
 - TOP SOIL STRIPPING HASN'T BEEN ALLOWED ON EXISTING PAVEMENT/BUILDING AREAS.
 - EARTHWORK LEVELS ARE GENERALLY LOWER THAN FINISHED LEVELS TO ALLOW FOR FINISHED SURFACE TREATMENTS. THE DIFFERENCE BETWEEN FINISHED SURFACE LEVELS AND EARTHWORKS LEVELS ARE APPROXIMATELY:
BUILDING SLAB = 350mm
CONCRETE FOOTPATH/AREAS = 175mm
PLANT MIX AREAS 1 = 150mm
PLANT MIX AREAS 1 = 150mm
PLANT MIX AREAS 3 = 525mm
TURF AREA = 200mm
GRAVEL AREA = 200mm

EARTHWORKS PLAN
SCALE 1:250

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PRELIMINARY

E	SCHEME DESIGN FOR APPROVAL			MR	MD*	BM*	20.10.17
D	ISSUED FOR SCHEMATIC DESIGN			MR	PM*	MD*	21.09.17
C	ISSUED FOR DEVELOPMENT APPLICATION			MR	PM*	MD*	19.09.17
B	ISSUED FOR REVIEW			MR	PM*	MD*	12.09.17
A	ISSUED FOR DEVELOPMENT APPLICATION			MR	MD*	MW*	24.08.17
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing		Drawn	Job Manager	Project Director	Date



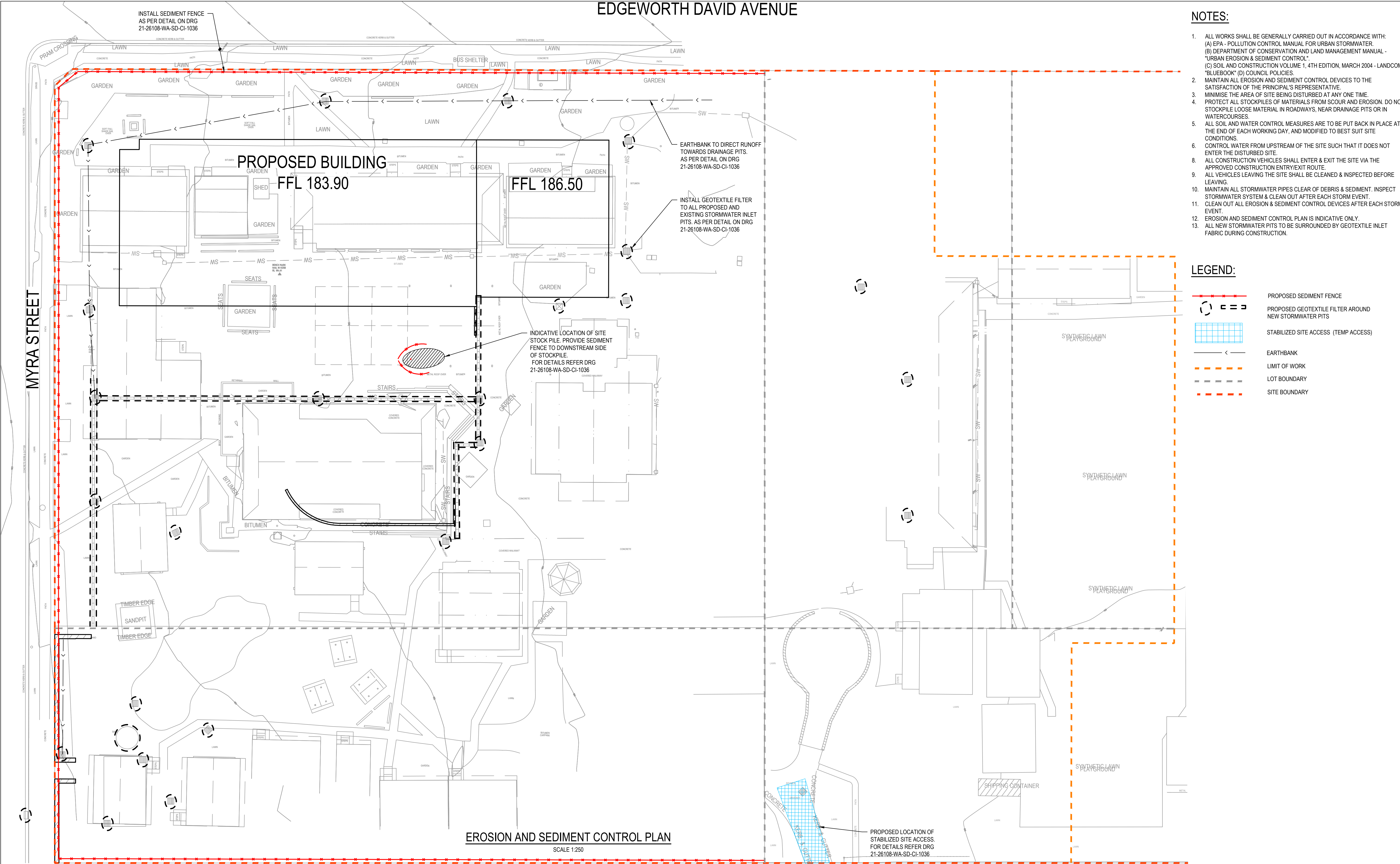
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Drafting Check	A.MACLEAN*	Design Check	A.RAHMAN*
Approved (Project Director)	Date		
Scale	1:250	This Drawing must not be used for Construction unless signed as Approved	

Client Project	NSW DEPARTMENT OF EDUCATION WAITARA PUBLIC SCHOOL REDEVELOPMENT		
Title	CIVIL EARTHWORKS PLAN		
Original Size	A1	Drawing No:	21-26108-WA-SD-CI-1030
Rev:	E		

Appendix B - Erosion and Sediment Plan

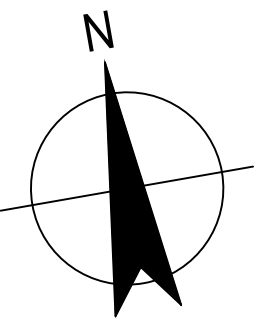
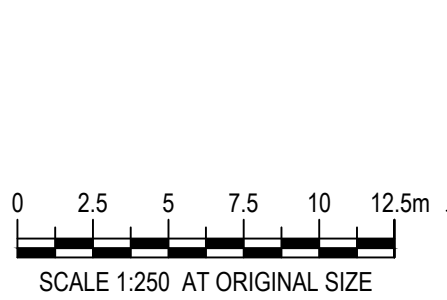


- NOTES:**
1. ALL WORKS SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH:
(A) EPA - POLLUTION CONTROL MANUAL FOR URBAN STORMWATER.
(B) DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT MANUAL - "URBAN EROSION & SEDIMENT CONTROL".
(C) SOIL AND CONSTRUCTION VOLUME 1, 4TH EDITION, MARCH 2004 - LANDCOM "BLUEBOOK" (D) COUNCIL POLICIES
 2. MAINTAIN ALL EROSION AND SEDIMENT CONTROL DEVICES TO THE SATISFACTION OF THE PRINCIPAL'S REPRESENTATIVE.
 3. MINIMISE THE AREA OF SITE BEING DISTURBED AT ANY ONE TIME.
 4. PROTECT ALL STOCKPILES OF MATERIALS FROM SCOUR AND EROSION. DO NOT STOCKPILE LOOSE MATERIAL IN ROADWAYS, NEAR DRAINAGE PITS OR IN WATERCOURSES.
 5. ALL SOIL AND WATER CONTROL MEASURES ARE TO BE PUT BACK IN PLACE AT THE END OF EACH WORKING DAY, AND MODIFIED TO BEST SUIT SITE CONDITIONS.
 6. CONTROL WATER FROM UPSTREAM OF THE SITE SUCH THAT IT DOES NOT ENTER THE DISTURBED SITE.
 8. ALL CONSTRUCTION VEHICLES SHALL ENTER & EXIT THE SITE VIA THE APPROVED CONSTRUCTION ENTRY/EXIT ROUTE.
 9. ALL VEHICLES LEAVING THE SITE SHALL BE CLEANED & INSPECTED BEFORE LEAVING.
 10. MAINTAIN ALL STORMWATER PIPES CLEAR OF DEBRIS & SEDIMENT. INSPECT STORMWATER SYSTEM & CLEAN OUT AFTER EACH STORM EVENT.
 11. CLEAN OUT ALL EROSION & SEDIMENT CONTROL DEVICES AFTER EACH STORM EVENT.
 12. EROSION AND SEDIMENT CONTROL PLAN IS INDICATIVE ONLY.
 13. ALL NEW STORMWATER PITS TO BE SURROUNDED BY GEOTEXTILE INLET FABRIC DURING CONSTRUCTION.

- LEGEND:**
- PROPOSED SEDIMENT FENCE
 - PROPOSED GEOTEXTILE FILTER AROUND NEW STORMWATER PITS
 - STABILIZED SITE ACCESS (TEMP ACCESS)
 - EARTHBANK
 - LIMIT OF WORK
 - LOT BOUNDARY
 - SITE BOUNDARY

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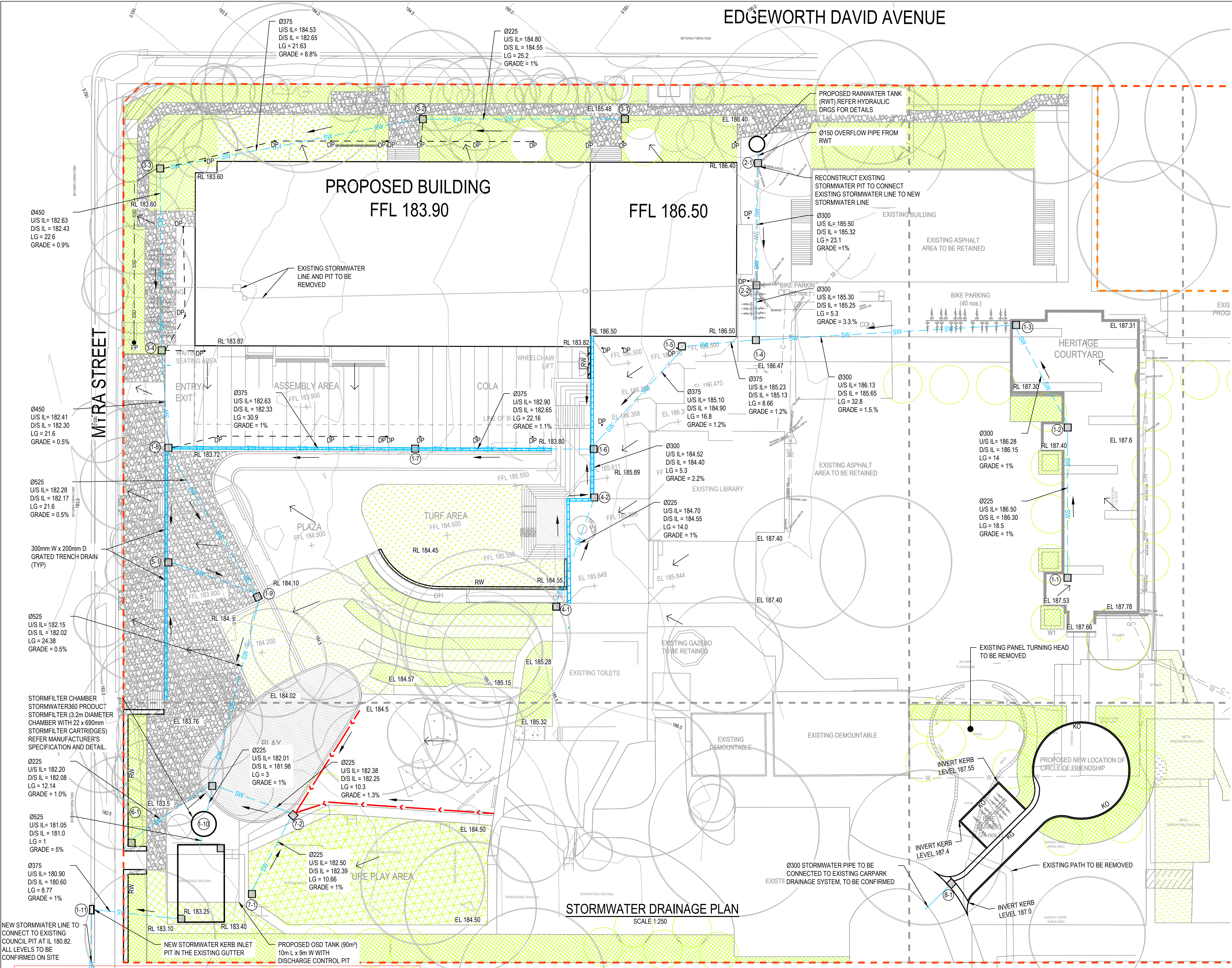
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Drafting Check	A.MACLEAN*	Design Check	A.RAHMAN*
Approved (Project Director)	Date		
Scale	1:250	This Drawing must not be used for Construction unless signed as Approved	

Client	NSW DEPARTMENT OF EDUCATION		
Project	WAITARA PUBLIC SCHOOL REDEVELOPMENT		
Title	CIVIL EROSION AND SEDIMENT CONTROL PLAN		
Original Size	A1	Drawing No:	21-26108-WA-SD-CI-1035
Rev:	E		

Appendix C - Stormwater Plan



- NOTES:**
1. ALL STORMWATER PIPES TO HAVE A MINIMUM OF 1% SLOPE IN DIRECTION SHOWN UNO.
 2. ALL IN-GROUND STORMWATER PIPES TO BE RCP CLASS 2 PIPES UNO.
 3. ALL IN-GROUND STORMWATER PIPES TO BE MINIMUM 450 BELOW LANDSCAPED SURFACES AND 600 BELOW SURFACES IN TRAFFICABLE AREA.
 4. STORMWATER PIPES ARE TO BE INSTALLED IN ACCORDANCE WITH AS 3725. ALL BEDDING IS TO BE TYPE H2 UNLESS NOTED OTHERWISE.
 5. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADE SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
 6. STORMWATER PITS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.
 7. GRATES AND COVERS SHALL CONFORM WITH AS 3996-1992.
 8. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH CURRENT STANDARDS AND CONSTRUCTION SPECIFICATIONS.
 9. THE CONTRACTOR SHALL VERIFY LOCATIONS OF EXISTING SERVICES WITH ALL RELEVANT AUTHORITIES BEFORE COMMENCING CONSTRUCTION.
 10. ALL STRUCTURES TO BE CONSTRUCTED TO NEW FINISHED SURFACE LEVELS.
 11. DATUM FOR LEVELS IS AHD, THE POSITION, SIZE, SURFACE LEVELS AND INVERT LEVELS OF EXISTING STORMWATER PITS ARE TAKEN FROM SURVEY DRAWING. THESE NEED TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
 12. ALL STORMWATER PITS SHALL BE CONSTRUCTED USING CAST IN-SITU CONCRETE OR HEAVY DUTY PRECAST PITS.
 13. CONNECTION TO EXISTING STORMWATER PITS TO BE CARRIED OUT BY THE CONTRACTOR IN ACCORDANCE WITH THE SPECIFICATION AND IN CONSULTATION WITH COUNCIL/RELEVANT AUTHORITIES. MAKE REQUIRED OPENING IN THE EXISTING STORMWATER PIT WALL AT THE CONNECTION POINT OF NEW LINE. REPAIR AND MAKE GOOD THE PIT WALL INCLUDING NECESSARY ADJUSTMENT OF THE PIT BENCHING TO MATCH NEW PIPE CONNECTIONS.
 14. GRATES, FRAMES AND COVERS IN ROADWAYS TO BE CLASS D.
 15. GRATES AND FRAMES NOT IN ROADWAYS TO BE CLASS B.
 16. ALL GRATES TO BE HINGED AND LOCKABLE. PROVIDE HEEL SAFE GRATE AS PER AS 1428.1-7.5 IN ROADWAYS AND PARKING AREA (PEDESTRIAN TRAVERSING AREAS).
 17. CONTRACTOR TO LOCATE AND EXPOSE ALL EXISTING SURFACES BEFORE CONSTRUCTION STARTS. EXISTING SERVICES TO BE RELOCATED WHERE NEEDED TO AVOID CLASHING.
 18. ALL DOWNPIPES DRAIN LINE TO BE Ø150 UPVC. REFER TO HYDRAULIC DRGS FOR LOCATIONS AND DETAILS.
 19. ALL EXISTING STORMWATER PIPES & PITS TO BE RETAINED UNLESS NOTIFIED

- LEGEND:**
- NEW GRATED TRENCH DRAIN 300mm WIDE x 200mm DEEP
 - NEW STORMWATER PIPE
 - NEW STORMWATER GRATED INLET PIT
 - NEW STORMWATER JUNCTION PIT
 - PIPE FLOW DIRECTION
 - NEW DOWNPIPE DRAIN
 - NEW DOWNPIPE CONNECTED TO RAINWATER TANK
 - NEW GRASS SWALE "V" SHAPED (MIN) 200 DEEP WITH 1.3 SIDE SLOPES
 - NEW FLUSHING POINT
 - OVERLAND FLOW DIRECTION
 - LIMIT OF WORK
 - LOT BOUNDARY
 - SITE BOUNDARY
 - NEW RETAINING WALL

PIT SCHEDULE		
PIT NUMBER	PIT DETAILS	RL
1-1	600 x 600 GRATED INLET PIT	187.5
1-2	600 x 600 GRATED INLET PIT	187.37
1-3	600 x 600 GRATED INLET PIT	187.20
1-4	900 x 900 GRATED INLET PIT	186.45
1-5	900 x 900 GRATED INLET PIT	186.50
1-6	900 x 900 GRATED INLET PIT	186.33
1-7	900 x 900 GRATED INLET PIT	183.76
1-8	900 x 900 GRATED INLET PIT	183.7
1-9	900 x 900 GRATED INLET PIT	184.10
1-10	900 x 900 GRATED INLET PIT	183.68
1-11	KERB INLET PIT	182.5
2-1	900 x 900 GRATED INLET PIT	186.30
2-2	900 x 900 GRATED INLET PIT	186.30
3-1	600 x 600 GRATED INLET PIT	185.70
3-2	600 x 600 GRATED INLET PIT	184.60
3-3	900 x 900 GRATED INLET PIT	183.55
3-4	900 x 900 GRATED INLET PIT	183.70
4-1	600 x 600 GRATED INLET PIT	185.65
4-2	600 x 600 GRATED INLET PIT	185.60
5-1	900 x 900 GRATED INLET PIT	183.72
6-1	900 x 900 GRATED INLET PIT	183.0
7-1	600 x 600 GRATED INLET PIT	183.50
7-2	600 x 600 GRATED INLET PIT	183.80

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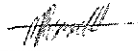
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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	G de Swardt	M Presswell	On file	M Dean	On file	
1	G de Swardt	M Presswell		B Millers		20.10.2017

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