7 References

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8 Appendices

8.1 Specific Site Descriptions [13]

Lot number represented:	Lot 1	**GPS reference:**	0759610	5874920
Slope position:	Gentle side slope		**Slope:**	**8 %**
Run-on, flooding:	low, none			
Exposure/aspect:	Moderate, east			
Erosion:	none			
Ground cover:	native bush			
Proximity to watercourses etc:	Wonboyn Lake approx 75 m to east			
Rock outcrop:	none			
Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**		
Layer 1	0 - 250	Grey sandy loam to clay loam, massive		
Layer 2	250 - 800	Orange brown sandy light clay, strongly pedal 800+ Bedrock		
Photo, comments				

13 Note that these specific site locations represented the originally proposed house sites. Bush fire issues have since changed the lot layout and so, in the case of Lots 1,2 and 3 these sites are not now the actual sites. However, the landscape is consistent enough for these descriptions to be representative.

Lot number represented:	Lots 1 and 2	**GPS reference:**	0759611	5874973
Slope position:	mid slope		**Slope:**	**8 %**
Run-on/ flooding:	low/none			
Exposure/aspect:	Moderate, east			
Erosion:	none			
Ground cover:	native vegetation			
Proximity to watercourses etc:	Wonboyn Lake about 75 - 100 m east			
Rock outcrop:	none			

Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**
Layer 1	0 - 250	Grey sandy loam to clay loam, massive
Layer 2	250 - 800	Orange brown sandy light clay, strongly pedal
Layer 3	800+	Bedrock

Photo, comments

Lot number represented:	Lot 2	**GPS reference:**	0759558	5875009
Slope position:	Gentle side slope		**Slope:**	**7 %**
Run-on, flooding:	low, none			
Exposure/aspect:	Moderate, east			
Erosion:	none			
Ground cover:	native bush			
Proximity to watercourses etc:	Wonboyn Lake approx 75 -100 m to east			
Rock outcrop:	none			

Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**
Layer 1	0 - 400	Grey sandy loam to clay loam, massive
Layer 2	400 - 800	Orange brown sandy light clay, moderately pedal
Layer 3	800+	Bedrock

Photo, comments

Lot number represented:	Lots 3 and 4	**GPS reference:**	0759746	5875235
Slope position:	Gentle side slope		**Slope:**	**5-6 %**
Run-on, flooding:	low, none			
Exposure/aspect:	Moderate to poor (dense vegetation), south			
Erosion:	none			
Ground cover:	native bush			
Proximity to watercourses etc:	Wonboyn Lake >100 m to south east			
Rock outcrop:	none			

Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**
Layer 1	0 - 250	Grey sandy loam to clay loam, massive
Layer 2	250 - 400	Yellow sandy loam, massive
Layer 3	400 - 600+	Yellow sandy clay loam, moderately pedal

Photo, comments

Lot number:	Lot 5	**GPS reference:**	0759803	5875623
Slope position:	Mid to lower side slope		**Slope:**	**20 %**
Run-on, flooding:	moderate to high, none			
Exposure/aspect:	Moderate to poor, east			
Erosion:	none			
Ground cover:	native bush			
Proximity to watercourses etc:	Wonboyn Lake approx 75 m to east. Propose that EMA be on higher lands near to entrance.			
Rock outcrop:	none			

Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**
Layer 1	0 - 250	Grey sandy loam to clay loam, massive
Layer 2	250 - 800	Orange brown sandy light clay, strongly pedal
Layer 3		Rock

Photo, comments

EMA will be on higher lands where less steep.

Lot number:	Lot 6	**GPS reference:**	0759760	5875683
Slope position:	Mid to lower side slope		**Slope:**	**15 %**
Run-on, flooding:	high, none			
Exposure/aspect:	poor, east			
Erosion:	none			
Ground cover:	native bush			
Proximity to watercourses etc:	Wonboyn Lake approx 75 m to east. Propose that EMA be on higher lands, near to entrance.			
Rock outcrop:	none			
Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**		
Layer 1		No Test Pit, EMA will be upslope on less steep land		
Layer 2				
Layer 3				
Photo, comments EMA will be on higher lands where less steep.				

Lot number:	Lot 7	**GPS reference:**	0759875	5875495
Slope position:	Gentle upper side slope		**Slope:**	**8 %**
Run-on, flooding:	low, none			
Exposure/aspect:	Moderate to poor, east			
Erosion:	none			
Ground cover:	native bush			
Proximity to watercourses etc:	Wonboyn Lake approx 100 m to east			
Rock outcrop:	none			

Soil profile:	**Depth**	**Colour, texture, pedality, mottles, fragments**
Layer 1	0 - 300	Grey sandy loam, massive
Layer 2	300 - 700	yellow brown sandy clay loam, moderately pedal
Layer 3	700 -800+	yellow brown sandy light clay

Photo, comments

8.2 Appendix 2: Universal MUSIC Calibration

Tables 7 and 8 present the calibrations for base flow and event mean concentrations of the various surfaces and land uses. These are derived from SCA, 2009.

Table 7 Base flow concentration calibrations used in MUSIC at this site

	TSS mean (log mean)	TSS std dev (log std dev)	TP mean (log mean)	TP std dev (log std dev)	TN mean (log mean)	TN std dev (log std dev)
Forest	6.03 (0.78)	1.35 (0.13)	0.70 (-1.52)	1.35 (0.13)	0.3 (-.52)	1.35 (0.13)
Roofs	0	0	0	0	0	0
Rural Residential	14.13 (1.15)	1.48 (0.17)	0.06 (-1.22)	1.55 (0.19)	0.89 (-0.52)	1.32 (0.12)
Road (sealed)	1.58 (1.2)	1.48 (0.17)	0.14 (-0.85)	1.55 (0.19)	1.3 (.11)	1.32 (0.12)
Road (unsealed)	1.58 (1.2)	1.48 (0.17)	0.14 (-0.85)	1.55 (0.19)	1.3 (.11)	1.32 (0.12)

Table 8 Stormflow concentration calibrations used in MUSIC at this site

	TSS mean (log mean)	TSS std dev (log std dev)	TP mean (log mean)	TP std dev (log std dev)	TN mean (log mean)	TN std dev (log std dev)
Forest	39.8 (1.6)	1.58 (0.2)	0.08 (-1.1)	1.66 (0.22)	0.89 (-.05)	1.74 (0.24)
Roofs	20 (1.3)	2.1 (0.320)	7.8 (-0.89)	1.8 (0.25)	1.78 (0.25)	1.55 (0.19)
Rural Residential	89 (1.95)	2.1 (0.32)	0.22 (-0.66)	1.8 (0.25)	2 (0.3)	1.55 (0.19)
Road (sealed)	269 (2.43)	2.1 (0.32)	0.5 (-0.30)	1.8 (0.25)	2.19 (0.34)	1.55 (0.19)
Road (unsealed)	1000 (3)	2.1 (0.32)	0.5 (-0.30)	1.8 (0.25)	2.19 (0.34)	1.55 (0.19)

The pervious area characteristics for each node are calibrated based on the observed soil properties according to the procedures in Macleod, 2008. Infiltration and groundwater properties are calibrated based on the observed soil properties according to the guidelines in SCA, 2009.

Table 9 Pervious area, infiltration and groundwater calibrations used in MUSIC

	0.9 m rooting depth (forest)	0.5 m rooting depth (cleared and re-vegetated land)
Soil storage capacity	190 mm	103 mm
Initial storage	30 mm	30 mm
Field capacity	146 mm	80 mm
Infiltration capacity coefficient	250	250
Infiltration capacity exponent	1.3	1.3
Groundwater initial depth	30 mm	30 mm
Daily recharge rate	60%	60%
Daily baseflow rate	45%	45%
Daily deep seepage rate	0%	0%

All treatment nodes use default MUSIC parameters, as changing these criteria is not recommended in the absence of alternative measurements. The mitre drains proposed on the power line track are modelled with a swale node per the requirements of SCA, 2009. We estimated there will be about 36 mitre drains installed.

8.3 Appendix 3 - Nutrient and Hydraulic Balances for Effluent Management Areas

Nutrient Balances

Application area: Un-managed (slashed)
Wastewater Volume 1000 (L/day)

Nitrogen Balance

A = (C x Q) / Lx

Where:

A = Land Area (m2)

C = Concentration of Nutrient = 35 mg/L

Q = Wastewater Flow = 1000 L/day

Lx = Critical Loading Rate = 25 (mg/m2/day)

A = 1400 m2

Phosphorus Loading

Step 1: P Sorption Calculation Is Lab Data Available ? Yes

P sorb	152 & 401	mg/kg	
Assumed Density	1500	kg/m3	
Thickness	250 & 650	mm	
Coarse Fragments	4	%	
Calculated P-sorb	4340	kg/ha	
Assumed P-sorb	1447	kg/ha	(insitu P-sorb assumed 33% of calculated P-sorb)

Step 2: Determine the required area to sorb phorphorus (50 year design life) :

P absorbed	= 4340	x 0.33	(default 6000 if no lab data available)
	= 1447	kg/ha	
	= 0.14	kg/m2	

P uptake	= 3x50x365	
	= 54,750	mg/m2
	= 0.055	kg/m2

Determine the amount of phosphorus generated over that time:

Concentration of phosphorus = 12 mg/L

Phosphorus generated = Concentration x volume of wastewater = 219 kg

Irrigation Area = P generated / (P sorbed + P uptake) = 1097 m2

Irrigation Hydraulic Balance

Hydraulic Balance

Rainfall Station	Pambula	
Evaporation Station	Pambula	
Wastewater Load	1000	L/day
Design Irrigation Rate	35	mm/week
Land Area	320	sqm
Storage required:	0.00	cubic m

Month	Days in month	70th percentile rainfall mm	Evaporation (mm)	Crop Factor
Jan	31	105.2	187	0.8
Feb	28	97.8	153	0.8
Mar	31	108.3	127	0.8
Apr	30	83	78	0.8
May	31	66.3	50	0.7
Jun	30	77.5	36	0.6
Jul	31	58.8	41	0.6
Aug	31	61.1	58	0.6
Sep	30	70.8	79	0.7
Oct	31	73.8	114	0.8
Nov	30	92.6	143	0.8
Dec	31	85.3	176	0.8
			1242	

INPUTS

	70th percentile rainfall mm	Effluent Irrigation (mm)	Inputs (mm)
Jan	105.2	96.88	202.08
Feb	97.8	87.50	185.30
Mar	108.3	96.88	205.18
Apr	83	93.75	176.75
May	66.3	96.88	163.18
Jun	77.5	93.75	171.25
Jul	58.8	96.88	155.68
Aug	61.1	96.88	157.98
Sep	70.8	93.75	164.55
Oct	73.8	96.88	170.68
Nov	92.6	93.75	186.35
Dec	85.3	96.88	182.18

OUTPUTS

	Evapotranspiration (mm)	Percolation (mm)	Outputs (mm)	Storage (mm)
Jan	149.6	155.00	304.60	-102.53
Feb	122.4	140.00	262.40	-77.10
Mar	101.6	155.00	256.60	-51.43
Apr	62.4	150.00	212.40	-35.65
May	35	155.00	190.00	-26.83
Jun	21.6	150.00	171.60	-0.35
Jul	24.6	155.00	179.60	-23.93
Aug	34.8	155.00	189.80	-31.83
Sep	55.3	150.00	205.30	-40.75
Oct	91.2	155.00	246.20	-75.53
Nov	114.4	150.00	264.40	-78.05
Dec	140.8	155.00	295.80	-113.63

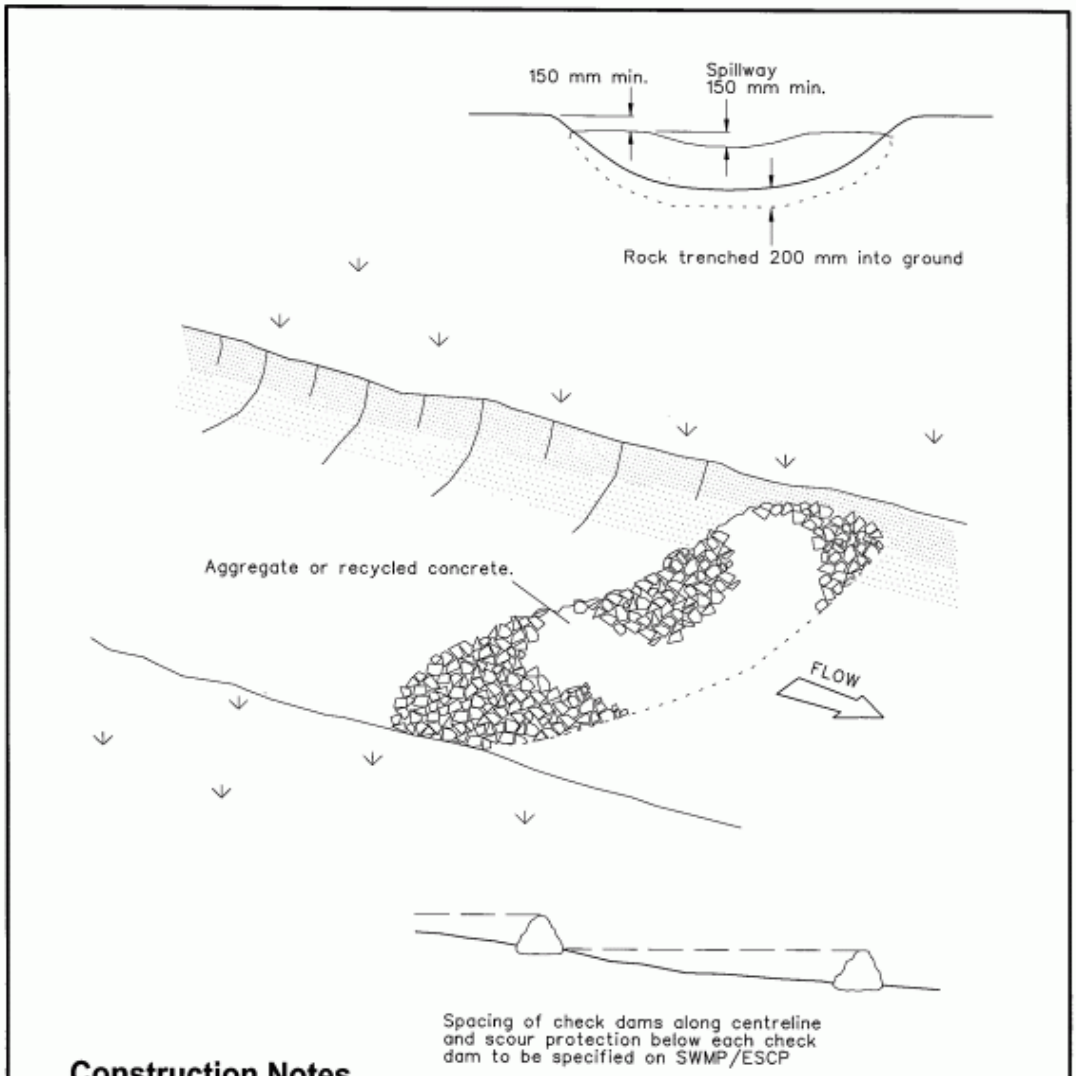
Hydraulic Balance for ETA beds

Depth of Stored Effluent for a Given Bed Area

Rainfall from Pambula Rainfall Station (70th %ile)

1	2	3	4	5	6	7	8	9	10
Month	Days in month	First trial Area (m^2)	Monthly applic-ation rate (mm)	Disposal rate per month (mm)	Net waste-water excess [4-5] (mm)	Increase in depth of stored effluent (mm)	Depth of effluent for previous month (mm)	Increase in depth of effluent (mm)	Computed depth of effluent [8+9] (mm)
Jan	31	135	229.6296	309.4	-79.7	-265.7	0.0	-265.7	0.0
Feb	28	135	207.4074	265.4	-58.0	-193.3	0.0	-193.3	0.0
Mar	31	135	229.6296	262.0	-32.4	-108.0	0.0	-108.0	0.0
Apr	30	135	222.2222	236.3	-14.0	-46.8	0.0	-46.8	0.0
May	31	135	229.6296	235.8	-6.1	-20.5	0.0	-20.5	0.0
Jun	30	135	222.2222	208.9	13.3	44.5	0.0	44.5	44.5
Jul	31	135	229.6296	234.7	-5.0	-16.7	44.5	-16.7	27.8
Aug	31	135	229.6296	245.7	-16.0	-53.5	27.8	-53.5	0.0
Sep	30	135	222.2222	246.2	-23.9	-79.8	0.0	-79.8	0.0
Oct	31	135	229.6296	278.2	-48.5	-161.7	0.0	-161.7	0.0
Nov	30	135	222.2222	277.8	-55.6	-185.3	0.0	-185.3	0.0
Dec	31	135	229.6296	316.0	-86.4	-288.0	0.0	-288.0	0.0

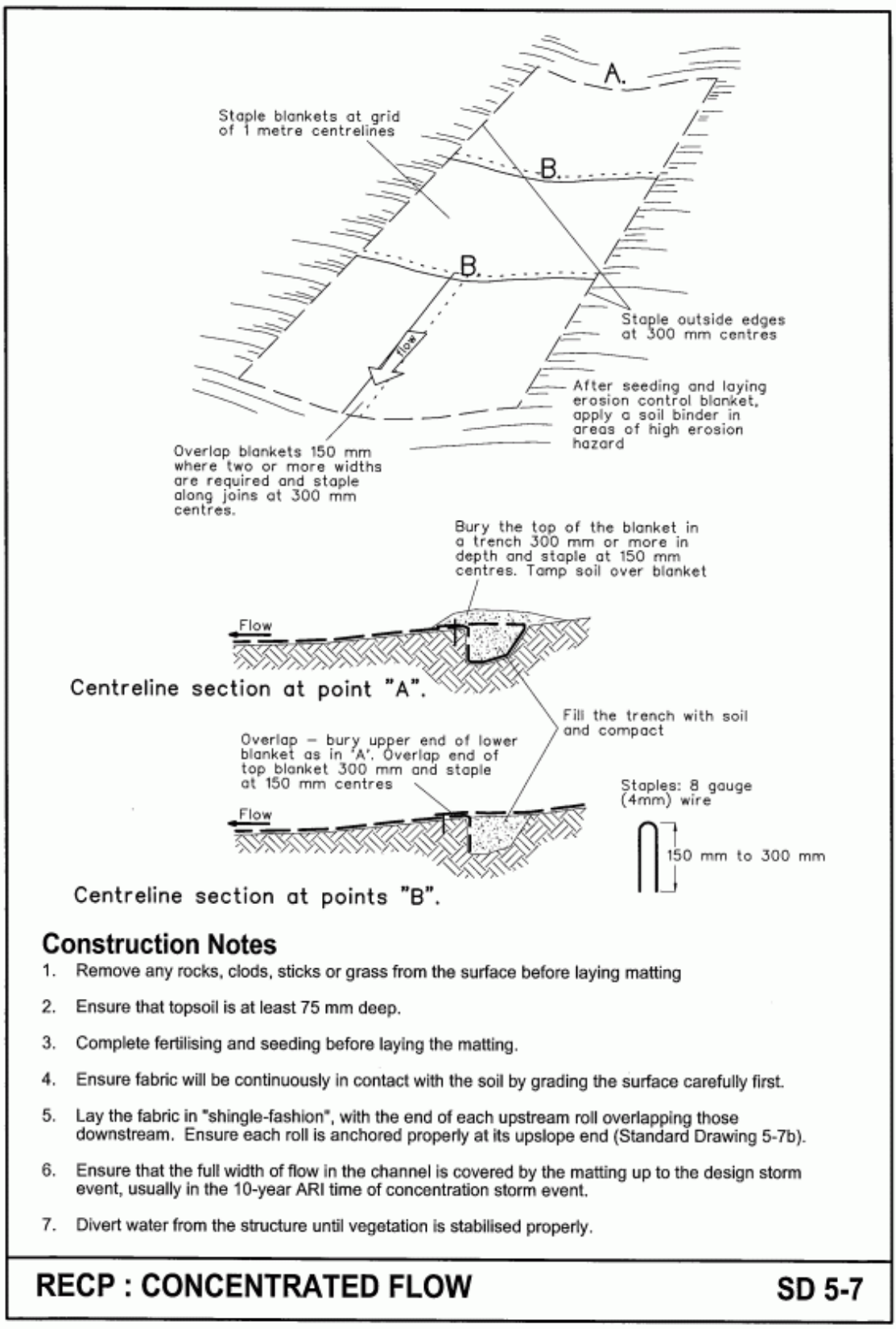
8.4 Appendix 4 Standard Drawings



Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

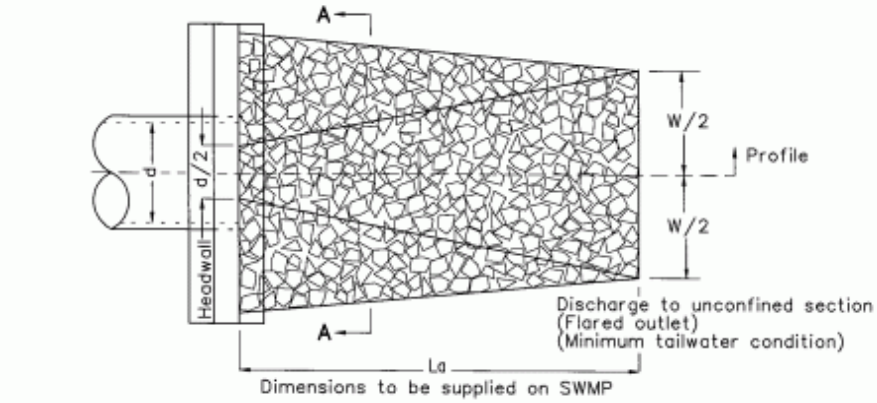
ROCK CHECK DAM **SD 5-4**



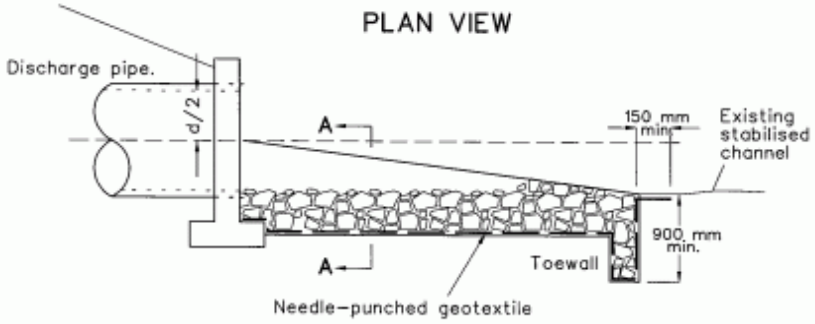
Construction Notes

1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end (Standard Drawing 5-7b).
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.

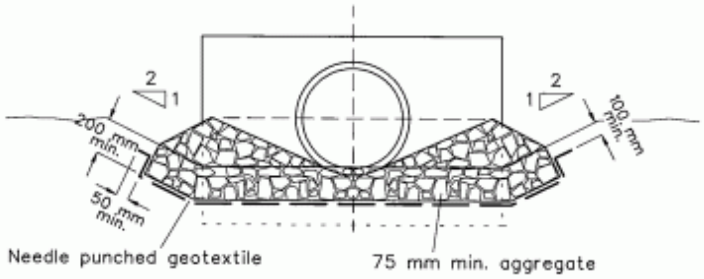
RECP : CONCENTRATED FLOW **SD 5-7**



PLAN VIEW



PLAN VIEW



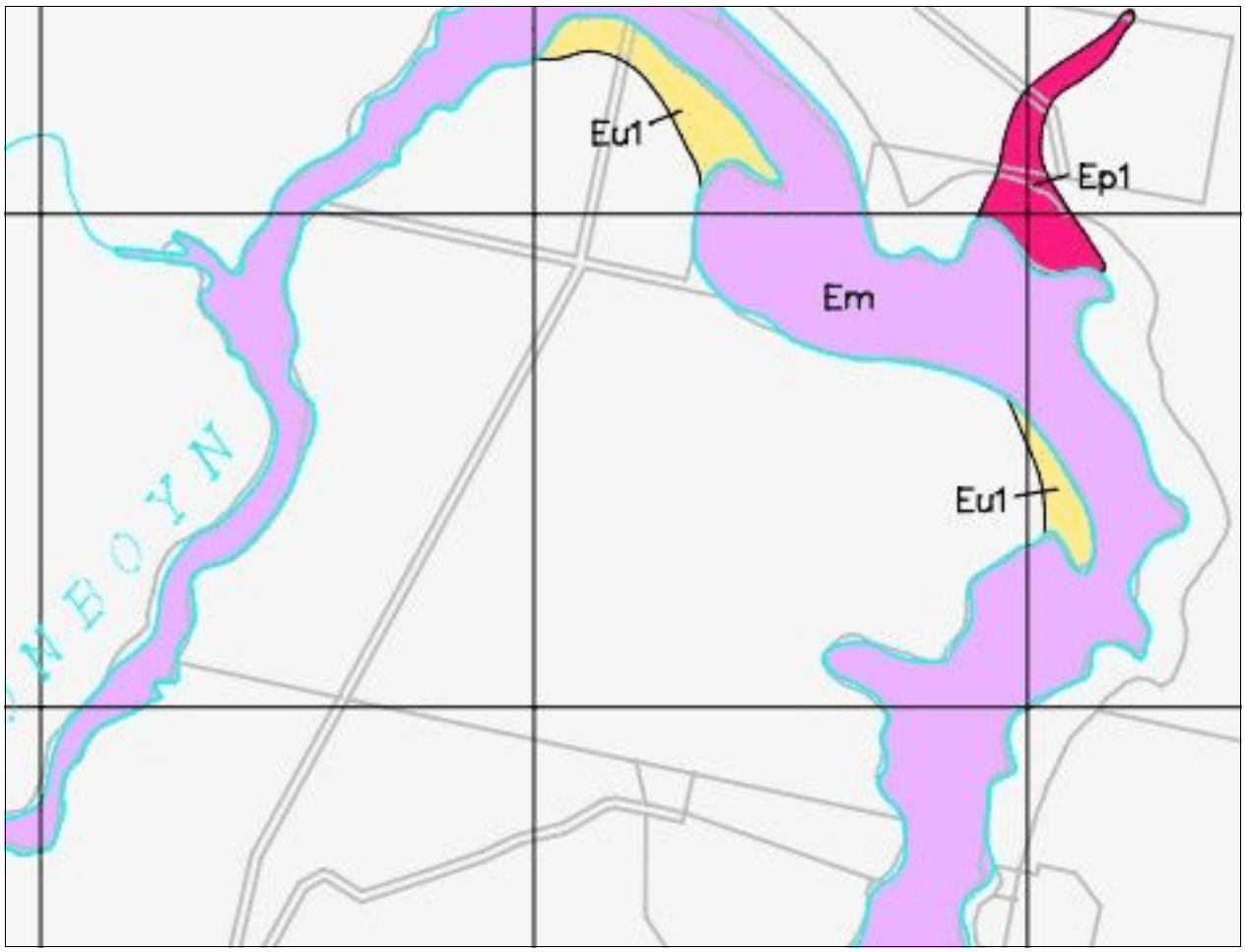
CROSS SECTION AA

Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

ENERGY DISSIPATER **SD 5-8**

8.5 Appendix 5 - DECCW Acid Sulfate Risk Mapping



The small area of Eu1 is on the extremity of Lot 7 (the residual lot).