Civil

TaylorThomsonWhitting

STORMWATER REPORT - HAMMONDCARE CARDIFF
158 MACQUARIE ROAD, CARDIFF

for HAMMONDCARE

16th December 2016

141125

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1.0 Introduction

This stormwater report is submitted by Engineering Consultancy firm Taylor Thomson Whitting (TTW) who have been engaged by HammondCare to investigate and design the stormwater for development at 158 Macquarie Road, Cardiff. The purpose of this report is to outline the stormwater impact and controls for the site in relation to the development and Lake Macquarie City Council's stormwater requirements. Meetings have been held with Lake Macquarie Council to discuss the proposed development and stormwater design.

1.1 Existing Site

The site falls from south to north at a grade of 2-3%. The site is bound Macquarie Road in the east, Haddington Drive in the east. There are residential dwellings on the southern boundary and an oval on the northern boundary. The site has a total area of about 5.2ha and is currently used as a golf driving range. Site area being developed covers about **2.2ha.**

Travelling from south to north, through the middle of our site, is a drainage gully that is a grass lined overland flow path that traverses the neighboring oval and eventually connects into Winding Creek. The overland flow path conveys catchment flows from east of Macquarie Road, east of Haddington Drive and south of the site.

There is an existing overhead power lines that traverse east to west across the middle of the site. In addition, there is sewer, telecommunications, water and stormwater infrastructure that are located within the site. Sewer, stormwater, water and powerlines have designated easements.

Other than the golf range buildings (about 650m^2), the site is generally pervious.

1.2 Proposed Development

The proposed development includes aged care units, parking, road ways and residential facilities. The new development is situated off Macquarie Road on the southern portion of the site. The northern part of the site (3ha) will not be developed as part of this submission other than, for a detention basin.

2.0 Flooding and Overland Flow

Refer to TTW Flood Impact Report (16.12.16) for flood analysis of the site.

The freeboard to the proposed substation and generator is to meet Ausgrid requirements, which based on previous projects are to be 500mm above the 1 in 100 Year ARI flood level.

Refer **Appendix A** for the alignment of proposed stormwater channel.

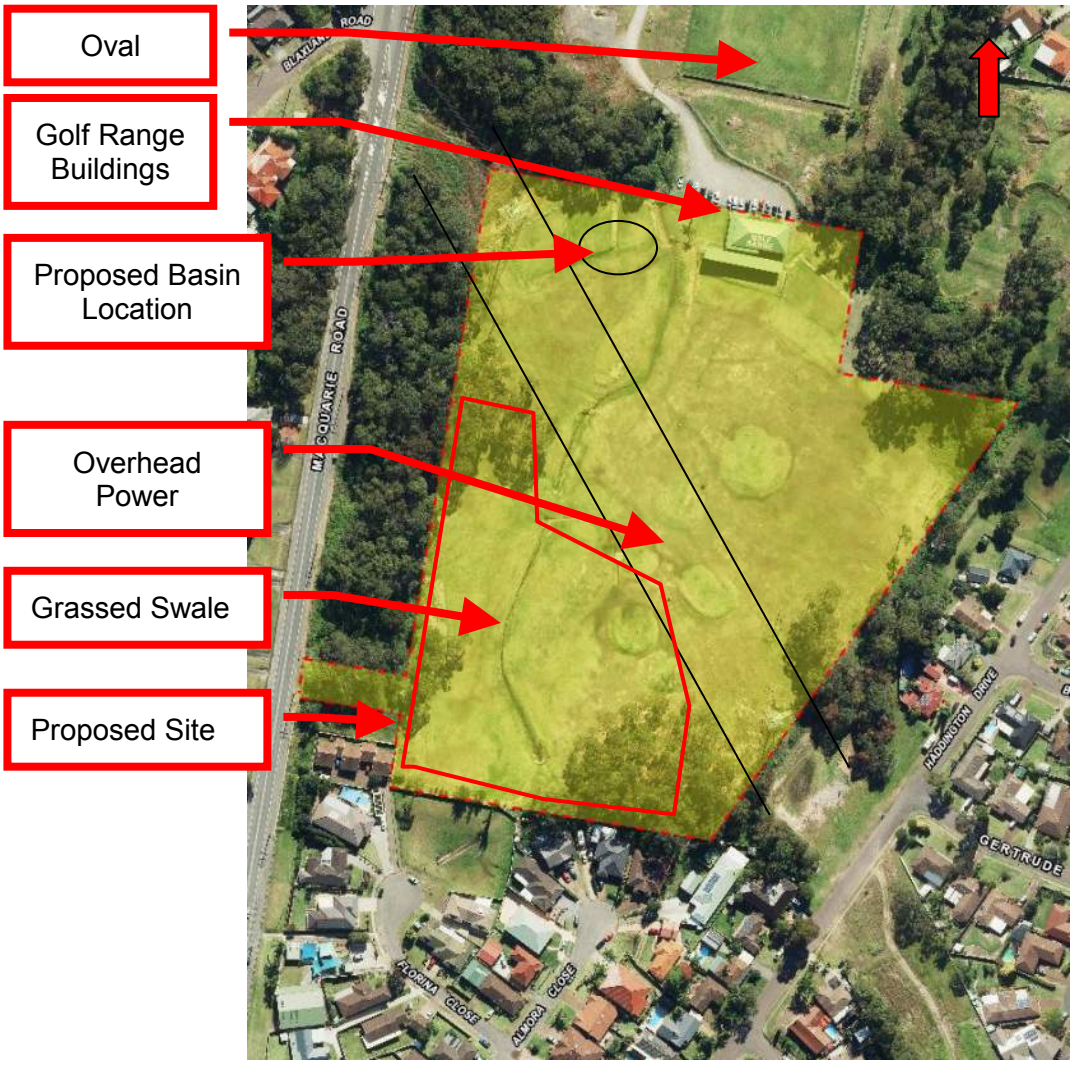

Figure 1 - Site Plan

2.1 Onsite Stormwater Detention (OSD)

In accordance with Lake Macquarie City Council *Handbook of Drainage Design Criteria* the proposed development is required to provide OSD. Section 2.5.1.2 indicates that the post development 20 Year ARI flow Q_{20}, is not to exceed the pre development 5 Year ARI flow Q_5.

$$\text{Post Development } Q_{20} \leq \text{Pre Development } Q_5$$

However, to further reduce flood impact, post development flow for the 100 Year ARI Q_{100} will be limited to pre development flow

$$\text{Post Development } Q_{100} \leq \text{Pre Development } Q_5$$

A DRAINS model has been produced which has been determined that the Pre Development $Q_5 = 519$L/s and the Post Development with no OSD $Q_{100} = 833$L/s. As a consequence OSD is required to limit post development outflow to $Q_5 = 519$L/s.

A mass curve OSD analysis was performed that indicates that about **415m^3** of OSD is required. Whereas a DRAINS analysis indicates a volume of **540m^3** is required. 540m^3 has been provided. **Table 1** below shows the flow attenuation for all the storm events.

Table 1 - Pre vs Post Discharge Rates

Storm Event	Pre Development	Post Development with OSD
Q_5	519 L/s	217 L/s
Q_{20}	703 L/s	258 L/s
Q_{50}	812 L/s	301 L/s
Q_{100}	919 L/s	366 L/s

In the northern part of the site an open basin is proposed, which will be about 3m deep. When larger storm events occur in the catchment, flows will be able to discharge safely via a weir or spill way. The basin flow control is via an orifice with a debris screen to prevent blockage. Regular maintenance will be required.

Refer to **Appendix B** for stormwater concept plan.

2.2 Rainwater reuse

Rain water is proposed to be collected in roof gutters and downpipes and used for irrigation only. There is no proposal to provide reuse into any of the proposed buildings.

A 120 000 litre storage tank is located under building 10. This tank is only harvesting from part roof area of Building 10.

The water is to be used exclusively for landscape and gardens due bacterial concerns of using reuse water with HammondCare residents. The irrigation Sydney is a fully automatic programmed watering system.

There will be two variable speed electric pumps drawing water from the rainwater tank.

2.3 Water Quality

Discussions with Council indicated that water quality removal rates for the development site should be as per table 2 below. The undeveloped site and up-stream flows through our site are not included in the proposed water quality strategy. As a consequence we aim to reduce pollutant loads by the following:

Table 2 - Proposed Removal Rates (Council pollution reduction targets)

Pollutant	Target %
Total Suspended Solids (TSS)	80%
Total Phosphorous (P)	45%
Total Nitrogen (N)	45%
Gross Pollutants	85%
Oils and Hydrocarbons	90%

To achieve the above, it is proposed to screen gross pollutants prior to discharge of water to the stormwater channel. In addition, an Oil and Silt Arrestor (OSA) is proposed that has been modelled using MUSIC to meet **Table 2** removal rates; the expected removal rates are shown in **Table 3.**

Table 3 - Summary of MUSIC water quality modelling for proposed site

Pollutant	% Reduction	Council removal rate
TSS	80%	80%
Total P	67%	45%
Total N	52%	45%
Gross Pollutants	90%	85%
Oils & Hydrocarbons	98%	90%

The water quality removal is being achieved by the incorporations of a water quality device (Humeceptor or equivalent), trash collections screens, as well bioretention for removal of nitrogen and phosphorous.

3.0 Erosion and Sediment Control

Erosion and sediment control has been designed in accordance with LANDCOM's Managing Urban Stormwater: Soils and Construction and Lake Macquarie City Councils DCP and specifications.

Sediment removal basins will be provided to minimise the spread of pollutants prior to discharge into the existing stormwater system.

Refer to **Appendix C** for the erosion and sediment control plan.

4.0 Stormwater Design

4.1 Pipe network

The piped stormwater system will collect stormwater from the roads, roofs and landscaped areas. The piped system will be designed to accommodate flow within the site up to and including the 1 in 20 year (5% AEP) storm event with approximately 20% blockage factor included. The 1 in 100 Year flows can be conveyed with no blockage factor incorporated.

The proposed stormwater will collect downpipes from buildings, subsurface drainage system; overflow connections from rainwater reuse tanks and pipes from rain gardens / bioretention areas.

The upstream catchment flows have not been accommodated in the piped network for the RACF. Refer to engineering Consultants GHD report for specifics on the upstream catchment amplification, extension and modification.

4.2 Overland Flow

In the event that the storm flows exceed the pipe capacity, the stormwater will be conveyed as overland flow. The overland flow paths will be designed to convey flows for all storms above the 5% AEP event up to the 1 in 100 year ARI (1% AEP). The overland flow paths will direct flows safely to the existing drainage swales.

The upstream catchment overland flows have been analysed by GHD. TTW have undertaken hydraulic modeling to ensure that the proposed development will not impact neighbouring properties. Please refer to TTW's Flood Impact Report for further information

5.0 Conclusion

The proposed development at 158 Macquarie Road, Cardiff will incorporate Onsite Stormwater Detention, rainwater reuse, water pollution removal devices and a piped stormwater system. The proposed development will incorporate rainwater reuse tanks to collect roof water to be reused for irrigation.

The RACF is increasing the runoff as a result of more hardstand (impervious) surface area and accordingly the attenuation of stormwater flows is required by the incorporation of Onsite Stormwater Detention. It is calculated that **540m^3 of OSD** will be required that is to be provided in a basin that is located in the northern site boundary.

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APPENDIX A - PROPOSED STORMWATER CONCEPT, CHANNEL ALIGNMENT AND SECTIONS SHEETS

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C00

STORMWATER DESIGN CRITERIA

POST DEVELOPMENT FLOW 1 IN 100 YEAR ARI (Q_{100}) TO BE ATTENUATED TO THE PRE-DEVELOPMENT 1 IN 5 YEAR ARI (Q_5)

POST Q_{100} = 366L/s

PRE Q_5 = 519L/s

OSD VOLUME REQUIRED=540m³

WATER QUALITY CRITERIA

Pollutant	Target Rate
Total Suspended Solids (TSS)	80%
Total Phosphorous (P)	45%
Total Nitrogen (N)	45%
Gross Pollutants	85%
Oils and Hydrocarbons	90%

ORIFICE CONTROLLED OUTLET WITH TRASH SCREEN

US IL25.90
600ø 'Z'
0.5%
DS IL25.85

PROVIDE SAFETY FENCE WITH TWO GATES AT STAIR LANDINGS.

DETENTION BASIN VOLUME: 540m³ 3m DEEP

PROVIDE STONE SCOUR PROTECTION

PROVIDE STONE SCOUR PROTECTION

PROPOSED STAIRS

US IL26.10
600ø 'Z'
0.6%
DS IL26.05

BREAK INTO EXISTING STORMWATER LINE AND CONSTRUCT NEW PIT

PROPOSED 3m WIDE EASEMENT

US IL26.55
600ø 'Z'
0.6%
DS IL26.50

US IL29.45
225ø 'Z'
3.0%
DS IL29.15

PROPOSED HUMECEPTOR STC27 OR APPROVED EQUIVALENT

US IL27.67
375ø 'Z'
1.0%
DS IL27.52

US IL26.69
525ø 'Z'
0.6%
DS IL26.57

US IL26.78
450ø 'Z'
1.0%
DS IL26.72

US IL29.88
375ø 'Z'
0.95%
DS IL29.70

US IL30.00
225ø 'Z'
5.25%
DS IL30.30

US IL26.96
450ø 'Z'
1.0%
DS IL26.81

US IL27.13
450ø 'Z'
1.0%
DS IL26.99

US IL31.00
225ø 'Z'
1.6%
DS IL30.90

US IL28.00
225ø 'Z'
1.00%
DS IL27.78

PROPOSED HEADWALL. REFER TO DETAIL ON DRG SK003

PROPOSED MAINTENANCE ACCESS TRAIL

EXISTING HUNTER WATER EASEMENT

US IL28.00
450ø 'Z'
4.3%
DS IL28.00

US IL30.00
450ø 'Z'
1.0%
DS IL29.83

US IL30.13
375ø 'Z'
0.95
DS IL29.92

BATTER EXTENT

PROPOSED BATTER TO EXISTING 1(V):3(H) MAX GRADE

US IL30.53
225ø 'Z'
4.00%
DS IL30.00

US IL31.00
225ø 'Z'
4.0%
DS IL30.48

US IL30.79
225ø 'Z'
1.0%
DS IL30.56

US IL30.27
450ø 'Z'
1.0%
DS IL30.03

US IL31.04
225ø 'Z'
1.0%
DS IL30.78

US IL31.09
225ø 'Z'
1.6%
DS IL30.75

US IL31.20
225ø 'Z'
1.15%
DS IL31.10

US IL30.40
375ø 'Z'
1.0%
DS IL30.16

REMOVE EXISTING STORMWATER AND EXTINGUISH EASEMENT

US IL30.83
225ø 'Z'
1.0%
DS IL30.82

US IL31.16
225ø 'Z'
1.0%
DS IL31.07

US IL30.36
450ø 'Z'
1.25%
DS IL30.24

US IL31.40
225ø 'Z'
4.85%
DS IL30.67

BREAK INTO EXISTING STORMWATER LINE AND CONSTRUCT NEW PIT

US IL31.30
225ø 'Z'
1.15%
DS IL31.20

US IL31.00
225ø 'Z'
1.0%
DS IL30.96

US IL31.81
225ø 'Z'
5.0%
DS IL30.82

US IL31.28
225ø 'Z'
0.9%
DS IL31.19

US IL30.55
300ø 'Z'
1.25%
DS IL30.39

US IL31.92
225ø 'Z'
10.0%
DS IL31.44

NW RETAINING WALL

US IL30.65
375ø 'Z'
1.0%
DS IL30.43

PROPOSED CHANNEL SLOPES TYPICAL – 1(V):3(H) MAX – 1(V):2(H)

US IL30.74
225ø 'Z'
1.00%
DS IL30.58

US IL32.02
225ø 'Z'
0.95%
DS IL31.95

US IL30.93
375ø 'Z'
1.0%
DS IL30.68

CULVERT UNDER CONVEY FLOWS IN EXCESS OF THE 1 IN 100 YEAR ARI STORM EVENT

US IL30.86
225ø 'Z'
1.25%
DS IL30.77

US IL31.55
300ø 'Z'
1.0%
DS IL31.35

US IL32.15
225ø 'Z'
1.0%
DS IL31.95

CHANNEL TO CONVEY FLOWS UP TO THE 1 IN 100 YEAR ARI STORM EVENT

US IL32.82
225ø 'Z'
7.00%
DS IL31.77

US IL34.44
225ø 'Z'
12.35%
DS IL32.05

US IL35.16
225ø 'Z'
8.15%
DS IL33.94

PROPOSED CULVERTS TO BE 3No. 1.5m(W) x 0.9m(D) AND AT 1% MINIMUM GRADE

US IL31.04
300ø 'Z'
1.2%
DS IL30.86

US IL31.21
300ø 'Z'
1.0%
DS IL31.07

US IL31.79
300ø 'Z'
1.0%
DS IL31.58

300ø OVERFLOW PIPE. INVERTS TO BE CONFIRMED ONSITE

US IL35.19
225ø 'Z'
1.0%
DS IL35.12

US IL36.50
225ø 'Z'
15.20%
DS IL34.50

US IL34.45
225ø 'Z'
12.0%
DS IL32.87

US IL32.06
300ø 'Z'
1.0%
DS IL31.81

US IL31.98
225ø 'Z'
1.3%
DS IL31.93

US IL31.41
300ø 'Z'
1.0%
DS IL31.24

US IL31.49
225ø 'Z'
1.0%
DS IL31.44

US IL32.26
300ø 'Z'
1.25%
DS IL32.09

US IL32.48
225ø 'Z'
0.5%
DS IL32.40

US IL32.54
225ø 'Z'
1.0%
DS IL32.51

US IL35.55
225ø 'Z'
1.0%
DS IL35.42

US IL35.39
225ø 'Z'
1.0%
DS IL35.22

US IL31.90
225ø 'Z'
0.8%
DS IL31.73

US IL31.68
225ø 'Z'
1.0%
DS IL31.52

US IL32.37
300ø 'Z'
1.0%
DS IL32.29

US IL35.57
225ø 'Z'
0.95%
DS IL35.50

US IL35.67
225ø 'Z'
1.0%
DS IL35.52

US IL35.49
225ø 'Z'
1.0%
DS IL35.42

US IL32.21
225ø 'Z'
1.0%
DS IL32.01

US IL32.67
225ø 'Z'
1.1%
DS IL32.47

US IL32.18
225ø 'Z'
1.0%
DS IL32.07

RECONSTRUCTION EXISTING STORMWATER LINES

RECONSTRUCTION EXISTING STORMWATER LINE

PROPOSED LANDSCAPING BERM

TREE TO BE RETAINED STRUCTURAL ROOT ZONE (SRZ) TYP.

TREE TO BE RETAINED

US IL32.22
225ø 'Z'
1.0%
DS IL32.12

US IL31.86
225ø 'Z'
1.0%
DS IL31.71

PROPOSED INLET STRUCTURE 7.2m LONG x 1.2m WIDE. REFER TO DETAIL ON DRG SK003

PROPOSED MAINTENANCE ACCESS TRAIL

MATCH INTO EXISTING BERM

MAINTAIN EXISTING BERM

SW RETAINING WALL

US IL32.04
225ø 'Z'
1.0%
DS IL31.89

MACQUARIE ROAD

HADDINGTON DRIVE

BRESSAY CLOSE

GERTRUDE STREET

LOT A DP 398198

LOT 2 DP 788892 5.249 ha

LOT 38 DP 827464

LOT 54 DP 264353

LOT 4 DP 264353

LOT 3 DP 264353

LOT 1 DP 264353

LOT 88 DP 827464

PT 145 DP 264352

145 DP 264352

LOT 18 DP 827464

LOT 39 DP 827464

LOT 40 DP 827464

SP 56797

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P5	ISSUE FOR DA	KH	PW	15.07.16
P4	ISSUE FOR DA	KH	PW	29.04.16
P3	ISSUE FOR DA	KH	PW	24.06.15
P2	ISSUE FOR DA	KH	KH	05.06.15
P1	PRELIMINARY	KH	PK	19.05.15
P10	ISSUE FOR DA	EH	PW	16.12.16
P9	ISSUE FOR DA	KH	PK	02.12.16
P8	ISSUE FOR DA	KH	PK	09.11.16
P7	ISSUE FOR COMMENT	KH	PK	28.09.16

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Project: HAMMONDCARE AGED CARE HOME CARDIFF
158 MACQUARIE ROAD CARDIFF

Sheet Subject: STORMWATER PLAN

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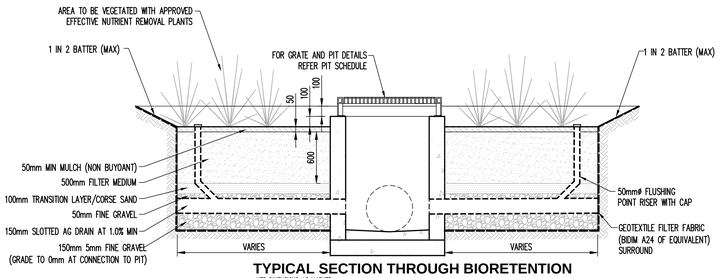

TYPICAL SECTION THROUGH BIORETENTION

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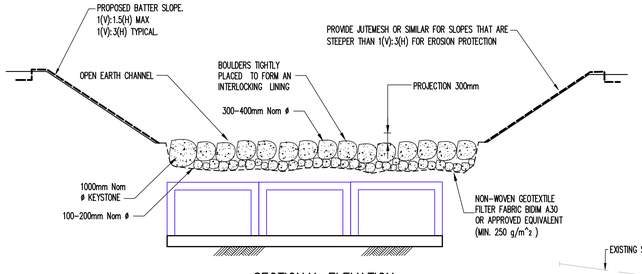

SECTIONAL ELEVATION STONE PITCH SCOUR PROTECTION

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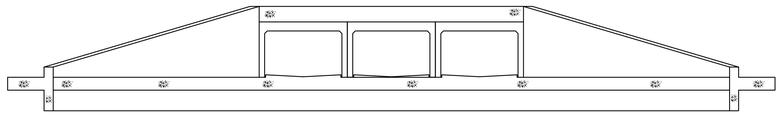

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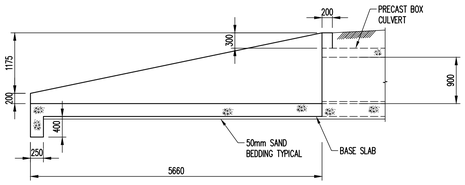

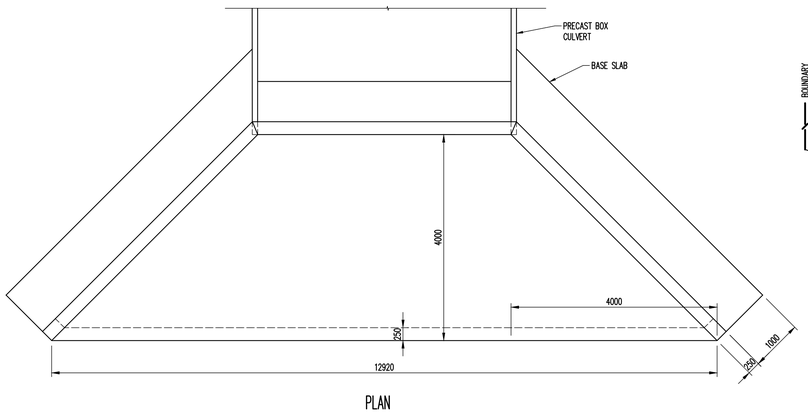

PLAN

CULVERT HEADWALL DETAIL

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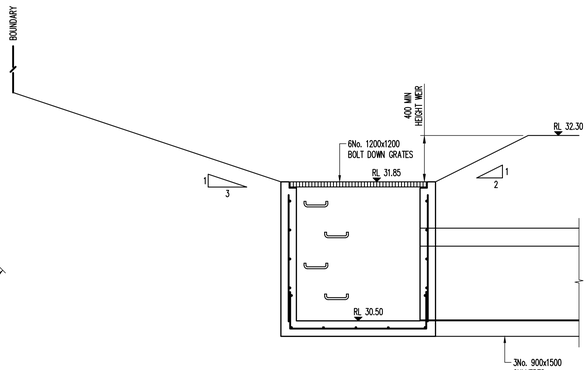
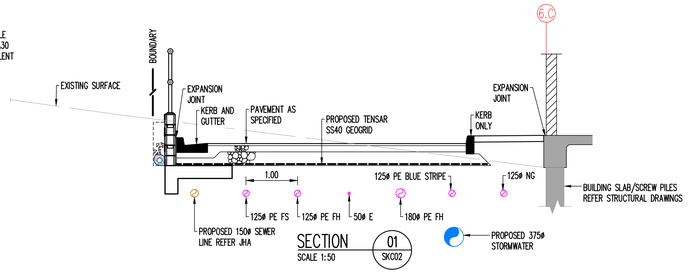


CULVERT INLET STRUCTURE

SCALE 1:25



SECTION 01

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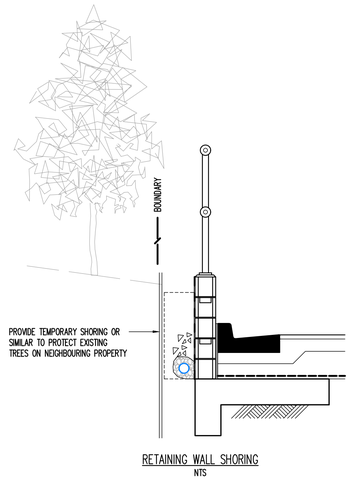
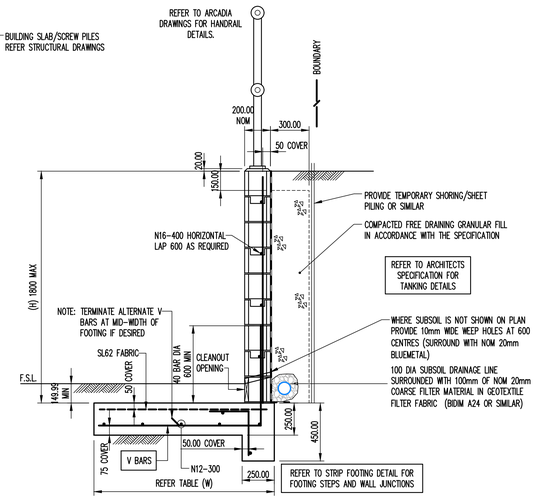


RETAINING WALL SHORING

NTS



200 WALL - UP TO 1.8m (RWA)

SCALE 1: 20

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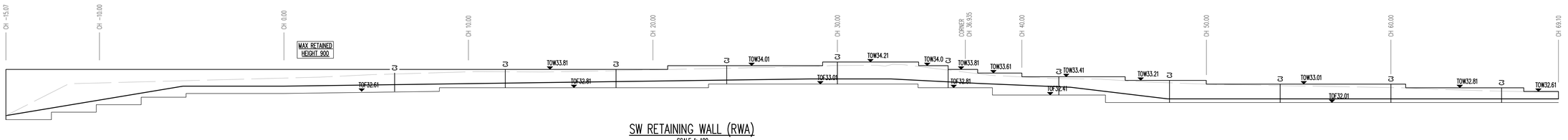
BW	1800	1750	N20-400	N20-400



SW RETAINING WALL (RWA)

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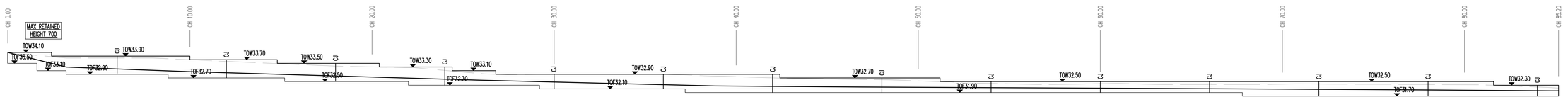

NW RETAINING WALL (RWA)

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Rev	Description	Eng	Draft	Date
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P2	ISSUE FOR DA	KH	PW	24.08.16
P1	ISSUE FOR DA	KH	PW	16.08.16

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Project: HAMMONDCARE AGED CARE HOME CARDIFF
158 MACQUARIE ROAD CARDIFF

Sheet Subject: RETAINING WALL DETAILS AND ELEVATIONS

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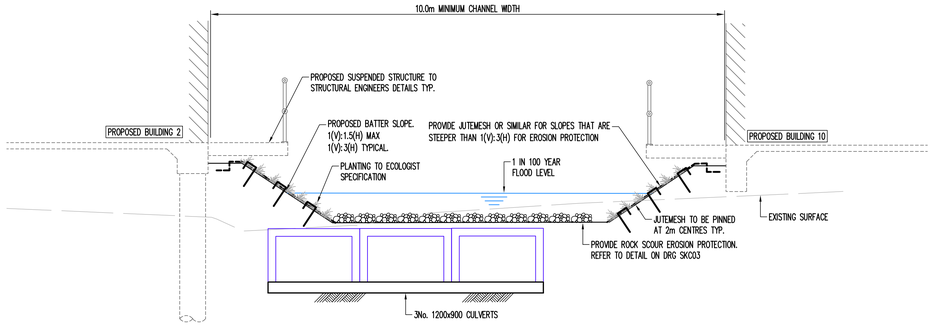

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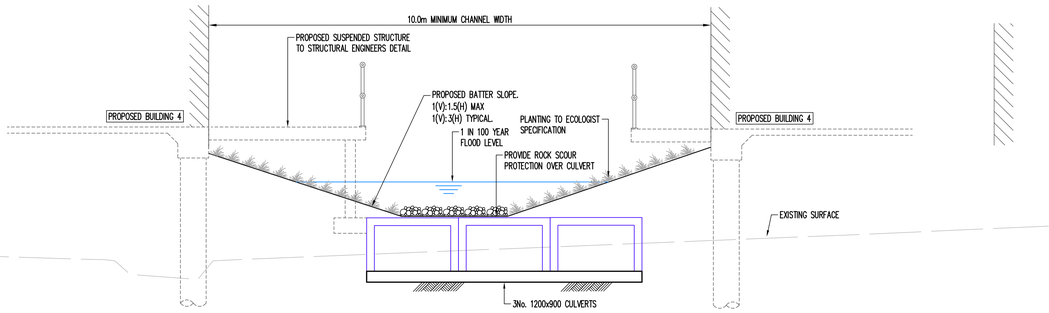

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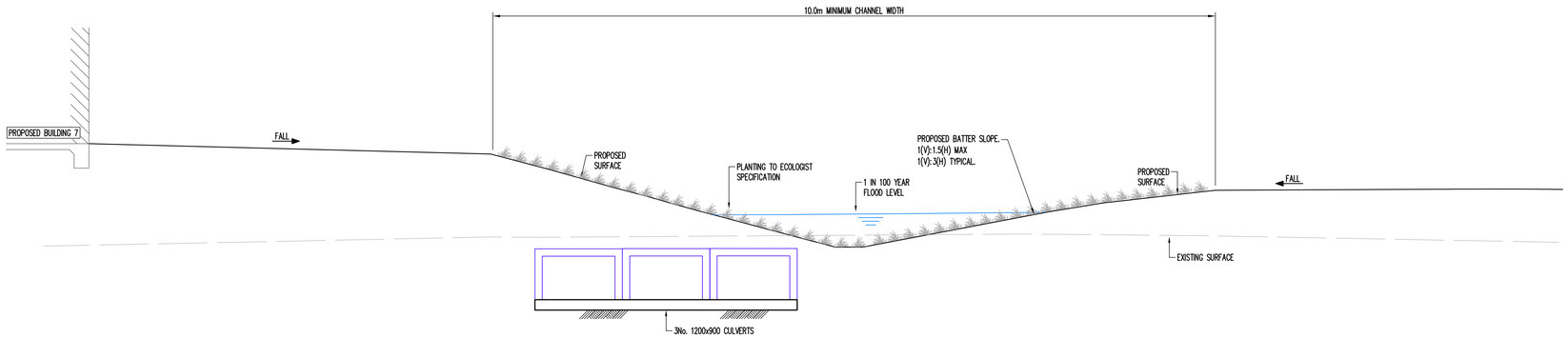

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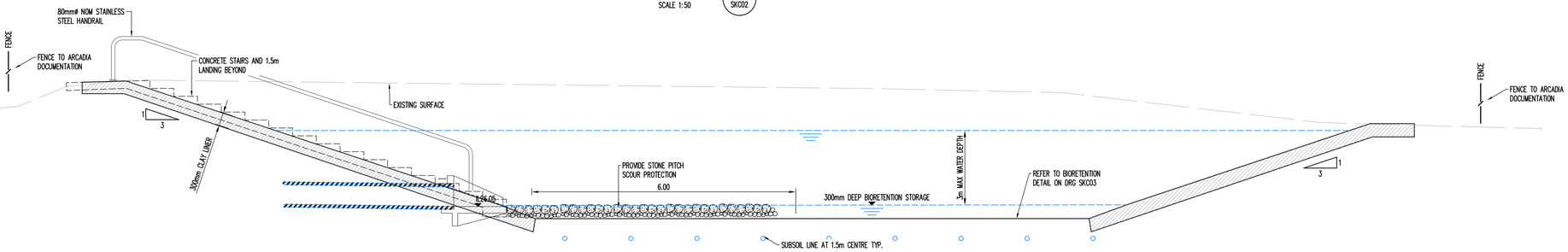

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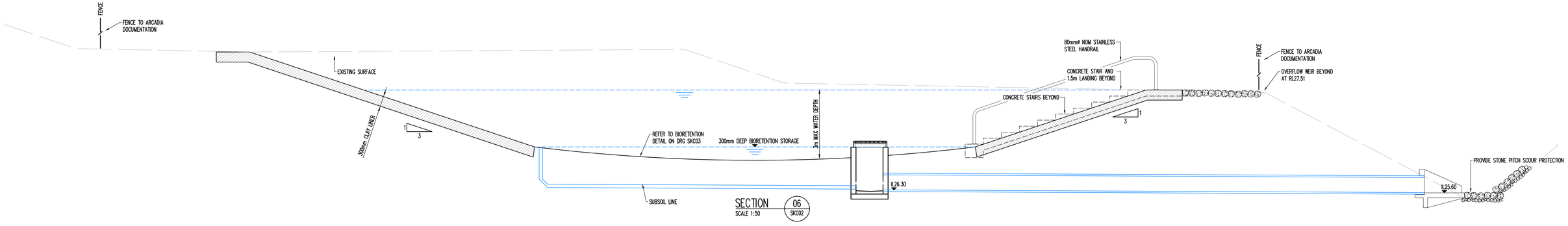

SECTION 06
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B1 0 1 2 3 4 5 6 7 8 9 10

Rev	Description	Eng	Draft	Date
P3	ISSUE FOR DA	KH	PK	16.12.16
P2	ISSUE FOR DA	KH	PK	02.12.16
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Project
HAMMONDCARE AGED CARE HOME CARDIFF
158 MACQUARIE ROAD
CARDIFF

Sheet Subject
SECTIONS SHEET

Scale : B1 | Drawn PK | Authorised
Job No 141125 | Drawing No SKC04 | Revision P3
Plot File Created: Dec 16, 2016 - 5:05pm

APPENDIX B - PROPOSED EROSION AND SEDIMENT CONTROL PLAN

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C00

SEDIMENT BASIN SIZING

1. Sediment basins have been sized in accordance with (A) LANDCOM NSW – Managing Urban Stormwater: Soils and Construction ("Blue Book").
2. Soil type D
3. Construction likely to be greater than 6 months therefore R (y %le, 5 day) = 85% = 38.9mm (Using Newcastle rainfall data)
4. Corresponding runoff coefficient Cv = 0.64
5. Construction separated into two zones due to channel zone
   - 5.1. Western Site Area = 0.96 Ha
   - 5.2. Eastern Site Area = 0.99 Ha
6. Settling Zone (SZ) Basin Volume for D type soil **(Western Site)**
   - 6.1. SZwest = 10 x Cv x A x R
     SZwest = 10 x 0.64 x 0.96 x 38.9
     SZwest = 240m³
7. Sediment Storage Zone (SSZ) Basin Volume for D type soil **(Western Site)**
   - 7.1. SSZwest = SZwest x 0.5 = 240m³ x 0.5 = 120m³

Total Western Site Area Volume = SZwest + SSZwest = 360m³

8. Settling Zone (SZ) Basin Volume for D type soil **(Eastern Site)**
   - 8.1. SZeast = 10 x Cv x A x R
     SZeast = 10 x 0.64 x 0.99 x 38.9
     SZeast = 246m³
9. Sediment Storage Zone (SSZ) Basin Volume for D type soil **(Eastern Site)**
   - 9.1. SSZeast = SZeast x 0.5 = 246m³ x 0.5 = 123m³

Total Western Site Area Volume = SZwest + SSZwest = 369m³

WATER QUALITY TESTING REQUIREMENTS

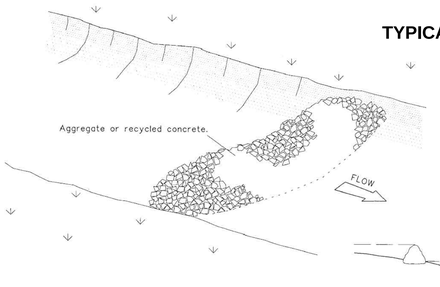
Prior to discharge of site stormwater, groundwater and seepage water into council's stormwater system, contractors must undertake water quality tests in conjunction with a suitably qualified environment consultant outlining the following:

- Compliance with the criteria of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- If required subject to the environmental consultants advice, provide remedial measures to improve the quality of water that is to be discharged into Councils storm water drainage system.this should include comments from a suitably qualified environmental consultant confirming the suitability of these remedial measures to manage the water discharged from the site into Councils storm water drainage system. Outlining the proposed, ongoing monitoring, contingency plans and validation program that will be in place to continually monitor the quality of water discharged from this site. This should outline the frequency of water quality testing that will be undertaken by a suitably qualified environmental consultant.

EROSION AND SEDIMENT CONTROL LEGEND

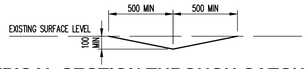
- Siltation fence
- Rock check barriers
- Catch drain
- Vehicle entry/exit

Rock Check Dam



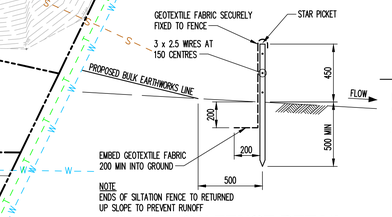
TYPICAL SECTION THROUGH CATCH DRAIN

SCALE 1: 20



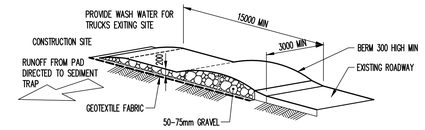
SILTATION FENCE DETAIL

SCALE 1: 20

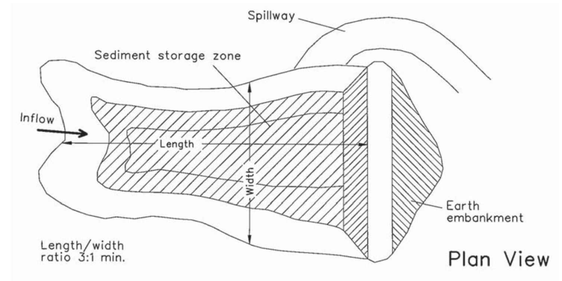


TEMPORARY CONSTRUCTION EXIT

NTS

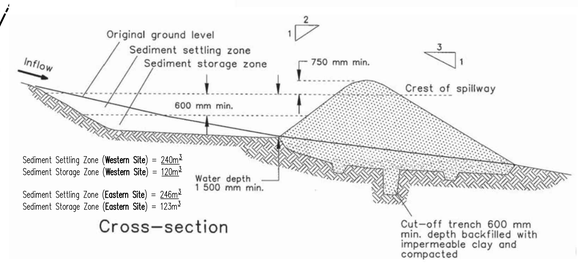


Earth Basin – Wet



Earth Basin – Wet

(TYPE D & F)



Cross–section

B1 0 1 2 3 4 5 6 7 8 9 10

Rev	Description	Eng	Draft	Date
P6	ISSUE FOR DA	KH	KH	09.11.16
P5	ISSUE FOR DA	KH	PW	15.07.16
P4	ISSUE FOR DA	KH	PW	29.04.16
P3	ISSUE FOR DA	KH	PW	25.06.15
P2	ISSUE FOR DA	KH	KH	05.06.15
P1	PRELIMINARY	KH	PK	19.05.15
P7	ISSUE FOR DA	EH	PW	16.12.16

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Project: HAMMONDCARE AGED CARE HOME CARDIFF
158 MACQUARIE ROAD CARDIFF

Sheet Subject: EROSION AND SEDIMENT CONTROL PLAN

Scale : B1 1:500 UNO | Drawn PW | Authorised

Job No 141125 | Drawing No SKC01 | Revision P7

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