

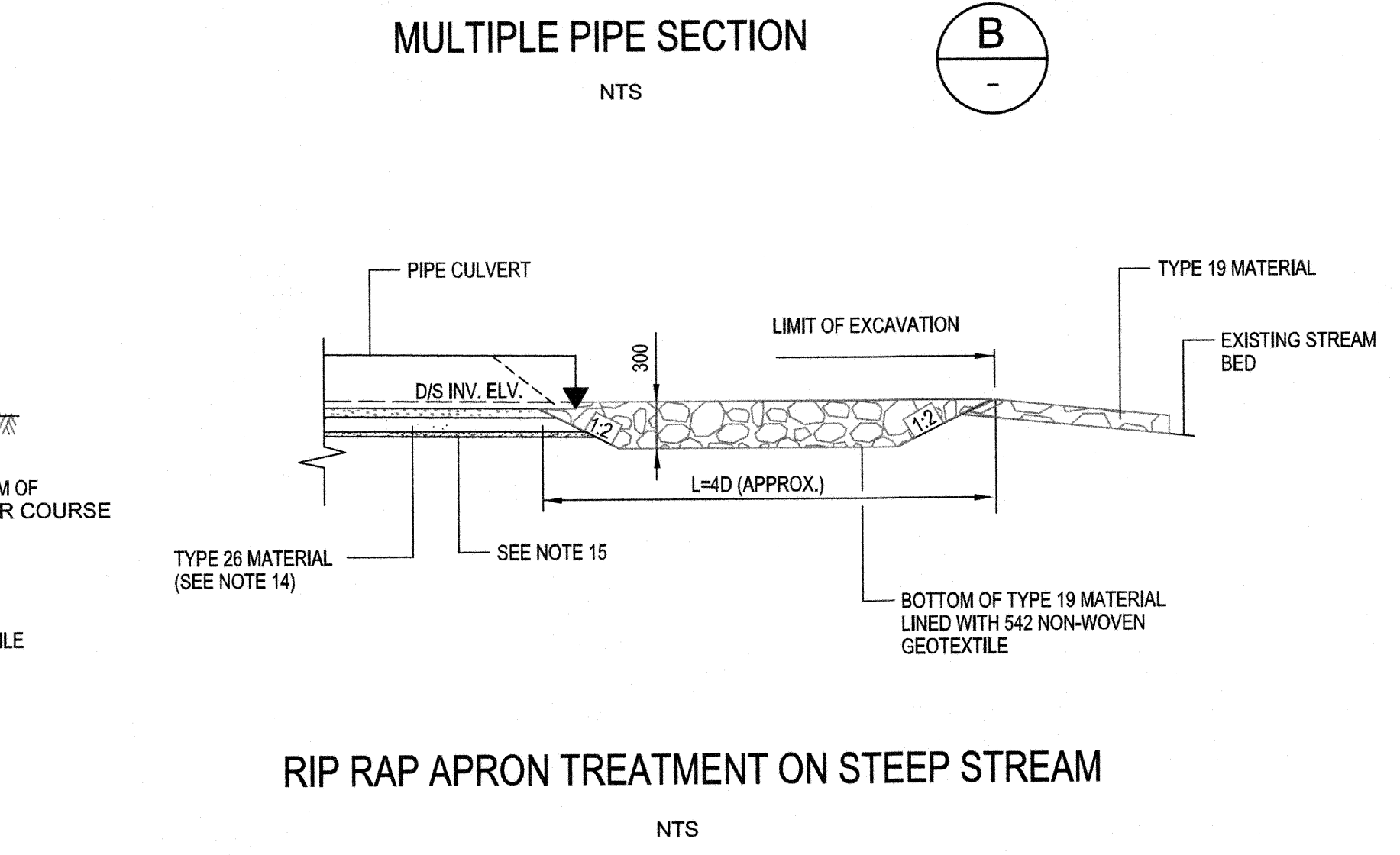
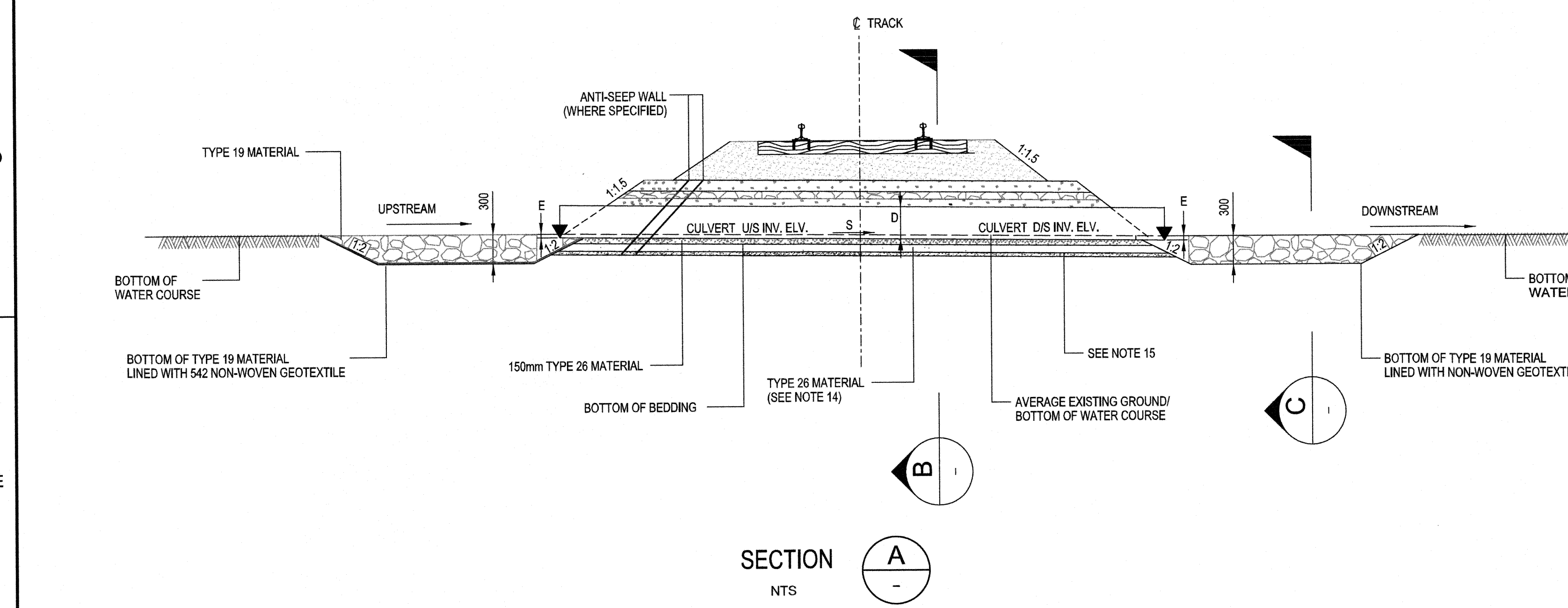
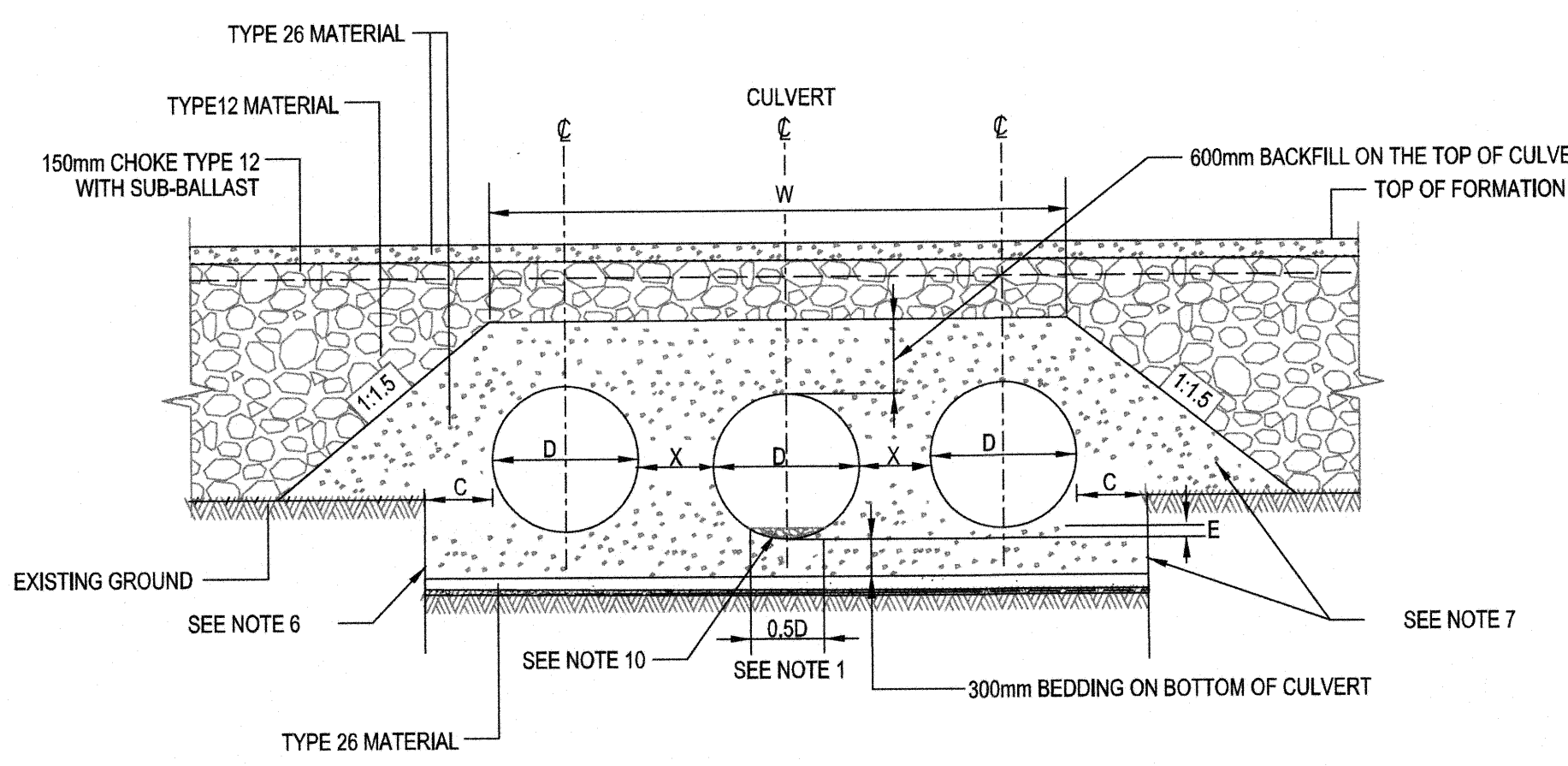
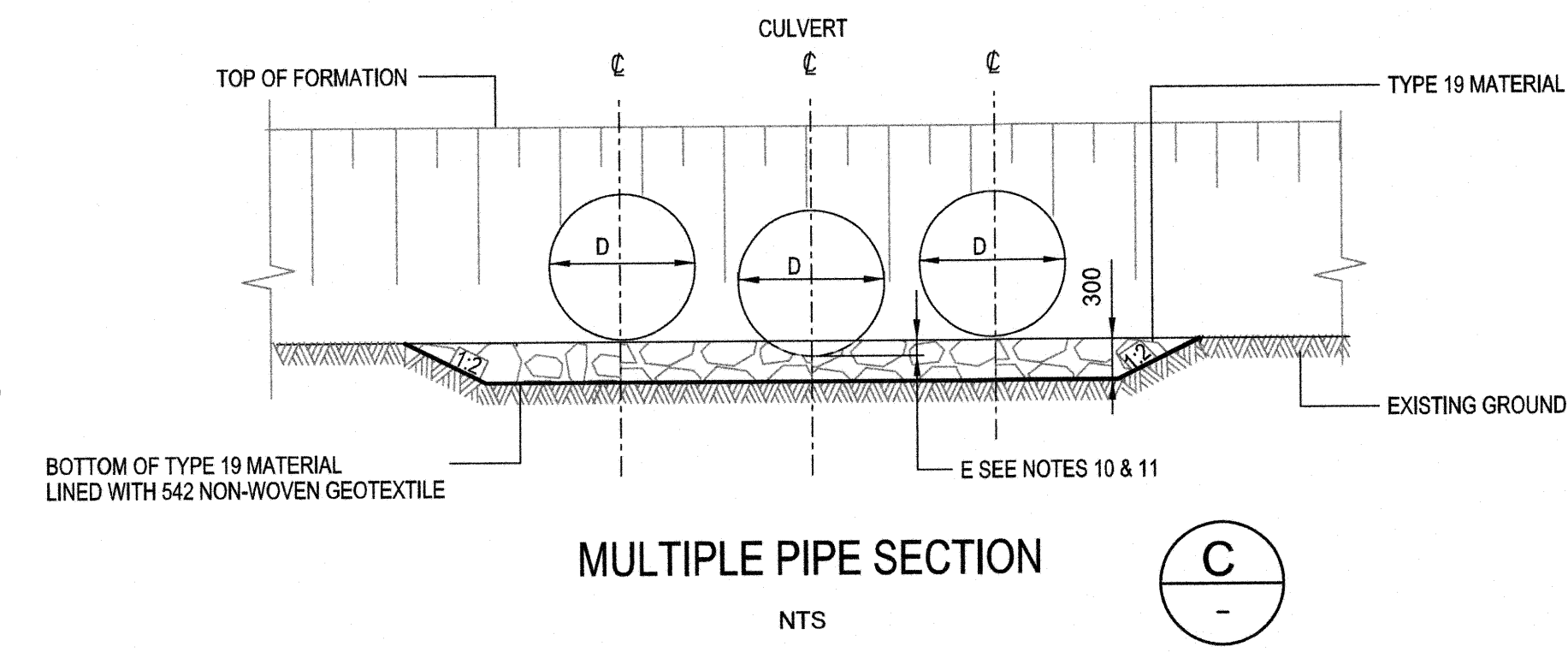
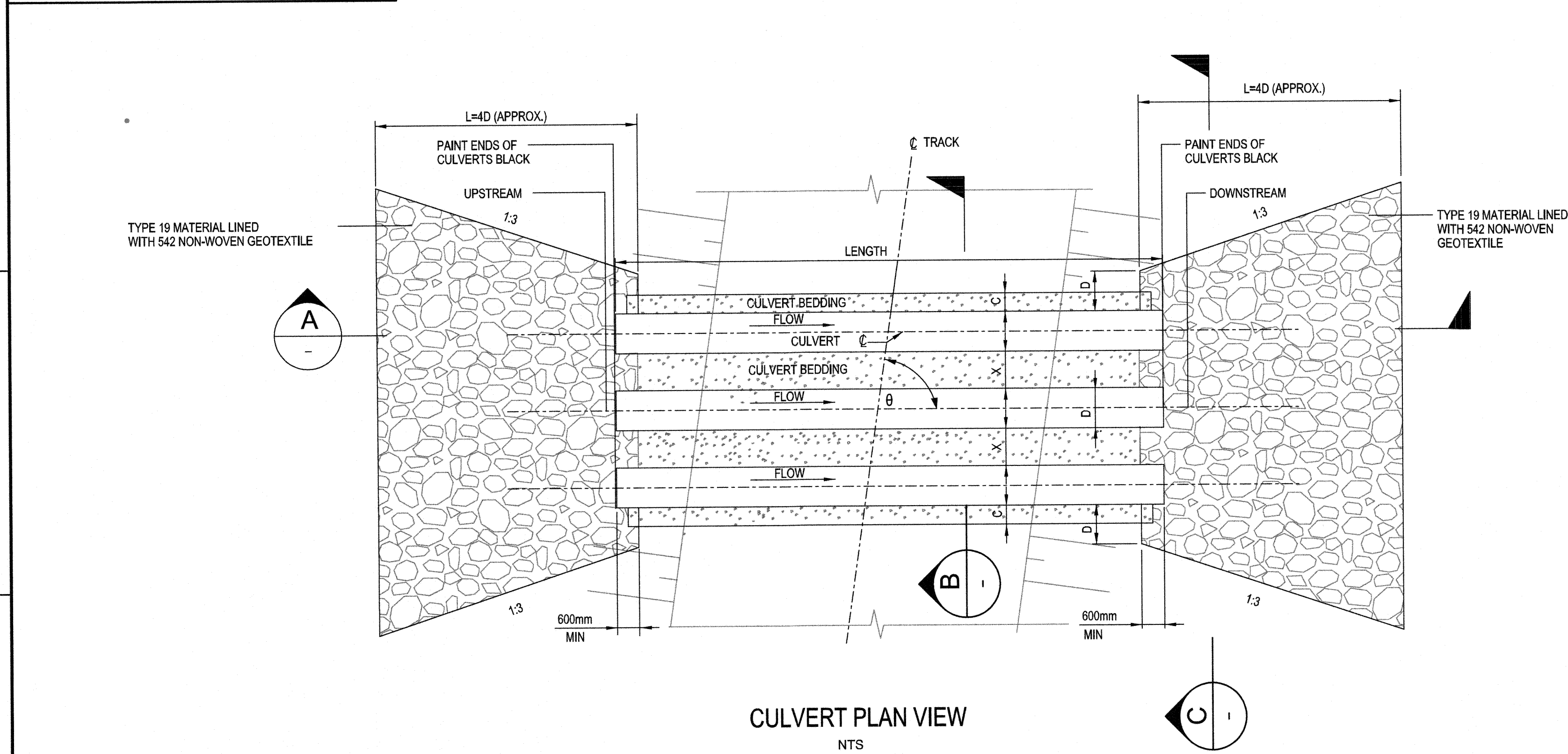
Attachment 13.4

North Railway Culvert Typical Drawings

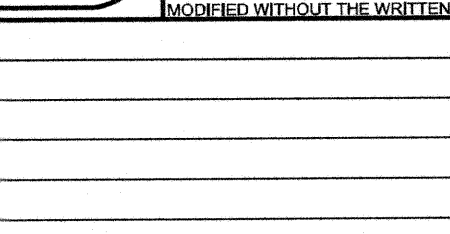
(2 Pages)

- LEGEND**
- D CULVERT DIAMETER
 - E EMBEDMENT DEPTH
 - C CULVERT SPACING AND BEDDING CLEARANCE
C=500 WHILE D>900mm
C=300 WHILE D<=900mm
 - W CULVERT BACKFILL TOP WIDTH
 $W=n'D+(n-1)'C$
 - U/S INV. ELV. CULVERT UPSTREAM INVERT ELEVATION
 - D/S INV. ELV. CULVERT DOWNSTREAM INVERT ELEVATION
 - L RIPRAP APRON LENGTH
 $L=4'D$ (APPROX.)
 - S CULVERT SLOPE
 - LENGTH CULVERT LENGTH
 - INV INVERT
 - θ ANGLE OF SKEW
 - X DISTANCE BETWEEN CULVERTS
 - n NUMBER OF CULVERTS

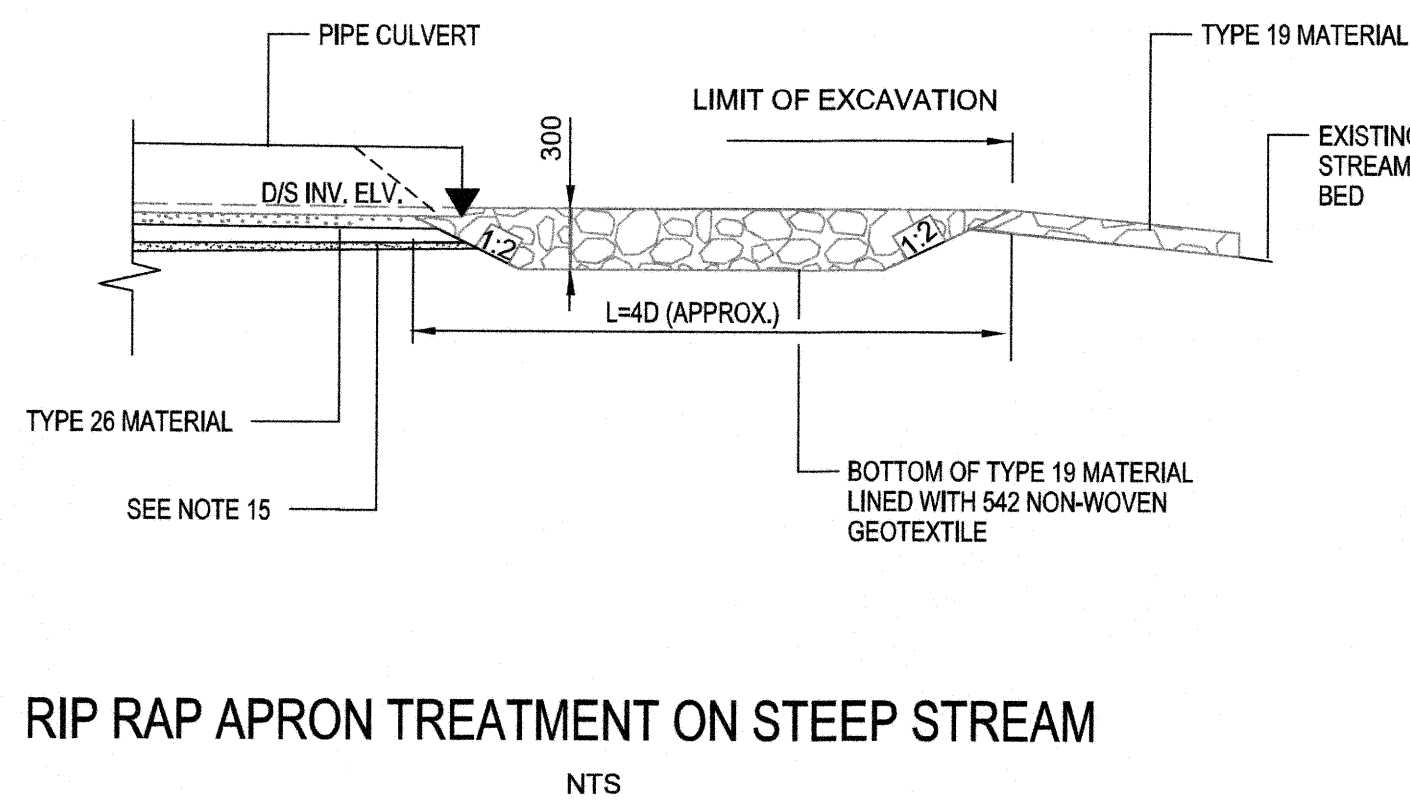
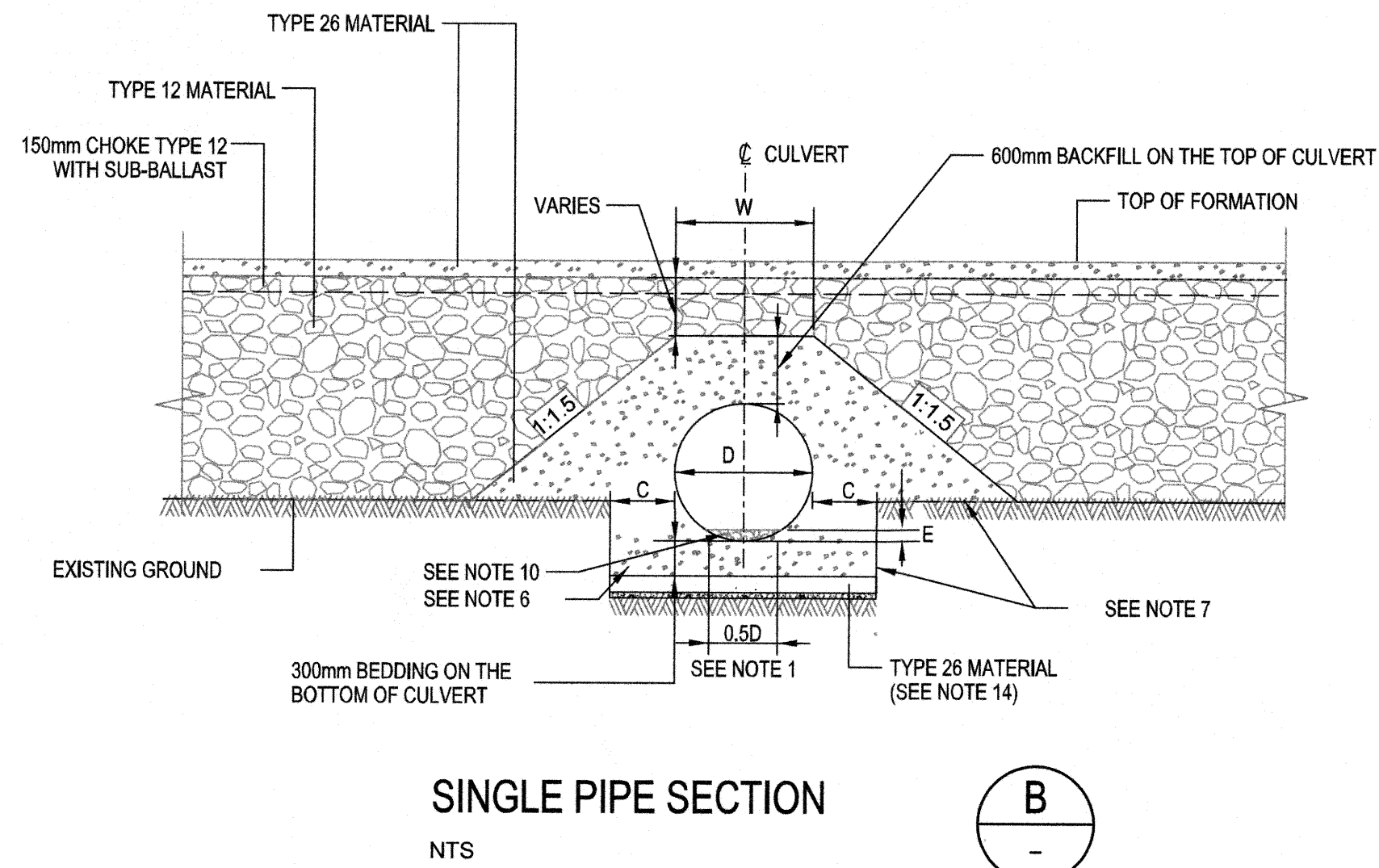
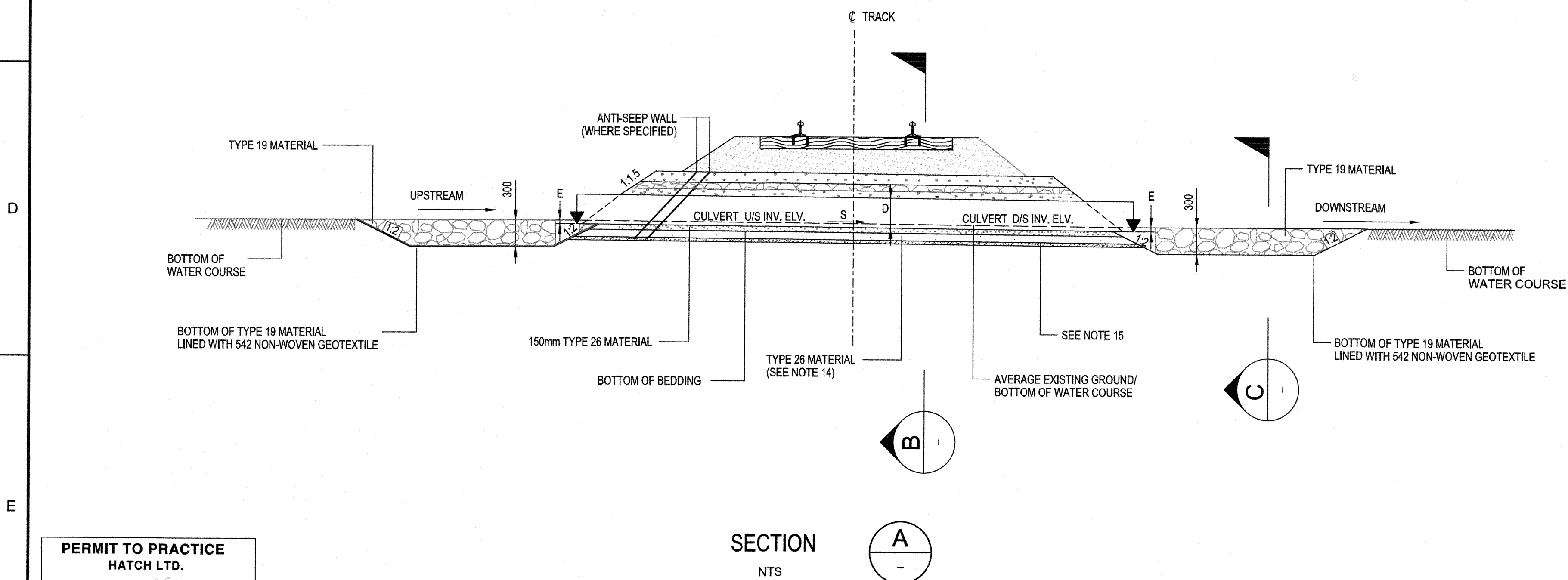
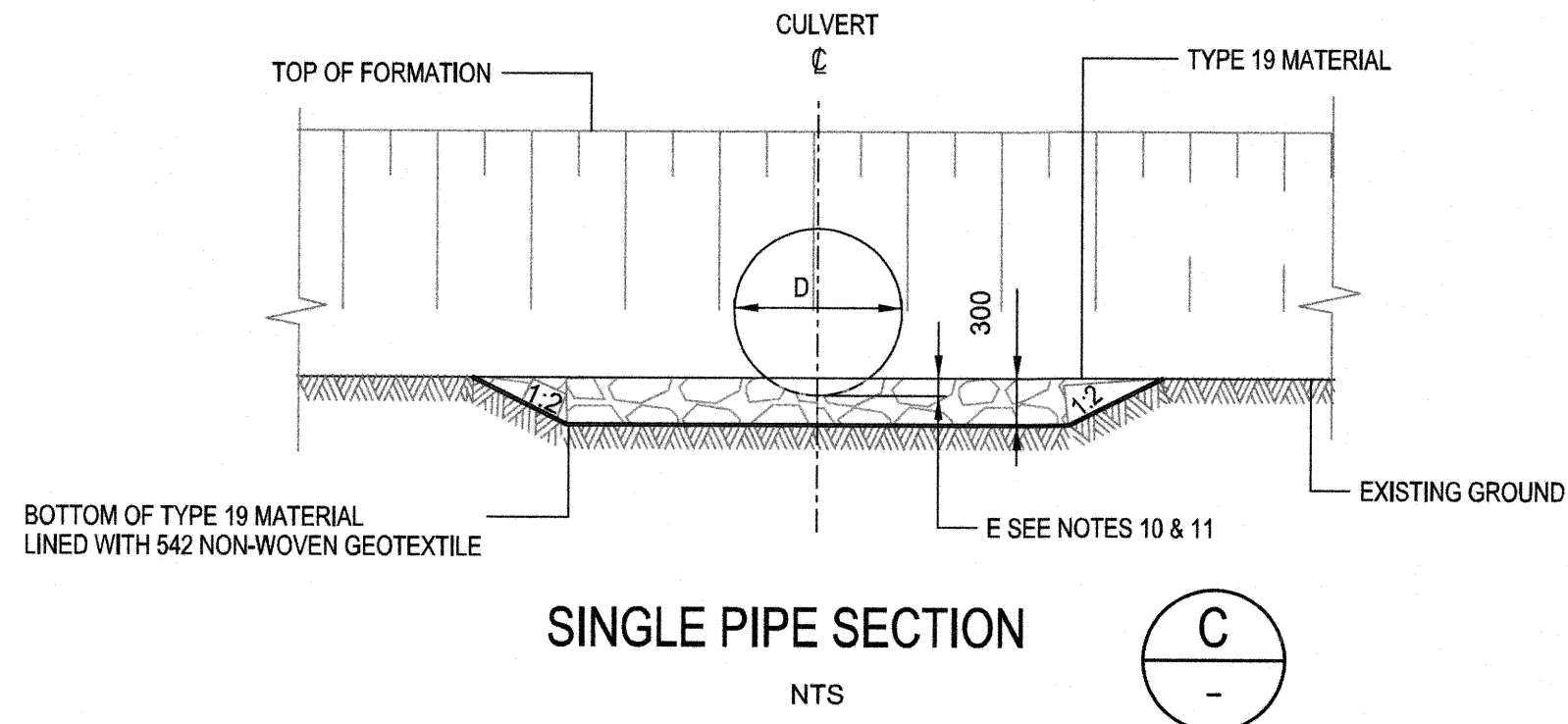
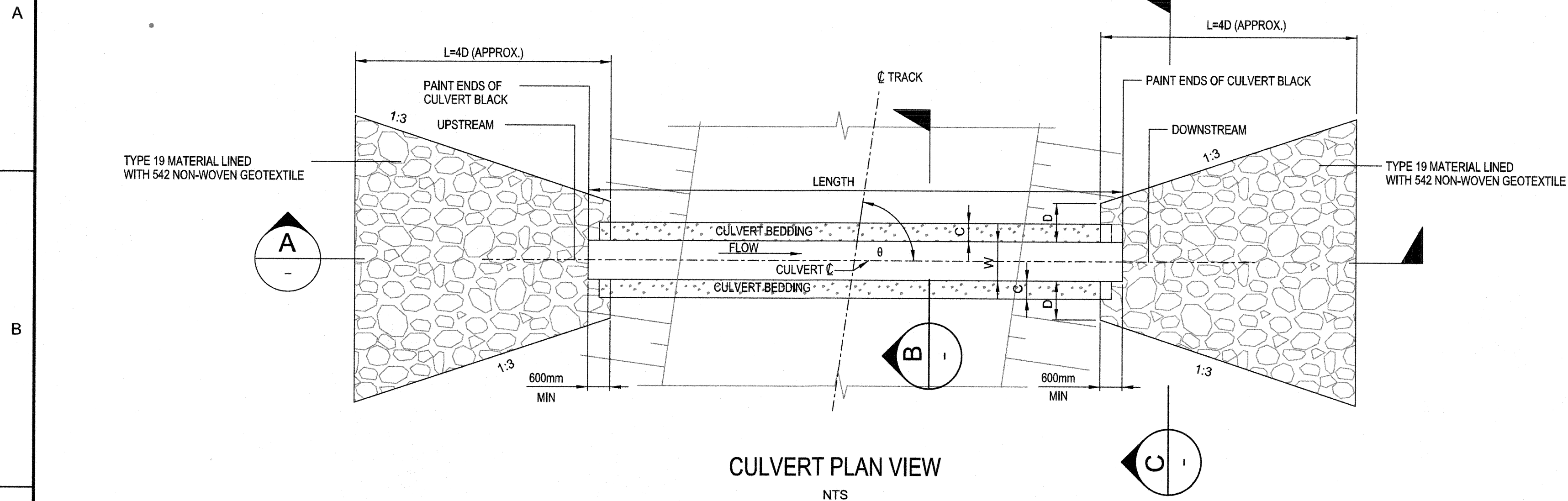
- NOTES:**
- THE PIPE BED SHALL BE SHAPED TO RECEIVE THE BOTTOM OF THE PIPE.
 - GRANULAR MATERIAL PLACED UNDER THE HAUNCH MUST BE COMPACTED.
 - BEDDING AND BACKFILL MATERIAL SHALL BE HOMOGENEOUS GRANULAR MATERIAL, AND SHALL BE PLACED AND COMPACTED UNIFORMLY AROUND THE PIPE.
 - ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE
 - ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.
 - WHERE VERTICAL EXCAVATION IS NOT POSSIBLE, MODIFY EXCAVATION SLOPE TO MIN. 1V:1.5H
 - PROVIDE 300mm TYPE 8 (150mm MINUS) AROUND BEDDING AND BACK FILL MATERIAL ONLY WHEN ROCKFILL IS PRESENT.
 - ADJUST CULVERT START AND END COORDINATES AND INVERT ELEVATIONS IN THE FIELD AS APPROVED BY COMPANY'S REPRESENTATIVE.
 - PROVIDE AVERAGE STREAM SLOPE ALONG THE CULVERT AS CULVERT SLOPE BASED ON ACTUAL FIELD CONDITION.
 - FOR FISH BEARING CULVERT, $E=0.1D$ TO 0.25D
FOR NON-FISH BEARING CULVERT, $E=0$
TYPE 19 MATERIAL IN BASE OF LOWERED CULVERT.
 - FOR FISH BEARING CULVERT WITH MULTIPLE PIPES, ONLY ONE PIPE SHALL BE EMBEDDED BY "E" (APPROXIMATELY 0.1D TO 0.25D) ALL OTHER PIPES SHALL BE PLACED ON GROUND/BOTTOM OF WATER COURSE.
 - COMPACTED ROCK-FILL (TYPE 8) MATERIAL TO BE PLACED ON THE NATURAL GROUND OR RAISED GRADE. DEPTH OF ROCK-FILL VARIES BETWEEN 1m AND 1.5m.
 - ADDITIONAL FILL OF RUN OF QUARRY (TYPE 12) OR ROCK-FILL (TYPE 8) MAY BE REQUIRED TO RAISE GRADE OF EMBANKMENT TO MATCH VERTICAL PROFILE OF RAILROAD OR WHERE A WEAK FOUNDATION SOIL IS PRESENT.
 - THE DEPTH OF THE EXCAVATION UNDER THE CULVERT AND THE REQUIREMENT OF THE INSULATION LAYER IS TO BE DEFINED BY CULVERT LOCATION.
 - 100mm OF DRY SAND, TYPE 9 FILL-CRUSHER FINES/LINER BEDDING OR A FILTER CLOTH PLACED ABOVE AND BELOW INSULATION LAYER FOR PROTECTION.
 - PREFABRICATED CONCRETE WINGWALLS WILL BE ALLOWED FOR. FLAG WILL BE PLANTED TO INDICATE BEGINNING/END OF PIPE.
 - DESIGN FOR 1:200 RETURN PERIOD.
 - MATERIAL TYPE DEFINITION:
TYPE 12: RUN OF QUARRY/ROCK FILL LAYER
TYPE 19: RIP RAP LAYER
TYPE 25: BALLAST LAYER
TYPE 26: SUB-BALLAST LAYER
 - THIS DRAWING WAS PREVIOUSLY ISSUED AS H353004-00000-220-294-0001-0001.



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HATCH LTD.
Signature: [Signature]
Date: 2018-11-08
PERMIT NUMBER: P 512
The Association of Professional Engineers,
Geologists and Geophysicists of NWT/NU

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							DRAFTSPERSON S. PINKNEY-ATKINSON NR 2018/09/26		BAFFINLAND IRON MINES LP MARY RIVER EXPANSION PROJECT			
							DESIGNER S. PINKNEY-ATKINSON NR					
							CHECKER GLEN JOHNSTONE Johnstone, Glen 2018-10-30 Design prepared by: gjohnstone Date: 2018-10-30 10:20:00					
							DESIGN COORD. GLEN JOHNSTONE Johnstone, Glen 2018-10-30 Design prepared by: gjohnstone Date: 2018-10-30 10:20:00					
							RESP. ENG. FANUS VAN BILJON 2018-11-06 10:11:08 2018-11-06 10:11:08 -0500					
							LEAD DISC. ENG. FANUS VAN BILJON 2018-11-06 10:12:23 -0500 2018-11-06 10:12:23 -0500		RAIL SITE STANDARD DRAWING			
							AREA LEAD FANUS VAN BILJON 2018-11-30 2018-11-30					
							ENG. MANAGER DANIEL STANGER 2018-11-08 2018-11-08					
H353004-30000-224-294-0002-0001			TYPICAL CROSS SECTION- SINGLE BARREL PIPE CULVERT		S.P.A G.J 2018/10/19		AREA MANAGER FAY PITTMAN Jay Pittman 2018-11-08 2018-11-08		TYPICAL CROSS SECTION- MULTIPLE BARREL PIPE CULVERT			
DRAWING No.		DRAWING TITLE		No. DESCRIPTION		BY CHK'D DATE		SCALE DWG. No. REV				
								NTS H353004-30000-224-294-0001-0001 0				
REFERENCE DRAWINGS		REG. PROFESSIONAL		REVISIONS		DRAWING APPROVAL STATUS: Approved for Construction		SHEET SIZE: F				

H353004-30000-224-294-0002-0001
DWG. No.



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L=4'D (APPROX.)
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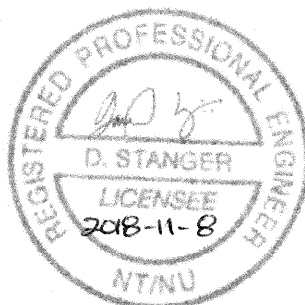
Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER EXPANSION PROJECT

RAIL SITE
STANDARD DRAWING

TYPICAL CROSS SECTION- SINGLE BARREL PIPE CULVERT

SCALE NTS
OR AS NOTED
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No.	DESCRIPTION	S.P.A	G.J	2018/10/19
0	APPROVED FOR CONSTRUCTION			

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	S PINKNEY-ATKINSON		2018/03/19
DESIGNER	S PINKNEY-ATKINSON		
CHECKER	GLEN JOHNSTONE		
DESIGN COORD.	GLEN JOHNSTONE		
RESP. ENG.	FANUS VAN BILJON		2018-10-30
LEAD DISC. ENG.	FANUS VAN BILJON		2018-11-08 10:17:56 -0500
AREA LEAD	FANUS VAN BILJON		2018-11-08 10:18:25 -0500
ENG. MANAGER	DANIEL STANGER		2018-10-30
AREA MANAGER	FAY PITTMAN		2018-11-08

DRAWING APPROVAL STATUS: Approved for Construction

DRAWING No.	DRAWING TITLE
H353004-30000-224-294-0001-0001	TYPICAL CROSS SECTION - MULTIPLE BARREL PIPE CULVERT
1	REFERENCE DRAWINGS

REG. PROFESSIONAL