Proposed RACF AT 64 WARNERS BAY ROAD, WARNERS BAY

Stormwater Drainage Report

Civil Engineering Consulting Services

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Revision	Author	Reviewer	Approved for Issue	Date
0	MS	BC		
1	MS	DP		27/06/2016
2	MS	DP		20/10/2016

Contents

Appendices

1. Introduction

1.1 Background

MPC Consulting Engineers has been engaged to formulate a stormwater drainage report to support a Development Application for a proposed residential aged care facility at 64 Warners Bay Road, Warners Bay NSW. The drainage report addresses both water quality and water quantity requirements for the proposed development. The drainage report has been undertaken as the proposed development site is larger than the limit of Lake Macquarie City Councils standard on-site detention calculations spreadsheet.

1.2 Study Area

The proposed development site is approximately 14423 m^2 in area and comprises Lot 1, 2, 3 and 4 DP515512 & Lot 11 DP 656806. The site is adjacent to South Creek. The site in its current state is subject to flooding in the 1 in 100 ARI and the PMF Storm events.

1.3 Aims

1.3.1 Water Quality

To provide adequate water quality control facilities for the site to minimise the effects of the development on the receiving waterway, and to ensure that the existing level of water quality present on the site is not detrimentally affected by the proposed development

1.3.2 Water Quantity

To provide adequate detention facilities such that the Post Development flow is limited to 100% of the Pre-Development flow for Average Recurrence Intervals (ARI) from 5 to 100 years.

1.4 Flooding

MPC understand that the site is subject to the 1 in 100 year and PMF flood events. The proposed building and carpark levels have been adopted to be above the 1 in 100 year flood event, and the building levels have been designed to achieve a 500mm freeboard to the PMF flood event. The floor levels are based on the recommendation in the Northrop report NL151532.

In addition to keeping floor levels above these flood events, the building and a portion of the carpark structure will be designed to incorporate floor inundation below the structure in these flood event to minimise any effects of flooding on neighbouring properties as a result of this development.

2. Proposed Water Quantity and Water Quality Measures

2.1 Proposed Water Quality Measures

To simulate the current and proposed stormwater quality discharging from the site area, MPC has used the Model for Urban Stormwater Improvement Conceptualisation Version 3.01 (MUSIC). MUSIC has been developed by the Cooperative Research for Catchment Hydrology (CRC) and can simulate a range of water quality features working as part of a treatment train at 6 minute intervals. MUSIC is a water quality modelling software that uses historical data to estimate the effectiveness of a stormwater quality treatment network for a number of different land uses.

MUSIC has a number of in-built modules that simulate both the generation of pollution from different land uses and the treatment and removal of pollution.

For this study, 6 minute rainfall data from the Bureau of Meteorology was used in the model.

The existing conditions for stormwater quality were modelled as a forest sub-catchment, using default pollutant export parameters.

The treatment train for the catchment consists of a rainwater tank for each roof area and a Gross Pollutant Trap located on the outflow of each detention system.

The results of the MUSIC model are given in the following table.

Table Estimated Pre-Development Pollutant Export Rates

Pollutant (annual load kg/yr)	Source	Residual Load	% Reduction
Suspended Solids	736	108	85.3
Total Phosphorous	1.49	0.090	94
Total Nitrogen	10.5	1.62	84.7
Gross Pollutants	122	0	100

The treatment train of the MUSIC model for the catchment is located in Appendix A. The MUSIC file has been issued by email.

2.2 Proposed Water Quantity Measures

It is proposed to use three underground detention tanks to cater for the discharge from the site. The proposed location of the detention tanks is shown on MPC's stormwater drawings.

The system supplied will ensure that the total discharge from the development will not exceed that prior to development.

3. Hydrological Analysis for Discharge Calculations

On-Site Harvesting

In regard to stormwater run-off from the site, on review of Lake Macquarie City Councils DCP. Generally, stormwater run-off will be directed to the stormwater drainage easement after harvesting systems and subsequent detention systems to limit the flows to that of the undeveloped site.

Onsite stormwater harvesting has been designed based on the requirements of the development. The harvesting system is proposed to only be used for irrigation purposes only.

Site Parameters:

Site Area =14423 m^2

Impervious Roof Area (Harvested / Detained) = 5162 m^2

Impervious Driveway areas (Detained) = 1310 m^2

Pervious Driveway Area (Permeable Paving) = 315m^2

It is proposed to incorporate rainwater re-use systems as site harvesting measures which will be used for irrigation purposes around the site. Over flows from the harvesting tank will be directed to the On-site detention system.

Site Discharge Index

Site Area (S) – 14423 m^2

Roof Area (R) – 5162m^2

Impervious Paved Area (P) – 1310m^2

Pervious Paved Area (P) – 315m^2

Total Impermeable Area (I = R+P) – 6787m^2

DC = I-M = 6787m^2-5162m^2-315m^2 = 1310m^2

SDI = DC/S = 1310m^2 / 14423m^2 = 0.09 < 0.1 Therefore SDI okay

On-Site Harvesting

On-site harvesting has been calculated using the mitigation depth procedure outlined in LMCC DCP No.1. A mitigation storage depth of 7mm has been adopted for the Cardiff area using a soil texture of Clay based on the parameters of the geotechnical report indicating that there is clay below the topsoil at the site.

Therefore:

MS = MICxMD/1000

MIC = Managed Impermeable Catchment (m2) – 5162m^2

MD = Mitigation Depth (mm) – 7mm

MS = Mitigation Storage (KL) = 36.1kl

A rainwater harvesting tank with a volume of 37000 litres will be provided for the proposed development which will be used for landscape irrigation only.

On-Site Detention

The catchment was analysed for tank sizing purposes using computer program RARE Version 1.53 which calculates the pre and post development discharge based on the rational method using AR&R kinematic wave equations for times of concentration. Variations to the co-efficient of runoff for intensity 10yr 1hr < 70mm/hr are automatically calculated using triangular hydrographs

Stormwater detention has been provided based on the following calculations.

Outflow from the detention areas will be by way of orifice plate chokes for 1 in 5, 1 in 20 year and 1 in 100 year storm events as required. Surcharge grates allowing for overflow in a fully blocked design case will also be provided with all overflow directed off the site.

3.1 Modelling Parameters

The input into RARE is as follows:

Site Area = 14423m^2
% through OSD =59%
% Impervious pre-developed = 0%
% Impervious post-developed = 45%
Flow Length =78m, Slope = 3.8%, Roughness = 0.2

ARI	Pre- Developed				Post-Developed			Excess Q Post-Pre (l/s)	Vol (m^3)
	Tc	C	I (mm/hr)	Q (l/s)	Tc	C	I (mm/hr)		
5	**16**	**0.40**	**85**	**133**	**12**	**0.61**	**97**	**37**	**72.1**
10	**15**	**0.42**	**101**	**167**	**11**	**0.64**	**116**	**46**	**84**
20	**14**	**0.44**	**123**	**215**	**10**	**0.67**	**59**	**59**	**99**

50	**13**	**0.48**	**155**	**300**	**10**	**0.73**	**92**	**92**	**124.4**
100	**12**	**0.50**	**185**	**370**	**9**	**0.77**	**110**	**110**	**142.8**

For a 1 in 100 year storm event, it is intended to provide 145 m^3 of storage in an underground detention tanks with an outflow control chamber utilising multiple orifice plate chokes as described above. Orifice plates will be designed as part of the detailed design.

It is proposed to provide one rainwater retention tank adjacent to the main stormwater detention tank to allow for irrigation purposes only for the site. It is understood that the no re-use water for toilets or laundry is proposed for the development.

Retention tank and detention tank locations and sizes can be found on MPC's stormwater plans.

4. Results

The models for the catchments were run for various design storm durations. The peak discharges for the various ARI's were determined along with the required detention volumes. Critical time of concentration is also shown in the table below. The peak flow results for the developable site are shown in Table 1.

Table 1: Peak Discharge for Developable Site

ARI (Years)	*Peak Flow (undeveloped) (m^3/s)*	*Peak Flow (Developed) (m^3/s)*	*Time of Concentration Tc(mins)*
20	0.215	0.573	14
100	0.370	0.881	12

Table 2 shows the detention volume required for the various ARI's

Table 2: Detention Requirement

ARI (Years)	*Detention Required (m^3)*
20	100
100	145

It is proposed to construct 2 separate underground detention tanks throughout the development to have a total volume of 145m^3.

5. Summary and Conclusions

This stormwater drainage report for the proposed Residential Aged Care Facility at 64 Warners Bay, Road, Warners Bay NSW. It is proposed to use a Gross pollutant trap, first flush devices and underground detention tanks for the management of stormwater quality and quantity from the developed site.

Figures

64 WARNERS BAY ROAD, WARNERS BAY NSW

DEVELOPMENT APPLICATION
ROADWORKS & DRAINAGE PLANS FOR
BUPA WARNERS BAY
LOT 1, 2, 3 & 4 DP 515512 & LOT 11 DP 656806

SCHEDULE OF DRAWINGS:

LOCALITY
N.T.S.

MGA

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
04	RE-ISSUED FOR COUNCIL APPROVAL	30.06.2016
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CLIENT: BUPA CARE SERVICES

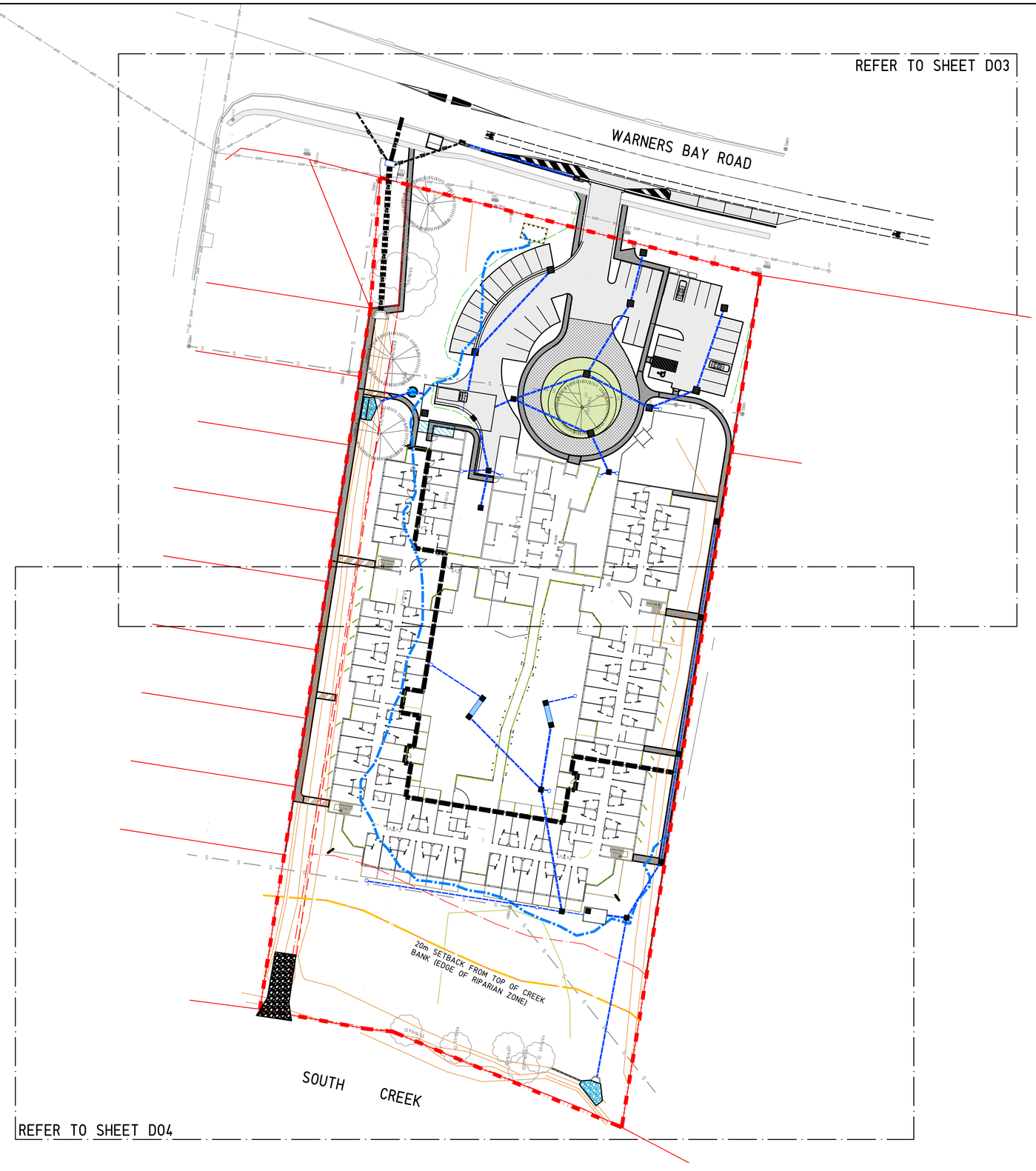
TITLE: COVER SHEET & LOCALITY

PROJECT: 64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C01	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



LEGEND

- SITE BOUNDARY
- PROPOSED RETAINING WALL
- 100 YR FLOOD EXTENTS
- RIPARIAN ZONE SETBACK LINE
- NEW PAVEMENT - ASPHALT
- NEW PAVEMENT - CONCRETE
- NEW CONCRETE FOOTPATH
- EXISTING CONCRETE FOOTPATH
- CONCRETE DISHED CROSSING
- FIRST FLUSH DEVICE FROM ROOFWATER DOWN PIPE
- ROOFWATER DOWN PIPE
- PROPOSED DRAINAGE KERB INLET PIT
- PROPOSED DRAINAGE SURFACE INLET PIT
- PROPOSED DRAINAGE GROSS POLLUTANT TRAP (GPT)
- PROPOSED DRAINAGE HEADWALL OUTLET
- PROPOSED NEW DRAINAGE LINE
- 4.1 DESIGN CONTOURS 0.1m INTERVAL
- 5.0 NATURAL SURFACE CONTOURS 0.5m INTERVAL

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CLIENT
BUPA CARE SERVICES

TITLE
SITE LAYOUT PLAN

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
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AS SHOWN	16-152	C02	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

PROPOSED LOCATION FOR NEW PEDESTRIAN REFUGE ADJACENT TO EXISTING BUS SHELTER, PROVIDE APPROVED CONCRETE ISLANDS, SIGNAGE AND LINEMARKING

WARNERS BAY ROAD

WARNERS BAY ROAD CONTROL LINE (EXISTING CENTRELINE)

EXISTING BUS SHELTER

MATCH INTO EXISTING KERB & GUTTER

INSTALL NO STOPPING SIGNAGE FOR CHEVRON AREA

MAINTAIN 1.5m WIDE BICYCLE LANE

ROAD WIDENING OF WARNERS BAY ROAD. PROVIDE 4 X PARALLEL PARKING BAYS 6.1m x 3.0m

MATCH EXISTING PATH LEVELS

SITE ENTRY RAMP CONTROL LINE

CHEVRON LINEMARKING

10m

6.1m

3.0m

INSTALL NO STOPPING SIGNAGE FOR CHEVRON AREA

DRIVEWAY CROSSOVER 7m WIDE, REFER TO LMCC SD EGSD-104

NEW KERB & GUTTER LIMIT OF WORKS CH33

TREE TO BE RETAINED

TREE TO BE REMOVED

TREE TO BE REMOVED

EXISTING CULVERT OUTLET

BURIED CONCRETE OSD TANK SYSTEM, TANK TO BE MIN. 1.0m FROM EXISTING SEWER LINE, REFER ALSO TO SHEET C05 FOR DETAILS

TREE TO BE RETAINED

CONSTRUCT PEDESTRIAN BRIDGE OVER OPEN CHANNEL TO ARCHITECTS DETAILS

DISCHARGE STORMWATER TO EXISTING OPEN CHANNEL HEADWALL OUTLET IL=4.3

TREE TO BE RETAINED

STORMWATER RE-USE CHAMBER

CLEAN OUT EXISTING OPEN CHANNEL AN MAINTAIN EXISTING PROFILE AND GRADE

CARPARK WEST CENTRELINE

CARPARK EAST CENTRELINE

LEGEND

- SITE BOUNDARY
- PROPOSED RETAINING WALL
- 100 YR FLOOD EXTENTS
- RIPARIAN ZONE SETBACK LINE
- NEW PAVEMENT - ASPHALT
- NEW PAVEMENT - CONCRETE
- NEW CONCRETE FOOTPATH
- EXISTING CONCRETE FOOTPATH
- CONCRETE DISHED CROSSING
- FIRST FLUSH DEVICE FROM ROOFWATER DOWN PIPE
- ROOFWATER DOWN PIPE
- PROPOSED DRAINAGE KERB INLET PIT
- PROPOSED DRAINAGE SURFACE INLET PIT
- PROPOSED DRAINAGE GROSS POLLUTANT TRAP (GPT)
- PROPOSED DRAINAGE HEADWALL OUTLET
- PROPOSED NEW DRAINAGE LINE
- 4.1 DESIGN CONTOURS 0.1m INTERVAL
- 5.0 NATURAL SURFACE CONTOURS 0.5m INTERVAL
- 7.64 PAVEMENT SPOT HEIGHT FINISHED LEVEL

CES	'CONCRETE EDGE' STRIP REFER TO LMCC SD EGSD-101
KO	KERB ONLY - TYPE 'SM' REFER TO LMCC SD EGSD-101
SB	DISHED CROSSING 'SB' REFER TO LMCC SD EGSD-101
K&G	STANDARD KERB & GUTTER REFER TO LMCC SD EGSD-101

5 0 5 10
Horizontal Scale 1:200 (A1)
1:400 (A3)

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CLIENT
BUPA CARE SERVICES

TITLE
GENERAL ARRANGEMENT PLAN
SHEET 1 OF 2

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C03	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

CONSTRUCT PEDESTRIAN BRIDGE OVER OPEN CHANNEL TO ARCHITECTS DETAILS

CONSTRUCT 1.2m WIDE CONCRETE PATH TO EXISTING LEVELS OFFSET 0.2m MIN FROM EXISTING BOUNDARY FENCES

CONSTRUCT PEDESTRIAN BRIDGE OVER OPEN CHANNEL TO ARCHITECTS DETAILS

INFILTRATION TRENCH, REFER TO DRAINAGE PLAN FOR DETAILS

INFILTRATION TRENCH, REFER TO DRAINAGE PLAN FOR DETAILS

CONSTRUCT 1.2m WIDE CONCRETE PATH TO EXISTING LEVELS OFFSET 0.2m MIN FROM EXISTING BOUNDARY FENCES

20m SETBACK FROM TOP OF CREEK BANK (EDGE OF RIPARIAN ZONE)

BURIED OSD TANK SYSTEM, REFER TO SHEET C05 FOR DETAILS

CLEAN OUT EXISTING OPEN CHANNEL & MAINTAIN PROFILE FROM EXISTING HEADWALL TO SOUTH CREEK, PROVIDE SCOUR PROTECTION MEASURES AT CREEK JUNCTION, REFER ALSO TO DRAINAGE PLAN FOR DETAILS

DISCHARGE STORMWATER TO EXISTING OPEN CHANNEL SYSTEM HEADWALL OUTLET IL=2.3

SOUTH CREEK

SWH

M.G.A.

LEGEND

- SITE BOUNDARY
- PROPOSED RETAINING WALL
- 100 YR FLOOD EXTENTS
- RIPARIAN ZONE SETBACK LINE
- NEW PAVEMENT - ASPHALT
- NEW PAVEMENT - CONCRETE
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- 4.1 DESIGN CONTOURS 0.1m INTERVAL
- 5.0 NATURAL SURFACE CONTOURS 0.5m INTERVAL

5 0 5 10
Horizontal Scale 1:200 (A1)
1:400 (A3)

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CLIENT
BUPA CARE SERVICES

TITLE
GENERAL ARRANGEMENT PLAN
SHEET 2 OF 2

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

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AS SHOWN	16-152	C04	04

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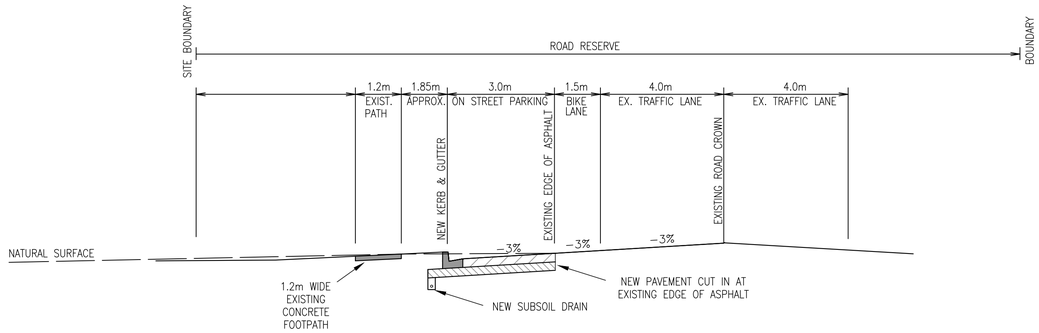
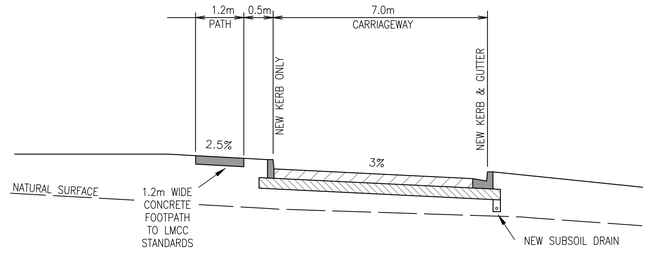


TYPICAL SECTION WARNERS BAY ROAD CH 60.000
(WIDENING FOR ON STREET PARKING)

SCALE 1:100 HOR
1:50 VERT



TYPICAL SECTION SITE ENTRY RAMP CH 20.000

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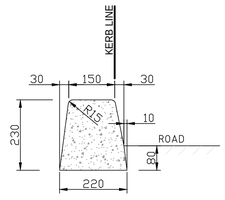
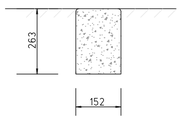
1:50 VERT



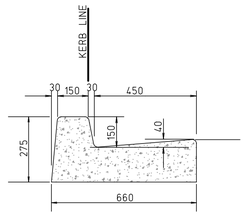
ENTRY ROAD BARRIER KERB

N.T.S



CARPARK CONCRETE EDGE STRIP

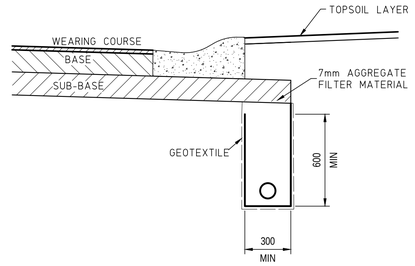
N.T.S



STANDARD KERB & GUTTER

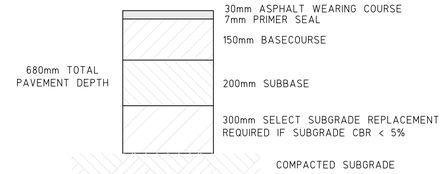
N.T.S

KERB NOTES:
1. ALL EXPOSED EDGES TO BE ROUNDED TO 20mm RADIUS
2. ALL DIMENSIONS ARE IN MILLIMETRES
3. ALL KERBS TO BE CONSTRUCTED WITH 20MPa CONCRETE UNLESS OTHERWISE NOTED



SUBSOIL DRAINAGE DETAIL

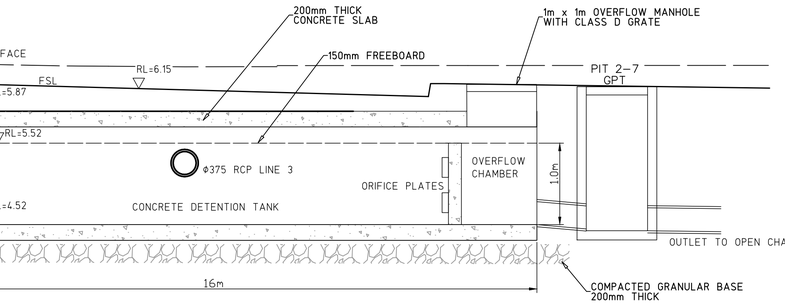
N.T.S



PAVEMENT DETAILS/NOTES:
PAVEMENT DESIGN TO BE FINALISED PRIOR TO CONSTRUCTION BASED ON SITE SUBGRADE CBR RESULTS BY A NATA ACCREDITED GEOTECHNICAL ENGINEER, PAVEMENT DESIGN TO BE APPROVED BY LAKE MACQUARIE CITY COUNCIL.

PAVEMENT THICKNESS ROAD WIDENING & CARPARK - FLEXIBLE (PRELIMINARY ONLY)

N.T.S

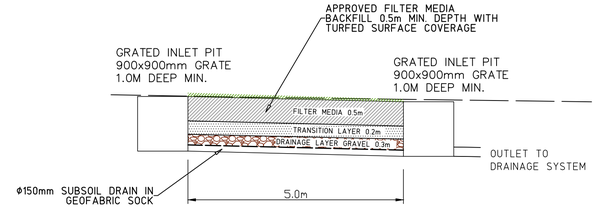


× CONCRETE DETENTION TANK

× ADJACENT CONCRETE RAINWATER RE-USE TANK

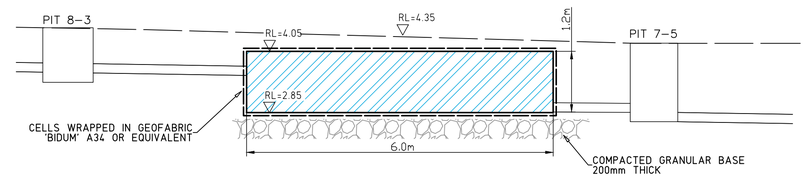
DETENTION TANK 2-6 (MAIN CARPARK)

SCALE 1:50 NAT.



BIO-FILTRATION TRENCH IN MAIN COURTYARD

SCALE 1:50 NAT.



DETENTION TANK - 'ATLANTIS CELL' OR EQUIVALENT
6.0m LONG x 3.1m WIDE x 1.2m DEEP = 22,000Ltr STORAGE CAPACITY

DETENTION TANK 8-4 (SOUTH OF MAIN STRUCTURE)

SCALE 1:50 NAT.

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03	ISSUED FOR CO-ORDINATION	27.06.2016
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CLIENT
BUPA CARE SERVICES

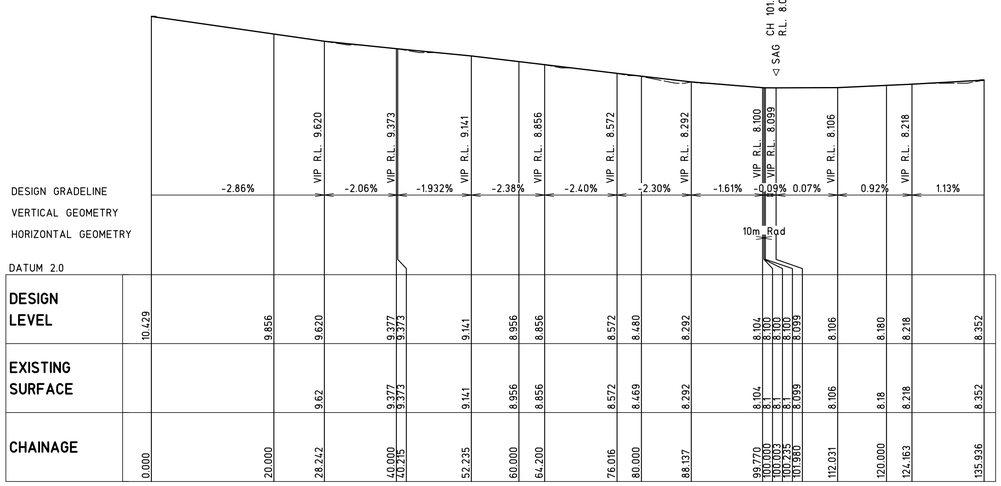
TITLE
TYPICAL SECTIONS & DETAILS

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

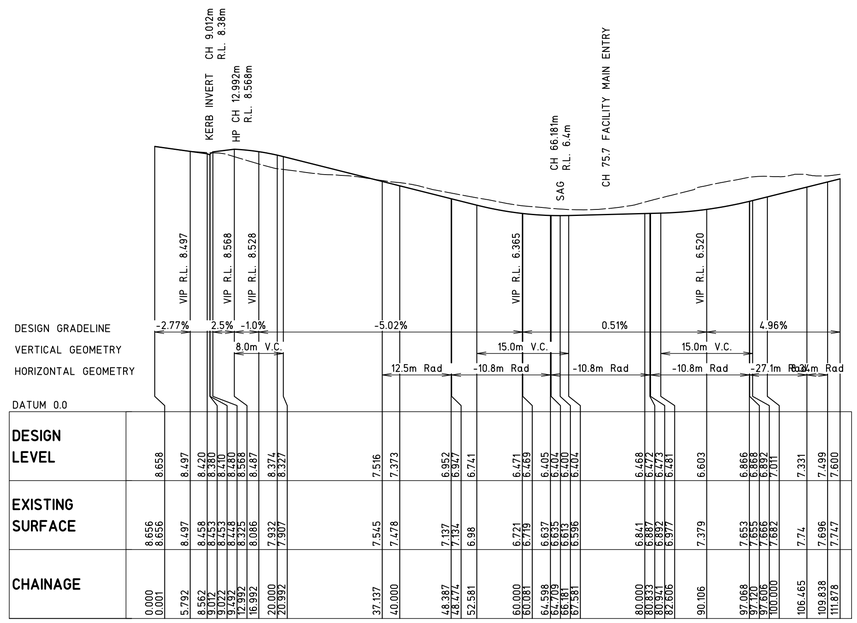
DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C05	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



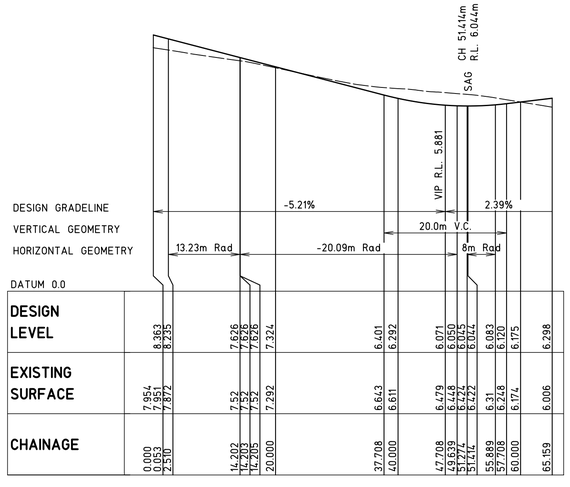
LONGITUDINAL SECTION - WARNERS BAY ROAD CONTROL LINE (EXISTING SURFACE)

Horizontal scale 1:500
Vertical scale 1:100



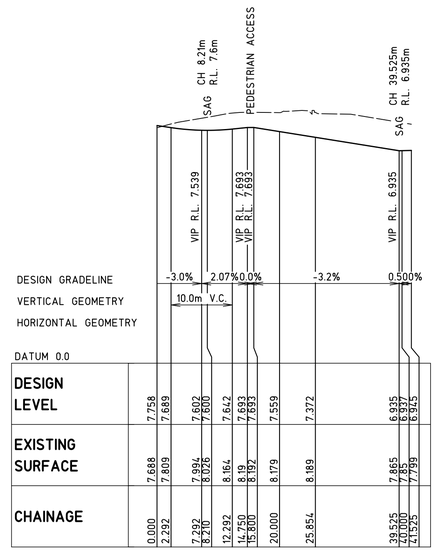
LONGITUDINAL SECTION - SITE ENTRY RAMP & TURN AROUND CENTRELINE

Horizontal scale 1:500
Vertical scale 1:100



LONGITUDINAL SECTION - CARPARK CENTRELINE (WEST)

Horizontal scale 1:500
Vertical scale 1:100



LONGITUDINAL SECTION - CARPARK CENTRELINE (EAST)

Horizontal scale 1:500
Vertical scale 1:100

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CLIENT
BUPA CARE SERVICES

TITLE
ROAD LONGITUDINAL SECTIONS & KERB RETURN PROFILES

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C06	04

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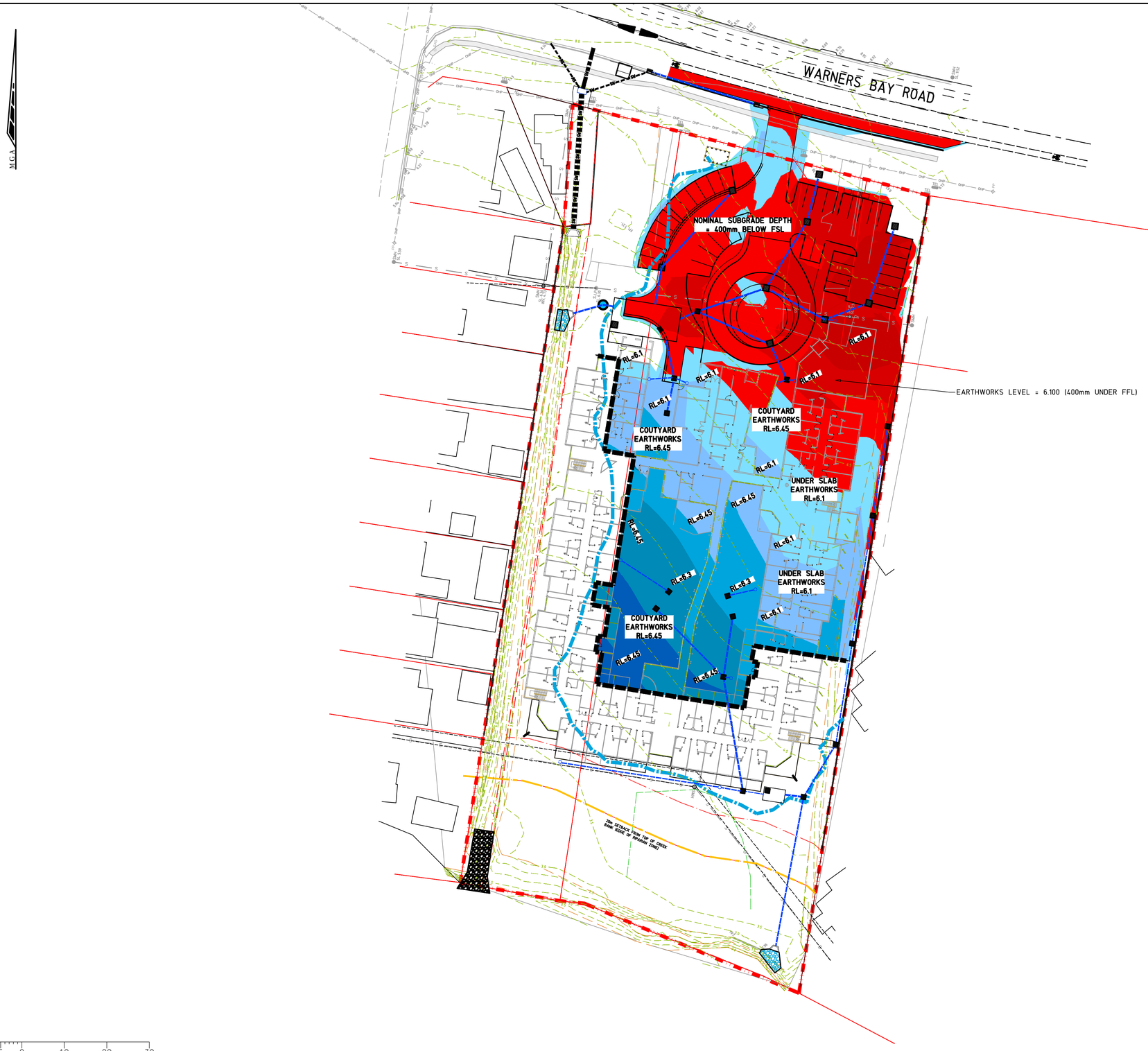

10 5 0 10 20 30
Horizontal Scale 1:500 (A1)
1:1000 (A3)

PRELIMINARY EARTHWORKS QUANTITIES FROM NOMINAL STRIPPED SURFACE TO DESIGN EARTHWORKS PADS & NOMINAL PAVEMENT SUBGRADE LEVEL

TOPSOIL STRIPPING = 1,550m^3 (NOMINAL 200mm STRIP DEPTH CUT TO STOCKPILE)
TOTAL CUT FROM STRIPPED SURFACE = 1,690m^3
TOTAL FILL FROM STRIPPED SURFACE = 3,985m^3
BALANCE = 2,295m^3 SHORTFALL

NOTE: NOMINAL PAVEMENT DEPTH 400mm SUBJECT TO FINAL PAVEMENT DESIGN & COUNCIL APPROVAL.

LEGEND
EARTHWORKS CUT / FILL DEPTH RANGES

- CUT 1.5 - 1.0m DEPTH
- CUT 0.5 - 1.0m DEPTH
- CUT 0.0 - 0.5m DEPTH
- FILL 0.0 - 0.5 DEPTH
- FILL 0.5 - 1.0m DEPTH
- FILL 1.0 - 1.5m DEPTH
- FILL 1.5 - 2.0m DEPTH
- FILL 2.0 - 2.5m DEPTH

LEGEND

- SITE BOUNDARY
- PROPOSED RETAINING WALL
- 100 YR FLOOD LEVEL EXTENTS
- PROPOSED STORMWATER DRAINAGE
- NATURAL SURFACE CONTOURS 0.5m INTERVAL

PLANS TO BE PRINTED IN COLOUR

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CLIENT
BUPA CARE SERVICES

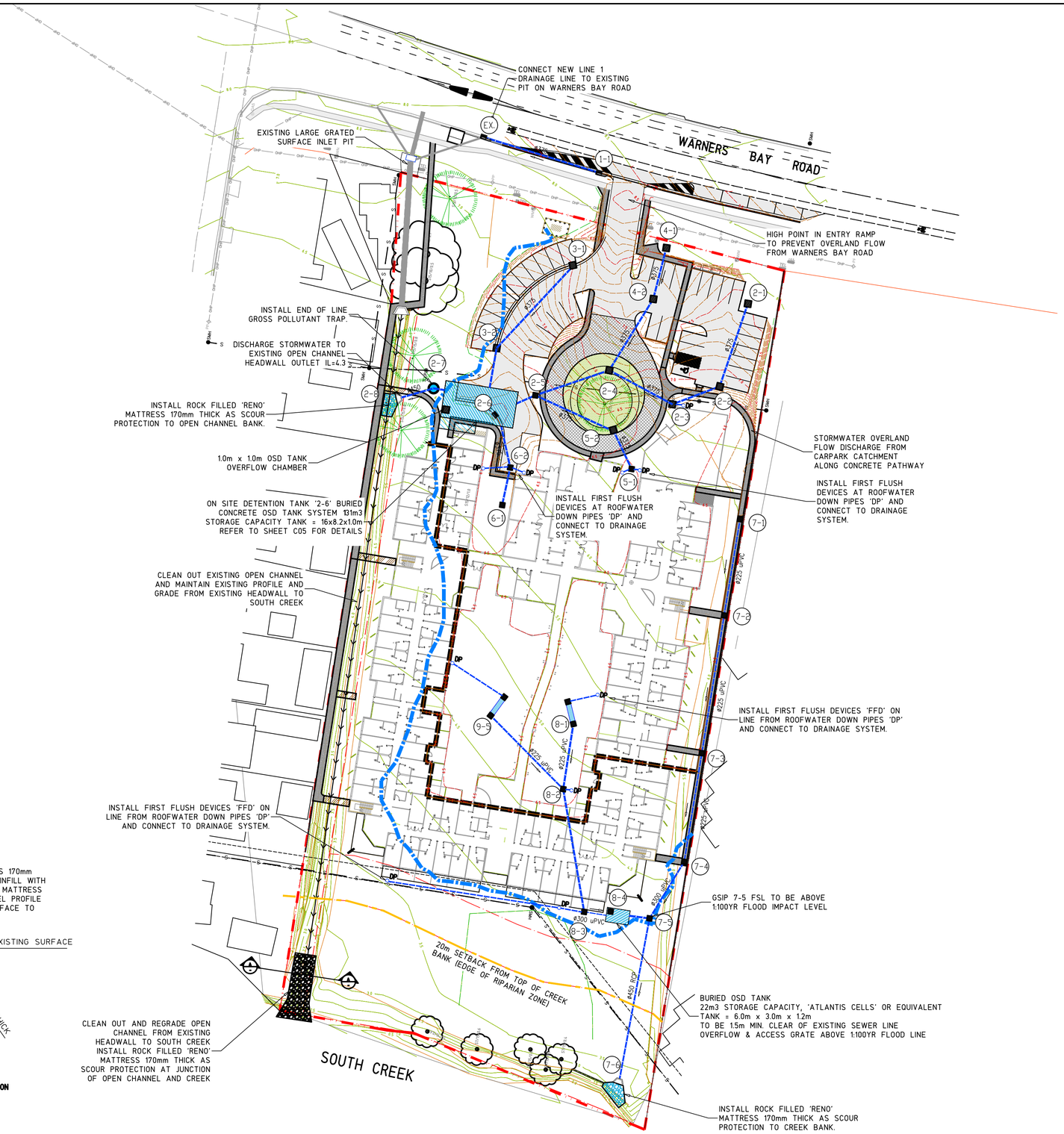
TITLE
SITE EARTHWORKS PLAN

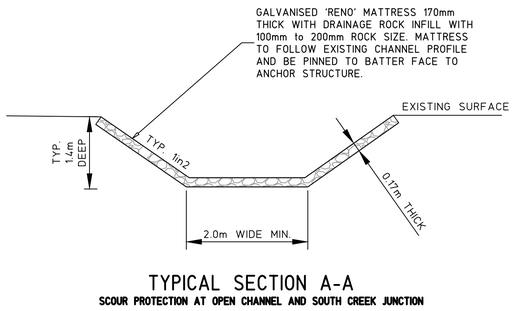
PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C07	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm





TYPICAL SECTION A-A
SCOUR PROTECTION AT OPEN CHANNEL AND SOUTH CREEK JUNCTION

LEGEND

- SITE BOUNDARY
- PROPOSED RETAINING WALL
- 100 YR FLOOD EXTENTS
- RIPARIAN ZONE SETBACK LINE
- NEW PAVEMENT - ASPHALT
- NEW PAVEMENT - CONCRETE
- NEW CONCRETE FOOTPATH
- EXISTING CONCRETE FOOTPATH
- FIRST FLUSH DEVICE FROM ROOFWATER DOWN PIPE
- ROOFWATER DOWN PIPE
- PROPOSED DRAINAGE KERB INLET PIT
- PROPOSED DRAINAGE SURFACE INLET PIT
- PROPOSED DRAINAGE GROSS POLLUTANT TRAP (GPT)
- PROPOSED DRAINAGE HEADWALL OUTLET
- PROPOSED NEW DRAINAGE LINE
- 4.1 DESIGN CONTOURS 0.1m INTERVAL
- 5.0 NATURAL SURFACE CONTOURS 0.5m INTERVAL

10 5 0 10 20 30
Horizontal Scale 1:500 (A1)
1:1000 (A3)

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CLIENT
BUPA CARE SERVICES

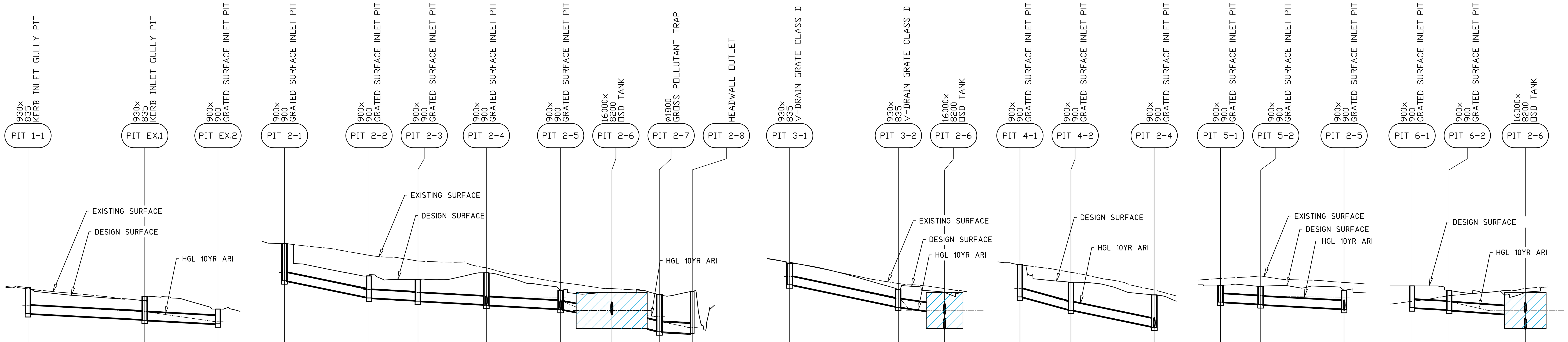
TITLE
STORMWATER DRAINAGE PLAN

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C08	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



LINE 1

	PIT 1-1		PIT EX.1		PIT EX.2
Coordinates	E: 374065.85 N: 6349781.947		E: 374025.642 N: 6349794.235		
Flow (L/s)		25.7		33.3	
Velocity (m/s)		0.2		0.3	
Pipe Size/Type		Ø375 RCP		Ø375 RCP	
Grade (%)		1.00%		1.00%	
Datum	-6.000				
Depth To Invert	1.194		1.046 / 1.076		0.670
HGL Levels	7.569		7.284 / 7.275		6.831 / 6.831
Invert Levels	7.194		6.930 / 6.900		6.734 / 6.734
Finished Surface (Natural Surface)	8.388 (8.317)		7.976 (7.781)		7.404
Chainage	0.000	26.426	26.426	16.563	42.989

LINE 2

	PIT 2-1		PIT 2-2		PIT 2-3		PIT 2-4		PIT 2-5		PIT 2-6		PIT 2-7		PIT 2-8
Coordinates	E: 374083.46 N: 6349757.817		E: 374077.288 N: 6349739.718		E: 374066.94 N: 6349735.824		E: 374053.063 N: 6349741.692		E: 374036.979 N: 6349737.789		E: 374025.386 N: 6349738.136		E: 374014.717 N: 6349739.311		E: 374007.552 N: 6349737.236
Flow (L/s)		11.2		26.4		35.9		69.6		149.1		241.7		240.4	
Velocity (m/s)		0.1		0.2		0.3		0.6		1.4		1.5		1.5	
Pipe Size/Type		Ø375 RCP		Ø375 RCP		Ø375 RCP		Ø375 RCP		Ø375 RCP		Ø450 RCP		Ø450 RCP	
Grade (%)		3.90%		1.00%		1.00%		1.00%		1.00%		1.00%		1.00%	
Datum	-8.000														
Depth To Invert	1.688		0.967 / 0.997		0.945 / 0.975		1.434 / 1.464		0.839 / 0.869		0.890 / 1.634		1.643 / 1.683		1.911
HGL Levels	7.056		6.286 / 6.280		6.150 / 6.139		5.998 / 5.958		5.942 / 5.756		5.486 / 5.103		5.058 / 4.825		4.564 / 4.564
Invert Levels	6.681		5.935 / 5.905		5.794 / 5.764		5.609 / 5.579		5.411 / 5.381		5.265 / 4.522		4.414 / 4.375		4.300 / 4.300
Finished Surface (Natural Surface)	8.369		6.902 (7.835)		6.739 (7.576)		7.043 (7.268)		6.250 (6.608)		6.155 (6.330)		6.057		6.211
Chainage	0.000	19.122	19.122	11.056	30.178	15.502	45.681	16.793	62.474	11.598	74.072	10.733	84.806	7.460	92.266

LINE 3

	PIT 3-1		PIT 3-2		PIT 2-6
Coordinates	E: 374045.173 N: 6349766.217		E: 374028.521 N: 6349748.114		E: 374025.386 N: 6349738.136
Flow (L/s)		6.5		23.6	
Velocity (m/s)		0.1		0.2	
Pipe Size/Type		Ø375 RCP		Ø375 RCP	
Grade (%)		4.00%		1.61%	
Datum	-8.000				
Depth To Invert	0.970		0.768 / 0.798		0.839 / 1.634
HGL Levels	6.874		5.865 / 5.860		5.389 / 5.097
Invert Levels	6.499		5.515 / 5.485		5.316 / 4.522
Finished Surface (Natural Surface)	7.469 (7.519)		6.283 (6.558)		6.155 (6.330)
Chainage	0.000	24.596	24.596	10.459	35.056

LINE 4

	PIT 4-1		PIT 4-2		PIT 2-4
Coordinates	E: 374065.605 N: 6349770.014		E: 374062.749 N: 6349758.846		E: 374053.063 N: 6349741.692
Flow (L/s)		11.5		18.3	
Velocity (m/s)		0.1		0.2	
Pipe Size/Type		Ø375 RCP		Ø375 RCP	
Grade (%)		5.00%		3.91%	
Datum	-7.000				
Depth To Invert	1.455		1.241 / 1.271		1.434 / 1.464
HGL Levels	7.328		6.724 / 6.721		5.998 / 5.958
Invert Levels	6.953		6.376 / 6.346		5.609 / 5.579
Finished Surface (Natural Surface)	8.408		7.618 (8.065)		7.043 (7.268)
Chainage	0.000	11.527	11.527	18.849	30.376

LINE 5

	PIT 5-1		PIT 5-2		PIT 2-5
Coordinates	E: 374058.01 N: 6349721.691		E: 374051.052 N: 6349731.619		E: 374036.979 N: 6349737.789
Flow (L/s)		60.4		71.9	
Velocity (m/s)		0.5		0.7	
Pipe Size/Type		Ø375 RCP		Ø375 RCP	
Grade (%)		1.00%		1.00%	
Datum	-8.000				
Depth To Invert	0.762		0.803 / 0.833		0.839 / 0.869
HGL Levels	6.096		6.018 / 5.975		5.942 / 5.756
Invert Levels	5.721		5.630 / 5.600		5.411 / 5.381
Finished Surface (Natural Surface)	6.482 (6.786)		6.433 (6.901)		6.250 (6.608)
Chainage	0.000	9.095	9.095	18.868	27.963

LINE 6

	PIT 6-1		PIT 6-2		PIT 2-6
Coordinates	E: 374029.748 N: 6349713.803		E: 374031.482 N: 6349722.013		E: 374025.386 N: 6349738.136
Flow (L/s)		55.5		56.1	
Velocity (m/s)		0.5		0.5	
Pipe Size/Type		Ø375 RCP		Ø375 RCP	
Grade (%)		1.00%		1.00%	
Datum	-8.000				
Depth To Invert	0.988		0.866 / 0.896		0.980 / 1.634
HGL Levels	5.837		5.749 / 5.723		5.328 / 5.097
Invert Levels	5.462		5.378 / 5.348		5.175 / 4.522
Finished Surface (Natural Surface)	6.450 (5.756)		6.244 (6.011)		6.155 (6.330)
Chainage	0.000	8.391	8.391	17.237	25.628

SCALE: Horizontal 1:500
Vertical 1:100

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CLIENT
BUPA CARE SERVICES

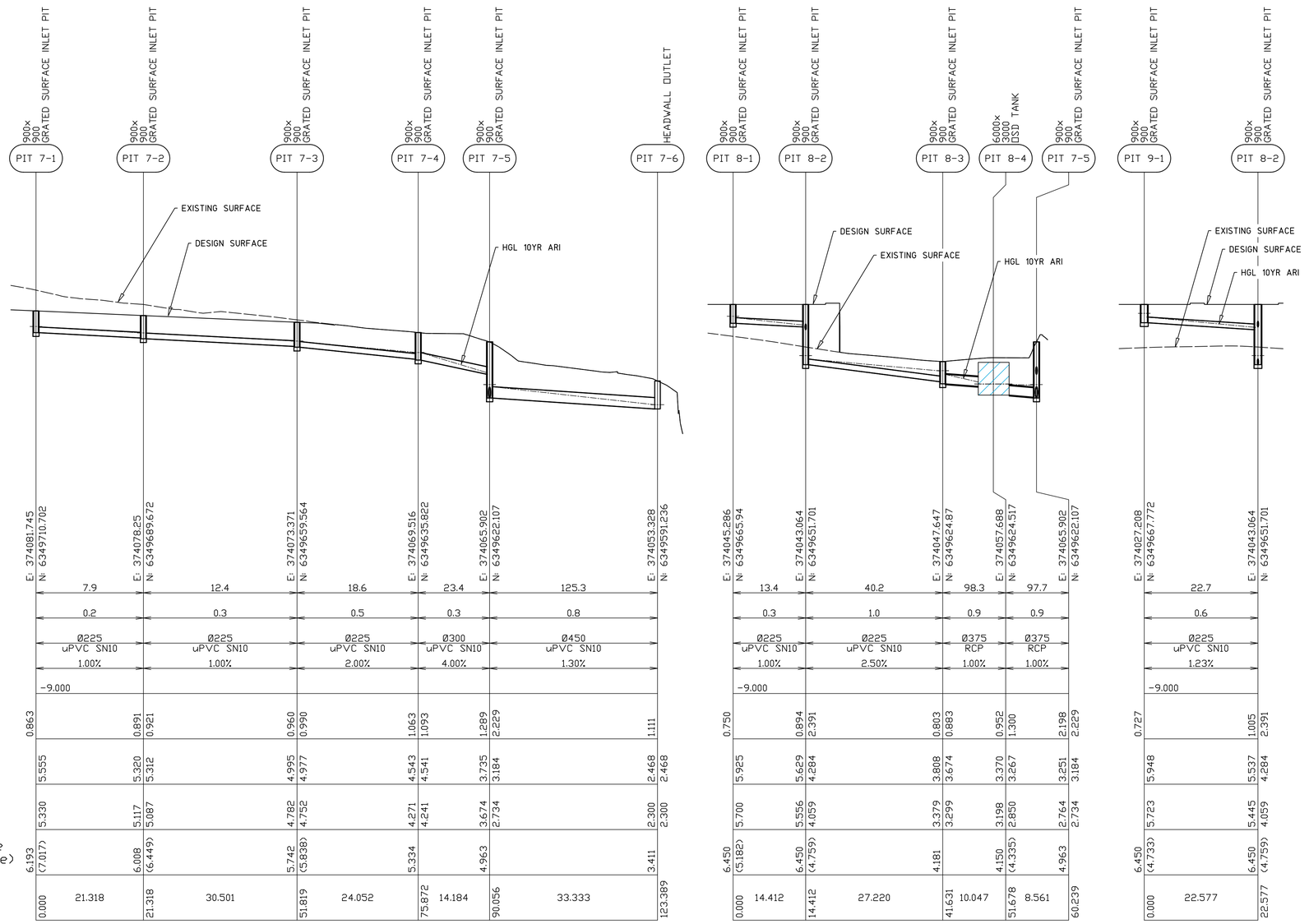
TITLE
STORMWATER LONGITUDINAL SECTIONS
SHEET 1 OF 2

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C09	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



SCALE: Horizontal 1:500
Vertical 1:100

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CLIENT: BUPA CARE SERVICES

TITLE: STORMWATER LONGITUDINAL SECTIONS SHEET 2 OF 2

PROJECT: 64 WARNERS BAY ROAD WARNERS BAY, NSW LOT 1, 2, 3 & 4 DP 515512 & LOT 11 DP 656806

DO NOT SCALE DRAWING

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TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C10	04

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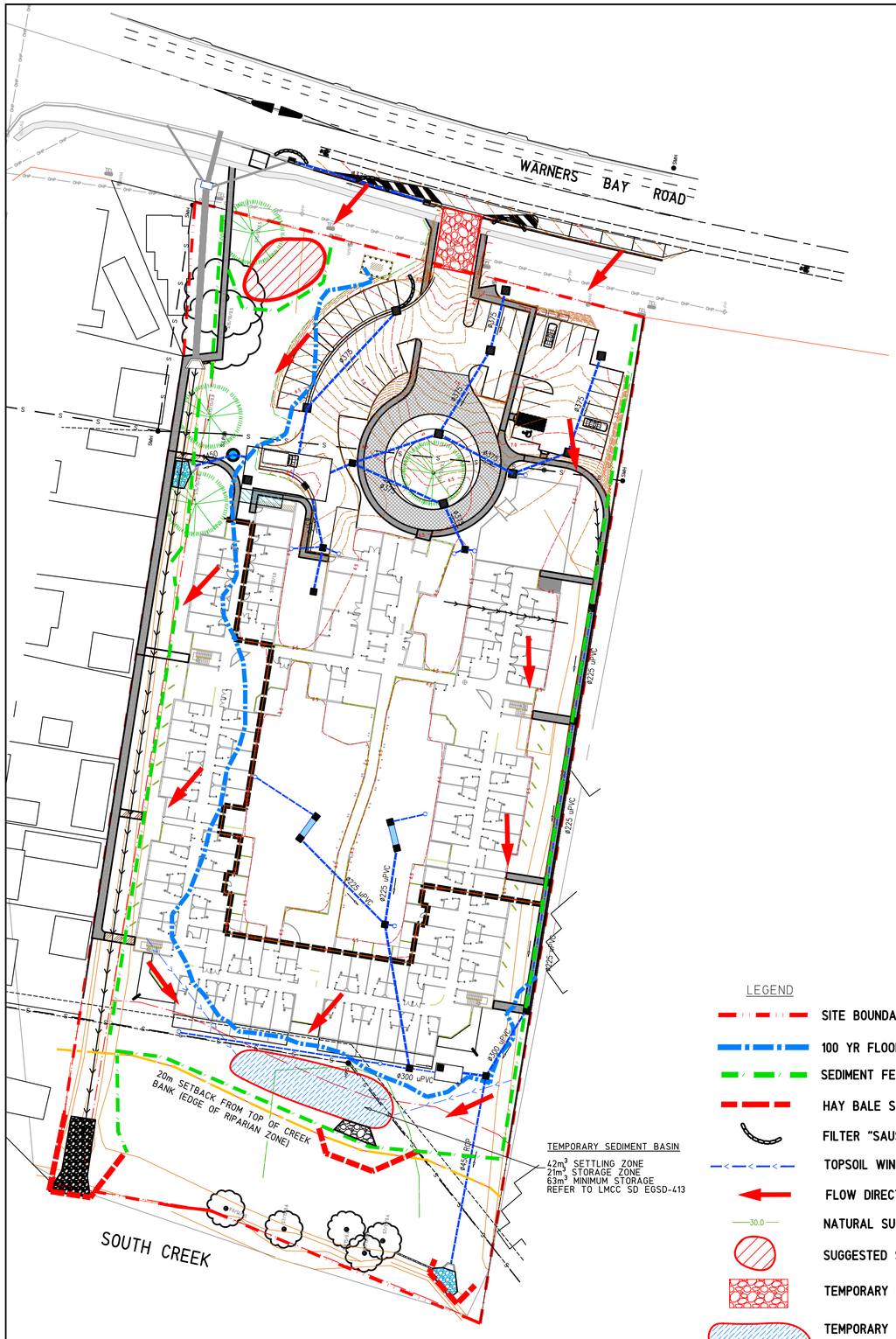


GENERAL REHABILITATION NOTES:

1. REHABILITATION SHALL BE UNDERTAKEN AS SOON AS POSSIBLE AFTER COMPLETION OF LAND SHAPING AND PREFERABLY WITHIN 7 DAYS.
2. BEFORE PLACING TOPSOIL, THE SURFACE SHALL BE SCARIFIED ALONG THE CONTOUR TO PROVIDE KEYING FOR TOPSOIL.
3. REHABILITATION AREAS WILL BE REGULARLY MAINTAINED UNTIL EFFECTIVE COVER HAS PROPERLY ESTABLISHED. THIS WILL INCLUDE REGULAR WATERING, FERTILISING, WEED CONTROL AND RE-SEEDING/SPRIGGING AS NECESSARY.
4. TEMPORARY SOIL CONSERVATION STRUCTURES SHALL REMAIN & BE REGULARLY MAINTAINED UNTIL ALL WORK HAS BEEN COMPLETED.
5. AS MUCH VEGETATION AS POSSIBLE SHOULD BE MAINTAINED DOWN SLOPE OF "SILT" FENCES AND BELOW DISCHARGE POINTS OF TEMPORARY DIVERSION DRAINS TO ACT AS FILTER STRIPS.
6. DISTURBED AREAS ARE TO BE REVEGETATED WITHIN 14 DAYS OF THE COMPLETION OF EARTHWORKS WITH THE FOLLOWING SEED AND FERTILISER

LAKE MACQUARIE SPECIAL BLEND
SPECIES
40% PERENNIAL RYEGRASS
8% ANNUAL RYEGRASS
40% UNHULLED COUCH GRASS
5% CHEWING FESCUE
7% WOOGENELLUP SUB CLOVER
RATE: 1kg SEED MIX PER 30m2

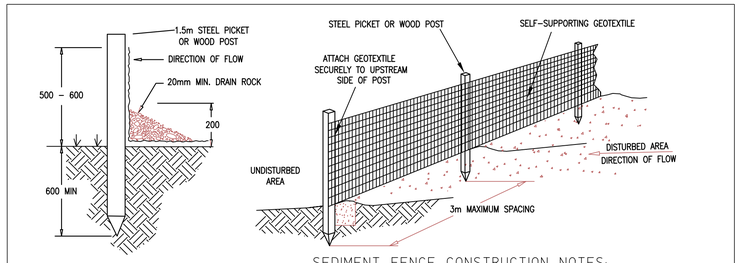
HYDRO SEEDING MIX
SUMMER
JAPANESE MILLET (Sept- March) 60kg/ha
RYECORN (Sept - March) 15kg/ha
UNHULLED COUCH GRASS 15kg/ha
HULLED COUCH GRASS 10kg/ha

HYDRO SEEDING MIX
WINTER
JAPANESE MILLET (April - Oct) 15kg/ha
RYECORN (April - Oct) 60kg/ha
UNHULLED COUCH GRASS 15kg/ha
HULLED COUCH GRASS 10kg/ha

FERTILISER: DYNAMIC LIFTER OR EQUIV. - 600kg/ha
FIBRE PULP - 400kg/ha
NON-REWETTABLE BINDER - TO STOP RAIN WASHING SEED MIX AWAY

EROSION & SEDIMENT CONTROL NOTES:

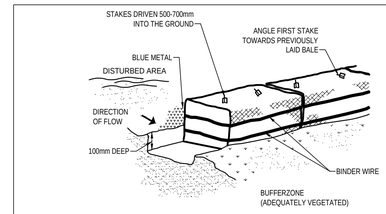
1. SOIL STOCKPILES TO BE NO HIGHER THAN 2.0 METRES (1.0m PREFERABLE) IN LOCATIONS DIRECTED BY THE SUPERINTENDENT.
2. CONSTRUCT SEDIMENT FENCE AT LOCATIONS SHOWN AND AS DIRECTED BY SITE SUPERINTENDENT. SEDIMENT FENCE OR EQUIVALENT TO BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH LMCC ENGINEERING REQUIREMENTS.
3. UPON COMPLETION OF FINAL EARTHWORKS OR AFTER WRITTEN DIRECTION OF COUNCIL, IMMEDIATE SOIL CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF IN 14 DAYS.
4. ALL PERIMETER AND SILTATION CONTROL MEASURES ARE TO BE THE FIRST STEP IN CLEARING OR EARTHWORKS.
6. SEDIMENTATION BASIN TO BE FLOCCULATED AND PUMPED OUT AFTER EVERY STORM EVENT. ALL FLOCCULATED SEDIMENT TO BE REMOVED FROM THE BASIN AT THE CONCLUSION OF THE CONTRACT PERIOD.
7. ALL TEMPORARY EARTH BERMS AND DIVERSION BANKS ARE TO BE TRACK ROLLED AND SEEDED OR MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
8. PROVIDE FILTER SAUSAGE KERB INLET SEDIMENT TRAPS OR EQUIVALENT (TO THE SATISFACTION OF THE SUPERINTENDENT) TO ALL CONSTRUCTED INLET PITS AND STORMWATER PIPING.
9. ALL TOPSOIL IS TO BE STOCKPILED ON SITE FOR RE-USE (AWAY FROM TREES AND DRAINAGE LINES). MEASURES SHALL BE APPLIED TO PREVENT EROSION FROM THE STOCKPILES.
10. SOIL/GRASS - TOPSOIL, 200mm THICK SHALL BE APPLIED TO ALL DISTURBED AREAS. ALL REMAINING EXPOSED TOPSOIL SHALL BE SEEDED IMMEDIATELY UPON COMPLETION OF THE SOIL SPREADING OPERATION.



DETAIL OF SEDIMENT FENCE
NOT TO SCALE

SEDIMENT FENCE CONSTRUCTION NOTES:

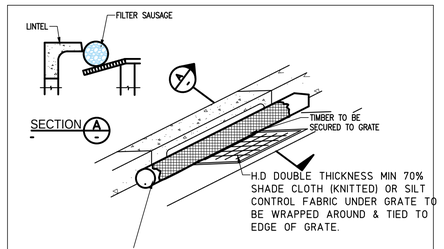
1. INSTALL SEDIMENT FENCE PARALLEL WITH SITE CONTOURS.
2. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH 150mm OVERLAP.
3. PLACE ON CONTOUR WITH SLIGHT CONVEX TO THE CONTOUR TO FORM A POND FOR WATER COLLECTION. EACH FENCE TO BE NO LONGER THAN 20m, SHOULD BE OVERLAPPING AND SHOULD NOT CAPTURE LARGE OR CONCENTRATED FLOWS.
4. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.



STRAW BALE BARRIERS

CONSTRUCTION NOTES STRAW BALE:

1. INSTALL BALES PARALLEL WITH SITE CONTOURS OR AT THE TOE OF A SLOPE.
2. BALES TO BE PLACED IN A ROW WITH THE ENDS TIGHTLY ABUTTING. USE STRAW TO FILL ANY GAPS BETWEEN BALES.
3. EMBED BALES TO PREVENT FLOW UNDER BALES.

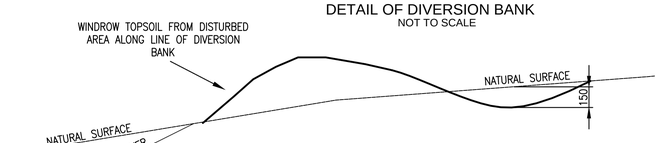


150mm FILTER SAUSAGE IN H.D. DOUBLE THICKNESS MIN 70% SHADE CLOTH (KNITTED) OR SILT CONTROL FABRIC WITH SMALL AMOUNT OF 10mm BLUE METAL ON ONE SIDE TO SUIT VARIABLE GAP ADJACENT TO THE LINTEL& GRATE

NOTE:
ENSURE CONSTANT MAINTENANCE BE CARRIED OUT - FABRIC TO BE CLEANED/REPLACED ETC IMMEDIATELY AFTER RAIN. THE ROADWAY MUST ALSO BE SWEPT REGULARLY, PREFERABLY EACH DAY.

KERB INLET CONTROL - FILTER SAUSAGE

DETAIL OF DIVERSION BANK
NOT TO SCALE



DIVERSION BANK CONSTRUCTION NOTES:

1. INSTALL DIVERSION BANK PARALLEL WITH SITE CONTOURS
2. CONSTRUCT WITH LONGITUDINAL GRADIENT OF BETWEEN 1-5%
3. AVOID DISTURBING EXISTING TREES AND SHRUBS IF POSSIBLE, AND INSTALL IN POSITIONS SHOWN ON THESE PLANS
4. DIVERSION BANK TO BE OF PARABOLIC OR, TRAPEZOIDAL SHAPE AND NOT V-SHAPED
5. INSPECT AND REPAIR DIVERSION BANK AFTER EACH STORM EVENT.

LEGEND

- SITE BOUNDARY
- 100 YR FLOOD EXTENTS
- SEDIMENT FENCE
- HAY BALE SEDIMENT TRAP
- FILTER "SAUSAGE" BARRIERS
- TOPSOIL WINDROW / DIVERSION BANK
- FLOW DIRECTION
- NATURAL SURFACE CONTOURS 0.5m INTERVAL (30.0)
- SUGGESTED STOCKPILE SITE
- TEMPORARY CONSTRUCTION ENTRY / EXIT
- TEMPORARY SEDIMENT BASIN

10 5 0 10 20 30
Horizontal Scale 1:500 (A1)
1:1000 (A3)

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
04	RE-ISSUED FOR COUNCIL APPROVAL	30.06.2016
03	ISSUED FOR CO-ORDINATION	27.06.2016
02	RE-ISSUED FOR COUNCIL APPROVAL	28.01.2016
01	ISSUED FOR COUNCIL APPROVAL	13.01.2016
00	CONCEPT PLANS ISSUED FOR CLIENT REVIEW	19.10.2015

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CLIENT
BUPA CARE SERVICES

TITLE
EROSION & SEDIMENTATION CONTROL PLAN

PROJECT
64 WARNERS BAY ROAD
WARNERS BAY, NSW
LOT 1, 2, 3 & 4 DP 515512
& LOT 11 DP 656806

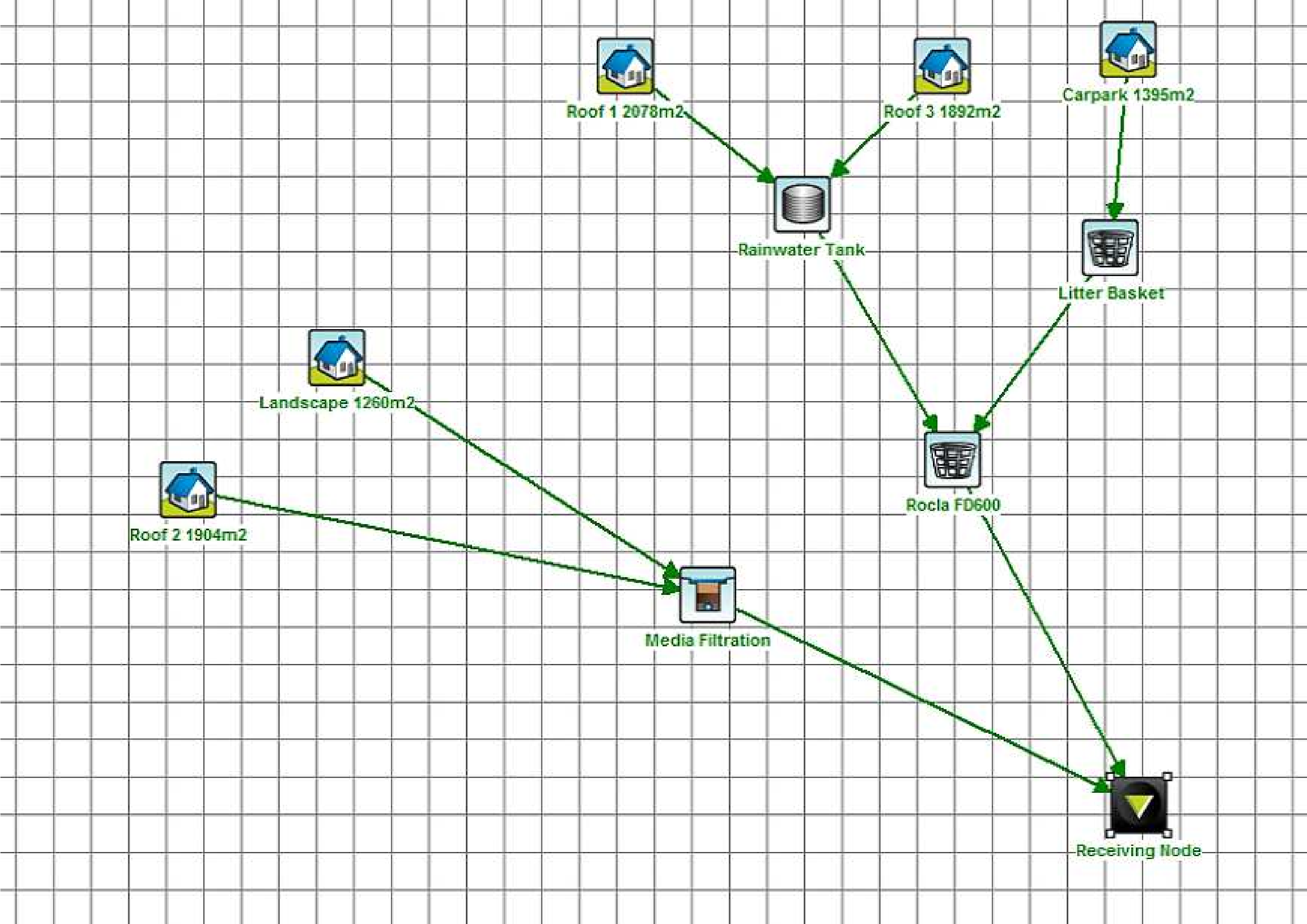
DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
TR	MS	11	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	16-152	C11	04

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

Appendix A

Water Quality Treatment Train


Roof 1 2078m2
Roof 3 1892m2
Carpark 1395m2
Rainwater Tank
Litter Basket
Landscape 1260m2
Roof 2 1904m2
Rocla FD600
Media Filtration
Receiving Node