Appendices

(Total No. of pages including blank pages = 52)

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Appendix 1

Spring Creek Crossing Civil Works

(Total No. of pages including blank pages = 24)

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DARGUES GOLD PROJECT
CONSTRUCTION OF
SPRING CREEK CROSSING
MAJORS CREEK, NSW, 2622

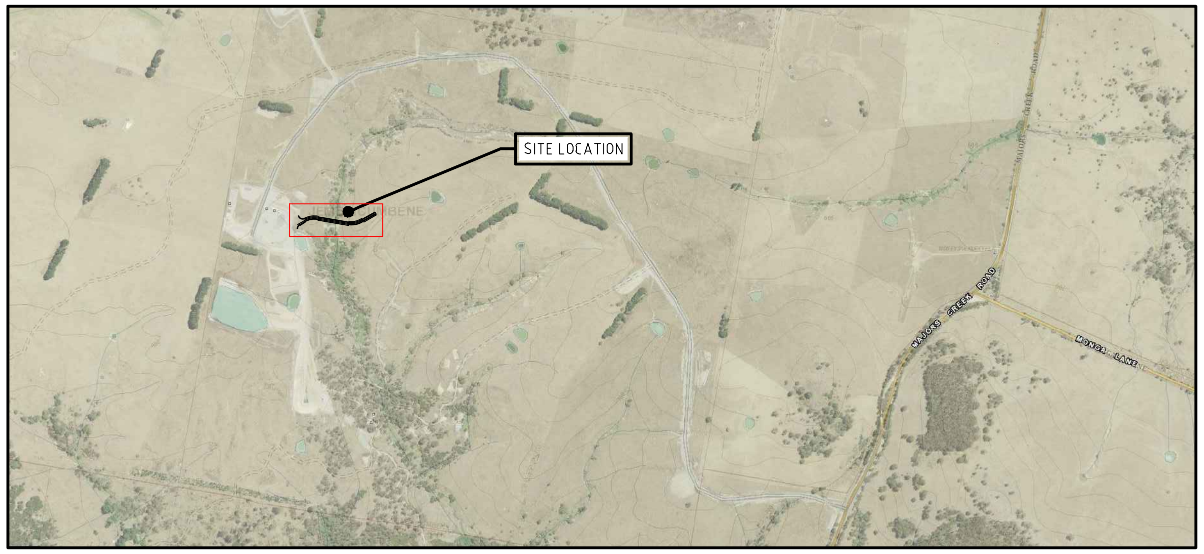
CIVIL WORKS

FOR APPROVAL

NOVEMBER 2018

DRAWING SCHEDULE

DRG. No.	DRAWING TITLE
C000	SPRING CREEK CROSSING TITLE SHEET, LOCALITY PLAN, DRAWING SCHEDULE AND NOTES
C001	SPRING CREEK CROSSING GENERAL NOTES
C100	SPRING CREEK CROSSING DETAIL PLAN & LONGITUDINAL SECTION
C101	SPRING CREEK CROSSING TYPICAL CROSS–SECTIONS & PAVEMENT DETAILS
C200	SPRING CREEK CROSSING TYPICAL CROSS–SECTIONS SHEET 1 OF 3
C201	SPRING CREEK CROSSING TYPICAL CROSS–SECTIONS SHEET 2 OF 3
C202	SPRING CREEK CROSSING TYPICAL CROSS–SECTIONS SHEET 3 OF 3
C300	SPRING CREEK CROSSING SITE CATCHMENT PLAN & STORMWATER DRAINAGE CALCULATIONS
C301	SPRING CREEK CROSSING DRAINAGE LONGITUDINAL SECTIONS
C302	SPRING CREEK CROSSING STORMWATER DRAINAGE DETAILS
C400	SPRING CREEK CROSSING CUT/FILL PLAN



LOCALITY PLAN

NOT TO SCALE

NOT FOR CONSTRUCTION

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	29/11/18	J.M.A	J.A	B.J	ISSUED FOR APPROVAL
A	26/11/18	J.M.A	J.A	B.J	DRAFT ISSUE – FOR REVIEW

DRAWING STATUS	
DESIGN BY	J.M.A
DRAWN BY	J.A
FINAL APPROVAL	B.J
SCALE: (on A1 Original)	N.T.S

FOR APPROVAL

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PROJECT TITLE

DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE

SPRING CREEK CROSSING
TITLE SHEET, LOCALITY PLAN
DRAWING SCHEDULE

PROJECT NO.	SUB–PR NO.	DRAWING NO.	REV
17000009	P05	C000	00

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EARTHWORKS NOTES

1. GENERAL NOTES

1.1. INSTALL SEDIMENT CONTROL DEVICES IN ACCORDANCE WITH THE EROSION AND SEDIMENT CONTROL DRAWINGS 17000009_P02_ESCP00 TO ESCP10.

1.2. BE AWARE OF THE FOLLOWING –
- A) THESE NOTES DO NOT REPLACE THE NEED TO COMPLY WITH ALL RELEVANT AUSTRALIAN STANDARD CODES OF PRACTICE.
- B) ERRORS AND OVERSIGHTS ON PLANS ARE TO BE RECTIFIED AT THE CERTIFYING ENGINEER'S DISCRETION.
- C) PROPOSED VARIATIONS TO THE PLANS ARE TO BE REFERRED BACK TO THE CERTIFYING ENGINEER FOR APPROVAL.

1.3. LOCATE ALL SERVICES WHETHER SHOWN ON THE PLAN OR NOT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTMENTS AND REPAIRS TO SERVICES AND FOR ANY DAMAGE TO THOSE SERVICES.

2. CLEARING AND GRUBBING.

2.1. THE WORKS AREA AND INCIDENTAL WORKS, TOGETHER WITH AN AREA EXTENDING BEYOND THE LIMITS OF EACH FOR A DISTANCE OF 2 METRES ALL ROUND SHALL BE CLEARED OF ALL TREES, SCRUB, STUMPS, ROOTS DEAD TIMBER AND RUBBISH AND THE SAME SHALL BE REMOVED FROM THE VICINITY OF THE WORK AND DISPOSED OF IN A MANNER APPROVED BY THE SUPERVISING OFFICER.

3. REMOVAL OF TOPSOIL FOR FUTURE USE

3.1. BEFORE CONSTRUCTION OF ANY ANCILLARY WORKS WITHIN THE WORKS AREA, ALL GRASS GROWTH AND TOPSOIL TO A MINIMUM DEPTH OF 350mm BELOW GROUND LEVEL SHALL BE REMOVED FROM THE AREA TO BE OCCUPIED BY THE FILL EMBANKMENT AND SHALL BE DEPOSITED CLEAR OF THE AREA AND RESERVED FOR USE IN COMPLETING THE EARTHWORKS & EMBANKMENTS. STOCKPILE IN ACCORDANCE WITH SD 4-1 SHOWN ON THE SOIL & WATER MANAGEMENT PLANS.

4. EARTHWORKS – FILL COMPACTION REQURIEMENTS.

4.1. AFTER THE WORKS AREA HAS BEEN STRIPPED OF ALL TOPSOIL AS DESCRIBED IN CLAUSE 3.1 ALL WATER SHALL BE DRAINED OR PUMPED AWAY AND ANY LOOSE SOIL, VEGETABLE MATTER, DEBRIS, AND ANY SOIL WITH A MOISTURE CONTENT HIGHER THAN THE SURROUNDING INSITU MOISTURE CONTENT SHALL BE REMOVED AND DUMPED IN NEAT SPOIL HEAPS OUTSIDE THE STORAGE AREA.

ALL MATERIAL TO BE STOCKPILED AWAY FROM WORKS AREA (REFER TO SD 4-1)

4.2. MATERIAL FOR USE IN EMBANKMENTS SHALL BE PLACED AS SHOWN ON THE PLANS IN LAYERS NOT EXCEEDING 150mm DEPTH LOOSE MEASUREMENT. ROCK AND STONES THAT CAN BE RETAINED ON A 75mm MESH SIEVE, ROOTS GREATER THAN 7mm IN DIAMETER, SILT, OR ANY OTHER UNSUITABLE MATERIAL SHALL NOT BE PLACED IN ANY ZONE OF THE DAM BUT SHALL BE DUMPED IN NEAT SPOIL HEAPS OUTSIDE THE STORAGE AREA.

4.3. THE MOISTURE CONTENT OF THE MATERIAL AT THE TIME OF PLACING AND COMPACTING SHALL BE UNIFORM WITHIN EACH ZONE AND WITHIN THE RANGE OF TWO (2) PER CENT DRY OF THE OPTIMUM MOISTURE CONTENT TO NOT MORE THAN THREE (3) PER CENT ABOVE THE OPTIMUM MOISTURE CONTENT. THE OPTIMUM MOISTURE CONTENT SHALL BE THE MOISTURE CONTENT AT WHICH THE MAXIMUM DRY DENSITY IS OBTAINED WHEN THE PARTICULAR MATERIAL IS SUBJECTED TO A STANDARD PROCTOR COMPACTION TEST. THIS OPTIMUM MOISTURE CONTENT MAY BE ASSUMED TO BE EQUIVALENT TO THAT DETERMINED IN AS 1289.5.1.1.-1993 METHODS OF TESTING SOILS FOR ENGINEERING PURPOSES.

IF THE SOIL MOISTURE CONTENT IS LESS THAN SPECIFIED IT SHALL BE UNIFORMLY ADJUSTED TO WITHIN THE SPECIFIED RANGE BY MIXING WATER UNIFORMLY WITH THE SOIL BEFORE THE MATERIAL IS PLACED IN THE EMBANKMENT. AN APPROVED WATER CART AND HOSE SHALL BE PROVIDED BY THE CONTRACTOR FOR THIS PURPOSE.

IF THE SOIL MOISTURE CONTENT IS MORE THAN SPECIFIED THE MATERIAL SHALL NOT BE PLACED IN THE EMBANKMENT UNTIL THE MOISTURE CONTENT IS UNIFORMLY LOWERED TO WITHIN THE RANGE SPECIFIED.

DURING CONSTRUCTION THE SURFACE OF ALL EMBANKMENTS SHALL BE MAINTAINED IN A COMPACTED AND DRAINED STATE TO ASSIST IN PREVENTING ANY EXCESS MOISTURE INTO THE SOIL THROUGH RAIN AND TO PREVENT ANY UNDUE LOSS OF MOISTURE BY EVAPORATION. THE CONTRACTOR SHALL ARRANGE TO LEAVE ALL EMBANKMENTS SURFACES COMPACTED AT THE END OF EACH WORKING DAY AND WILL COMPLETE THE COMPACTION OF ALL PLACED MATERIAL PRIOR TO IMMINENT RAINFALL.

ANY SOIL WHICH FOR ANY REASON BECOMES DRIER OR WETTER THAN SPECIFIED AFTER BEING PLACED IN THE EMBANKMENT SHALL BE REMOVED AND DUMPED IN NEAT SPOIL HEAPS OUTSIDE THE STORAGE AREA.

4.4. SUITABLE MATERIAL AS SPECIFIED IN CLAUSE 4.4 SHALL BE USED TO BUILD UP EMBANKMENTS IN PROGRESSIVE LAYERS, EACH LAYER BEING PLACED AT THE SPECIFIED MOISTURE CONTENT AND COMPACTED AS SPECIFIED IN CLAUSE 4.7. EACH LAYER IS TO BE SPREAD EVENLY ACROSS THE FULL FILLING AREA, SO THAT THE THICKNESS OF EACH LAYER SHALL NOT EXCEED THE DIMENSIONS GIVEN IN CLAUSE 4.2 BEFORE COMPACTION. INDIVIDUAL ZONES OF EMBANKMENT MATERIAL MUST NOT BE RAISED IN THE EMBANKMENT INDEPENDENTLY OF OTHER ZONES.

4.5. MATERIAL SHALL BE PLACED AND SPREAD EVENLY THROUGHOUT EACH LAYER AND SHALL NOT CONTAIN LUMPS OR "CURLS" OF DIMENSIONS GREATER THAN TWO THIRDS OF THE LAYER THICKNESS. LUMPS OR "CURLS" LARGER THAN SPECIFIED SHALL BE REMOVED OR BROKEN UP BEFORE COMPACTION COMMENCES.

EACH LAYER SHALL BE COMPACTED BEFORE THE NEXT LAYER IS PLACED.

EVERY LAYER OF THE MATERIAL PLACED IN FILL EMBANKMENTS SHALL BE UNIFORMLY COMPACTED WITH A VIBRATING PAD FOOT ROLLER OR OTHER SUITABLE EQUIPMENT AS APPROVED BY THE SUPERINTENDENT.

THE CONTRACTOR IS RESPONSIBLE FOR THE PAYMENT OF ALL SOIL TESTING CARRIED OUT. THE COST OF TESTING SHALL BE INCLUDED IN THE OVERALL COST OF THE WORKS.

4.6. EVERY LAYER OF THE MATERIAL PLACED IN THE FILL AREAS SHALL BE COMPACTED WITH THE NUMBER OF PASSES REQUIRED TO OBTAIN THE REQUIRED COMPACTION. THE WHOLE OF THE EMBANKMENT, EXCEPT THE TOPSOIL, SHALL BE UNIFORMLY COMPACTED TO AT LEAST 95 PER CENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD COMPACTION TEST (AS 1289.5.1.1)

4.7. AT THE DISCRETION OF THE SUPERVISING OFFICER COMPACTION CONTROL TESTING SHALL BE CARRIED OUT TO DETERMINE THE MOISTURE CONTENT OF THE SOIL AS PLACED IN THE FILL AREA RELATIVE TO THE OPTIMUM MOISTURE CONTENT AS DEFINED IN CLAUSE 4.4 AND TO DETERMINE THE RATIO OF THE DRY DENSITY OF THE SOIL AS PLACED IN THE FILL AREA TO THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE FREQUENCY OF TESTING FOR THE PURPOSE OF CONTROL ON COMPACTION DURING CONSTRUCTION OF THE EMBANKMENTS SHALL BE ONE TEST PER $500m^3$ OF EMBANKMENTS MATERIAL PLACED, RELAXING TO ONE TEST PER $1,000m^3$ WHEN WARRANTED BY CONSISTENCY OF DENSITY RESULTS, AS DETERMINED BY THE SUPERINTENDENT.

4.8. THE SUPERVISING OFFICER MAY DIRECT THE REMOVAL AND REPLACEMENT IN ACCORDANCE WITH THIS SPECIFICATION OF ANY SOIL PLACED IN THE ALL FILL EMBANKMENTS WHICH HAS BEEN PLACED NOT IN ACCORDANCE WITH THE SPECIFICATION.

4.9. THE TOPSOIL PREVIOUSLY STRIPPED AND DEPOSITED CLEAR OF THE WORKS AS SPECIFIED IN CLAUSE 3.1 SHALL BE UNIFORMLY SPREAD OVER THE SURFACE OF ALL EMBANKMENTS. REFER TO DETAILS SD 4-2 AND SD 7-1 SHOWN ON THE SOIL & WATER MANAGEMENT PLANS. THE PURPOSE OF THIS TOPSOIL IS TO ASSIST IN THE CULTIVATION OF A GRASS COVER.

IF INSUFFICIENT TOPSOIL IS AVAILABLE FOR THIS PURPOSE THEN ADDITIONAL TOPSOIL SHALL BE OBTAINED FROM BORROW PITS SELECTED BY THE SUPERVISING OFFICER.

WHERE THE AMOUNT OF TOPSOIL IS MORE THAN REQUIRED TO COMPLETE THE WORKS AS SPECIFIED, THE EXCESS SHALL BE DEPOSITED IN NEAT SPOIL HEAPS WHERE DIRECTED BY THE SUPERINTENDENT.

5. GRASS COVER.

5.1. AFTER ALL WORK HAS BEEN COMPLETED THE COMPLETED SURFACES SHALL BE PROTECTED AGAINST EROSION BY IMMEDIATELY PLANTING AND MAINTAINING A GOOD HOLDING GRASS SUCH AS KIKUYU. IT IS ESSENTIAL THAT THIS GRASS BE ESTABLISHED AS QUICKLY AS POSSIBLE, IF NECESSARY ASSISTED BY FERTILISERS AND WATERING. ESTABLISHMENT OF A GRASS COVER, ANY TURF, FERTILISER OR WATERING THAT MAY BE REQUIRED ON THE COMPLETED WORK IS TO BE CARRIED OUT BY THE CONTRACTOR.

6. COMPLETION.

THE WHOLE OF THE WORKS SHALL BE COMPLETED IN ACCORDANCE WITH THE PLANS AND SPECIFICATION TO THE SATISFACTION OF THE SUPERVISING OFFICER. THE AREA COVERED BY THE WORKS SHALL BE LEFT CLEAN AND TIDY AND ALL SURPLUS MATERIAL AND DEBRIS SHALL BE REMOVED OR OTHERWISE DISPOSED OF AS DIRECTED BY THE SUPERINTENDENT.

ROADWORKS:

R1 FINAL PAVEMENT THICKNESS AND TESTING REQUIREMENTS ARE TO BE IN ACCORDANCE WITH GEOTECHNICAL TESTING TO CONFIRM FINAL DESIGN THICKNESS.

R2 FILL AREAS:-
- a) ALL ROAD AND FILL AREAS TO BE CLEARED OF UNDERGROWTH AND GRASS, TOPSOIL TO BE REMOVED AND STOCKPILED ON SITE FOR SPREADING ON FOOTPATHS, BATTER AREAS, AND OTHER FILL AREAS PRIOR TO COMPLETION.
- b) ALL UNSUITABLE MATERIAL, AS DETERMINED BY THE SUPERINTENDENT, TO BE REMOVED AND REPLACED BY SELECT MATERIAL. SELECT MATERIAL TO BE CONFIRMED AS COMPLIANT BY A GEOTECHNICAL CONSULTANT.
- c) ALL FILLING TO BE CONTROLLED AND INSPECTED BY NATA REGISTERED LABORATORY IN ACCORDANCE WITH RELEVANT AUSTRALIAN STANDARD AND BEST ACCEPTED PRACTICE.

R3 ALL TESTING WORKS SHALL BE CONTROLLED AND CERTIFIED BY NATA REGISTERED LABORATORY, COPIES OF ALL TEST CERTIFICATES CLEARLY INDICATING THE LOCATION OF EACH TEST AND LABORATORY'S CERTIFICATES COVERING THE WHOLE OF THE AREA TESTED.

CONCRETE – CULVERT STRUCTURES

C1 WORKMANSHIP AND MATERIALS TO CONFORM WITH THE REQUIREMENTS OF AS3600, FORMWORK TO BE IN ACCORDANCE WITH AS1509.

C2 CONCRETE STRENGTH TO BE GRADE 20, AS3600 (20MPa) THROUGHOUT UNLESS NOTED OTHERWISE.

C3 PLACING: ALL CONCRETE SHALL BE MECHANICALLY VIBRATED, VIBRATORS SHALL NOT BE USED TO SPREAD CONCRETE.

C4 INSPECTION: CONCRETE SHALL NOT BE PLACED UNTIL THE COMPLETED FALSEWORK, FORMWORK AND REINFORCEMENT FIXING HAVE BEEN INSPECTED AND APPROVED BY THE ENGINEER.

STORMWATER:

S1 ALL PIPE JOINS IN PITS, HEADWALLS AND OTHER DRAINAGE STRUCTURES ARE TO BE MORTARED TO PREVENT INFILTRATION.

S2 ALL PIT GRATES ARE TO BE GALVANISED STEEL GRID TYPE. HEAVY DUTY GRATES ARE TO BE USED IN AREAS WHERE THEY MAY BE SUBJECT TO VEHICLE LOADING.

SURVEY REFERRENCE DETAILS:

ALL SURVEY DATA SUPPLIED BY DIVERSIFIED MINERALS

SOIL AND WATER MANAGEMENT:

SWMP1 REFER TO THE OCCOMPANYING EROSION AND SEDIMENT CONTROL PLANS FOR DETAILS

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DRAWN BY	J.A
FINAL APPROVAL	B.J
SCALE: (on A1 Original)	N.T.S

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PROJECT TITLE
DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE
SPRING CREEK CROSSING
GENERAL NOTES

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C001	00

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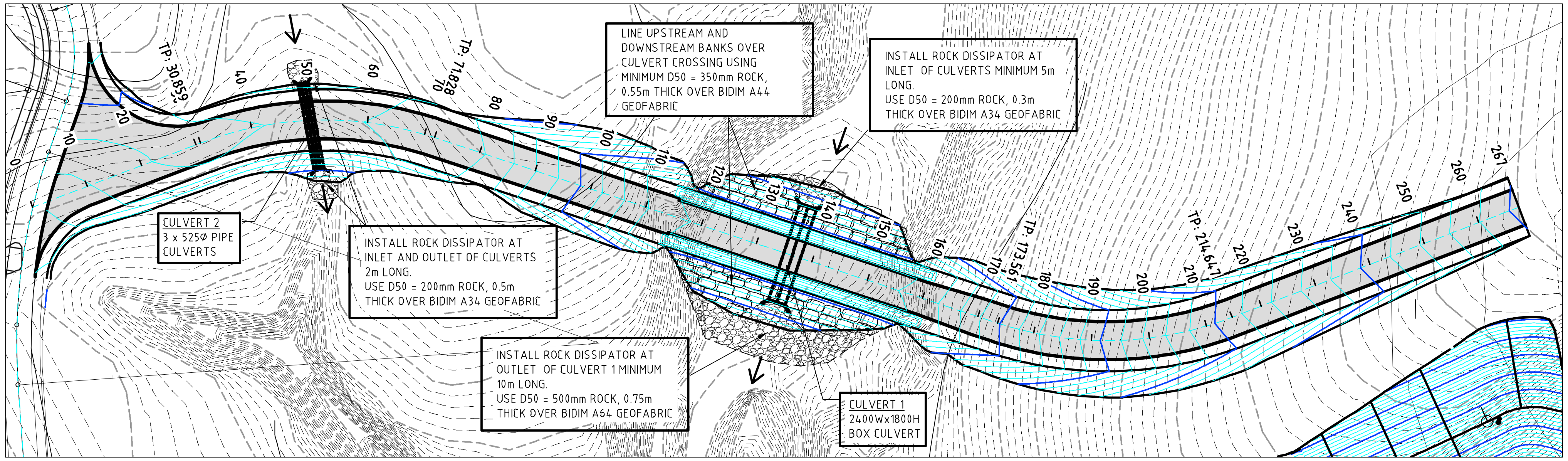
LEGEND

- DIVERSION BUND
- ROCK PROTECTION
- FLOW DIRECTION
- ROAD PAVEMENT EXTENTS
- EXISTING SURFACE CONTOURS
- MAJOR DESIGN SURFACE CONTOUR
- MINOR DESIGN SURFACE CONTOUR



HAUL ROAD - DETAIL PLAN

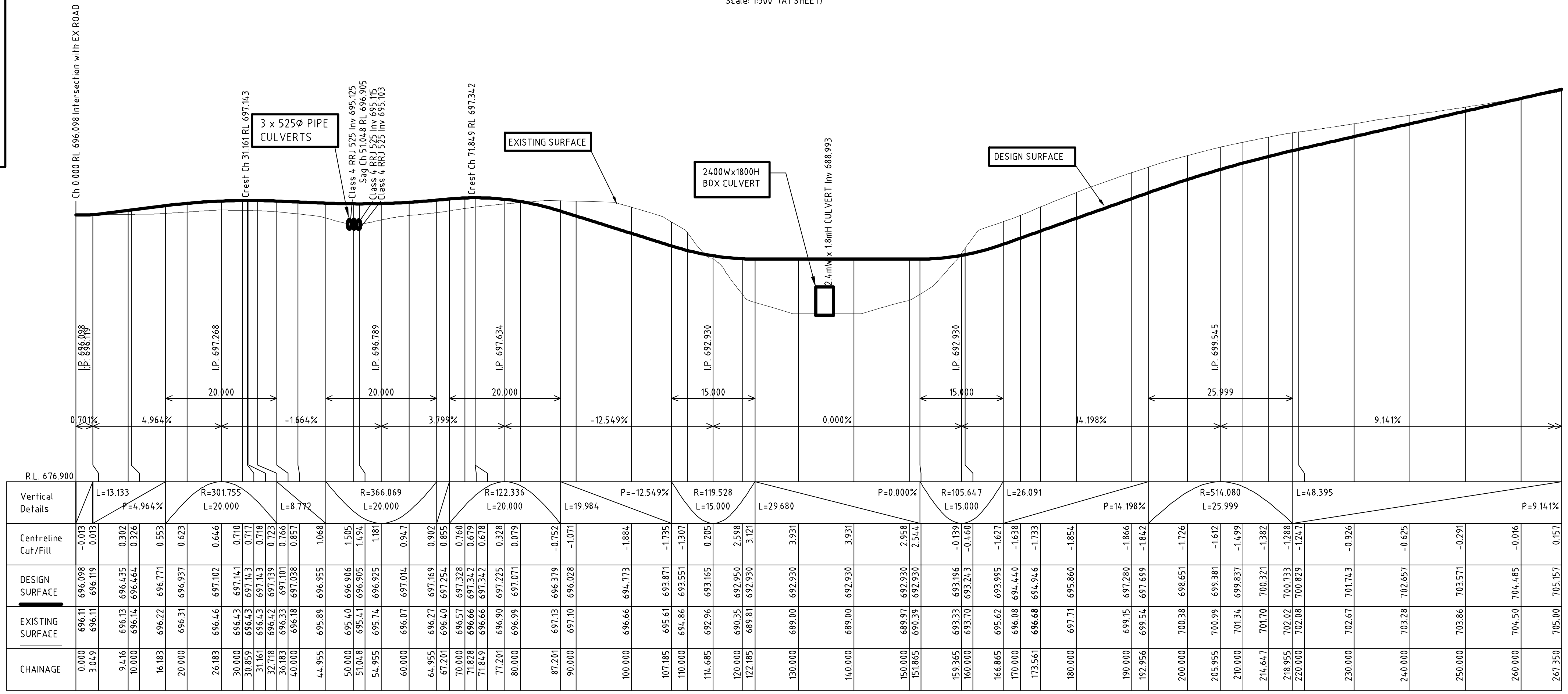
Scale: 1:500 (A1 SHEET)

NOTE RE EROSION & SEDIMENT CONTROL

REFER TO THE EROSION AND SEDIMENT CONTROL PLANS 17000009_P02_ESCP_REV02 FOR TEMPORAY AND PERMANENT EROSION CONTROLS TO BE IMPLEMENTED DURING THE COURSE OF CONSTRUCTION INCLUDING THE MANAGEMENT OF STORMWATER IN AND AROUND THE WORKS AREA.

NOTE RE ROCK SCOUR PROTECTION

ALL ROCK TO BE HARD ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL ROCK SIZE AND SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SHALL BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. SPECIFIC GRAVITY TO BE AT LEAST 2.5. REFER TO IECA STANDARD DRAWING CH-06 ON DRAWING C302.



HAUL ROAD - LONGITUDINAL SECTION

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Scale: 1:500 (A1 SHEET) HORIZONTAL

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PROJECT TITLE

DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE

SPREING CREEK CROSSING
DETAIL PLAN AND
LONGITUDINAL SECTION

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17000009	P05	C100	00

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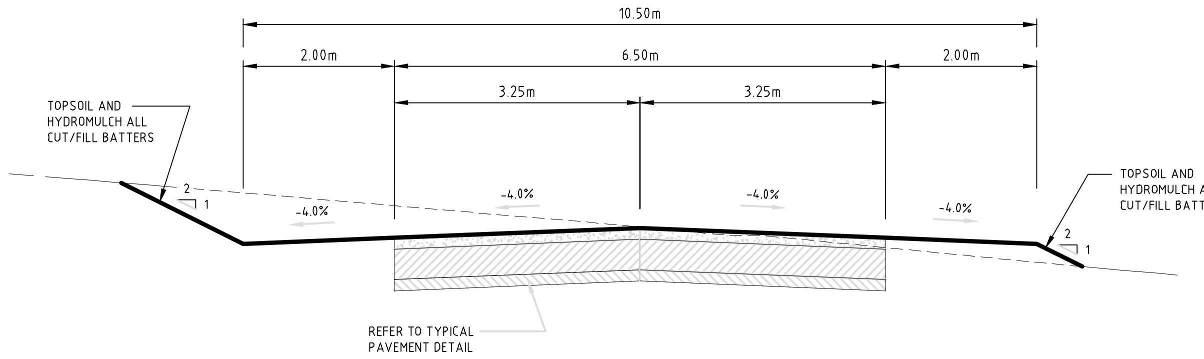

TYPICAL HAUL ROAD CROSS SECTION

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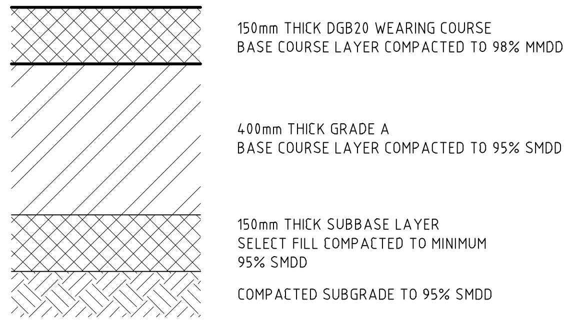
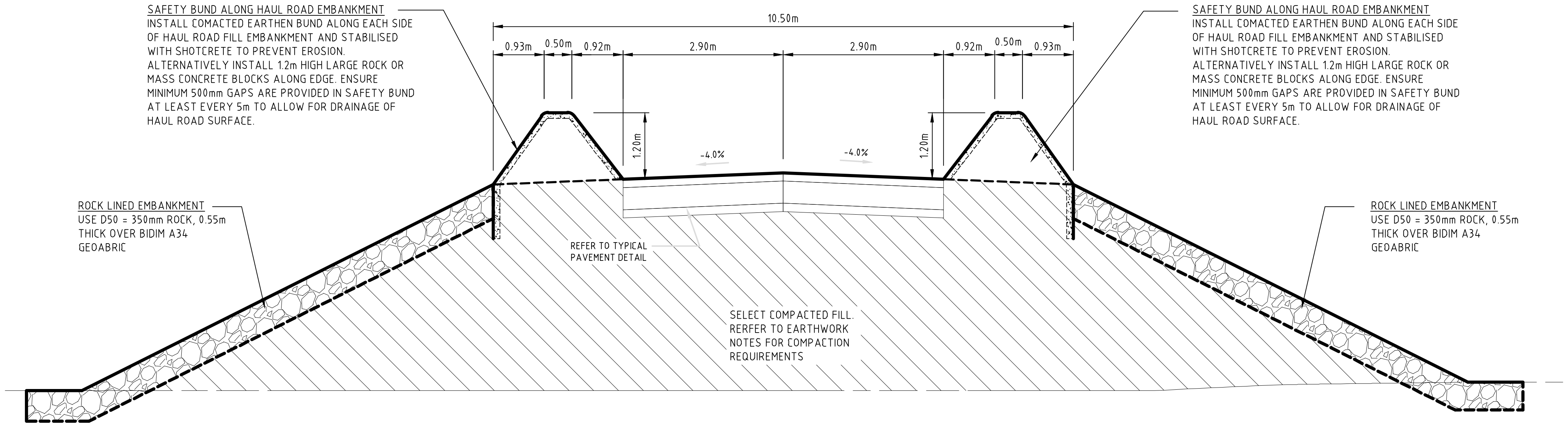


PRELIMINARY UNSEALED PAVEMENT DETAIL

SCALE 1:10

PAVEMENT DETAILS:

1. PAVEMENT DESIGN SHOWN IS PRELIMINARY ONLY AND FINAL DESIGN WOULD BE SUBJECT TO ADDITIONAL CBR TESTING OF THE SUBGRADE AND ALSO SELECT FILL MATERIAL TO BE USED FOR THE CONSTRUCTION OF THE FILL EMBANKMENT.
2. ALL DIMENSIONS ON PAVEMENT ARE IN MILLIMETRES.
3. BASE AND SUB BASE MATERIALS FROM APPROVED UNBOUND NATURAL GRAVELS TYPE 2(C).
4. IF THE ACTUAL SUBGRADE CBR IS FOUND TO BE LESS THAN THAT INDICATED ON THE DRAWINGS, THE TEST RESULTS SHOULD BE SUBMITTED TO THE SUPERINTENDENT WITHIN 24 HOURS OF RECEIPT. PAVEMENT REDESIGN SHALL BE OBTAINED FROM THE SUPERINTENDENT BEFORE CONSTRUCTION PROCEEDS.



TYPICAL SECTION THROUGH HAUL ROAD EMBANKMENT - CH 115 TO CH 160

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Scale: 1:50 (A1 SHEET)

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DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE

SPRING CREEK CROSSING
TYPICAL CROSS-SECTIONS
& PAVEMENT DETAILS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C101	00

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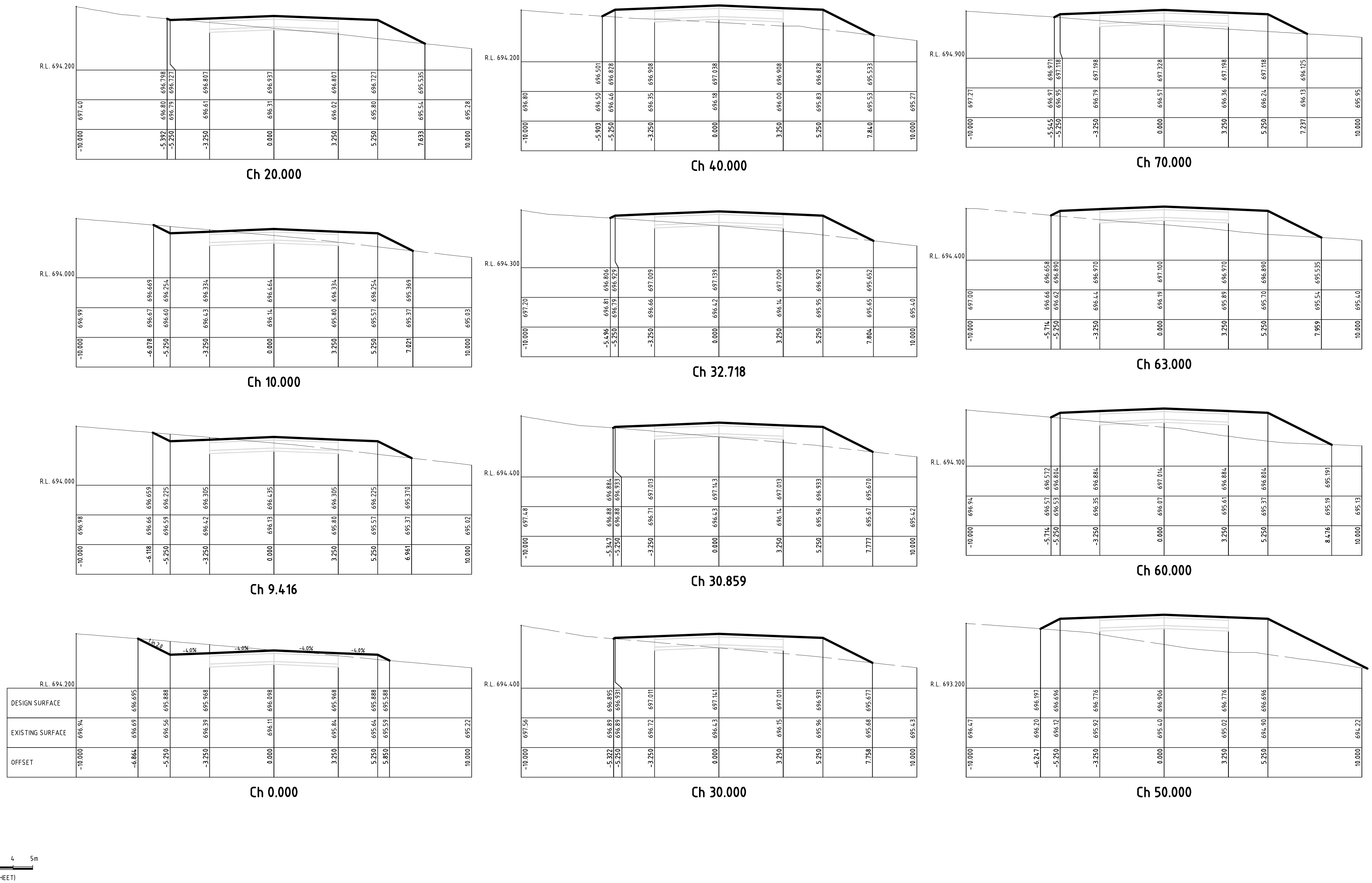

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PROJECT TITLE

DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE

SPRING CREEK CROSSING
CROSS SECTIONS
SHEET 1 OF 3

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C200	00

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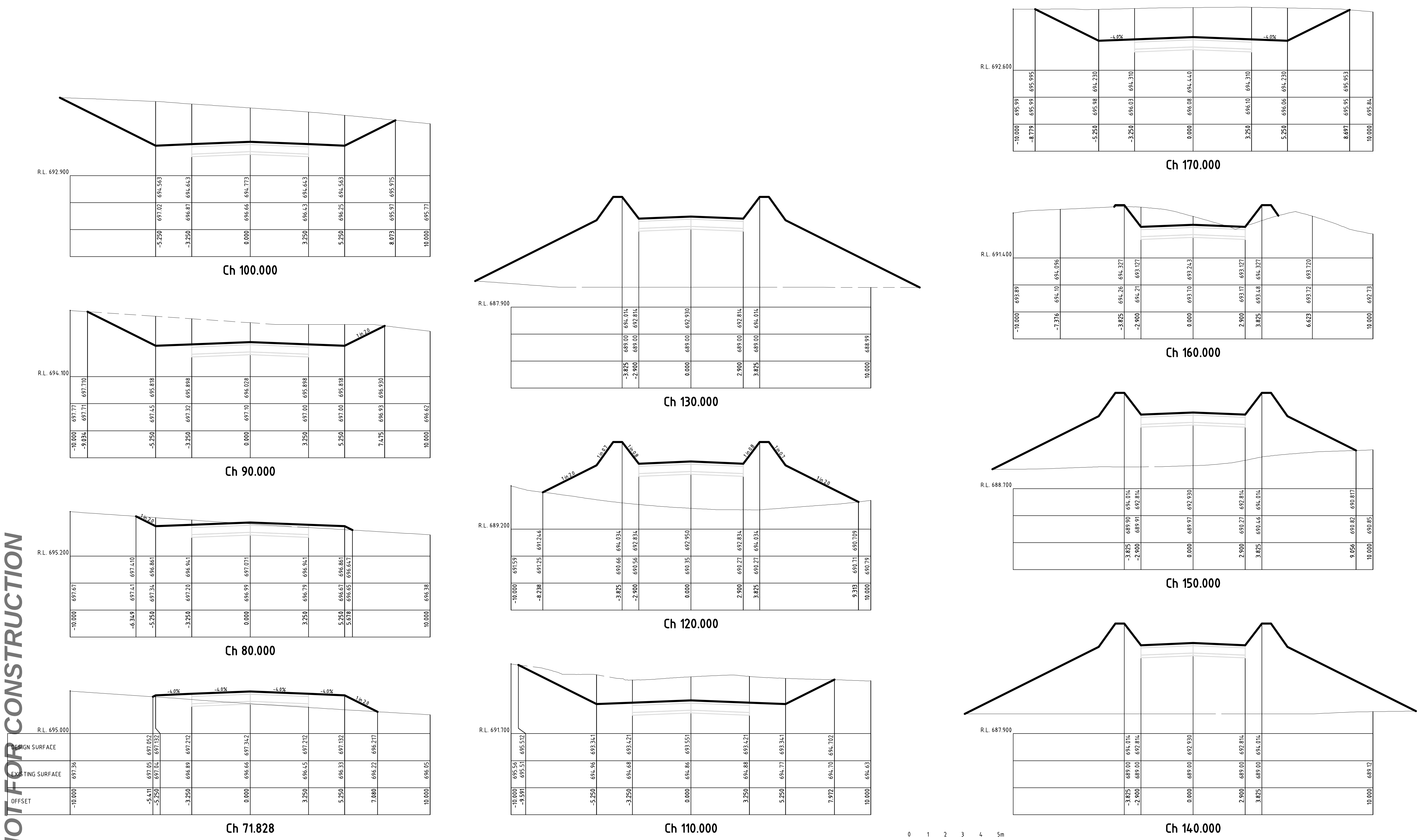

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DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE

SPRING CREEK CROSSING
CROSS SECTIONS
SHEET 2 OF 3

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C201	00

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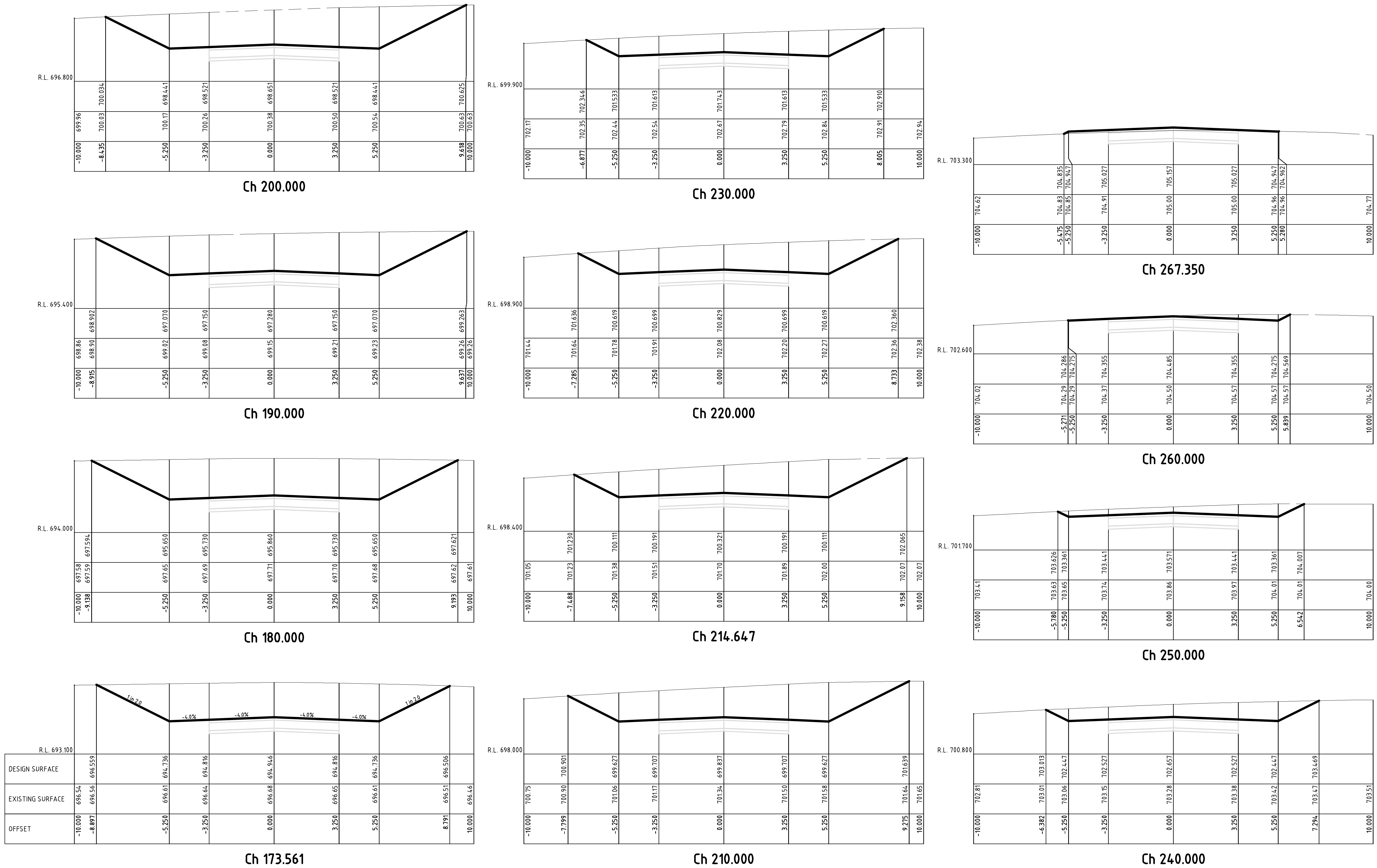

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SCALE: (on A1 Original)	AS SHOWN

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North

CLIENT

DARGUES GOLD MINE

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PROJECT TITLE

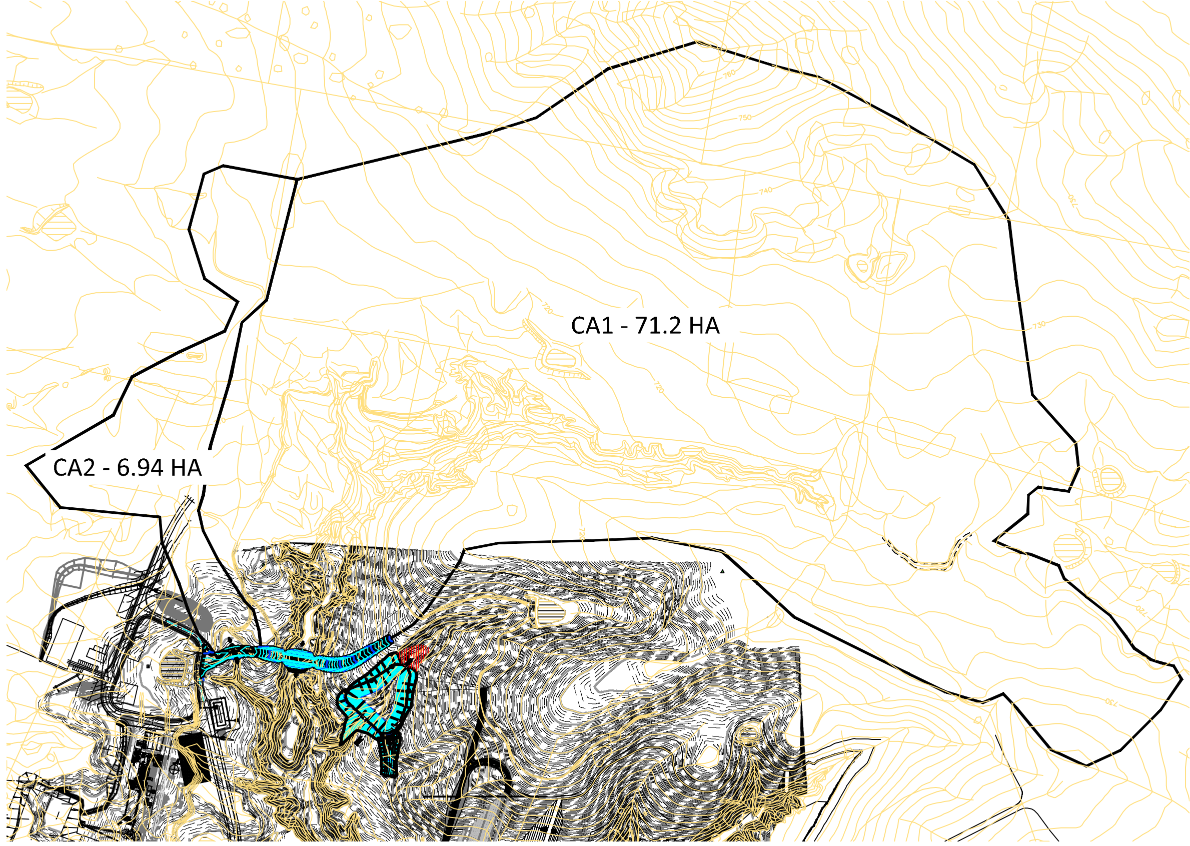
DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE

SPRING CREEK CROSSING
CROSS SECTIONS
SHEET 3 OF 3

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C202	00

Plot Date: Thursday, November 29, 2018 2:56:40 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P05_C_REV00.dwg



SITE CATCHMENT PLAN

0 50 100 150 200 250m
Scale: 1:5000 (A1 SHEET)

NOT FOR CONSTRUCTION

STORMWATER FLOW CALCULATIONS

Peak flow is given by the Rational Formula: $Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,tc} \times A$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years.
- F_y is a frequency factor for "Y" years
- A is the catchment area in hectares (ha)
- $I_{y,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent. Place an x in the appropriate row below to automatically halve the time of concentration for that sub-catchment.

Structure Details

			Notes
Name	CA1	CA2	
Catchment Area (ha)	71.2	6.94	
Place an x here to halve tc			Place an x if disturbed catchment
Time of concentration (tc)	40	17	minutes

Rainfall Intensities

1-year, tc	28	46	Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2-year, tc	38	62	
5-year, tc	48	80	
10-year, tc	55	90	
20-year, tc	67	100	
50-year, tc	75	120	
100-year, tc	85	130	

C10 runoff coefficient	0.5	0.5	Use AR&R or Table F3, pg F-6

Frequency Factors

FF, 1-year	0.89	0.89	Can use 0.8 for a construction site
FF, 2-year	0.92	0.92	Can use 0.85 for a construction
FF, 5-year	0.95	0.95	Can use 0.95 for a construction
FF, 10-year	1	1	Generally always 1
FF, 20-year	1.05	1.05	Can use 1.05 for a construction
FF, 50-year	1.17	1.17	Can use 1.15 for a construction
FF, 100-year	1.24	1.24	Can use 1.2 for a construction site

Flow Calculations

			Notes
1-year, tc (m^3/s)	2.466	0.395	
2-year, tc (m^3/s)	3.46	0.55	
5-year, tc (m^3/s)	4.513	0.733	
10-year, tc (m^3/s)	5.443	0.868	
20-year, tc (m^3/s)	6.962	1.013	
50-year, tc (m^3/s)	8.684	1.354	
100-year, tc (m^3/s)	10.431	1.555	

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	29/11/18	J.M.A	J.A	B.J	ISSUED FOR APPROVAL
A	26/11/18	J.M.A	J.A	B.J	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS
DESIGN BY J.M.A
DRAWN BY J.A
FINAL APPROVAL B.J
SCALE: (on A1 Original) AS SHOWN
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PROJECT TITLE
DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE
SPRING CREEK CROSSING
SITE CATCHMENT PLAN AND
STORMWATER DRAINAGE CALCULATIONS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C300	00

Plot Date: Thursday, November 29, 2018 2:57:30 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P05_C_REV00.dwg

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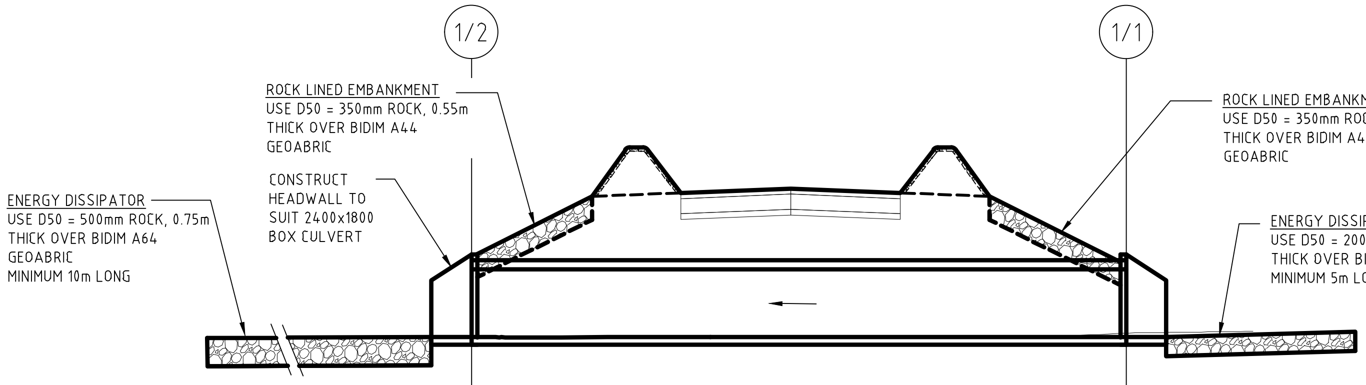


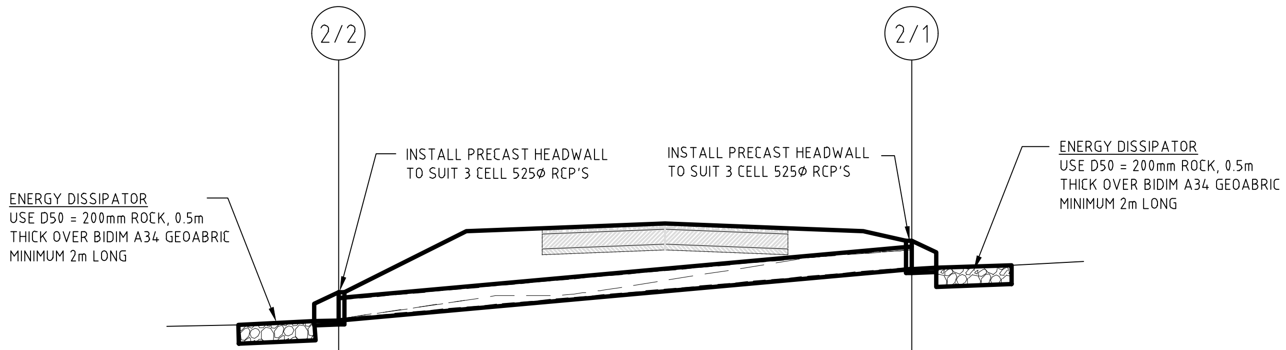
Q100 (l/sec) 10431
Q10 (l/sec) 5443
PIPE DETAILS 2400 WIDE x 1800 HIGH BOX CULVERT
SLOPE/GRADE 0.5%
DATUM RL 684

HGL	690.789	690.789
DEPTH TO INVERT	0.006	0.000
INVERT LEVEL	688.989	688.998
FINISHED SURFACE	688.995	688.998
EXISTING SURFACE	688.995	688.998
CHAINAGE	0.000	17.315

17.315

CULVERT 1 - DRAINAGE LONGITUDINAL SECTION

0 1 2 3 4 5m
Scale: 1:100 (A1 SHEET)



Q100 (l/sec) 1555
Q10 (l/sec) 868
PIPE DETAILS 3x525Ø Class 4 RRJ
SLOPE/GRADE 11.1%
DATUM RL 689.3

HGL	694.938	695.700
DEPTH TO INVERT	0.042	0.501
INVERT LEVEL	694.340	695.700
FINISHED SURFACE	694.382	696.201
EXISTING SURFACE	694.382	696.201
CHAINAGE	0.000	15.152

15.152

CULVERT 2 - DRAINAGE LONGITUDINAL SECTION

0 1 2 3 4 5m
Scale: 1:100 (A1 SHEET)

NOTE REGARDING FINAL CULVERT DESIGN

FINAL CULVERT TYPES, SIZING, FOUNDATION TREATMENT, BASE SLAB DESIGN, MINIMUM COVER AND COMPACTION REQUIREMENTS TO BE PROVIDED PRIOR TO CONSTRUCTION

0 1 2 3 4 5m
Scale: 1:100 (A1 SHEET)

NOT FOR CONSTRUCTION

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	29/11/18	J.M.A	J.A	B.J	ISSUED FOR APPROVAL
A	26/11/18	J.M.A	J.A	B.J	DRAFT ISSUE - FOR REVIEW

DRAWING STATUS

DESIGN BY	J.M.A
DRAWN BY	J.A
FINAL APPROVAL	B.J
SCALE: (on A1 Original)	AS SHOWN

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PROJECT TITLE
DARGUES GOLD PROJECT
SPRING CREEK CROSSING

DRAWING TITLE
SPRING CREEK CROSSING
DRAINAGE LONGITUDINAL SECTIONS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C301	00

Plot Date: Thursday, November 29, 2018 2:59:06 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P05_C_REV00.dwg

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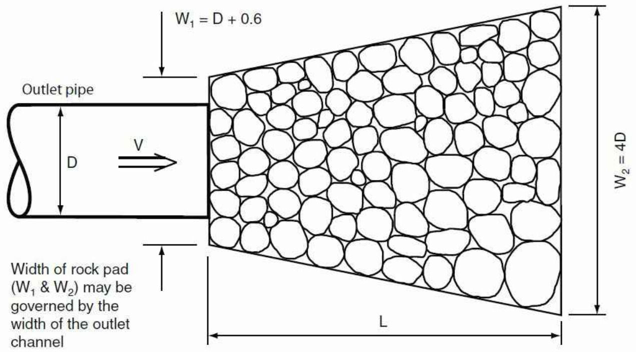
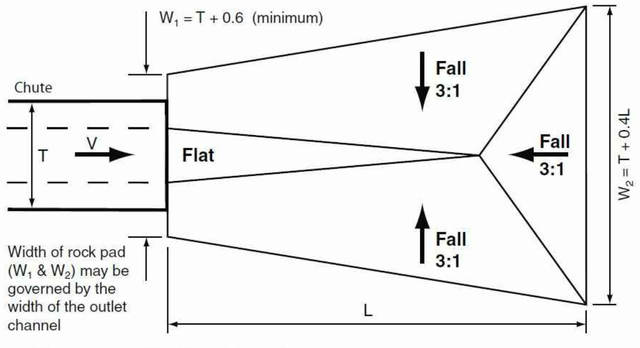
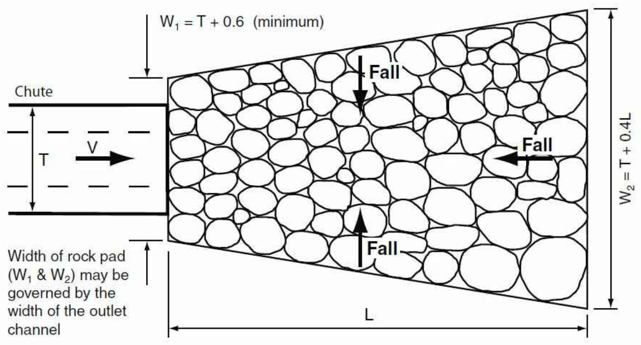


(a) Typical layout of a rock pad outlet structure for a pipe outlet

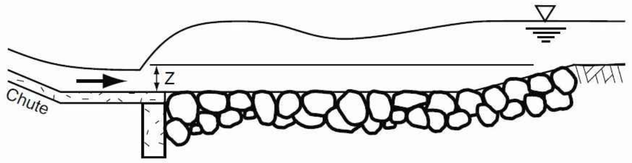


T = Maximum top width of flow at base of chute

(b) Typical form of a rock pad outlet structure for a drainage chute



(c) Typical layout of a rock pad outlet structure for a drainage chute



(d) Typical profile of a rock pad outlet structure for a drainage chute

Notes:
1. Drawings applicable to temporary drainage chutes and slope drains.
2. Rock pad outlet structures for slope drains usually are not required to be recessed below natural ground level as is the case for chute outlets (see Figure B).

Drawn:	Date:		
GMW	Dec-09	Outlet Structures	OS-01

MATERIALS (ROCK PADS)

ROCK: HARD, ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL ROCK SIZE AND SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. SPECIFIC GRAVITY TO BE AT LEAST 2.5.

GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM BIDIM A24 OR EQUIVALENT.

INSTALLATION (ROCK PADS)

1. REFER TO APPROVED PLANS FOR LOCATION AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. THE DIMENSIONS OF THE OUTLET STRUCTURE MUST ALIGN WITH THE DOMINANT FLOW DIRECTION.

3. EXCAVATE THE OUTLET PAD FOOTPRINT TO THE SPECIFIED DIMENSION SUCH THE WHEN THE ROCK IS PLACED IN THE EXCAVATED PIT THE TOP OF THE ROCKS WILL BE LEVEL WITH THE SURROUNDING GROUND, UNLESS OTHERWISE DIRECTED.

4. IF THE EXCAVATED SOILS ARE DISPERSIVE, OVER-EXCAVATED THE ROCK PAD BY AT LEAST 300mm AND BACKFILL WITH STABLE, NON-DISPERSIVE MATERIAL.

5. LINE THE EXCAVATED PIT WITH GEOTEXTILE FILTER CLOTH, PREFERABLY USING A SINGLE SHEET. IF JOINTS ARE REQUIRED, OVERLAP THE FABRIC AT LEAST 300mm.

6. ENSURE THE FILTER CLOTH IS PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION OF THE FABRIC AND THE ROCK. REPAIR ANY DAMAGE BY REMOVING THE ROCK AND PLACING WITH ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA OVERLAPPING THE EXISTING FABRIC A MINIMUM OF 300mm.

7. ENSURE THERE ARE AT LEAST TWO LAYERS OF ROCKS. WHERE NECESSARY, REPOSITION THE LARGER ROCKS TO ENSURE TWO LAYERS OF ROCKS ARE ACHIEVED WITHOUT ELEVATING THE UPPER SURFACE ABOVE THE PIPE INVERT.

8. ENSURE THE ROCK IS PLACED IN A MANNER THAT WILL ALLOW WATER TO DISCHARGE FREELY FROM THE PIPE.

9. ENSURE THE UPPER SURFACE OF THE ROCK PAD DOES NOT CAUSE WATER TO BE DEFLECTED AROUND THE EDGE OF THE ROCK PAD.

10. IMMEDIATELY AFTER CONSTRUCTION, APPROPRIATELY STABILISE ALL DISTURBED AREAS.

MAINTENANCE

1. WHILE CONSTRUCTION WORKS CONTINUE ON THE SITE, INSPECT THE OUTLET STRUCTURE PRIOR TO FORECAST RAINFALL, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF PRODUCING RAINFALL, AND ON AT LEAST A WEEKLY BASIS.

2. REPLACE ANY DISPLACED ROCK WITH ROCK OF A SIGNIFICANTLY (MINIMUM 110%) LARGER SIZE THAN THE DISPLACED ROCK.

REMOVAL

1. TEMPORARY OUTLET STRUCTURES SHOULD BE COMPLETELY REMOVED, OR WHERE APPROPRIATE, REHABILITATED SO AS NOT TO CAUSE ONGOING ENVIRONMENTAL NUISANCE OR HARM.

2. FOLLOWING REMOVAL OF THE DEVICE, THE DISTURBED AREA MUST BE APPROPRIATELY REHABILITATED SO AS NOT TO CAUSE ONGOING ENVIRONMENTAL NUISANCE OR HARM.

3. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

Drawn:	Date:		
GMW	Dec-09	Outlet Structure - Rock Pad	OS-02

MATERIALS

ROCK: HARD, ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL ROCK SIZE AND SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. SPECIFIC GRAVITY TO BE AT LEAST 2.5.

GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM BIDIM A24 OR EQUIVALENT.

INSTALLATION (CHUTE FORMATION)

1. REFER TO APPROVED PLANS FOR LOCATION AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. ENSURE ALL NECESSARY SOIL TESTING (e.g. SOIL pH, NUTRIENT LEVELS) AND ANALYSIS HAS BEEN COMPLETED, AND REQUIRED SOIL ADJUSTMENTS PERFORMED PRIOR TO PLANTING.

3. CLEAR THE LOCATION FOR THE CHUTE CLEARING ONLY WHAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT FOR INSTALLATION.

4. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY.

5. CONSTRUCT THE SUBGRADE TO THE ELEVATIONS SHOWN ON THE PLANS. REMOVE ALL UNSUITABLE MATERIAL AND REPLACE WITH STABLE MATERIAL TO ACHIEVE THE DESIRED FOUNDATIONS.

6. IF THE CHUTE IS TEMPORARY, THEN COMPACT THE SUBGRADE TO A FIRM CONSISTENCY. IF THE CHUTE IS INTENDED TO BE PERMANENT, THEN COMPACT AND FINISH THE SUBGRADE AS SPECIFIED WITHIN THE DESIGN PLANS.

7. AVOID COMPACTING THE SUBGRADE TO A CONDITION THAT WOULD PREVENT THE TURF FROM BONDING WITH THE SUBGRADE.

8. ENSURE THE SIDES OF THE CHUTE ARE NO STEEPER THAN A 1.5:1 (H:V) SLOPE.

9. ENSURE THE COMPLETED CHUTE HAS SUFFICIENT DEEP ALONG ITS FULL LENGTH.

10. ENSURE THE CHUTE IS STRAIGHT FROM ITS CREST TO THE TOE OF THE CHUTE.

11. ON FILL SLOPES, ENSURE THAT THE SOIL IS ADEQUATELY COMPACTED FOR A WIDTH OF AT LEAST ONE METRE EACH SIDE OF THE CHUTE TO MINIMISE THE RISK OF SOIL EROSION, OTHERWISE PROTECT THE SOIL WITH SUITABLE SCOUR PROTECTION MEASURES SUCH AS TURF OR EROSION CONTROL MATS.

12. PLACE AND SECURE THE TURF AS DIRECTED.

13. INSTALL AN APPROPRIATE OUTLET STRUCTURE (ENERGY DISSIPATER) AT THE BASE OF THE CHUTE (REFER TO SEPARATE SPECIFICATIONS).

14. ENSURE WATER LEAVING THE CHUTE AND THE OUTLET STRUCTURE WILL FLOW FREELY WITHOUT CAUSING UNDESIRABLE PONDING OR SCOUR.

15. APPROPRIATELY STABILISE ALL DISTURBED AREAS IMMEDIATELY AFTER CONSTRUCTION.

INSTALLATION (ROCK PLACEMENT)

1. OVER-CUT THE CHANNEL TO A DEPTH EQUAL TO THE SPECIFIED DEPTH OF ROCK PLACEMENT SUCH THAT THE FINISHED ROCK SURFACE WILL BE AT THE ELEVATION OF THE SURROUNDING LAND.

2. ROCK MUST BE PLACED WITHIN THE CHANNEL AS SPECIFIED WITHIN THE APPROVED PLANS, INCLUDING THE PLACEMENT OF ANY SPECIFIED FILTER LAYER.

3. IF DETAILS ARE NOT PROVIDED ON THE ROCK PLACEMENT, THEN THE PRIMARY ARMOUR ROCK MUST BE EITHER PLACED ON:
(i) A FILTER BED FORMED FROM A LAYER OF SPECIFIED SMALLER ROCK (ROCK FILTER LAYER);
(ii) AN EARTH BED LINED WITH FILTER CLOTH;
(iii) AN EARTH BED NOT LINED IN FILTER CLOTH, BUT ONLY IF ALL VOIDS BETWEEN THE ARMOUR ROCK ARE TO BE FILLED WITH SOIL AND POCKET PLANTED IMMEDIATELY AFTER PLACEMENT OF THE ROCK.

4. IF A ROCK/AGGREGATE FILTER LAYER IS SPECIFIED, THEN PLACE THE FILTER LAYER IMMEDIATELY AFTER THE FOUNDATIONS ARE PREPARED. SPREAD THE FILTER ROCK IN A UNIFORM LAYER TO THE SPECIFIED DEPTH BUT A MINIMUM OF 150mm. WHERE MORE THAN ONE LAYER OF FILTER MATERIAL HAS BEEN SPECIFIED, SPREAD EACH LAYER SUCH THAT MINIMAL MIXING OCCURS BETWEEN EACH LAYER OF ROCK.

5. IF A GEOTEXTILE (FILTER CLOTH) UNDERLAY IS SPECIFIED, PLACE THE FABRIC DIRECTLY ON THE PREPARED FOUNDATION. IF MORE THAN ONE SHEET OF FABRIC IS REQUIRED TO OVER THE AREA, OVERLAP THE EDGE OF EACH SHEET AT LEAST 300mm AND PLACE ANCHOR PINS AT MINIMUM 1m SPACING ALONG THE OVERLAP.

6. ENSURE THE GEOTEXTILE FABRIC IS PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION OF THE FABRIC AND THE ROCK. REPAIR ANY DAMAGE BY REMOVING THE ROCK AND PLACING WITH ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA OVERLAPPING THE EXISTING FABRIC A MINIMUM OF 300mm.

7. WHERE NECESSARY, A MINIMUM 100mm LAYER OF FINE GRAVEL, AGGREGATE OR SAND SHOULD BE PLACED OVER THE FABRIC TO PROTECT IT FROM DAMAGE.

8. PLACEMENT OF ROCK SHOULD FOLLOW IMMEDIATELY AFTER PLACEMENT OF THE FILTER LAYER. PLACE ROCK SO THAT IT FORMS A DENSE, WELL-GRADED MASS OF ROCK WITH A MINIMUM OF VOIDS.

9. PLACE ROCK TO ITS FULL THICKNESS IN ONE OPERATION. DO NOT PLACE ROCK BY DUMPING THROUGH CHUTES OR OTHER METHODS THAT CAUSE SEGREGATION OF ROCK SIZES.

10. THE FINISHED SURFACE SHOULD BE FREE OF POCKETS OF SMALL ROCK OR CLUSTERS OF LARGE ROCKS. HAND PLACING MAY BE NECESSARY TO ACHIEVE THE PROPER DISTRIBUTION OF ROCK SIZES TO PRODUCE A RELATIVELY SMOOTH, UNIFORM SURFACE. THE FINISHED GRADE OF THE ROCK SHOULD BLEND WITH THE SURROUNDING AREA. NO OVERFALL OR PROTRUSION OF ROCK SHOULD BE APPARENT.

11. IMMEDIATELY UPON COMPLETION OF THE CHANNEL, VEGETATE ALL DISTURBED AREAS OR OTHERWISE PROTECT THEM AGAINST SOIL EROSION.

12. WHERE SPECIFIED, FILL ALL VOIDS WITH SOIL AND VEGETATE THE ROCK SURFACE IN ACCORDANCE WITH THE APPROVED PLAN.

MAINTENANCE

1. DURING THE CONSTRUCTION PERIOD, INSPECT ALL CHUTES PRIOR TO FORECAST RAINFALL, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF PRODUCING STORM EVENTS, OR OTHERWISE ON A WEEKLY BASIS. MAKE REPAIRS AS NECESSARY.

2. CHECK FOR SCOUR OR DISLODGED ROCK. REPAIR DAMAGED AREAS IMMEDIATELY.

3. CLOSELY INSPECT THE OUTER EDGES OF THE ROCK PROTECTION. ENSURE WATER ENTRY INTO THE CHANNEL OR CHUTE IS NOT CAUSING EROSION ALONG THE EDGE OF THE ROCK PROTECTION.

4. INVESTIGATE THE CAUSE OF ANY SCOUR, AND REPAIR AS NECESSARY.

5. CAREFULLY CHECK THE STABILITY OF THE ROCK LOOKING FOR INDICATIONS OF PIPING, SCOUR HOLES, OR BANK FAILURES.

6. REPLACE ANY DISPLACED ROCK WITH ROCK OF A SIGNIFICANTLY (MINIMUM 110%) LARGER SIZE THAN THE DISPLACED ROCK.

7. ENSURE SEDIMENT IS NOT PARTIALLY BLOCKING FLOW ENTRY INTO THE CHUTE. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

8. DISPOSE OF ANY SEDIMENT IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

9. WHEN MAKING REPAIRS, ALWAYS RESTORE THE CHUTE TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED.

Drawn:	Date:		
GMW	May-10	Chutes - Rock Linings	CH-06

NOT FOR CONSTRUCTION

0 2 4 6 8 10m
Scale: 1:200 (A1 SHEET)

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
00	29/11/18	J.M.A	J.A	B.J	ISSUED FOR APPROVAL
A	26/11/18	J.M.A	J.A	B.J	DRAFT ISSUE – FOR REVIEW

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PROJECT TITLE
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SPRING CREEK CROSSING

DRAWING TITLE
SPRING CREEK CROSSING
STORMWATER DETAILS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C302	00

Plot Date: Thursday, November 29, 2018 2:59:11 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P05_C_REV00.dwg

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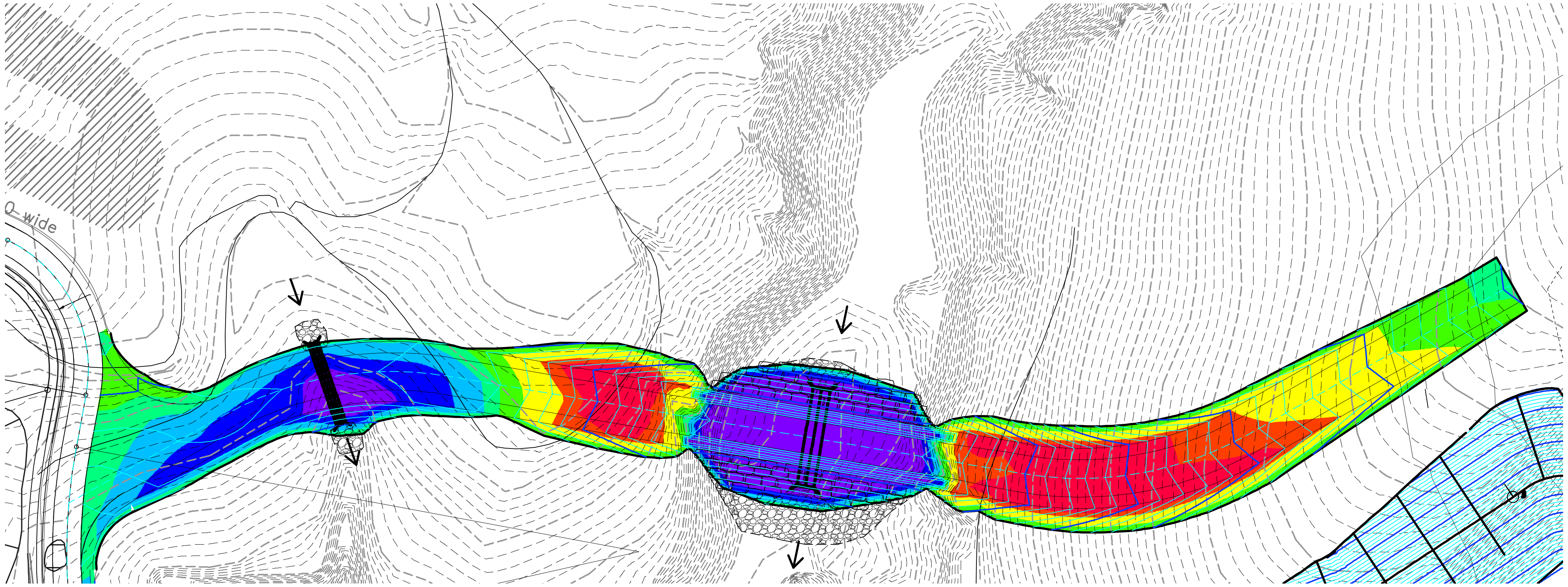
Surface Analysis: Elevation Ranges			
Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-2.466	-1.700
2		-1.700	-1.300
3		-1.300	-0.500
4		-0.500	0.000
5		0.000	0.300
6		0.300	0.700
7		0.700	1.200
8		1.200	5.100



SPRING CREEK CROSSING - CUT/FILL PLAN

0 5 10 15 20 25m
Scale: 1:500 (A1 SHEET)

NOT FOR CONSTRUCTION

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
CUT-FILL HAUL RD	**1.000**	**1.000**	4420.975sq.m	2560.253 Cu. M.	2874.990 Cu. M.	314.737 Cu. M.<Fill>
Totals			4420.975sq.m	2560.253 Cu. M.	2874.990 Cu. M.	314.737 Cu. M.<Fill>

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
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DRAWING STATUS
DESIGN BY J.M.A
DRAWN BY J.A
FINAL APPROVAL B.J
SCALE: (on A1 Original) 1:500
FOR APPROVAL

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PROJECT TITLE
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SPRING CREEK CROSSING

DRAWING TITLE
SPRING CREEK CROSSING
CUT/FILL PLAN

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P05	C400	00

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Appendix 2

Spring Creek Crossing Erosion and Sediment Control Plan

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DARGUES GOLD PROJECT
CONSTRUCTION OF
SPRING CREEK CROSSING
MAJORS CREEK, NSW, 2622

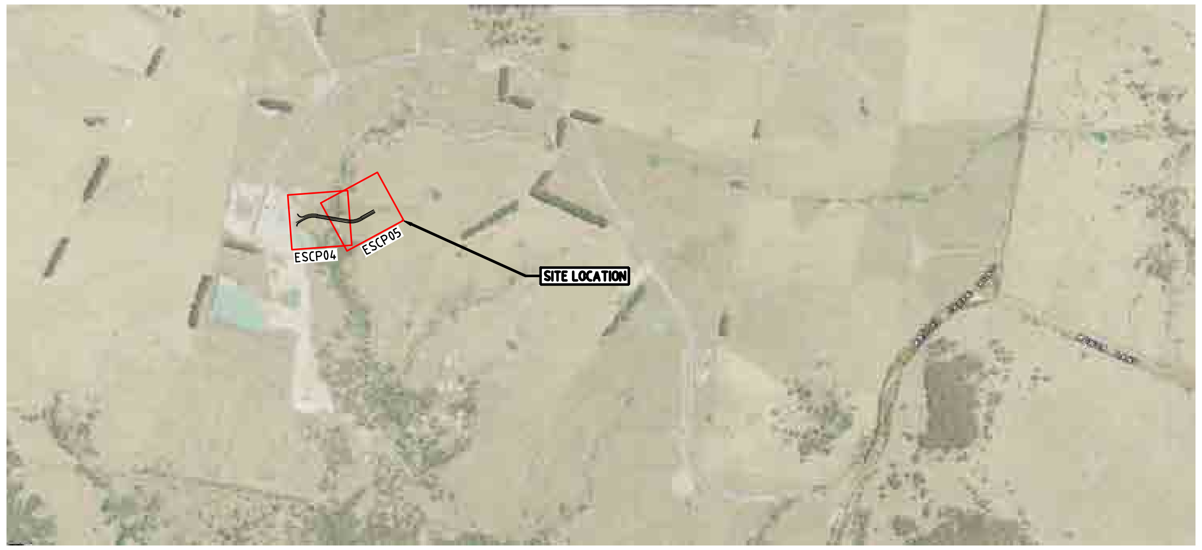
EROSION AND SEDIMENT CONTROL PLAN

FOR APPROVAL

NOVEMBER 2018

DRAWING SCHEDULE

DRAWING No.	NAME
ESCP00	EROSION & SEDIMENT CONTROL TITLE SHEET, LOCALITY PLAN AND DRAWING SCHEDULE
ESCP01	EROSION & SEDIMENT CONTROL GENERAL NOTES & REQUIREMENTS
ESCP02	EROSION & SEDIMENT CONTROL TABLES
ESCP03	EROSION & SEDIMENT CONTROL CALCULATIONS AND DETAIL
ESCP04	EROSION & SEDIMENT CONTROL PLAN MAIN PLAN – SHEET 1 OF 2
ESCP05	EROSION & SEDIMENT CONTROL PLAN MAIN PLAN – SHEET 2 OF 2
ESCP06	EROSION & SEDIMENT CONTROL PLAN CULVERT TYPICAL DETAIL
ESCP07	EROSION & SEDIMENT CONTROL PLAN DETAILS AND PHOTOS
ESCP08	EROSION & SEDIMENT CONTROL PLAN STANDARD DRAWINGS



LOCALITY PLAN

NOT TO SCALE

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
02	29/11/18	M.P.	L.O.	M.P.	FOR APPROVAL
D	28/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE – AMENDED TO REFLECT COMMENTS
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DESIGN BY	M.P.
DRAWN BY	L.O.
FINAL APPROVAL	J.M.A

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PROJECT TITLE
DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING
CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
GENERAL NOTES & REQUIREMENTS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP00	02

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GENERAL EROSION AND SEDIMENT CONTROL REQUIREMENTS

EROSION AND SEDIMENT CONTROL STAGING REQUIREMENTS

All erosion and sediment controls for each stage/section of works must be installed and functioning prior to undertaking any stripping or earthworks for that particular stage. The site supervisor or environmental manager is to ensure this. Stripping and earthworks necessary to implement the required erosion and sediment controls is permitted but is to be kept to an absolute minimum.

Erosion and sediment control locations, details and sizes to be confirmed onsite during construction with detailed survey. Controls may need to be varied to suit site conditions.

General Road Works

Before commencement of stripping and earthworks, the site is to be secured and the following erosion and sediment control measures installed in order except for Items 11 to 15 which are to be undertaken progressively as required throughout all stages of works (Refer to the Monitoring and Maintenance notes):

1. Barrier fencing should be installed around the edge of the construction boundary to restrict access and in any additional locations as necessary to minimise unnecessary disturbance. Refer to the 'Barrier Fencing' notes below.
2. Establish sediment fencing in the locations shown and following Standard Drawing SD 6-8 (Refer to the 'Sediment Fencing' notes below).
3. Establish a site office, toilet and parking area (alternatively existing amenities can be used).
4. Temporary waterway crossings are to be installed in accordance with Standard Drawing 5-1.
5. Prior to stripping topsoil, gypsum is to be spread evenly over the ground surface at a rate of 5 tonnes/ha to be stripped up with the topsoil (Refer to the 'Soil Treatment and Stabilisation' notes).
6. Clean water diversion drains and topsoil bunds are to be formed and stabilised. Energy dissipaters are to be installed at the outlets (Refer to Detail 2).
7. Sediment basins are to be constructed including their outlet spillways and energy dissipaters (Refer to Standard Drawing SD 6-4 and the 'Sediment Basin' notes below for construction details and Table 3 for sizing and lining specifications).
8. Dirty water diversion drains are to be formed and stabilised. Energy dissipaters are to be installed at the outlets (Refer to Detail 2) and check dams are to be installed as nominated (Refer to Drawings 17000009_P02_ESCP04 to 05 for locations and to Standard Drawing SD 5-4 for construction details).
9. Establish stockpile areas within the locations specified and following Standard Drawing SD 4-1 (Refer to the 'Stockpiling' notes below). Note: Other locations may be possible, however, approval must be granted and appropriate erosion and sediment controls implemented.
10. Earthworks can now commence. Stockpile topsoil and subsoil separately and in accordance with the requirements on Standard Drawing SD 4-1 and the 'Stockpiling' notes below.
11. Slope lengths across disturbed lands to be maintained at the required intervals during all rainfall events (Refer to the 'Slope Lengths' notes).
12. Dust suppression to be carried out when required (Refer to the 'Dust Suppression' notes).
13. Measurement of dirty water is to be carried out as necessary in accordance with the Sediment Basin' notes.
14. Monitoring, maintenance and auditing is to be carried out regularly as required, in accordance with the 'Monitoring and Maintenance' notes and the 'Self Auditing Program' notes.
15. Undertake progressive stabilisation of lands (including soil treatment) as final earthworks and road works are complete in each area (rather than waiting until the completion of works).
16. Final soil treatment and stabilisation is to be completed in accordance with the 'Soil Treatment and Stabilisation' notes and Table 1.

Works Within the Spring Creek Waterway Extent (Culvert/Pipe Installation and Roadway Fill/Earthworks)

Refer to the typical details for new online culvert (Drawings 17000009_P02_ESCP06) and pipe installation works (17000009_P02_ESCP07) for erosion and sediment control staging requirements for works in the Spring Creek waterway extent and additional pipe location (see Drawings 17000009_P02_ESCP04 & 05 for the waterway extent).

STOCKPILING

Stockpile locations are shown on Drawings 17000009_P02_ESCP04 & 05. Other locations may be possible, however, approval must be granted and appropriate erosion and sediment controls implemented.
They should also incorporate clearly defined access controls and comply with the regulations outlined below.

All stockpiles must be constructed and maintained in accordance with Standard Drawing SD 4-1 and the following regulations:

- All stockpiles must have sediment fencing installed around their bases as per Standard Drawing SD 4-1.
- Stockpiles are not to be positioned within a riparian zone (i.e. within 40m of a drainage reserve/creek).
- Mulched vegetation, topsoil and subsoil (if applicable) are to be stockpiled separately.
- Stockpiles are to be trimmed and immediately sown with permanent pasture species.
- Stockpiles are to be stabilised to achieve a C-factor of 0.1 within 10 days of formation. Stabilisation measures on stockpiles must be employed as per the requirements set out in Table 1.
- Stabilisation can be achieved by seeding and spraying stockpiles with Vital P47, hydromulching, covering with jute matting or geotextile (or equivalent).
- Stockpiles should be constructed to no more than 2 meters in height.
- The working face of the stockpile should be battered down to no steeper than 2:1 (H:V).

SEDIMENT FENCING

- Install sediment fences in the locations shown on Drawings 17000009_P02_ESCP04 & 05.
- Install all sediment fencing in accordance with Standard Drawing SD 6-8.
- Sediment fences must be firmly trenched into the ground for their entire length.
- Sediment fences must include small 'returns' (see Standard Drawing 6-8) to minimise the risk of water flowing along them rather than through them.
- Sediment fences are to be installed around the toe of all stockpiles (Refer to Standard Drawing SD 4-1).

BARRIER FENCING

- Barrier fencing is to be used to delineate the work extent.
- Install barrier fencing around the edge of the works boundary. Install 2-5m from the edge of the construction area.
- Barrier fencing can simply be made from tape wound around star pickets or stakes. Alternatively, sediment fence, flagging or chain wire fences can be used for this purpose if so desired. Existing site fences can also be used where it is present in the relevant locations.
- Barrier fencing is to be used at the discretion of the site manager to delineate other 'no go' areas to minimise unecessary disturbance.
- The soil erosion hazard on the site will be kept as low as practicable by minimising land disturbance. Some ways of doing this are outlined in Table 2.

SEDIMENT BASIN MANAGEMENT

- The required sediment basin sizes and details are shown in on drawing ESCP03.
- Sediment basins are to be constructed in accordance with Standard Drawing SD 6-4 and engineering and geotechical specifications/design.
- Gypsum is to be shallow ripped into the basin internal walls at a rate of 5 tonnes/ha during basin construction.
- The sediment basins are to be built to incorporate a primary outlet (weir overflow/spillway) sized to have a capacity to pass the 100 year ARI peak flow. (Refer to drawing ESCP03 for sizing and details). Spillway and outlet dissipater is to be designed and constructed in accordance with engineering and geotechnical specifications/design.
- An energy dissipater is to be incorporated into the outlet of the spillway overflow. Dissipater is to extend to watercourse or 100% vegetated lands. Construct with geotextile and rock size equivalent to the spillway overflow and in accordance with Standard Drawing SD 5-8.
- Gypsum is to be shallow ripped into the spillway surfaces and dissipater surface at the base of the spillway at a rate of 10 tonnes/ha prior to placing geotextile and rock.
- Refer to Table 5.10 in the Water Management Plan for Trigger Action Response Plan for Sediment Basins.
- If a basin overflows implement the level 4 response in Table 7.5 of the Water Management Plan.
- Water trapped in a sediment basin will be pumped to either the irrigation fields or MWSD01 for disposal. Refer to Section 5.4 of the Water Management Plan.
- The sediment basins must be discharged within 5 days or less following a rainfall event:
- Although not essential, it is recommended that flow or rainfall activated flocculant/coagulant dosing occurs at the basin inlet/s for settling out dirty water. This would protect pumps and irrigation lines, etc.
- A sediment basin marker is to be installed within all sediment basins indicating the sediment volume level.
- Sediment is to be cleaned out (removed) from the sediment basins prior to it reaching this sediment volume level. Removed sediment must be placed away from concentrated flow or lands that drain back to the basin.

OTHER DIRTY WATER MANAGEMENT

- Any water accumulating onsite within general works area (e.g. excavations, boxed out road sections, sediment traps, sumps or any other low point) must be considered as dirty water.
- The water can be used back on-site for construction or dust-suppression purposes as long as it drains back into the sediment capture system.
- Alternatively it can be transferred to a sediment basin for ultimate disposal by irrigation.

DUST SUPPRESSION

- Dust suppression should be carried out whenever necessary to minimise sediments becoming air borne due to wind erosion.
- Ensure a reliable water source and/or dust suppression management system (i.e. dustex, dustguard or Vital Stonewall) is available onsite prior to starting any construction works (including stripping and clearing works).

SOIL TREATMENT AND STABILISATION

- Prior to stripping topsoil, weeds are to be sprayed and gypsum is to be spread evenly over the ground surface at a rate of 5 tonnes/ha to be stripped up with the topsoil.
- Disturbed lands that grade more than 6% must be temporarily stabilised with soil binder or other suitable product if rain is forecast (more than 50% chance of more than 10mm), even if they are to be re-worked.
- Undertake progressive stabilisation of disturbed ground surfaces as they are completed rather than at the end of the works program (Refer to Table 1).
- Final stabilisation is to achieve the C-factors outlined in Table 1.
- Stabilisation of batters and general surfaces can be achieved by:
  1. Shallow ripping gypsum into the subgrade at a rate of 5 tonnes/ha and to a depth of 50-100mm to break up hardsetting surfaces.
  2. Placing treated topsoil over the ripped subgrade surface (see Standard Drawing SD 4-2 and SD 7-1 for instructions regarding topsoil replacement).
  3. Seeding, then placing placing locally sourced native mulch over the soil . Alternatively, topsoil can be placed then hydromulched (with seed) or seeded and sprayed with Vital P47 (or equivalent).
  4. Mulch, hydromulch or soil binders and additional seed might need re-application if adequate vegetation is not achieved.
- Appropriate seedbed preparation should be carried out when stabilising lands (See Standard Drawing SD 7-1).
- Diversion drains, bunds and table drains are to be stabilised as indicated in Table 1.
- Stockpiles are to be stabilised as per the requirements of Table 1 and as shown in Standard Drawing SD 4-1.
- As surfaces are stabilised and permanent drainage measures are installed, temporary water management structures can be removed (e.g. diversion drains).

SELF AUDITING PROGRAM

- A self-auditing program must be initiated for the site. The site manager is to inspect the site at least weekly and maintain a log of inspections, paying particular attention to:
  a. Removal of spilled soils or other materials from near creeks/drainage lines.
  b. Ensuring barrier fencing is maintained and exclusion zones are being observed by all workers and contractors.
  c. Constructing additional erosion and/or sediment control works as might become necessary to ensure the desired water control is achieved.
  d. Maintaining erosion and sediment control measures in a functioning condition for the duration of the excavation works.
  e. Removal of trapped sediment and disposal to safe areas.
- Areas of localised soil erosion are to be identified and appropriate preventative measures implemented. These might include but are not limited to:
  a. Planting additional stabilising vegetation or wind breaks.
  b. Stabilising soils with mulches or alternative soil binders.
  c. Taking steps to minimise any concentrated stormwater flows.
- Any areas of localised poor drainage are to be identified and appropriate remedial action taken. This might include but are not limited to:
  a. Installing formalised drainage channels or pipes.
  b. Improving soil permeability by cultivating the soil surface.
  c. Improving soil permeability by installing infiltration trenches.

SLOPE LENGTHS

- Ensure slope lengths are maintained at no more than 80m across all disturbed lands during any rainfall event.
- Diversion bunds/drains, low flow earth banks (Standard Drawing SD 5-5) or sandbags/equivalent should be installed prior to any forecast rainfall event to achieve this.

MONITORING AND MAINTENANCE

General

- The site manager is to delineate an appropriate location for the site office or compound/s (or existing amenities can be used).
- A rain gauge is to be installed on site and daily rainfall is to be recorded .
- Safe storage areas for wastes, fuels and other hazardous materials are to be delineated at the discretion of the site manager.
- Storage locations for erosion control materials (e.g. jute matting) are to be delineated at the discretion of the site manager.
- Any waste materials (such as rocks and debris) are to be removed from any publically trafficked road surface as soon as possible.
- Any sediment accumulated in trapping devices is to be removed and deposited in a secure location where there is a low risk that it will be re-entrained in runoff.
- Waste receptacles are to be emptied as necessary. Disposal of waste must be in a manner approved by the site superintendent.

THE SOILS

Details of soils across the Project Site are contained in Part 8 of the Project's EA (available at http://www.divminerals.com.au/dargues-gold-mine/project-approvals/). Recommendations for their management are given at Section 8.8. In summary, soils within the Project Site have the following characteristics:

- Coarse to medium-grained, weakly-structured topsoils with sandy-clay subsoils.
- Initial drainage into topsoils is rapid, although subsoils have imperfect drainage. As such, infiltration rates would decrease rapidly as soils approach maximum water holding capacity.
- Soils are moderately erodible but are significantly dispersible (i.e. Type D according to the classifications in Landcom, 2004). A conservative K-Factor of 0.06 is adopted.
- Sub Soils are inorganic, highly plastic clays and are prone to significant shrinking and swelling as they wet and dry.
- Soils are prone to tunnelling and slumping and might not be inherently suitable for use in earth structures (e.g. dam walls or embankments). Refer to the geotechnical engineering report/design.
- Soils are:
  - o non-saline,
  - o strongly to very strongly acidic (topsoil = pH 4.6 to 5.4) and
  - o relatively infertile.
- Liming rate to achieve pH = 6.5 would be approximately 300 to 400 gsm.
- Recommended gypsum rate is 500 to 1000 gsm.

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A	21/03/17	M.P.	M.R.	M.P.	DRAFT ISSUE FOR CONSULTATION

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PROJECT TITLE

DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE

EROSION & SEDIMENT CONTROL PLAN
GENERAL NOTES & REQUIREMENTS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP01	02

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TABLE 1 - STABILISATION REQUIREMENTS AND TREATMENT METHODS

DURING CONSTRUCTION - TEMPORARY STABILISATION
(During periods of inactivity when works are on hold)

LANDS	STABILISATION REQUIREMENT	TIMEFRAMES	TREATMENT METHODS - PRODUCTS	REMARKS
High Risk Areas Soil Loss Class 6 or above lands (where applicable)	C-factor = 0.1 (60% grass cover or equivalent ground cover [1])	Applies prior to rainfall and after 10 working days of inactivity (even though works might continue later)	Soil binder (i.e. Vital P47/stonewall or equivalent [1])	- Stabilise all exposed soils by spraying surfaces with Vital P47/stonewall or equivalent [1]. - Vital dilution rate = 1:10 (Vital:Water). - Application rate = 1L / m^2 of diluted Vital mixture. - Re-apply/maintain as necessary to ensure the required cover is provided.
			Geotextile, jute matting, black plastic or equivalent [1]	- Cover all exposed soils. - Re-apply/maintain as necessary to ensure the required cover is provided.
All lands (including waterways and stockpiles)	C-factor = 0.15 (50% grass cover or equivalent ground cover [1])	Applies after 20 working days of inactivity (even though works might continue later)	Soil binder (i.e. Vital P47/stonewall or equivalent [1])	- Spray all stockpile surfaces with Vital P47/stonewall or equivalent [1]. - Vital dilution rate = 1:10 (Vital:Water). - Application rate = 1L / m^2 of diluted Vital mixture. - Re-apply/maintain as necessary (approx. every 3-6 months without suitable vegetation cover) to ensure the required cover is provided.
			Geotextile, jute matting, black plastic or equivalent [1]	- Cover all exposed soils. - Re-apply/maintain as necessary to ensure the required cover is provided.

TABLE 1 - STABILISATION REQUIREMENTS AND TREATMENT METHODS CONTINUED

POST CONSTRUCTION

LANDS	STABILISATION REQUIREMENT	TIMEFRAMES	TREATMENT METHODS - PRODUCTS	REMARKS
Waterways, drainage lines and concentrated flow areas	C-factor = 0.05 (70% grass cover or equivalent ground cover [1])	Applies after 10 working days from completion of formation and before they are allowed to carry concentrated flows	Refer to the drain specifications detailed on the plan for specific lining/stabilisation requirements. Example treatment methods are shown below.	
			Temporary lining - Geotextile (i.e. Bidim A24 or equivalent [1])	- Complete any subsoil treatment before laying the matting. - Install matting in accordance with SD 5-7. - Re-apply/maintain as necessary to ensure the required cover is provided.
			Jute mesh, seeding and soil binder (i.e. Vital P47/stonewall or equivalent [1]) - Low flows	- Complete subsoil treatment (i.e. gypsum lightly ripped into surgrade at a rate of 5tonnes/ha). - Place topsoil to a depth of at least 75mm. - Complete any fertilisation and seeding before laying the matting. - Install matting in accordance with SD 5-7. - Spray all surfaces with Vital P47/stonewall or equivalent [1]. - Vital dilution rate = 1:10 (Vital:Water). - Application rate = 1L / m^2 of diluted Vital mixture. - Re-apply/maintain as necessary to ensure the required cover is permanently maintained.
			Jute matting (~350gsm) and seeding or equivalent [1] - Low to moderate flows	- Complete subsoil treatment (i.e. gypsum lightly ripped into surgrade at a rate of 5tonnes/ha). - Place topsoil to a depth of at least 75mm. - Complete any fertilisation and seeding before laying the matting. - Install matting in accordance with SD 5-7. - Re-apply/maintain as necessary to ensure the required cover is permanently maintained.
			Turf reinforcement matting (TRM) (e.g. TerraMat or equivalent [1]) - Moderate flows	- Complete subsoil treatment (i.e. gypsum lightly ripped into surgrade at a rate of 5tonnes/ha). - Place topsoil to a depth of at least 75mm. - Complete any fertilisation and seeding before laying the matting. - Install matting in accordance with SD 5-7. - Re-apply/maintain as necessary to ensure the required cover is permanently maintained.
			Rock lining - High flows	- Complete subsoil treatment (i.e. gypsum lightly ripped into surgrade at a rate of 5tonnes/ha). - Install geotextile underlay (if specified) in accordance with SD 5-7. - Install rock armouring (to the depth and size as specified on the plan). - Re-apply/maintain as necessary to ensure the required cover is provided.
Stockpiles	C-factor = 0.10 (60% grass cover or equivalent ground cover [1])	Applies after 10 working days from completion of formation	Seeding and soil binder (i.e. Vital P47/stonewall or equivalent [1])	- Apply seed to all stockpile surfaces (Note: seeding may not be required if existing seedbed is present). - Spray all stockpile surfaces with Vital P47/stonewall or equivalent [1]. - Vital dilution rate = 1:10 (Vital:Water). - Application rate = 1L / m^2 of diluted Vital mixture. - Re-apply/maintain as necessary to ensure the required cover is permanently maintained.
			Geotextile, jute matting, black plastic or equivalent [1]	- Cover all exposed soils. - Re-apply/maintain as necessary to ensure the required cover is provided.
General Surfaces	C-factor = 0.10 / 0.05 (60% / 70% grass cover or equivalent ground cover [1])	C-factor = 0.1 applies after 10 working days from completion of formation and C-factor = 0.05 applies within a further 60 days	Topsoil, seeding and soil binder (i.e. Vital P47/stonewall or equivalent [1])	- Refer to SD 7-1. - Complete subsoil treatment (i.e. gypsum lightly ripped into surgrade at a rate of 5tonnes/ha). - Place gypsum treated topsoil to a depth of at least 75mm. - Apply any fertilisers required. - Apply seed to all surfaces (Note: seeding may not be required if existing seedbed is present). - Spray all surfaces with Vital P47/stonewall or equivalent [1]. - Vital dilution rate = 1:10 (Vital:Water). - Application rate = 1L / m^2 of diluted Vital mixture. - Re-apply/maintain as necessary to ensure the required cover is permanently maintained.
			Hydromulch or equivalent [1]	- Refer to SD 7-1. - Complete subsoil treatment (i.e. gypsum lightly ripped into surgrade at a rate of 5tonnes/ha). - Place topsoil to a depth of at least 75mm. - Apply hydromulch to soil surfaces. - Re-apply/maintain as necessary to ensure the required cover is permanently maintained.

[1] - Equivalent cover/product must achieve the equivalent C-factor with proven reasearch/documentation to verify this.

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PROJECT TITLE
DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
TABLES

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP02	02

TABLE 3 - BASIN SIZING DETAILS

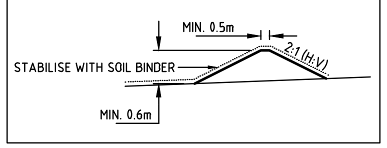
Site area	Sub-catchment or Name of Structure						Notes
	SB1	SB2	SB3	SB4			
Total catchment area (ha)	0.064	0.052	0.115	0.124			
Disturbed catchment area (ha)	0.064	0.052	0.115	0.124			
Soil analysis (enter sediment type if known, or laboratory particle size data)							
Sediment Type (C, F or D) if known:	D	D	D	D			From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D	D			Automatic calculation from above
Rainfall data							
Design rainfall depth (no of days)	5	5	5	5			See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	95	95	95	95			
x-day, y-percentile rainfall event (mm)	83.2	83.2	83.2	83.2			
Rainfall R-factor (if known)	2410	2410	2410	2410			Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	10.5	10.5	10.5	10.5			
RUSLE Factors							
Rainfall erosivity (R-factor)	2410	2410	2410	2410			Auto-filled from above
Soil erodibility (K-factor)	0.06	0.06	0.06	0.06			RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	6	6	6	6			
Slope gradient (%)	50	50	50	50			
Length/gradient (LS-factor)	2.18	2.18	2.18	2.18			
Erosion control practice (P-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (C-factor)	1	1	1	1	1	1	
Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)							
Storage (soil) zone design (no of months)	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.9	0.9	0.9	0.9	0.9	0.9	See Table F2, page F-4 in Appendix F
Calculations and Type D/F Sediment Basin Volumes							
Soil loss (t/ha/yr)	410	410	410	410			
Soil Loss Class	4	4	4	4			See Table 4.2, page 4-13
Soil loss (m³/ha/yr)	316	316	316	316			Conversion to cubic metres
Sediment basin storage (soil) volume (m³)	3	3	6	7			See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m³)	48	39	86	93			See Sections 6.3.4(i) for calculations
Sediment basin total volume (m³)	51	42	92	100			

TABLE 4 - BASIN SPILLWAY SIZING DETAILS

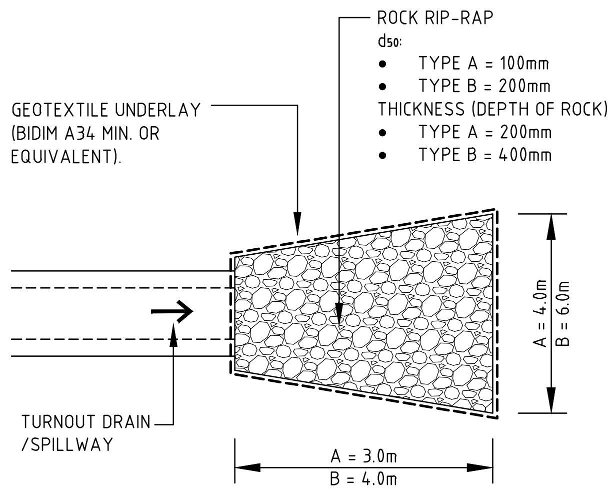
Basin	Basin Spillway				
	Depth (m)	Side Slope (H:V)	Base Width (m)	Top Width (m)	Lining
SB1	0.08	3:1	2	2.32	Rock (d50 = 100) with geotextile underlay (bidim A34 min.)
SB2	0.08	3:1	2	2.32	
SB3	0.08	3:1	2	2.32	
SB4	0.08	3:1	2	2.32	

NOTES:
- Gypsum is to be shallow ripped into the basin walls at a rate of 5 tonnes/ha during basin construction.
- Gypsum is to be shallow ripped into the spillway walls at a rate of 10 tonnes/ha during basin construction.
- Ensure the total basin volumes are provided within the available basin capacity below the spillway level.
- Ensure suitable access is provided into the sediment basins to enable treatment, sediment removal and maintenance.
- A sediment marker is to be installed within each basin (well away from the inlets and outlets) to indicate the sediment storage volume level (measured from the bottom surface of the basin).
- Dissipaters are to be provied at the outlet of sediment basin spillways and are to extend to a watercourse or 100% vegetated lands.

DETAIL 1 - DIVERSION BUND



DETAIL 3 - ROCK DISSIPATER



- ROCK DISSIPATERS TO BE INSTALLED IN ACCORDANCE WITH BLUE BOOK STANDARD DRAWING (SD 5-8).
- GYPSUM IS TO BE SHALLOW RIPPED INTO THE SUBGRADE SURFACE (AT A RATE OF 10 tonnes/ha) PRIOR TO PLACING THE GEOTEXTILE AND ROCK.
- BASIN SPILLWAY DISSIPATERS ARE TO BE CONSTRUCTED WITH GEOTEXTILE, ROCK AND AN OUTLET WIDTH OF EQUIVALENT SIZE/SPECIFICATIONS TO THE SPILLWAY REQUIREMENTS.
- BASIN SPILLWAY DISSIPATERS TO EXTEND TO A WATERCOURSE OR 100% VEGETATED LANDS.

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00	12/05/17	M.P.	M.R.	M.P.	ISSUED FOR CONSTRUCTION
A	21/03/17	M.P.	M.R.	M.P.	DRAFT ISSUE FOR CONSULTATION

DRAWING STATUS

DESIGN BY	M.P.
DRAWN BY	L.O.
FINAL APPROVAL	J.M.A

SCALE:
(on A3 Original)

FOR APPROVAL

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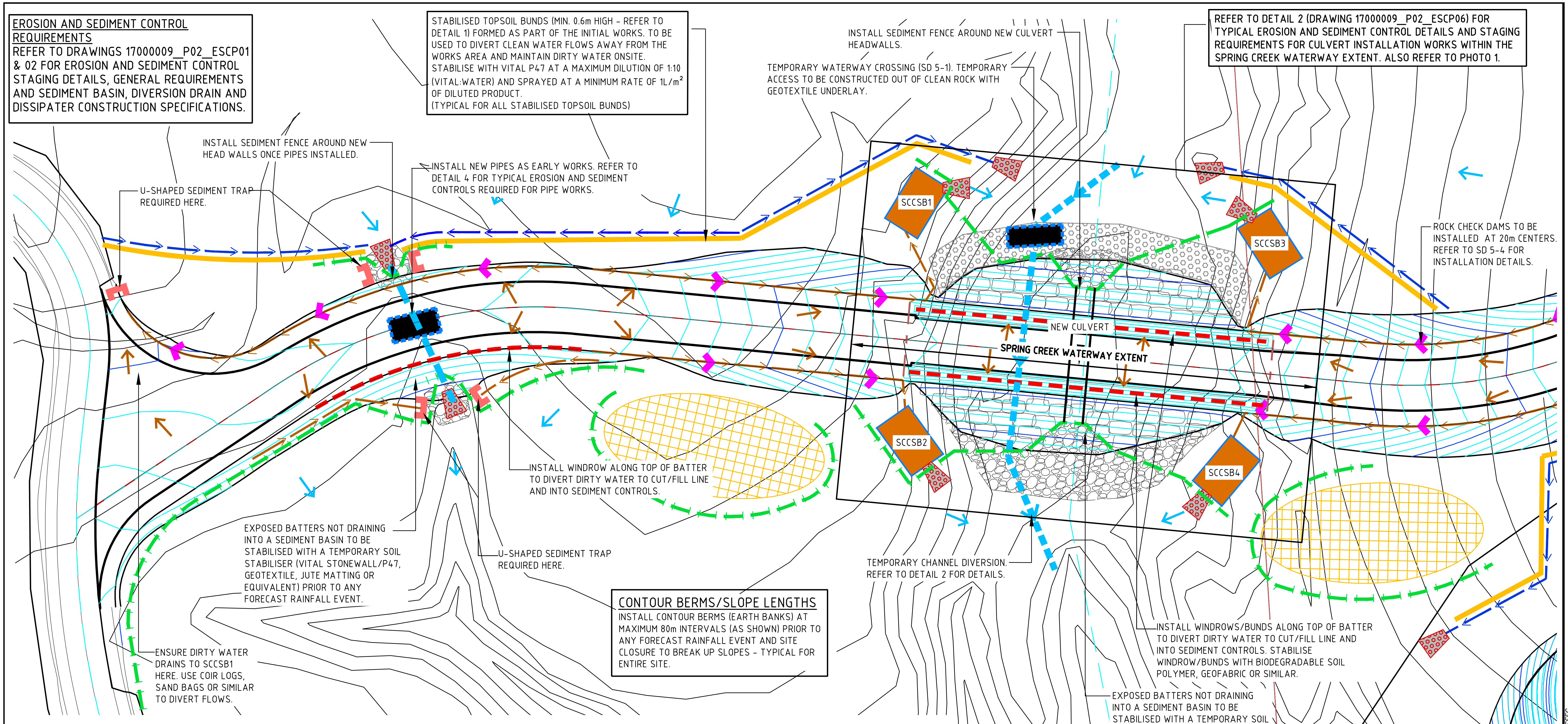
PROJECT TITLE
DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
CALCULATIONS AND DETAIL

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP03	02



LEGEND

- DIRTY WATER DRAIN FLOW PATH
- STABILISED TOPSOIL BUND (0.6m HIGH MIN. - SEE DETAIL 1)
- SEDIMENT FENCE (SD 6-8)
- STORMWATER PIPE (MIN. ø450)
- DIVERSION BANK/CONTOUR BERM - TO DIRECT FLOWS & BREAK UP SLOPE LENGTHS (SD 5-5)
- SEDIMENT BASIN (SD 6-4)
- CLEAN WATER DIVERSION DRAIN
- NOMINATED STOCKPILE AREAS (SD 4-1) - (NOTE THAT OTHERS MIGHT BE POSSIBLE AND THE LOCATIONS SHOWN ARE OPTIONAL)
- TEMPORARY WATERWAY CROSSING (SD 5-1)
- DIRTY WATER SURFACE FLOW
- CLEAN WATER SURFACE FLOW
- CHECK DAM (SD 5-4)
- GEOTEXTILE LINED BATTER CHUTE
- ROCK ARMOURING / DISSIPATOR - (MIN. ø100 ROCK WITH GEOTEXTILE UNDERLAY)
- WINDROW/BUND ALONG EDGE OF FILL WORKS
- U-SHAPED SEDIMENT TRAP
- TEMPORARY ACCESS
- TEMPORARY CHANNEL DIVERSION

SD # REFERS TO STANDARD DETAILS ON ESCP07 & 08

ADDITIONAL SEDIMENT BASIN CONSTRUCTION REQUIREMENTS (Also Refer to General Notes on Drawing 17000009_P02_ESCP01)

- SCHEDULE SEDIMENT BASIN CONSTRUCTION WORKS FOR A SUFFICIENT PERIOD TO ENABLE CONSTRUCTIONS WHEN THE WEATHER FORECAST PREDICTS RAINFALL IS UNLIKELY (<50% CHANCE OF RAINFALL >=10mm).
- ALL EXPOSED AREAS ADJACENT TO THE CREEKLINE AND WITHIN FLOOD PRONE LANDS ARE TO BE STABILIED/COVERED IF AN UNEXPECTED RAINFALL EVENT WAS TO OCCUR DURING CONSTRUCTION WORKS.
- EROSION CONTROL MATERIALS (E.G. GEOTEXTILE FABRIC OR JUTE MATTING) ARE TO BE LOCATED ONSITE TO ENABLE THIS.
- SEDIMENT FENCE IS TO BE INSTALLED DOWNSLOPE OF THE SEDIMENT BASIN CONSTRUCTION AREA PRIOR TO STARTING CONSTRUCTION WORKS.
- THE OUTER BATTERS/BASIN WALLS ARE TO BE STABILISED TO ACHIEVE 70% GROUND COVER WITHIN 10 DAYS AFTER THE BASIN CONSTRUCTION WORKS ARE COMPLETE.

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DRAWING STATUS	
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FINAL APPROVAL	J.M.A
SCALE: (on A3 Original)	1:500

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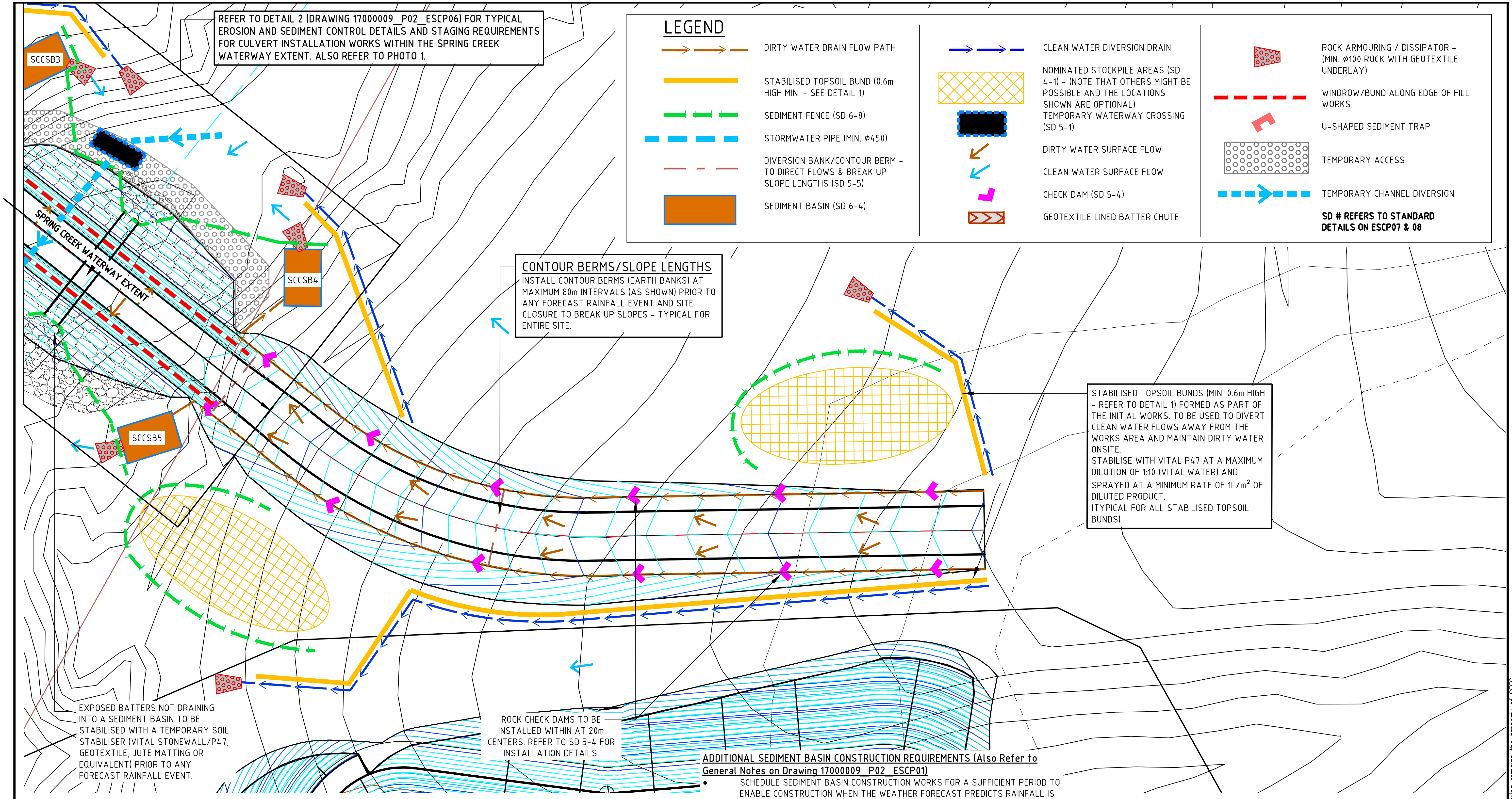
PROJECT TITLE
DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
MAIN PLAN - SHEET 1 OF 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP04	02

Plot Date: Thursday, 29 November 2018 2:13:19 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P02_ESCP_REV02.dwg



ADDITIONAL SEDIMENT BASIN CONSTRUCTION REQUIREMENTS (Also Refer to General Notes on Drawing 17000009_P02_ESCP01)

- SCHEDULE SEDIMENT BASIN CONSTRUCTION WORKS FOR A SUFFICIENT PERIOD TO ENABLE CONSTRUCTION WHEN THE WEATHER FORECAST PREDICTS RAINFALL IS UNLIKELY (<50% CHANCE OF RAINFALL >=5mm).
- ALL EXPOSED AREAS ADJACENT TO THE CREEKLINE AND WITHIN FLOOD PRONE LANDS ARE TO BE STABILIED/COVERED IF AN UNEXPECTED RAINFALL EVENT WAS TO OCCUR DURING CONSTRUCTION WORKS.
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EROSION AND SEDIMENT CONTROL REQUIREMENTS

REFER TO DRAWINGS 17000009_P02_ESCP01 TO ESCP03 FOR EROSION AND SEDIMENT CONTROL STAGING DETAILS, GENERAL REQUIREMENTS AND SEDIMENT BASIN, DIVERSION DRAIN AND DISSIPATER CONSTRUCTION SPECIFICATIONS.

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DRAWN BY	L.O.
FINAL APPROVAL	J.M.A
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CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
MAIN PLAN – SHEET 2 OF 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP05	02

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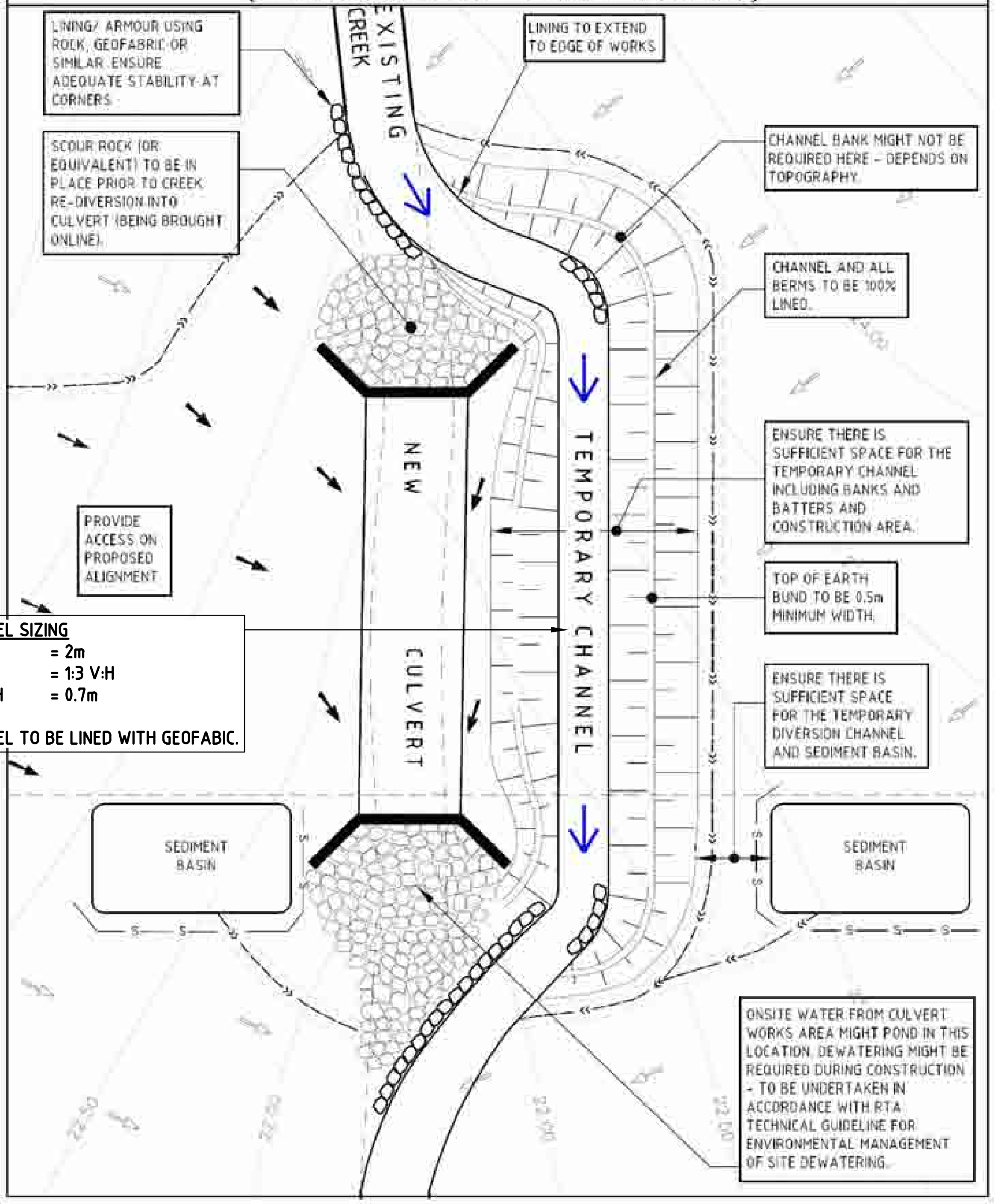
NEW ONLINE CULVERT (PREFERABLY AS "EARLY WORKS")



TEMPORARY CHANNEL SIZING
BASE WIDTH = 2m
SIDE SLOPES = 1:3 V:H
MIN. CHANNEL DEPTH = 0.7m

TEMPORARY CHANNEL TO BE LINED WITH GEOFABIC.

SWMP – ONLINE CULVERT CONSTRUCTION AND CREEK STABILISATION WORKS

NEW ONLINE CULVERT – CONSTRUCTION NOTES

THESE STEPS TO BE UNDERTAKEN IN THE ORDER GIVEN BELOW.

Stage 1: Temporary Channel Construction
- Establish diversion drains for offsite water.
- Construct and line the temporary channel including rock armouring at the existing creek and temporary channel junctions.
- Construct and line temporary earth bunds.
- Divert creek flows into this channel. Work downstream to upstream.

Stage 2: Culvert Construction Works
- Construct the new culvert including the stabilised culvert inlet and outlets.
- Stabilise the culvert construction works area once culvert construction works are complete.

Stage 3: Final diversion and Rehabilitation Works
- Divert creek flows into new culvert.
- Temporary channel and bunds to be decommissioned without allowing sediment downstream to creek and the disturbed area stabilised.
- Diversion drains for offsite water can be redirected to inlet of new culvert on upstream site or can be removed and rehabilitated.

OTHER NOTES

1. This design assumes that culvert construction is part of the 'early works' for the site.
2. Temporary channel to be sized and lined as per the requirements in Table 6.1 (DECC, 2008) and Table 5.2 (Landcom, 2004)
3. Ideally schedule works to periods when rainfall erosivity is low (Refer to Table 4.3 – Landcom, 2004)
4. Only undertake in-stream works (e.g. placement of rock) during periods of zero or very low flow and only when the 24 hour weather forecast suggests a significant rain event is not likely.
5. Ensure suitable temporary groundcover materials (e.g. geofabric or black plastic) are located on site for rapid stabilisation of exposed soils within in-stream locations if an unexpected rain or flow event occurs.
6. No culvert works are to occur until creek flows are successfully diverted into the stabilised temporary channel.
7. Culverts are to be completed before being allowed to convey flows. This includes all inlet and outlet protection, wingwalls etc.
8. Stabilisation, as defined by the Blue Book, means achieving:
   - For concentrated flows – At least 70% vegetation cover (or equivalent) within 10 days AND using only materials that are suitable in concentrated flow conditions (refer to Tables A3 and D1 in the Blue Book for suitability).
   - For all other areas – At least 60% vegetation cover (or equivalent) in 20 days AND 70% in 2 months.
9. A management regime should be in place to address the risk of these works creating a flooding issue due to constriction of the channel during construction.
10. If temporary access is required across the existing creek or a diversion channel, use a temporary water crossing – see standard drawing 5-1 in Blue Book Vol 1 (Landcom, 2004).
11. Minimise the time that soil is exposed to erosion.

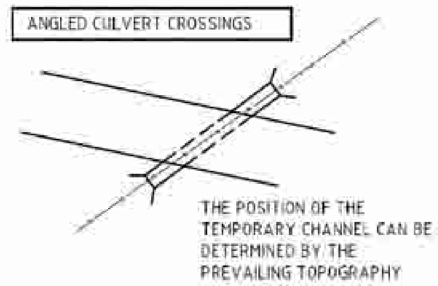
STANDARD DRAWINGS FROM VOL 1 OF THE BLUE BOOK (LANDCOM, 2004) USED HERE:

Sediment fence: SD 6-8
High flow earth bank (diversion drain): SD 5-6
Energy dissipater: SD 5-8
Temporary waterway crossing: SD 5-1

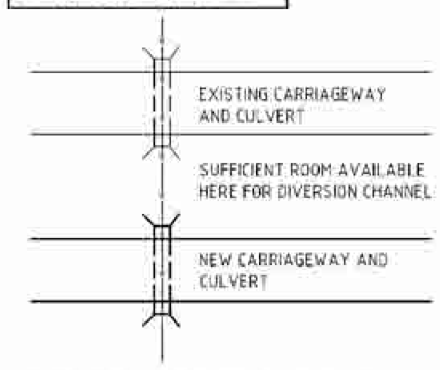
AT ALL TIMES DURING WORKS, ENSURE THAT 'OFFSITE' WATER IS PASSED AROUND OR THROUGH THE SITE WITHOUT COMING INTO CONTACT WITH EXPOSED SOIL OR 'ONSITE' WATER

THIS SCENARIO ALSO APPLIES TO:

ANGLED CULVERT CROSSINGS



DIVIDED CULVERT EXTENSION



THE APPLICATION OF THIS SCENARIO TO DIVIDED CULVERT EXTENSIONS IS DEPENDENT ON WHETHER THERE IS ENOUGH AVAILABLE SPACE. IF SPACE IS LIMITED PART OF THE TEMPORARY CHANNEL CAN BE CONSTRUCTED OUT OF SHEET PILING OR SIMILAR OR ALTERNATIVELY THE SITE SHOULD BE STABILISED AS FOR A CONTINUOUS ONLINE CULVERT EXTENSION

LEGEND

- S SEDIMENT FENCE (SD 6-8)
- DIVERSION DRAIN FOR 'OFFSITE' WATER (SD 5-6)
- SURFACE CONTOURS
- 'ONSITE' FLOWS
- 'OFFSITE' FLOWS
- CREEK/CHANNEL FLOWS
- CUT/FILL BATTER
- ROCK DISSIPATION/ STABILISATION STRUCTURES (SD 5-8)

NOTE THAT NOT ALL ONSITE WATER MANAGEMENT AND SEDIMENT CONTROLS ARE SHOWN HERE.

DETAIL 2 – NEW ONLINE CULVERT CONSTRUCTION (TYPICAL) DETAIL. REFER TO PHOTO 1 FOR TYPICAL TEMPORARY CHANNEL DIVERSION.

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DESIGN BY	M.P.
DRAWN BY	L.O.
FINAL APPROVAL	J.M.A
SCALE: (on A3 Original)	NTS

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PROJECT TITLE: DARGUES GOLD PROJECT CONSTRUCTION OF SPRING CREEK CORSSING MAJORS CREEK, NSW, 2622

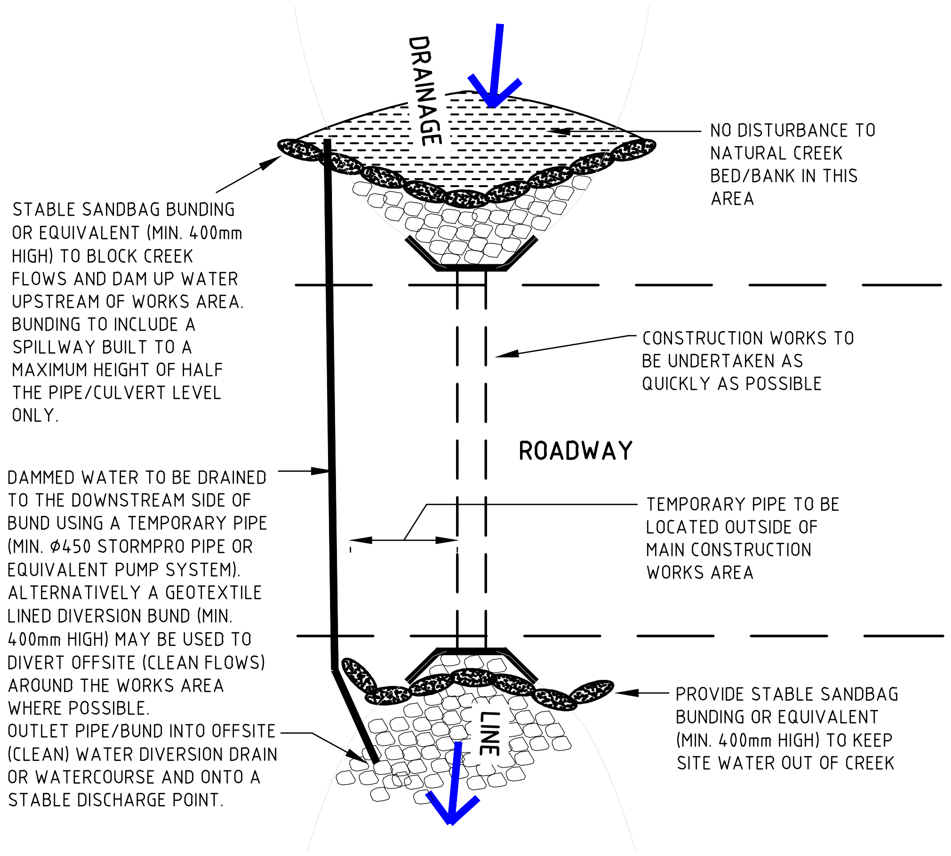
DRAWING TITLE: EROSION & SEDIMENT CONTROL PLAN CULVERT TYPICAL DETAIL

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP06	02

Plot Date: Thursday, 29 November 2018 2:13:32 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P02_ESCP_REV02.dwg

DETAIL 4 - TYIPCAL WATER MANAGEMENT FOR PIPE INSTALLATION WORKS

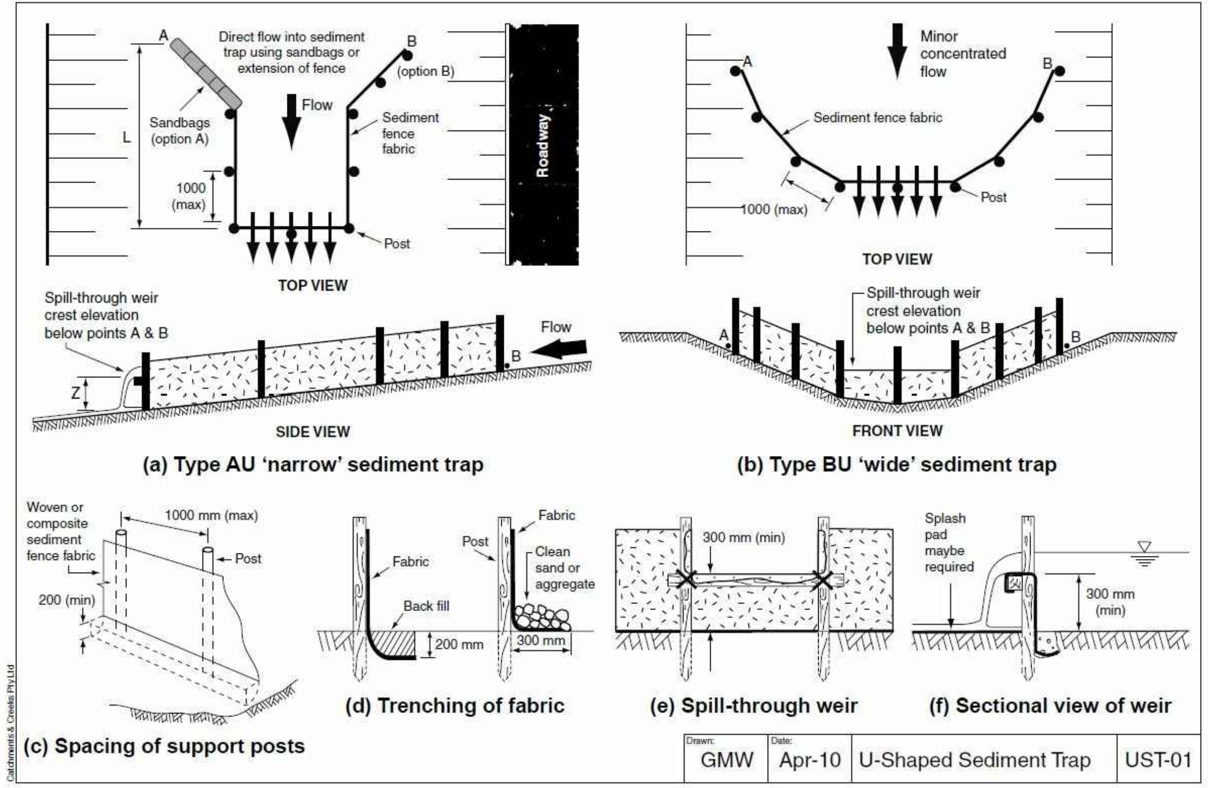
PHOTO 1 - EXAMPLE OF CLEAN WATER DIVERSION



EROSION AND SEDIMENT CONTROL REQUIREMENTS FOR PIPE WORKS

GENERAL

- IDEALLY ALL WORKS ARE TO BE SCHEDULED FOR THE MONTHS FROM APRIL TO MAY INCLUSIVE OR JULY TO SEPTEMBER INCLUSIVE (THE LOWEST RAINFALL EROSIVITY AND AVERAGE RAINFALL MONTHS BASED ON DATA SOURCED FROM THE BLUE BOOK (2004) AND THE BUREAU OF METEROLOGY WEBSITE (APRIL 2014)).
- PRIOR TO UNDERTAKING ANY CONSTRUCTION OR EARTHWORKS ENSURE TEMPORARY GROUNDCOVER MATERIALS (E.G. GEOFABRIC OR BLACK PLASTIC) ARE TO BE LOCATED ON SITE FOR STABILISATION OF EXPOSED SURFACES.
- EARTHWORKS OR SOIL DISTURBANCE OF ANY KIND MUST NOT COMMENCE WITHIN THE DRAINAGE LINE UNTIL A CLEAN DIVERSION (PUMP, PIPE OR LINED DRAIN) IS IN PLACE TO TAKE UPSTREAM FLOWS AROUND THE WORK AREA.
- AT ALL TIMES DURING WORKS, ENSURE THAT NATURAL UPSTREAM FLOWS ARE PIPED, PUMPED OR DIVERTED AROUND THE WORK SITE WITHOUT COMING INTO CONTACT WITH EXPOSED SOIL OR DIRTY CONSTRUCTION WATER.
- TEMPORARY CLEAN WATER DIVERSIONS (PUMPS/PIPES/DRAINS) HAVE THE CAPACITY TO TAKE LOW FLOWS ONLY. HIGHER DRAINAGE LINE FLOWS DURING LARGER STORM EVENTS MAY OVERTOP THE CLEAN DIVERSION AND THEREFORE ALL EXPOSED SOILS WITHIN THE WATERWAY MUST BE COVERED OR LINED PRIOR TO RAINFALL TO MINIMISE THE RISK OF EROSION.
- DURING ALL WORKS STAGES ALL EXPOSED SOILS WITHIN THE DRAINAGE LINE EXTENT ARE TO BE STABILISED WITH A TEMPORARY GROUNDCOVER (E.G. GEOFABRIC OR BLACK PLASTIC) PRIOR TO RAINFALL. THE TOP SURFACE OF THE EARTHWORKS FILL PLATFORM MAY BE STABILISED WITH VITAL STONEWALL PRIOR TO RAINFALL (IN PLACE OF GEOTEXTILE) ONCE THE SUBJECT LEVEL IS AT LEAST 500mm ABOVE THE PIPE OVERFLOW LEVEL.
- EXPOSED BATTERS WITHIN THE DRAINAGE LINE EXTENT WHERE WORKS ARE NOT ACTIVELY OCCURRING ARE TO BE TEMPORARILY COVERED WITH GEOTEXTILE OR EQUIVALENT.
- DISTURBANCE WITHIN IN-STREAM LOCATIONS IS TO BE MINIMISED AS MUCH AS POSSIBLE.
- FINAL STABILISATION OF SURFACES IS TO OCCUR PROGRESSIVELY AS EACH SECTION OF WORKS ARE COMPLETE.
- DIRTY (ON-SITE) WATER ACCUMULATING WITHIN THE WORKS AREA IS TO BE PUMPED TO A SEDIMENT BASIN FOR TREATMENT OR TREATED IN-SITU PRIOR TO DISCHARGING.
- ALTERNATIVELY ONSITE WATER CAN BE USED FOR DUST SUPPRESSION ON THE ROADWORK AREAS OUTSIDE OF THE WATERWAY EXTENT (I.E. AREAS THAT DRAIN BACK INTO A SEDIMENT BASIN).



MATERIALS

FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700mm IN WIDTH AND A MINIMUM UNIT WEIGHT OF 140g/m². ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS AND STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE (ULTRAVIOLET STABILITY EXCEEDING 70%).

FABRIC REINFORCEMENT: (IF USED) WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200mm.

SUPPORT POSTS/STAKES: 1500mm² (MIN) HARDWOOD, 2500mm² (MIN) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE FOR ATTACHING FABRIC.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND REQUIRED TYPE OF FABRIC (IF SPECIFIED). IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, FABRIC TYPE, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. INSTALL THE FABRIC IN A U-SHAPE, EXTENDING THE WING WALLS EITHER UP THE SIDE SLOPES AND/OR UP THE CHANNEL INVERT (AS DIRECTED) TO A POINT WHERE THE GROUND LEVEL IS AT LEAST 100mm HIGHER THAN THE CREST OF THE SPILL-THROUGH WEIR.

3. ENSURE THAT THE EXPECTED CHANNEL FLOW WILL ENTER THE SEDIMENT TRAP, EITHER BY EXTENDING THE WING WALLS UP THE BANK SLOPE, OR CONSTRUCTING SANDBAG FLOW DIVERSION BANKS.

4. UNLESS DIRECTED BY THE SITE SUPERVISOR, EXCAVATE A 200mm WIDE BY 200mm DEEP TRENCH ALONG THE ALIGNMENT OF THE SPILL-THROUGH WEIR AND WING WALLS.

5. ALONG THE LOWER SIDE OF THE TRENCH, APPROPRIATELY SECURE THE STAKES INTO THE GROUND SPACED NO GREATER THAN 1m.

6. CONSTRUCT THE SEDIMENT TRAP FROM A CONTINUOUS ROLL OF FABRIC.

7. SECURELY ATTACH THE FABRIC TO THE SUPPORT POSTS/STAKES USING 25mm STAPLES OR TIE WIRE AT MAXIMUM 150mm SPACING WITH THE FABRIC EXTENDED AT LEAST 200mm INTO THE TRENCH.

8. INSTALL A SPILL-THOUGH WEIR AT THE LOWEST POINT IN THE FENCE. THE WEIR MUST BE AT LEAST 300mm ABOVE ADJACENT GROUND LEVEL, AND BELOW THE LOWEST GROUND LEVEL AT THE ENDS OF THE WING WALLS.

9. SECURELY TIE A HORIZONTAL CROSS MEMBER (WEIR) TO THE ADJACENT SUPPORT POSTS. CUT THE FABRIC DOWN THE SIDE OF THE POSTS AND FOLD THE FABRIC OVER THE CROSS MEMBER AND APPROPRIATELY SECURE THE FABRIC.

10. IF DIRECTED, INSTALL A SUITABLE SPLASH PAD IMMEDIATELY DOWN-SLOPE OF THE SPILL-THROUGH WEIR TO CONTROL SOIL EROSION DOWNSTREAM OF THE SEDIMENT TRAP.

11. BACKFILL THE TRENCH AND TAMP THE FILL TO FIRMLY ANCHOR THE BOTTOM OF THE FABRIC AND MESH TO PREVENT WATER FROM FLOWING UNDER THE FENCE.

MAINTENANCE

1. INSPECT THE SEDIMENT TRAP AT LEAST WEEKLY AND AFTER ANY SIGNIFICANT RAIN. MAKE NECESSARY REPAIRS IMMEDIATELY.

2. REPAIR ANY TORN SECTIONS WITH A CONTINUOUS PIECE OF FABRIC FROM POST TO POST.

3. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.
4. IF THE FABRIC IS SAGGING BETWEEN STAKES, INSTALL ADDITIONAL SUPPORT POSTS/STAKES.

5. REMOVE ACCUMULATED SEDIMENT IF THE SEDIMENT DEPOSIT EXCEEDS A DEPTH OF 150mm.

6. DISPOSE OF SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. REPLACE THE FABRIC IF THE SERVICE LIFE OF THE EXISTING FABRIC EXCEEDS SIX MONTHS.

REMOVAL

1. WHEN DISTURBED AREAS UP-SLOPE OF THE SEDIMENT TRAP ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, THE SEDIMENT TRAP MUST BE REMOVED.

2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. REHABILITATE/REVEGETATE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.

Catchments & Creeks Pty Ltd

Drawn:	Date:		
GMW	Apr-10	U-Shaped Sediment Trap	UST-02

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
02	29/11/18	M.P.	L.O.	M.P.	FOR APPROVAL
D	28/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE - AMENDED TO REFLECT COMMENTS
C	27/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE
B	23/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE FOR CONSULTATION
01	23/08/17	M.P.	M.N.	M.P.	LOCALITY PLAN UPDATED
00	12/05/17	M.P.	M.R.	M.P.	ISSUED FOR CONSTRUCTION
A	21/03/17	M.P.	M.R.	M.P.	DRAFT ISSUE FOR CONSULTATION

DRAWING STATUS	
DESIGN BY	M.P.
DRAWN BY	L.O.
FINAL APPROVAL	J.M.A
SCALE: (on A3 Original)	

FOR APPROVAL

North

CLIENT

DARGUES GOLD MINE

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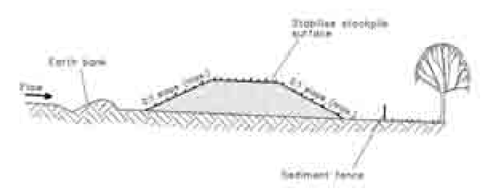
PROJECT TITLE
DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
DETAILS AND PHOTOS

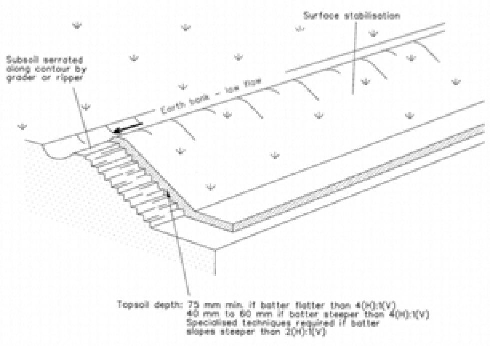
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP07	02



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES SD 4-1



Construction Notes

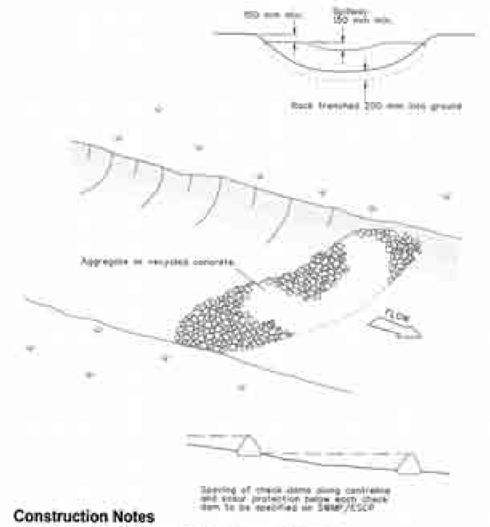
1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

REPLACING TOPSOIL SD 4-2

Construction Notes

1. Prohibit all traffic until the access way is constructed.
2. Strip any topsoil and place a needle-punched textile over the base of the crossing.
3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.
4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H): 1 (V) slope on side batters.
5. Install a lower section to act as an emergency spillway in greater than design storm events.
6. Ensure that culvert outlets extend beyond the toe of fill embankments.

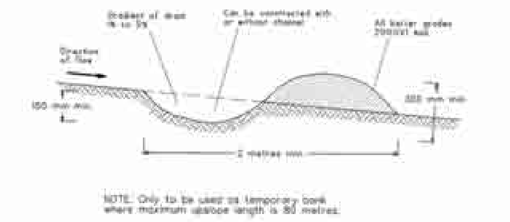
TEMPORARY WATERWAY CROSSING SD 5-1



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.

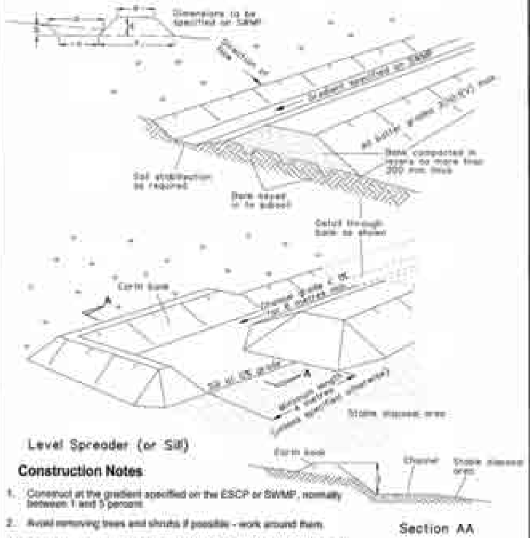
ROCK CHECK DAM SD 5-4



Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

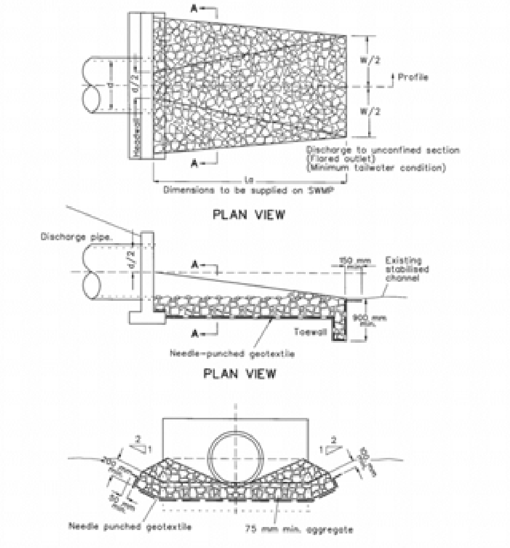
EARTH BANK (LOW FLOW) SD 5-5



Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

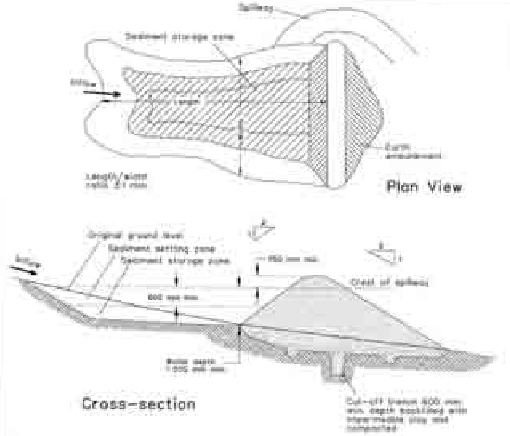
EARTH BANK (HIGH FLOWS) SD 5-6



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.

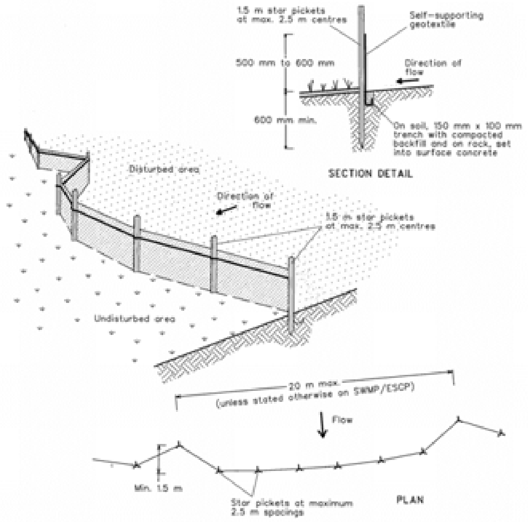
ENERGY DISSIPATER SD 5-8



Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

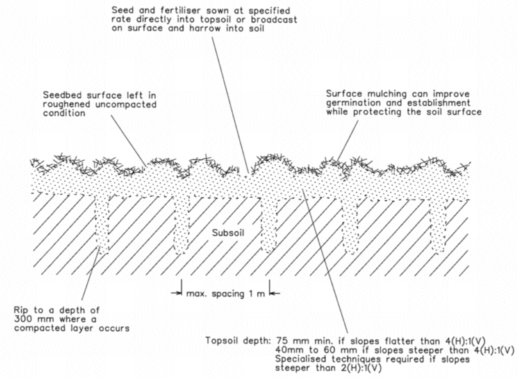
EARTH BASIN - WET SD 6-4
(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE SD 6-8



Construction Notes

1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.
2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.
3. Avoid cultivation in very wet or very dry conditions.
4. Cultivate on or close to the contour where possible, not up and down the slope.

SEEDBED PREPARATION SD 7-1

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
02	29/11/18	M.P.	L.O.	M.P.	FOR APPROVAL
D	28/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE - AMENDED TO REFLECT COMMENTS
C	27/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE
B	23/11/18	M.P.	L.O.	M.P.	DRAFT ISSUE FOR CONSULTATION
01	23/08/17	M.P.	M.N.	M.P.	LOCALITY PLAN UPDATED
00	12/05/17	M.P.	M.R.	M.P.	ISSUED FOR CONSTRUCTION
A	21/03/17	M.P.	M.R.	M.P.	DRAFT ISSUE FOR CONSULTATION

DRAWING STATUS	
DESIGN BY	M.P.
DRAWN BY	L.O.
FINAL APPROVAL	J.M.A
SCALE: (on A3 Original)	

FOR APPROVAL

North

CLIENT

DARGUES GOLD MINE

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WWW.SEEC.COM.AU

PROJECT TITLE

DARGUES GOLD PROJECT
CONSTRUCTION OF SPRING CREEK CORSSING
MAJORS CREEK, NSW, 2622

DRAWING TITLE

EROSION & SEDIMENT CONTROL PLAN
STANDARD DRAWINGS

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
17000009	P02	ESCP08	02

Plot Date: Thursday, 29 November 2018 2:13:45 PM CAD File Name: P:\17000009 Dargues Reef CEMP and Revised Water Management Plan for WREA\Drawings\17000009_P02_ESCP_REV02.dwg

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Appendix 3

Ecological Assessment

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Suite 2, Level 3 668 Old Princes Highway Sutherland
NSW 2232
t: (02) 8536 8600

23 November 2018

Our ref: 18ARM-9625

Diversified Minerals Pty Ltd
Level 10, 56 Pitt Street,
Sydney NSW 2000
Sent via email: James.Dornan@divminerals.com.au

Attention: James Dornan

Dear James,

Dargues Gold Mine, Modification 4, Spring Creek Crossing

Background

Dargues Gold Mine is located at Majors Creek in the NSW Southern Highlands (**Figure 1**). The mine was approved on 7 February 2012 and since this time, three modifications to the approval have been granted. Modification 3 included a heavy vehicle crossing of Spring Creek to allow access between the process plant and the tailings storage facility (shown in **Figure 1** as "approved crossing"). However, a modification to the approval is now being sort to move the location of the creek crossing approximately 400m upstream, shown in **Figure 1** as "proposed new crossing".

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), a Biodiversity Development Assessment Report (BDAR) is required for the new proposed crossing, unless the authority or person determining the application for modification is satisfied that the modification will not increase the impact on biodiversity values (Clause 7.17 (c) of the BC Act). There are 8 biodiversity values that are described in the BC Act (section 1.5) and *Biodiversity Conservation Regulation 2017* (BC Reg) (clause 1.4), for which to base this assessment. These include:

BC Act (Clause 1.5):

a) vegetation integrity—being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,

b) habitat suitability—being the degree to which the habitat needs of threatened species are present at a particular site,

c) biodiversity values, or biodiversity-related values, prescribed by the regulations (listed below)

BC Reg (Clause 1.4):

a) threatened species abundance—being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site,

b) vegetation abundance—being the occurrence and abundance of vegetation at a particular site,

c) habitat connectivity—being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range,

d) threatened species movement—being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle,

e) flight path integrity—being the degree to which the flight paths of protected animals over a particular site are free from interference,

f) water sustainability—being the degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site.

The report aims to address these values and determine if the proposed new crossing will increase the impact on biodiversity values, compared to the approved crossing, thus requiring the preparation of a BDAR.

Figure 1: Location of the approved and proposed new crossing of Spring Creek at Dargues Gold Mine, Majors Creek

Methodology

Desktop Review

Previous studies undertaken at the site were reviewed to gain an understanding the biodiversity values of the site. This included:

- Gaia (2010) *Ecology Assessment presented as Part 2 in Volume 1 of the Specialist Consultants Studies Compendium prepared to support the Environmental Assessment.*
- Diversified Minerals (2016) *Biodiversity Management Plan for the Dargues Gold Mine.*
- Diversified Minerals (2018) *Background paper for the Dargues Gold Mine Modification 4.*
- Eco Logical Australia (2018) Dargues Gold Mine Flora Monitoring – Autumn 2018 Summary Report. Prepared for Diversified Minerals Pty Ltd.
- Eco Logical Australia 2018. Dargues Gold Mine Flora and Fauna Ecology Monitoring – 2017 Annual Report. Prepared for Pybar Mining Services Pty Ltd.
- Floristic data collected by Eco Logical Australia during flora monitoring

Site Inspection

A site inspection was undertaken by Karen Spicer (ELA Senior Ecologist) on 21 November 2018. The weather was fine and 18°C. A storm and heavy rain occurred during the evening prior to the site inspection. Approximately 2.5 hours were spent on site. Both the approved and proposed new crossings of Springs Creek were inspected.

The proposed crossing would be a 6.5 m wide, unsealed, compacted road base all-weather road, suitable for use by underground haul trucks. However, a 20 m wide impact area was assumed at both locations due to the requirement for earth works and battering either side of the crossing. A flora list of species to be impacted within this area was compiled.

Results

The vegetation mapping contained in the Biodiversity Management Plan (Diversified Minerals 2016) shows the location of both the approved and proposed new crossing to be within vegetation mapped as "Regenerating Wattles". However the width of this vegetation community is narrower at the proposed new crossing.

This site inspection confirmed that both sites occur within the same vegetation type, being heavily disturbed Acacia regrowth, with fragmented Ribbon Gum Forest adjacent to the proposed crossing. The Ribbon Gum Forest south of the approved crossing is in better condition, with a larger contiguous patch size compared to the forest adjacent to the proposed new crossing, which consists of sparse eucalypts. Ribbon Gum Forest is considered to be a form of the Tableland Basalt Forest endangered ecological community (EEC) as listed under the BC Act.

A species list for both sites is contained in **Appendix A.** The dominant ground cover at both sites includes the native species *Microlaena stipoides, Poa labillardierei*, and *Themeda australis,* with the exotic grass *Holcus lantatus* dominant is more sheltered moist areas. A diversity of exotic and native forbs were recorded at both sites. Low flow, inundated sections of the creek at both locations had a dense cover of *Typha domingensis*.

The shrub layer is dominated by regenerating *Acacia melanoxylon* and *A. mearnsii*, however, the site of the approved crossing will likely require the removal of 2-3 *Eucalyptus viminalis* (Ribbon Gum) and 5 mature *Acacia melanoxylon*. One *Eucalyptus pauciflora* (Snow Gum) occurs downstream of the proposed new crossing, but is unlikely to be impacted by the proposed works.

Weeds including *Rubus* spp. agg. (Blackberry), *Cratageus monogyna* (Hawthorn) and *Cytisus scoparius* (Scotch Broom) are common at both sites. Active control via spraying of Scotch Broom was evident at the approved crossing site.

Both sites have severe erosion and due to past historical alluvial mining activities. The approved crossing is located at a wider section of the creek (**Figure 1**) and an artificial bund wall has been constructed across the majority of the creek cross section, likely by Chinese gold diggers in the 1860's (Len Sharp, pers. comm). As such, the approved crossing will require additional earth works and vegetation clearing to construct the crossing, compared to the proposed new crossing.

The proposed new crossing has concrete present within the creek, as the site was previously used as a vehicle crossing. **Figure 2** shows the location of the approved crossing and **Figure 3** shows the location of the new proposed crossing.

Figure 2: Location of the approved crossing (facing west)

Figure 3: Location of the proposed new crossing (facing west)

<u>Impacts on Biodiversity Values</u>

The 8 biodiversity values are listed below in **Table 1** and an assessment has been made against each of the values to compare the approved and proposed new Spring Creek crossing.

Biodiversity Value	Approved crossing	Proposed new crossing	Net Impact
Vegetation integrity	The vegetation integrity (composition, structure and function of the vegetation) has been reduced due to a long history of alluvial gold mining and grazing. The vegetation present on site is regenerating Acacia with a native dominated pasture. Ribbon Gum Forest (EEC) is present to the immediate south of the proposed crossing, which has higher vegetation integrity due to the patch size, conditino and relative cover of Eucalypt canopy species.	The vegetation integrity (composition, structure and function of the vegetation) has been reduced due to a long history of alluvial gold mining and grazing. The vegetation present on site is regenerating Acacia with a native dominated pasture. One Snow Gum is adjacent to the proposed crossing. The vegetation integrity upstream and downstream is relatively poor, given the sparse cover of Ribbon Gum Forest canopy species.	The approved crossing is adjacent to higher integrity vegetation (Ribbon Gum Forest EEC), with some clearing of Ribbon Gums (approximately 2-3 trees) and 5 mature Blackwood likely to be required. In addition, indirect impacts to the Ribbon Gum Forest will likely result. No clearing of mature vegetation is required at the proposed new crossing. **Reduced impact to vegetation integrity.**
Habitat suitability	Several threatened species of birds and microbats have been previously recorded at the study area (Gaia 2010, ELA 2017). The approved crossing has relatively poor habitat for threatened species given the site is highly disturbed. However, some mature native vegetation will require removal. Adjacent Ribbon Gum Forest to the south is more suitable habitat for threatened species, including a known nest tree for Gang-gang Cockatoo.	Threatened species habitat is relatively poor given the site is highly disturbed.	**Reduced impact to habitat suitability** given the proposed new crossing will not require the clearing a mature native vegetation and the site is not adjacent to more suitable threatened species habitat (Ribbon Gum Forest).
Threatened species abundance	The occurrence and abundance of threatened species is likely to be low, but adjacent Ribbon Gum Forest (EEC) to the immediate south is likely to have a higher abundance of threatened species. Some mature Blackwood and Ribbon Gums (diagnostic species of Basalt Tableland Forest EEC) are likely to require removal.	Ribbon Gum Forest (EEC) is not present at the site of the proposed crossing or in adjacent vegetation. The occurrence and abundance of threatened species is likely to be low relative to the Ribbon Gum Forest south of approved crossing.	**Reduced impact on threatened species abundance**

Biodiversity Value	Approved crossing	Proposed new crossing	Net impact
Vegetation abundance	Regenerating wattles are present within the site and Ribbon Gum Forest (EEC) occurs to the immediate south. Some mature native vegetation will be impacted.	Regenerating wattles are present within the site.	**Reduced impact on vegetation abundance**
Habitat connectivity	The site is relatively cleared but some mature vegetation will be removed, thus decreasing habitat connectivity.	The site is relatively cleared apart from native dominated pasture and regenerating native Acacias.	**Reduced impact on habitat connectivity** as the new proposed site will not require the removal of mature native vegetation. However threatened species of bats and birds recorded at the site are all highly mobile.
Threatened species movement	The site is relatively cleared but some mature vegetation will be removed.	The site is relatively cleared apart from native dominated pastures and regenerating native Acacias	**Reduced impact on threatened species movement** as the new proposed crossing will not require the removal of mature native vegetation. However, threatened species of bats and birds previously recorded at the site are all highly mobile the crossing of Spring Creek is unlikely to reduce the movement of threatened species along the riparian corridor.
Flight path integrity	NA – as the proposed works are on the ground.	NA	**No impact** as the flight path of protected migratory species will not be impacted by the proposed crossing of Spring Creek.
Water sustainability			**No change in the net impact,** as both creek crossings will be designed to meet NSW Office of Water and NSW Fisheries guidelines.

Conclusion

The new proposed location for the crossing of Spring Creek will have less ecological impact compared to the approved crossing, because:

- it was previously used as a crossing with a concrete ford still present within Spring Creek and is highly cleared /disturbed land;
- it presents the shortest distance between the process plant and the tailings storage (approximately 240m shorter than the approved road), thus reducing impacts on the native dominated pasture;
- the new proposed crossing will not require the removal of any mature native vegetation;
- the impacts of biodiversity values as listed in **Table 1**, demonstrate that a net reduction in impacts to biodiversity values will result

Therefore, the proposed new crossing of Spring Creek will not increase the impact on biodiversity values and a BDAR is not required to be submitted with Modification 4.

Regards,

Karen Spicer
Senior Ecologist

1. Appendix A: Flora List

Family	Species	Common Name	Status	Priority Weed	WONS	Approved Crossing	Proposed new crossing
Araliaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	N			X	X
Asteraceae	*Chrysocephalum apiculatum*	Yellow Buttons					X
	Cirsium vulgare	Spear Thistle	E			X	
	Conyza sp.	Fleabane	E				X
	Euchiton sp.		N				X
	Hypochaeris radicata	Catsear	E			X	X
	Vittadinia muelleri		N				X
	Vittadinia cuneata	Fuzzweed	N			X	
Brassicaceae	*Brassica* sp.		E				X
	Lepidium sp.		E			X	
	Rorippa nasturtium-aquaticum						
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell	N			X	X
Chenopodiaceae	*Einadia nutans*	Climbing Saltbush	N			X	X
Convolvulaceae	*Convolvulus erubescens*	Blushing Bindweed	N				X
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	N			X	X
Fabaceae - Faboideae	*Cytisus scoparius*	Scotch Broom	E	Yes	Yes	X	X
	Trifolium repens	White Clover	E			X	X
	Trifolium sp	Clover	E				X
Fabaceae - Mimosoideae	*Acacia mearnsii*	Black Wattle	N			X	X
	Acacia melanoxylon	Blackwood	N			X	X
Geraniaceae	*Geranium solanderi var. solanderi*	Native Geranium	N				X
Haloragaceae	*Gonocarpus tetragynus*		N				X
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	E			X	X
Myrtaceae	*Eucalyptus pauciflora*	Snow Gum	N				X (adjacent to proposed crossing)

Family	Species	Common Name	Status	Priority Weed	WONS	Approved Crossing	Proposed new crossing
	Eucalyptus viminalis	Ribbon Gum	N			X	
Plantaginaceae	*Plantago lanceolata*	Plantain, Ribwort	E			X	X
Poaceae	*Holcus lanatus*	Yorkshire Fog	E			X	X
	Microlaena stipoides	Weeping Grass	N			X	X
	Poa labillardierei	Tussock	N			X	X
	Themeda triandra	Kangaroo Grass	N			X	X
Polygonaceae	*Rumex brownie*	Swamp Dock	N				X
Rosaceae	*Crataegus monogyna*	Hawthorn	E			X	X
	Rubus fruticosus sp. agg.	Blackberry	E	Yes	Yes	X	X
	Rubus parvifolius	Native Raspberry	N			X	X
Rubiaceae	*Asperula conferta*	Common Woodruff	N				X
Typhaceae	*Typha domingensis*	Narrow-leaved Cumbungi	N			X	X

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