

CONTRACT 18261 – HWY 682-02
DITCH EROSION REPAIRS
16 KM W. FAIRVIEW, AB

PARTICIPANTS

OWNER = AT

CONSULTANT = Thurber

CONTRACTOR = IN-LINE Contracting Partnership

SUBCONSULTANTS:

- Northwest Hydraulics (Flows and Preliminary Liner Design)
- WSP (Surveying)

SUPPLIERS:

- Nilex (Armorflex ACB Mats – Class 40T & 60T; Microgrid; Non-Woven Geotextile); Mat Design Details & Install Support – Tom Croskey, Armorflex, Minnesota
- Armtec (All Half Culverts and accessories)





Site 1 Erosion (6 to 8% Ditch Grades)



Site 2 Erosion (7 to 20% Ditch Grades)

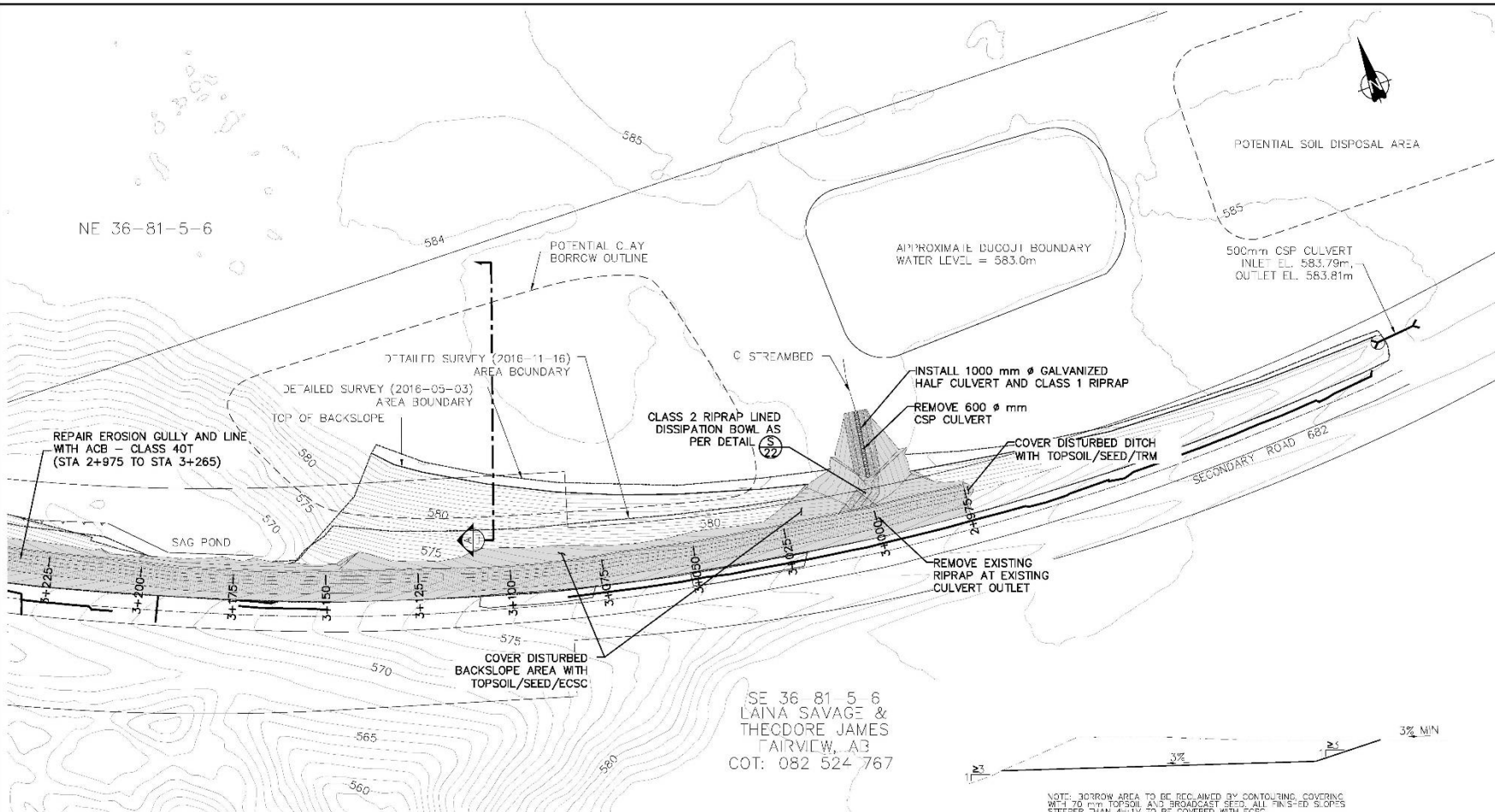


Site 3 Erosion (3 to 25% Ditch Grades)



Site 3 Erosion

NE 36-81-5-6



LEGEND

- CRACK IN PAVEMENT
- HWY 682 SURFACE (8.2m WIDE)
- DP / PROPERTY LINE
- BOUNDARY OF DETAILED SURVEY
- RIPRAP
- ACB - CLASS 40T
- GRAZING LIMITS

NOTES

1. BASE PLAN PROVIDED BY WS1 (SURVEYED AUGUST 3, 2016 AND NOVEMBER 5, 2016)
2. NAD83 UTM 11N COORDINATE SYSTEM
3. LIDAR USED TO GENERATE CONTOURS OUTSIDE SURVEY LIMITS (E-LOWN 15, 2015)
4. SURVEY AND LIDAR CONTOURS MAY VARY FROM EACH OTHER AND MAY NOT BE IN WA-SHED CO. DRAWING AT BOUNDARY
5. CONTOUR INTERVALS ARE 1 m OUTSIDE THE SURVEYED AREA AND 0.5 m INSIDE THE SURVEYED AREA

0 10 20 30 40 50 60 m

SITE PLAN

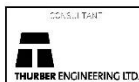
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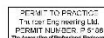
TYPICAL CLAY BORROW SECTION

1:300

NOTE: BORROW AREA TO BE RECLAIMED BY CONTOURING, COVERING WITH 100mm TOPSOIL AND BROADCAST SEED. ALL FINISHED SLOPES STEEPER THAN 4:1V TO BE COVERED WITH ECSC.



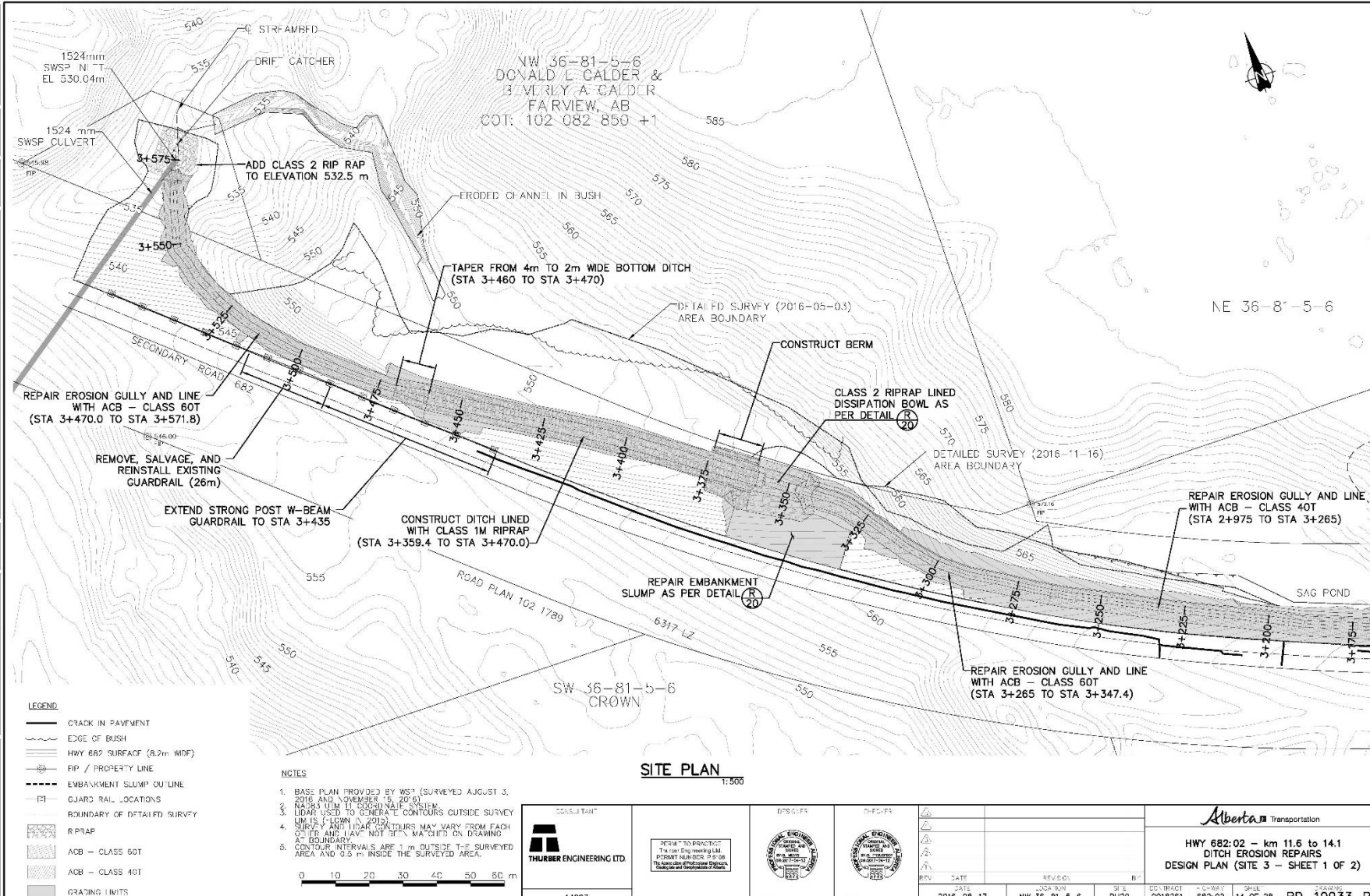
14093



DATE: 2016-08-17
 DESIGNER: SE 36-81-5-6
 PH67
 CHECKED: 0018261
 682-02
 15 OF 28
 RD-19934-P

Alberta Transportation

HWY 682-02 - km 11.6 to 14.1
 DITCH EROSION REPAIRS
 DESIGN PLAN (SITE 3 - SHEET 2 OF 2)



CONSULTANT
THURBER ENGINEERING LTD.
14093

PERMIT TO PRACTICE
Thurber Engineering Ltd.
PROFESSIONAL ENGINEER
P. 0104
The Association of Professional Engineers
Ontario and Transportation of Canada



HWY 682-02 - km 11.6 to 14.1 DITCH EROSION REPAIRS DESIGN PLAN (SITE 3 - SHEET 1 OF 2)			
REV	DATE	REVISION	BUT
2016-08-17	2016-08-17	NW 36-81-5-6	Ph29
CONTRACT	PROJECT	SHEET	DATE
0018261	682-02	14 OF 28	RD-19933-P



Site 3 – Erosion Void Backfilled with Pitrun Gravel
in Fall, 2016 – PreConstruction Condition.



Site 3 – Excavation and Clay Backfill of ACB
60T Mat at Grimms Creek Culvert Entrance



Site 3 – Microgrid and 60T ACB mat placement



Site 3 – Almost Complete 60T ACB mat placement near entrance to Grimms Creek



Site 3 – Compacting
2-25 gravel adjacent
to ACB mat edges

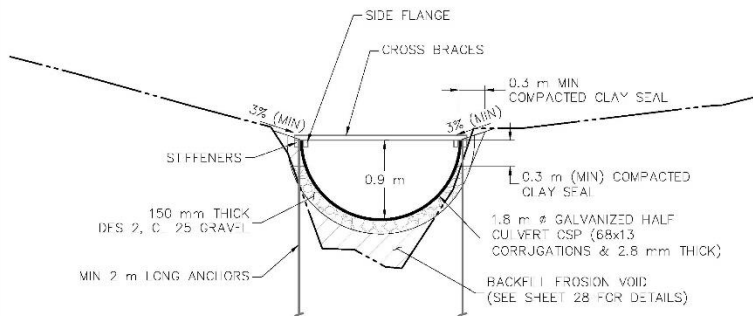




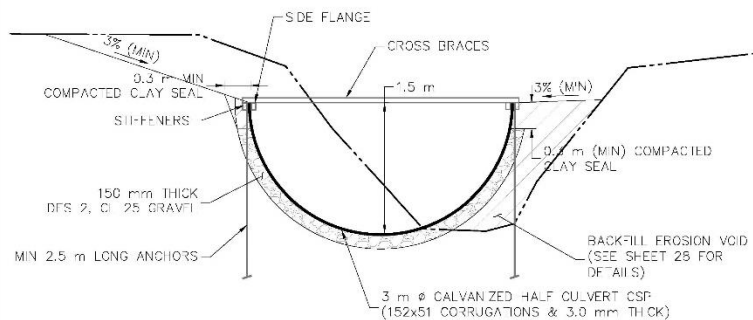
Site 3 – Compacted clay & Topsoil placement adjacent to ACB backslope mat edges



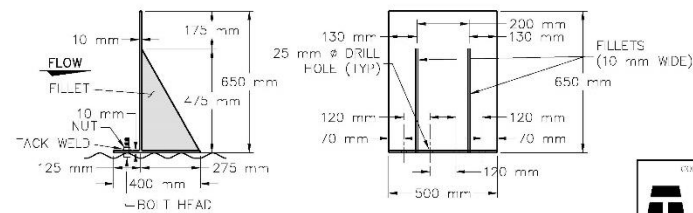
Site 3 – Heating/hoarding ACB mat area prior to grout pour



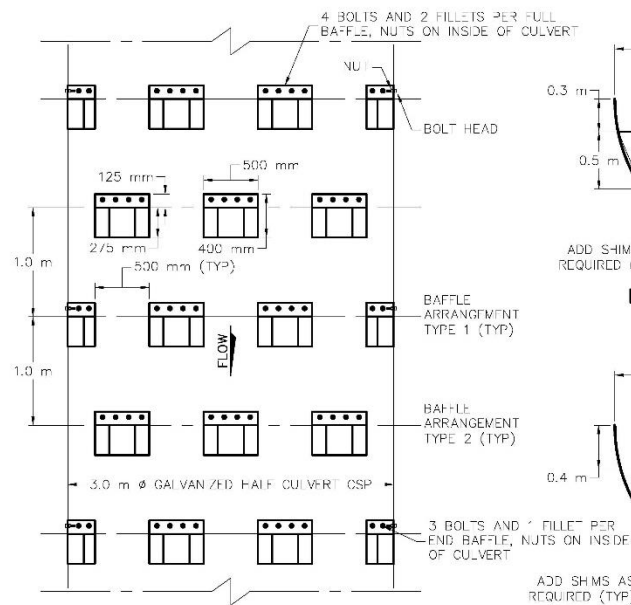
TYPICAL 1.8 m Ø HALF CULVERT SECTION
(STA 24021.9 TO STA 24086.8 - SITE 2)



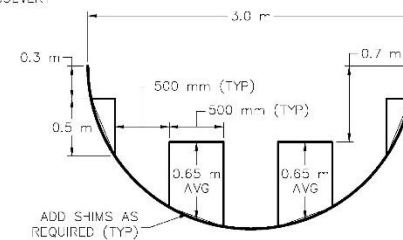
TYPICAL 3.0 m Ø HALF CULVERT SECTION
(STA 24086.8 TO STA 24088.5 - SITE 2)



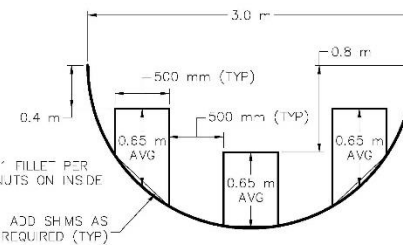
TYPICAL BAFFLE DETAIL



PLAN VIEW



BAFFLE ARRANGEMENT TYPE 1



BAFFLE ARRANGEMENT TYPE 2

TYPICAL BAFFLE LAYOUT FOR 3.0 m Ø HALF CULVERT
1:20

NOTES

CSP - ALL CULVERTS

1. ALL CROSS BRACES, SIDE FLANGES, SIDE STIFFENERS, AND NUTS/BOLTS TO CONSIST OF GALVANIZED STEEL.
2. ALL CROSS BRACES, SIDE STIFFENERS, AND ANCHORS TO CONSIST OF 50 mm x 50 mm x 6 mm L IRON.
3. ALL CROSS BRACES AND ANCHORS SPACED AT 2 m ON-CENTRE.
4. SIDE STIFFENERS TO BE CON NUTS ALONG BOTH LONG EDGES OF HALF CULVERT.
5. SEE BELOW FOR TYPICAL BOLT INSTALLATION DETAILS.

BAFFLES

6. ALL BAFFLES TO BE HOT DIP GALVANIZED AFTER FABRICATION.
7. TWO FILLETS PER BAFFLE, EXCEPT ONE FILLET PER BAFFLE ON ENDS OF TYPE 1 ARRANGEMENT. WELD BOTH SIDES OF FILLET EDGES ON TO BAFFLES.
8. ALL BOLTS TO BE 19 mm DIAMETER x 75 mm (MIN) LONG. USE GALVANIZED NUTS, BOLTS, AND WASHERS.
9. ALL BOLTS TO BE DRILLED TO 25 mm DIAMETER.
10. FOUR BOLTS PER BAFFLE ON ALL BAFFLES, EXCEPT TWO BOLTS PER BAFFLE ON ENDS OF TYPE 1 ARRANGEMENT.
11. TIGHTEN NUTS SMOOTHLY, THEN, EITHER TACK WELD BAFFLE TO ROBT OR DAMAGE THREADS. ALL AREAS OF CULVERT DAMAGED BY WELDING/CUTTING/INSTALLATION TECHNIQUES MUST BE COVERED WITH TWO COATS OF ZINC RICH GALVANIZING PAINT.
12. ADD STAINLESS STEEL SHIMS BETWEEN BAFFLE BOTTOMS AND CULVERT TO CONFORM THE ROUNDED CULVERT TO THE FLAT BOTTOMED BAFFLES.

THURBER ENGINEERING LTD.	PERMIT TO PRACTICE Thurber Engineering Ltd. Professional Engineer (P.Eng.) The Association of Professional Engineers Ontario and the Association of Professional Engineers Alberta			DATE 2016-08-17	LOCATION NE 35-81-5-6	SHEET PH66	CONTRACT 0018261	REVISION 682-02	SHEET 28 OF 28	PROJECT RD-19947-P
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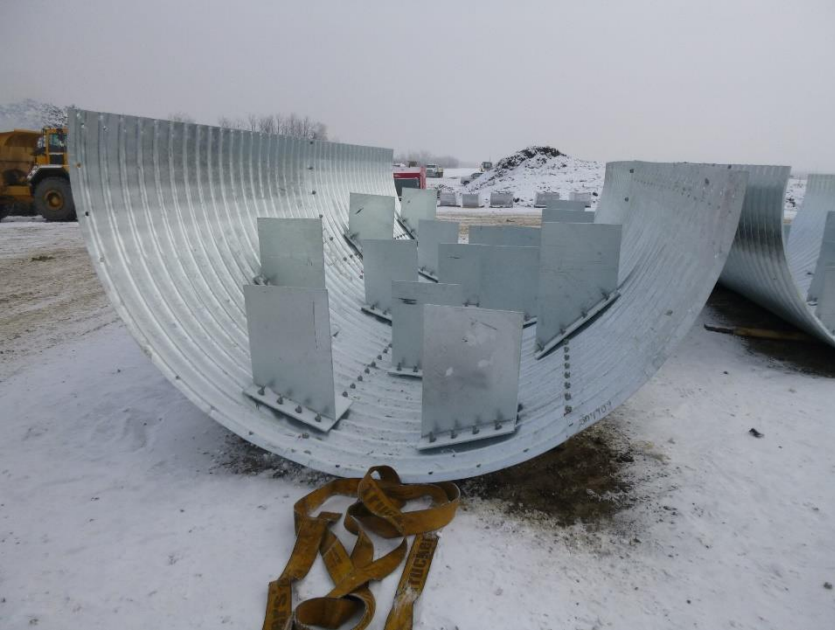
Site 3 Top of Hill – 1 m dia. half culvert reinforcing



Site 2 – Placing the downstream section of the 3 m dia. baffled half culvert



Site 2 – Installation of the 1.8 m dia. half culvert nested overtop the 3 m



Assembling sections of the 3 m dia. half culvert at the laydown area prior to transport



Site 2 – Near Completed 1.8 m dia. half culvert,
Nov. 23, 2017

SUMMARY

Sites 1 & 2:

Flow = 3.6 m³/sec & Supercritical

Gradient 6% average, 20% near Hines Creek

Velocities about 3 m/sec, 5.5 m/sec at 20% slope

Baffles in 3 m CSP half culvert reduce exit velocity to ~1.5 m/sec

Site 3

Flow = 3.0 m³/sec

Avg. Gradients/Velocities/Liner:

3-4%, 1.5 m/sec, Cl 1M Riprap

5-8%, <4 m/sec, Class 40T Armorflex ACB mat

8-25%, ~6 m/sec at steepest slope, Class 60T ACB mat

Freeboard on flow depth = >0.25 m

SUMMARY

Armorflex Articulated Concrete Block (ACB) Mats

Mat size: Prefabricated, 2.4 m long x 7.7 to 8.9 m widths

Open cell tapered Block sizes:

60T = 440 x 390 x 190 mm high

40T = 440 x 390 x 120 mm high

Composite liner consists of: ACB block/microgrid/150 mm ballast/
Type C non-woven/0.3 m compacted clay

Polyester cables used (considering salt environment on hill)

Ballast = 40 mm to 13 mm, <1% fines, >80% crush

Grout = >28 Mpa, 8-12% air content, 10-30 sec efflux time in flow cone