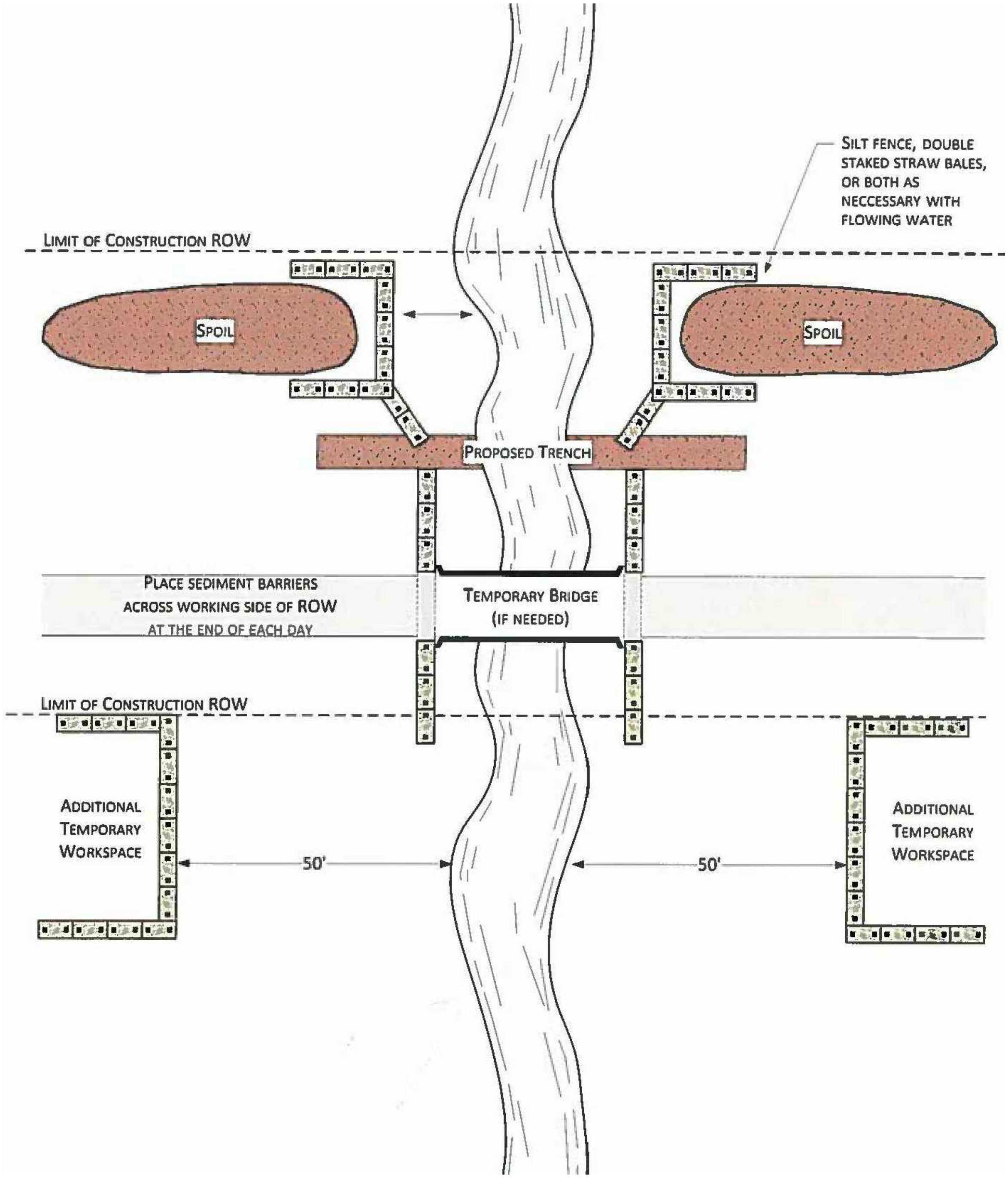


CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

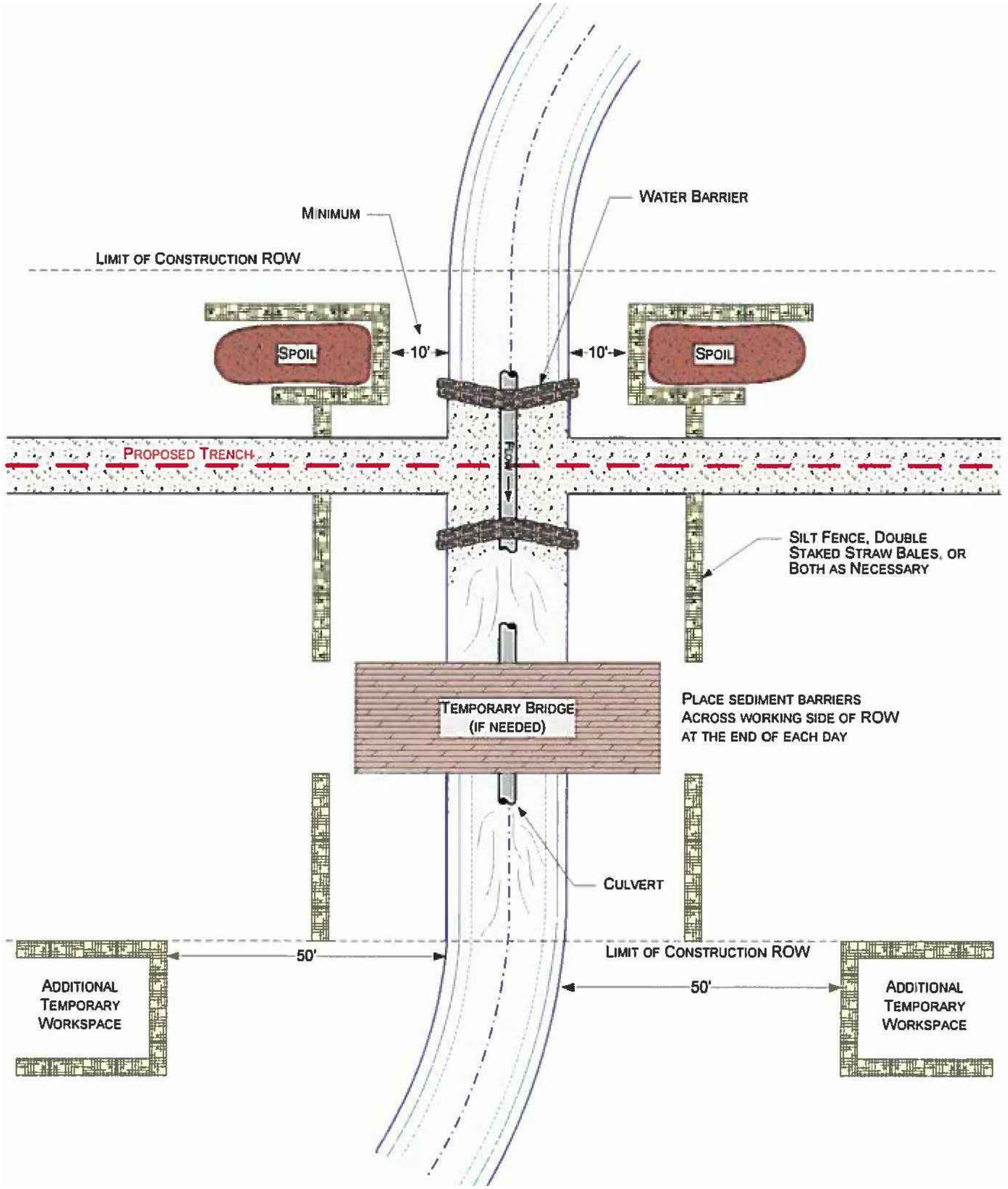
TITLE
TYP WATERBODY OPEN CUT

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

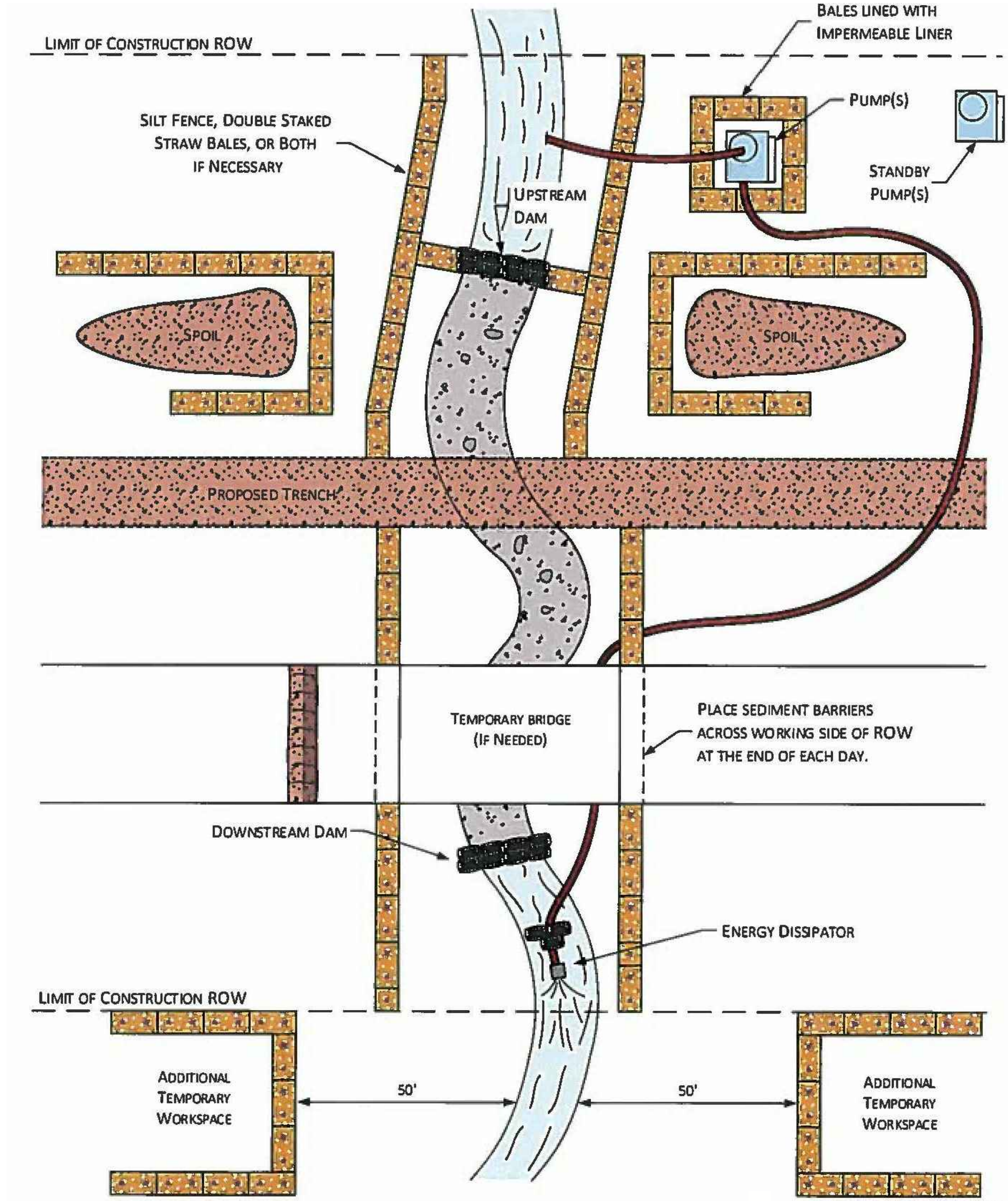
CONSULTANT: Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP WATERBODY FLUME METHOD

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13B

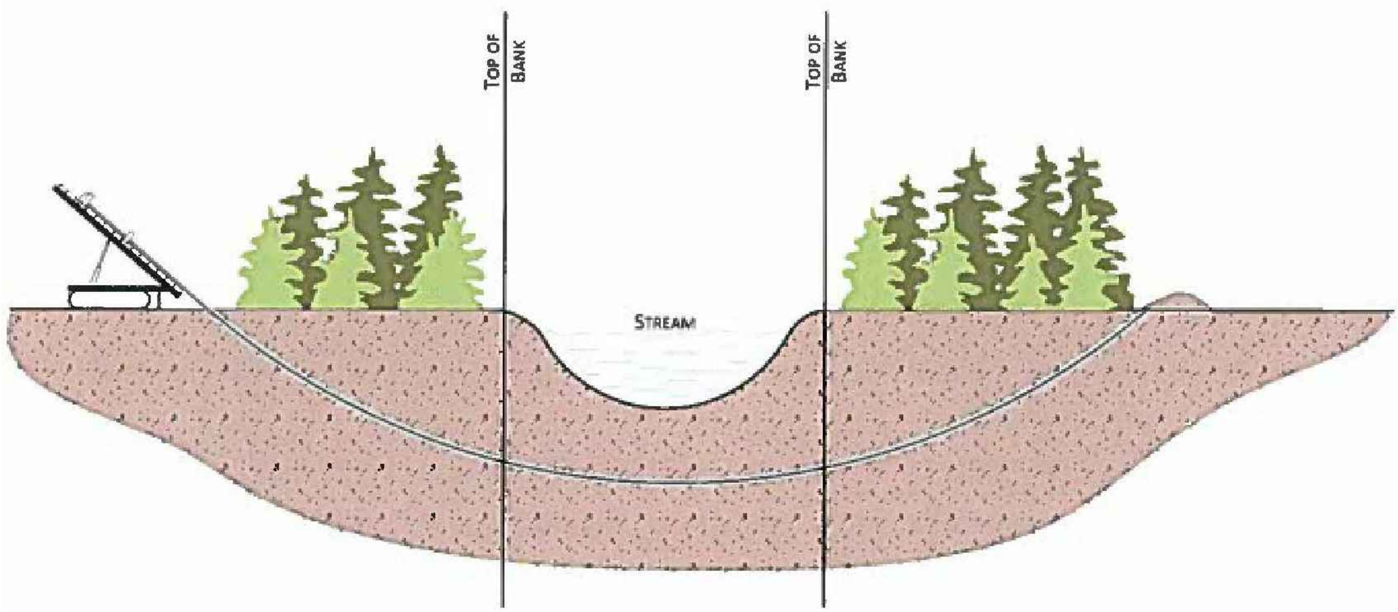
0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS			
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **TYP WATERBODY DAM AND PUMP**			
Golder Associates	PREPARED	REDMOND				
	DESIGN	DBC				
	REVIEW	-	PROJECT No. 1535050	PHASE 500	Rev. F	FIGURE 13C
	APPROVED	AQK				

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

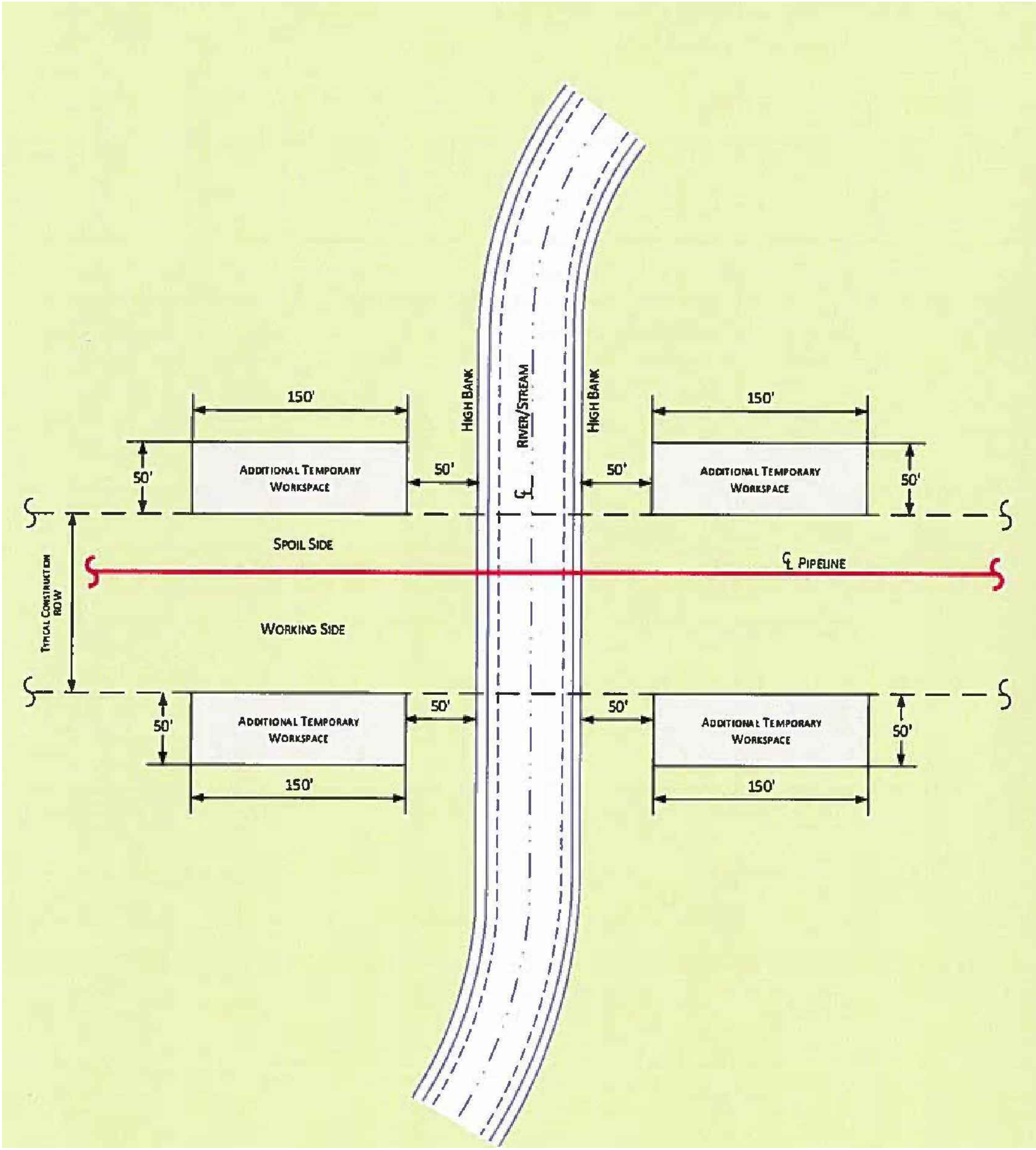
0 1 in



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

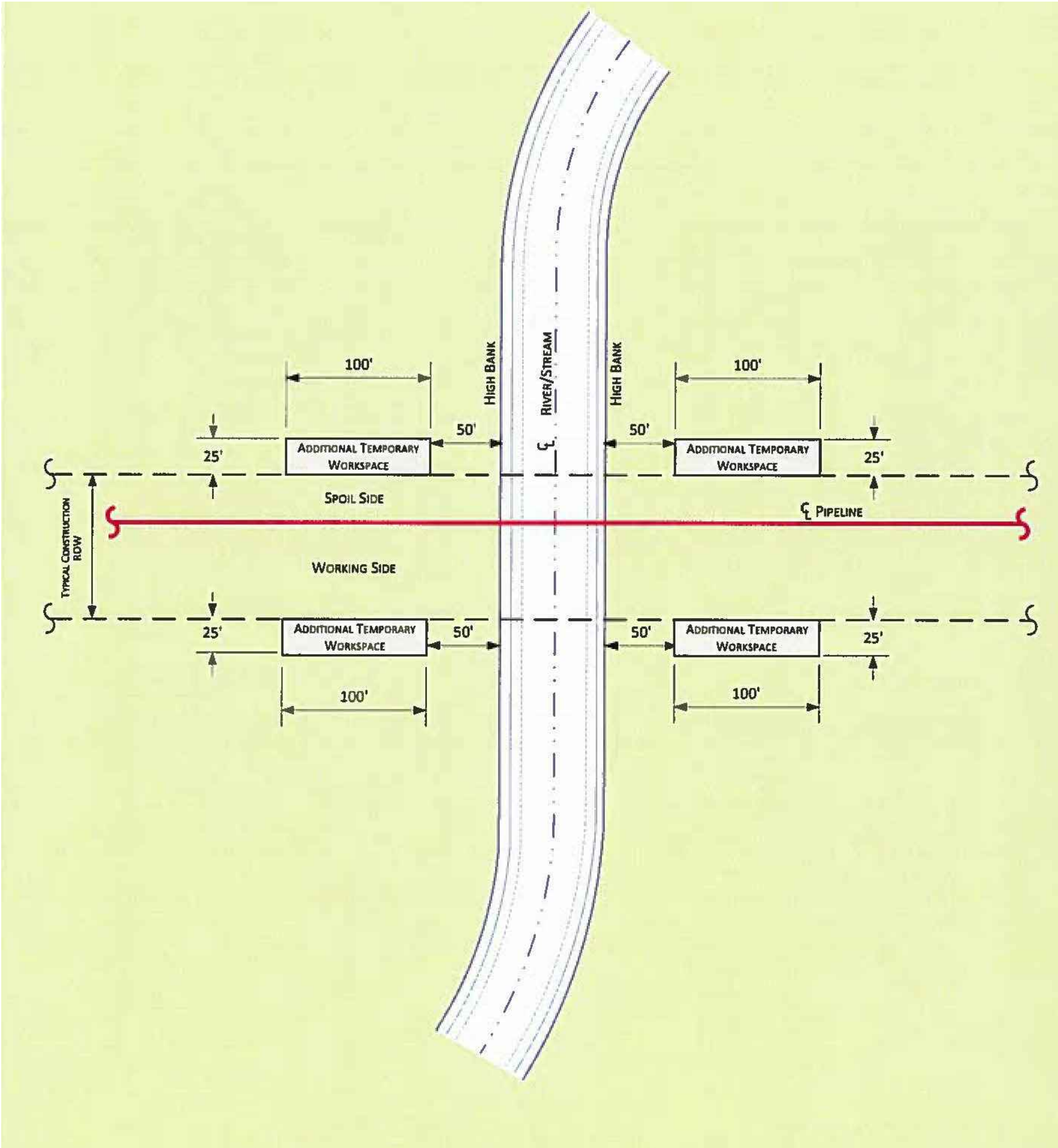
0 1 in

CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **TYP WATERBODY HDD METHOD**
Golder Associates	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 13D
	APPROVED	AQK	



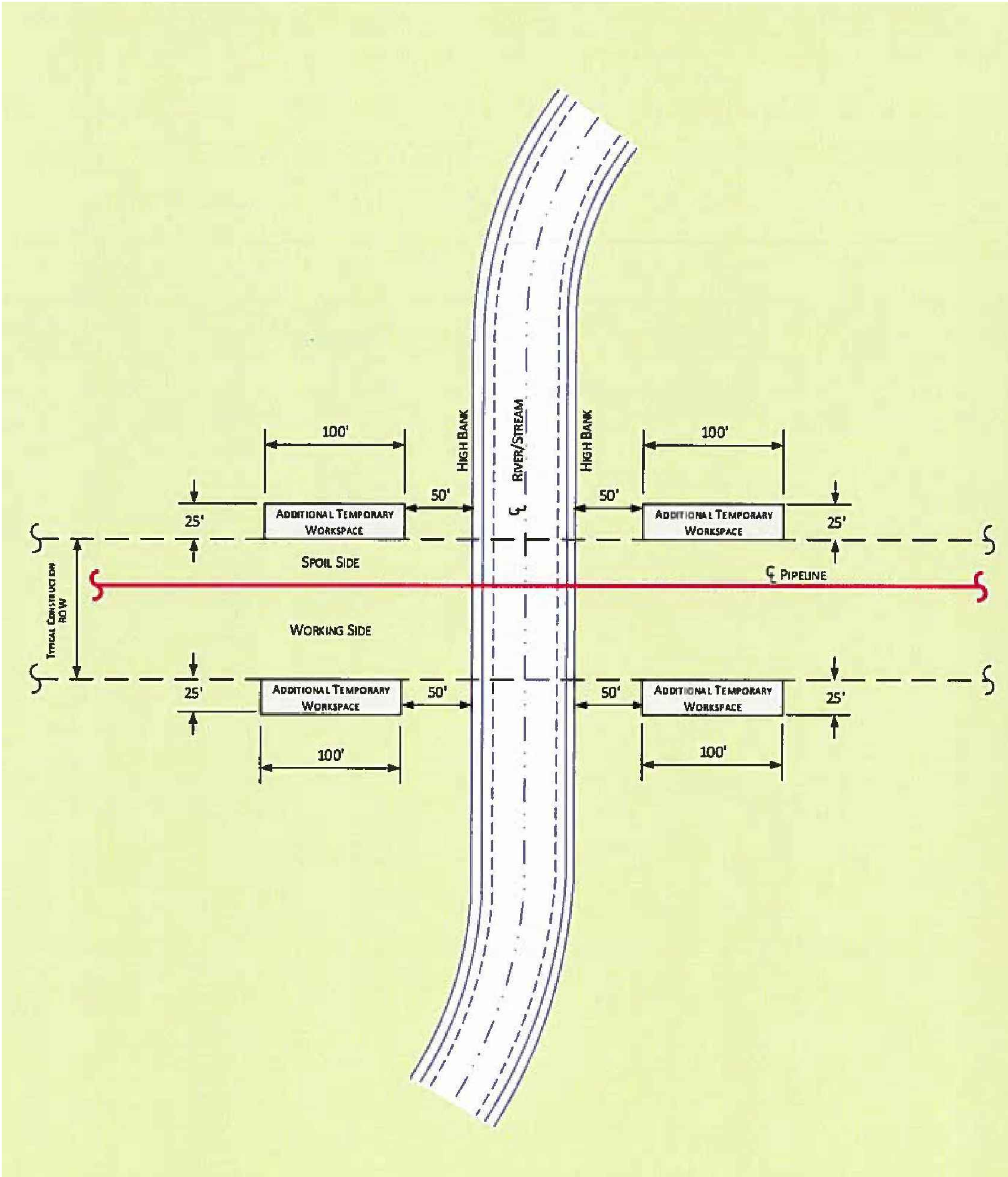
CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13E-1

0 1 in



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD: 2017-02-28	TITLE **TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1 AP-2 AP-3 AP-4 AP-5**	
Golder Associates	PREPARED: REDMOND		
	DESIGN: DBC		
	REVIEW: -		
	APPROVED: AQK	PROJECT No. 1535050 · PHASE 500 · Rev. F	FIGURE 13E-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

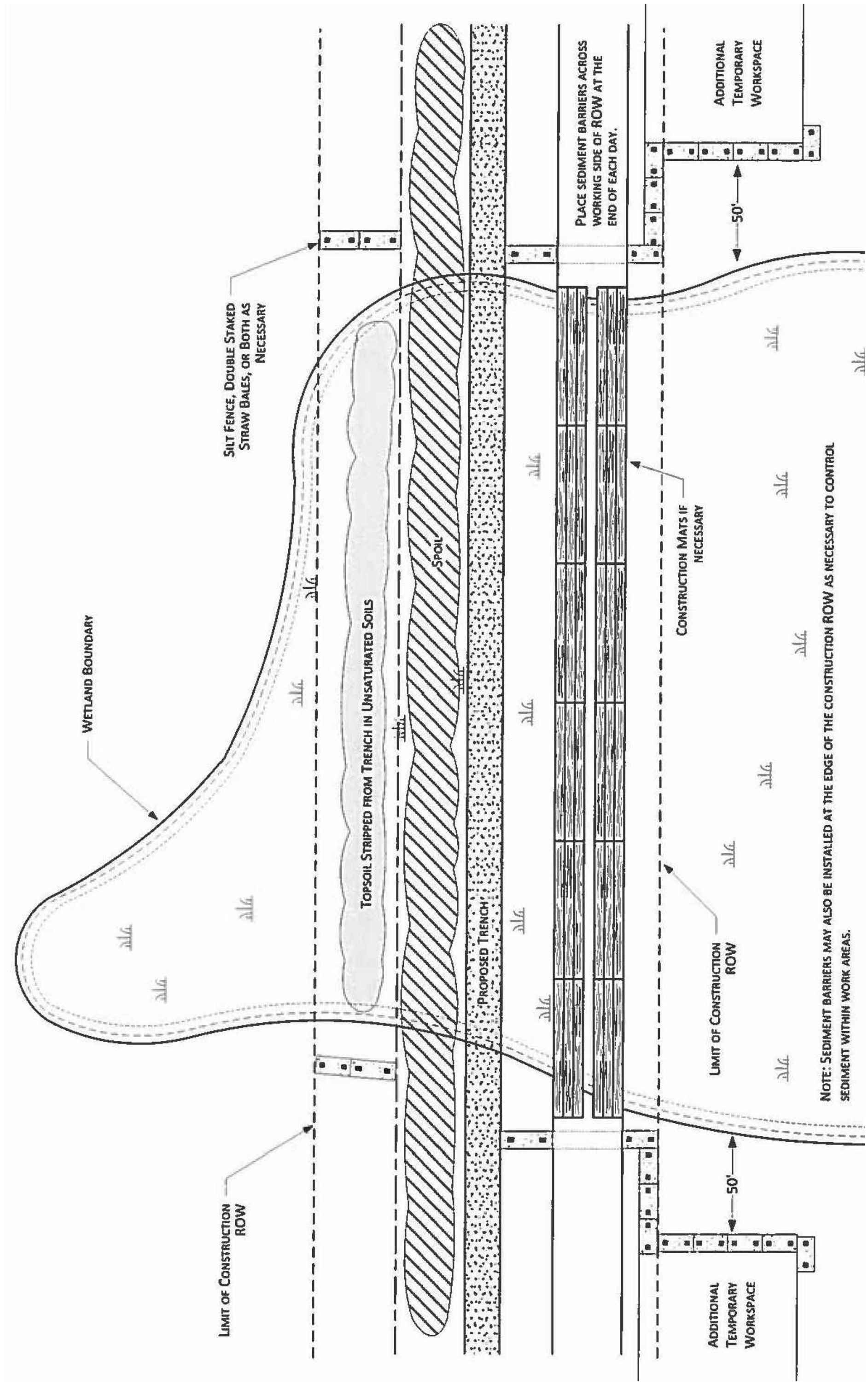
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT WATERBODY SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13E-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in
0



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

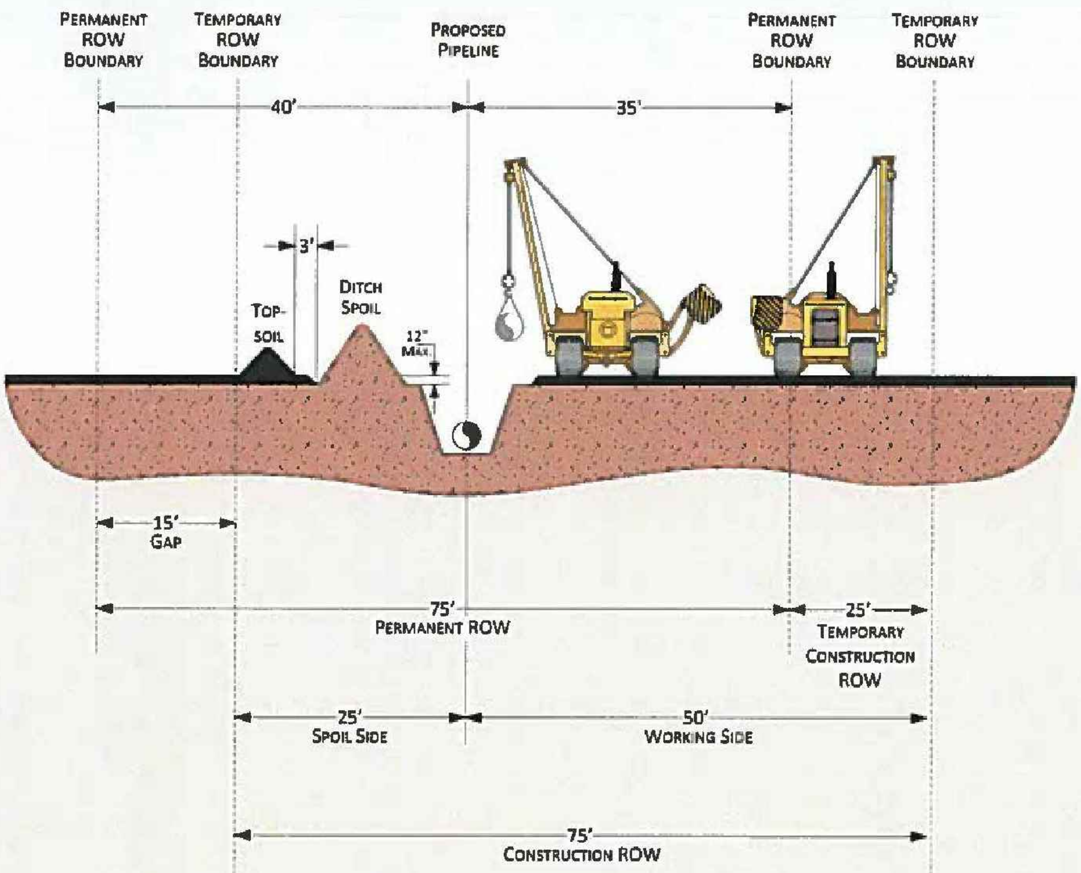
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP WETLAND OPEN CUT METHOD ACP AP-1 AP-2 AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13F



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE WITH 25' ON THE SPOIL SIDE AND 50' ON THE WORKING SIDE. THE PERMANENT ROW WILL BE 75' WIDE WITH 40' ON THE SPOIL SIDE AND 35' ON THE WORKING SIDE. THIS WILL LEAVE A 15' GAP BETWEEN THE AREA OF DISTURBANCE DURING CONSTRUCTION AND THE BOUNDARY OF THE PERMANENT ROW. NO IMPACT IS EXPECTED IN THIS AREA.
2. DURING CONSTRUCTION, A WORKING SIDE OF 50 FEET IN WETLANDS WILL BE NECESSARY GIVEN THE DIAMETER OF THE PIPE.
3. DURING OPERATIONS, ATLANTIC PROPOSES A STANDARD PERMANENT EASEMENT IN WETLANDS CONSISTENT WITH OTHER SEGMENTS OF THE PIPELINE. MAINTENANCE ACTIVITIES IN THE PERMANENT EASEMENT WILL BE CONSISTENT WITH THE PROCEDURES.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

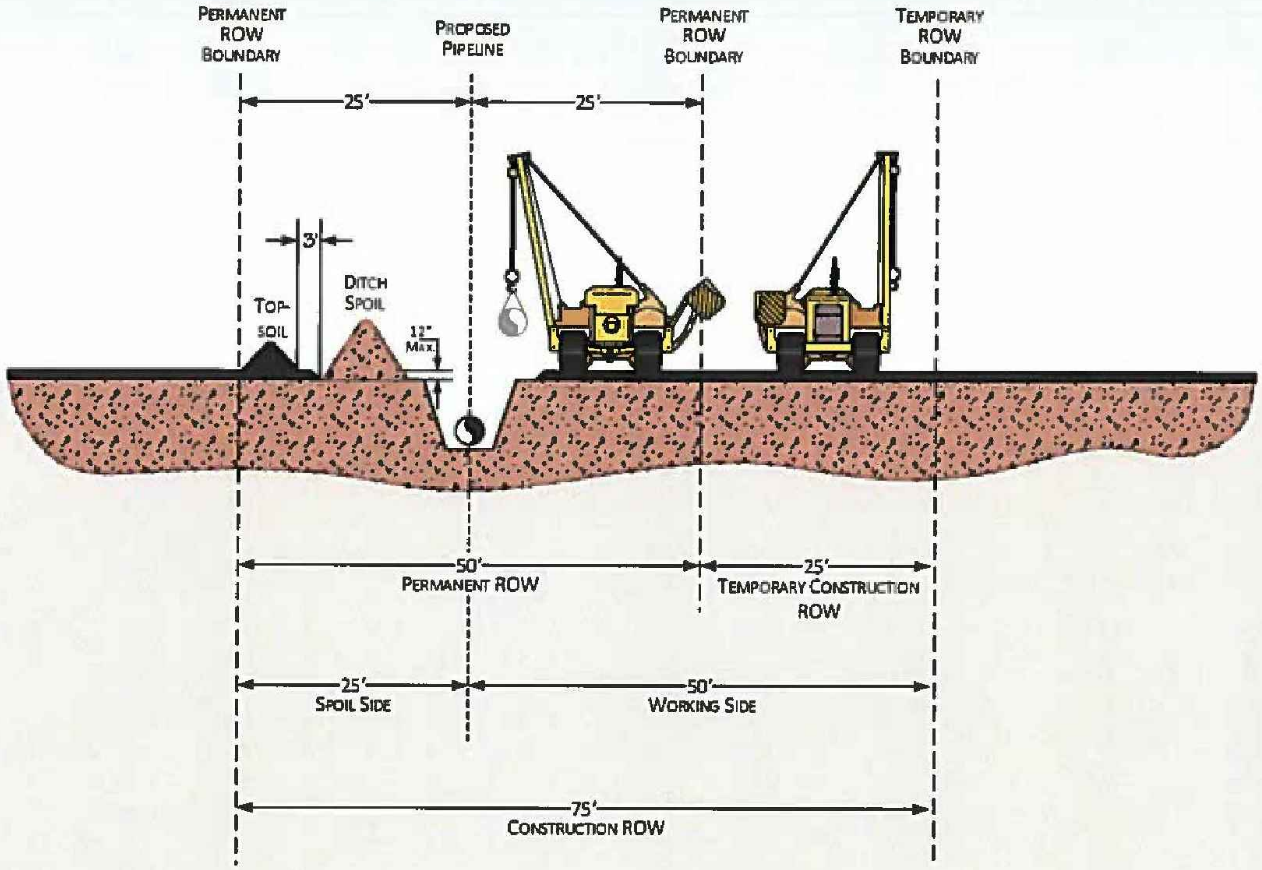
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN WETLANDS ACP AP-1

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13G-1



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

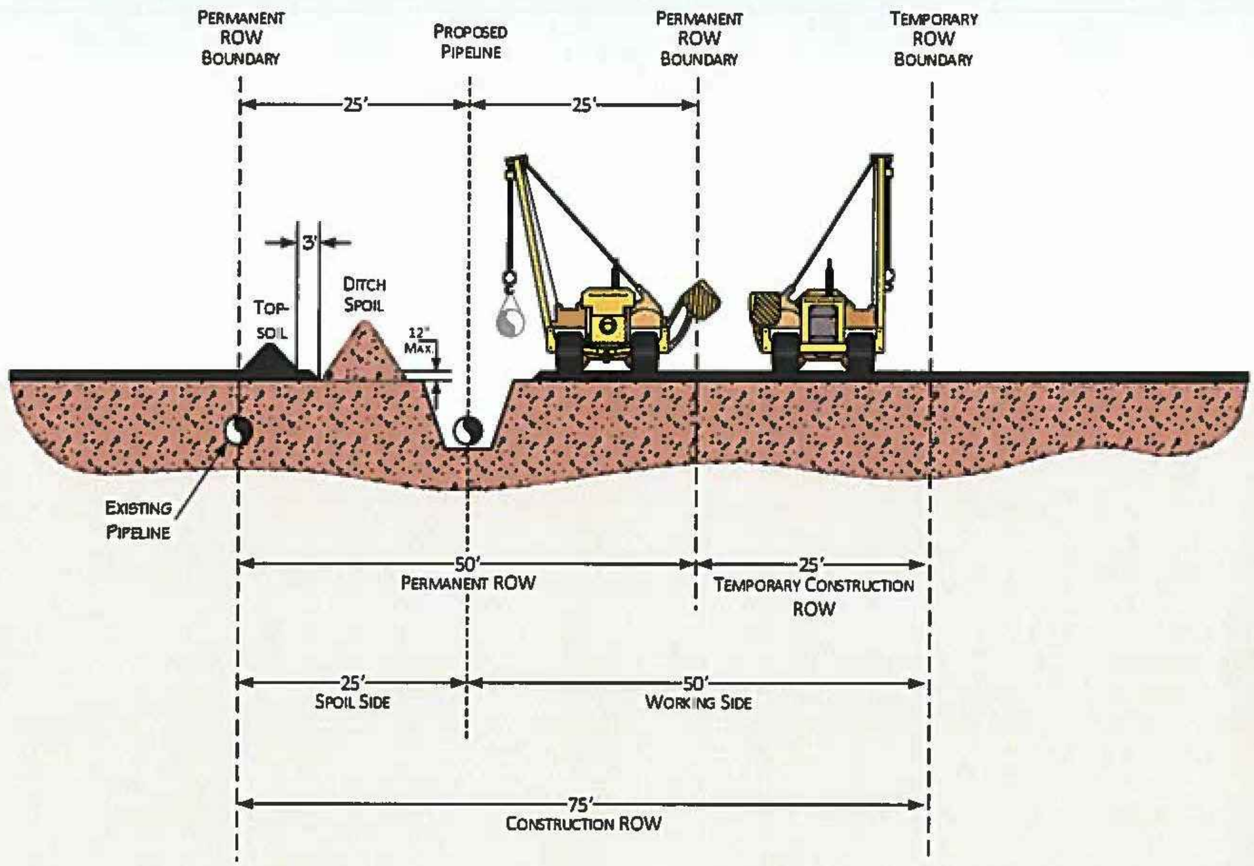
TITLE
TYP CONSTRUCTION ROW IN WETLANDS ACP AP-2

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13G-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

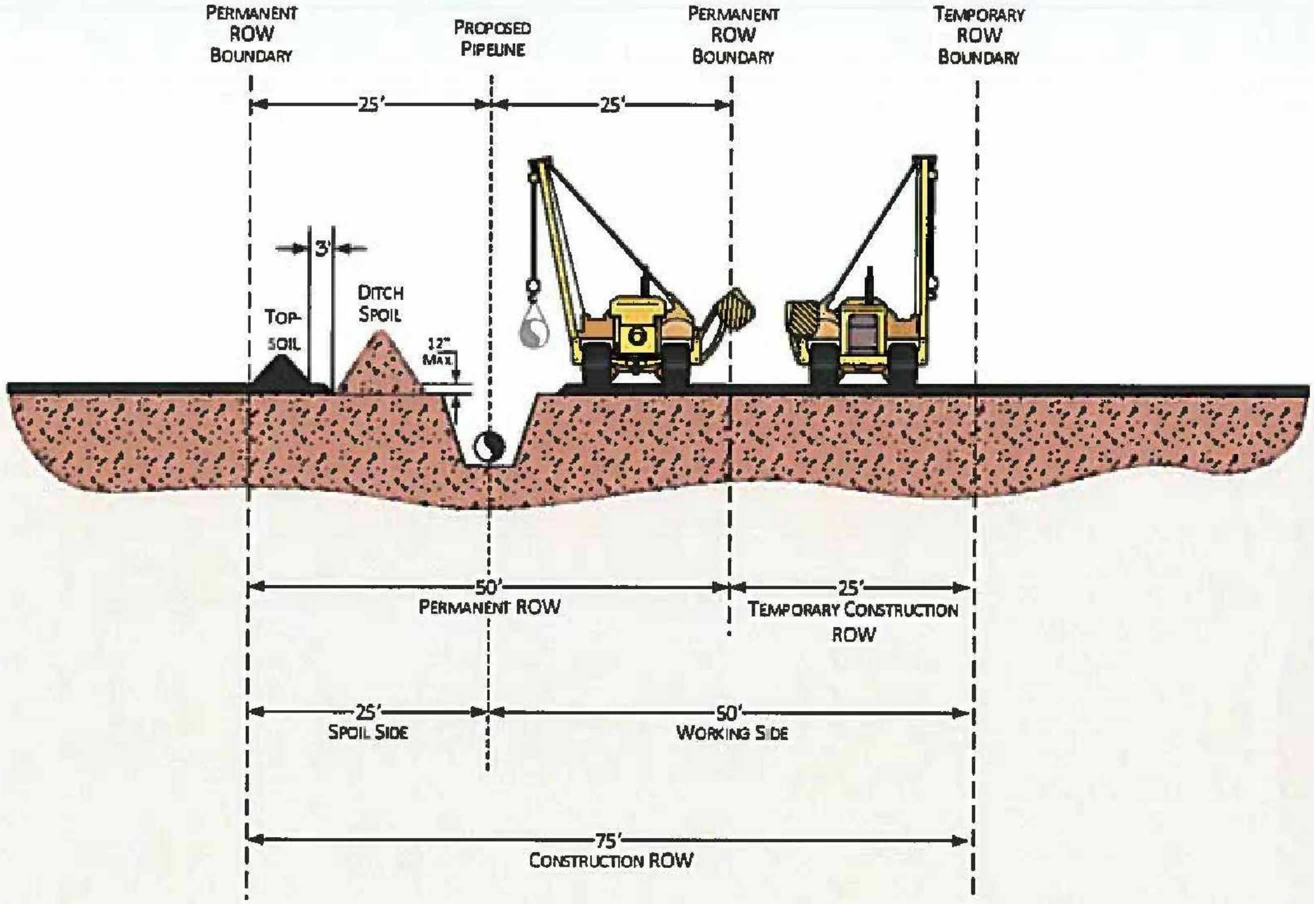
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN WETLANDS COLLOCATED SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13G-3

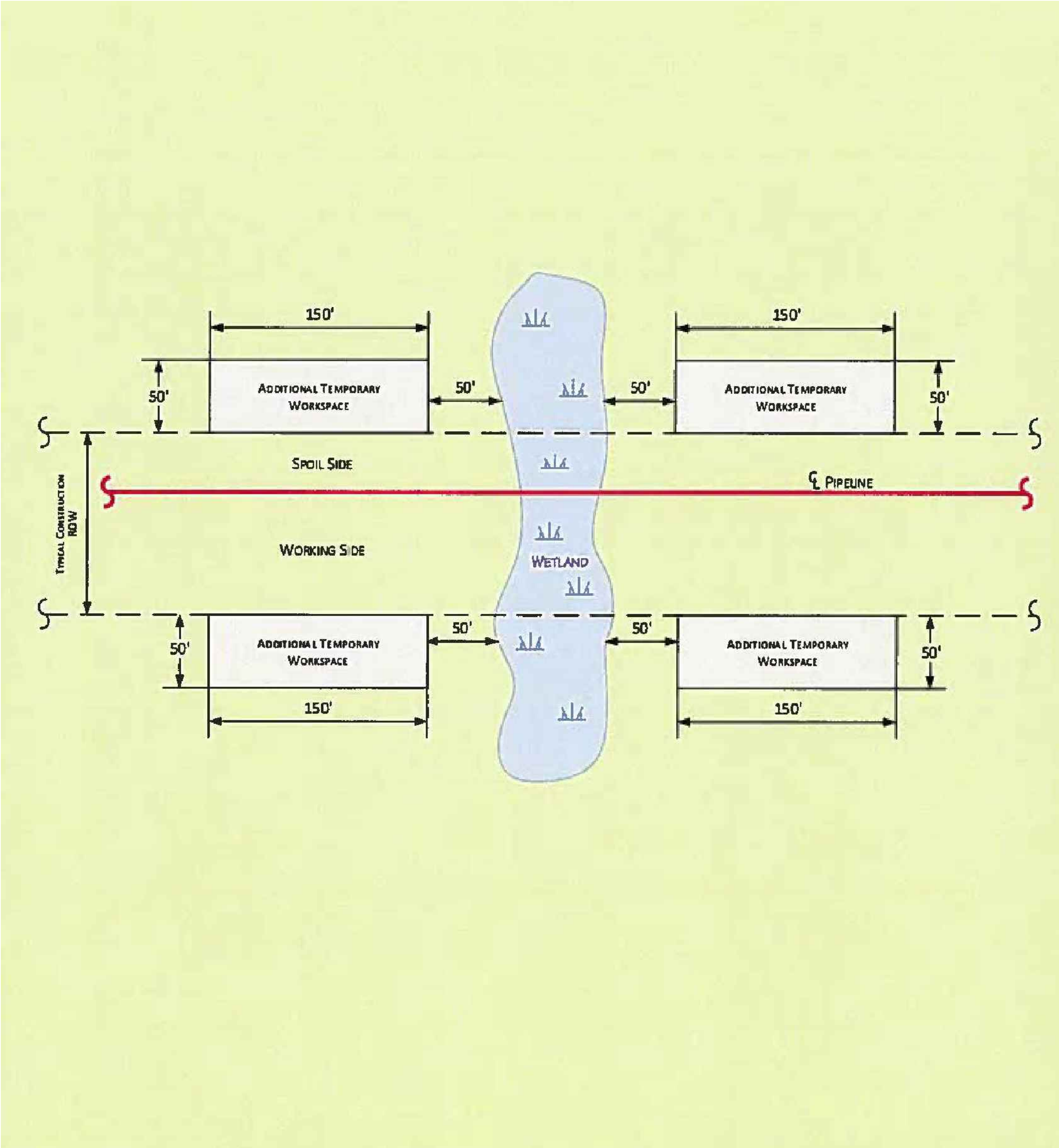


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP CONSTRUCTION ROW IN WETLANDS NOT-COLLOCATED SHP TL-635 TL-636
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13G-4

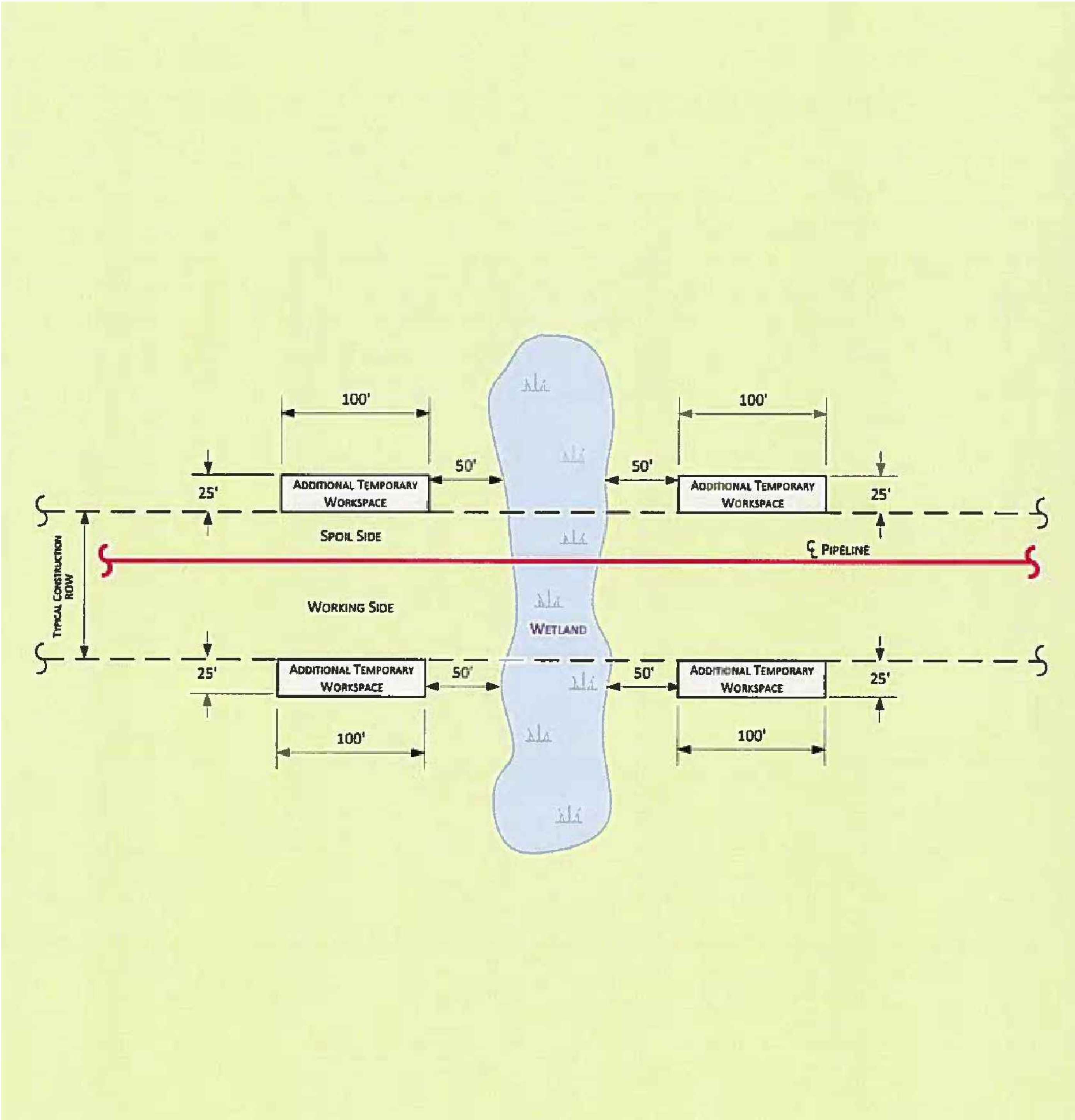


CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT		
Golder Associates	YYYY-MM-DD	2017-02-28
	PREPARED	REDMOND
	DESIGN	DBC
	REVIEW	-
	APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-1

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13H-1



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

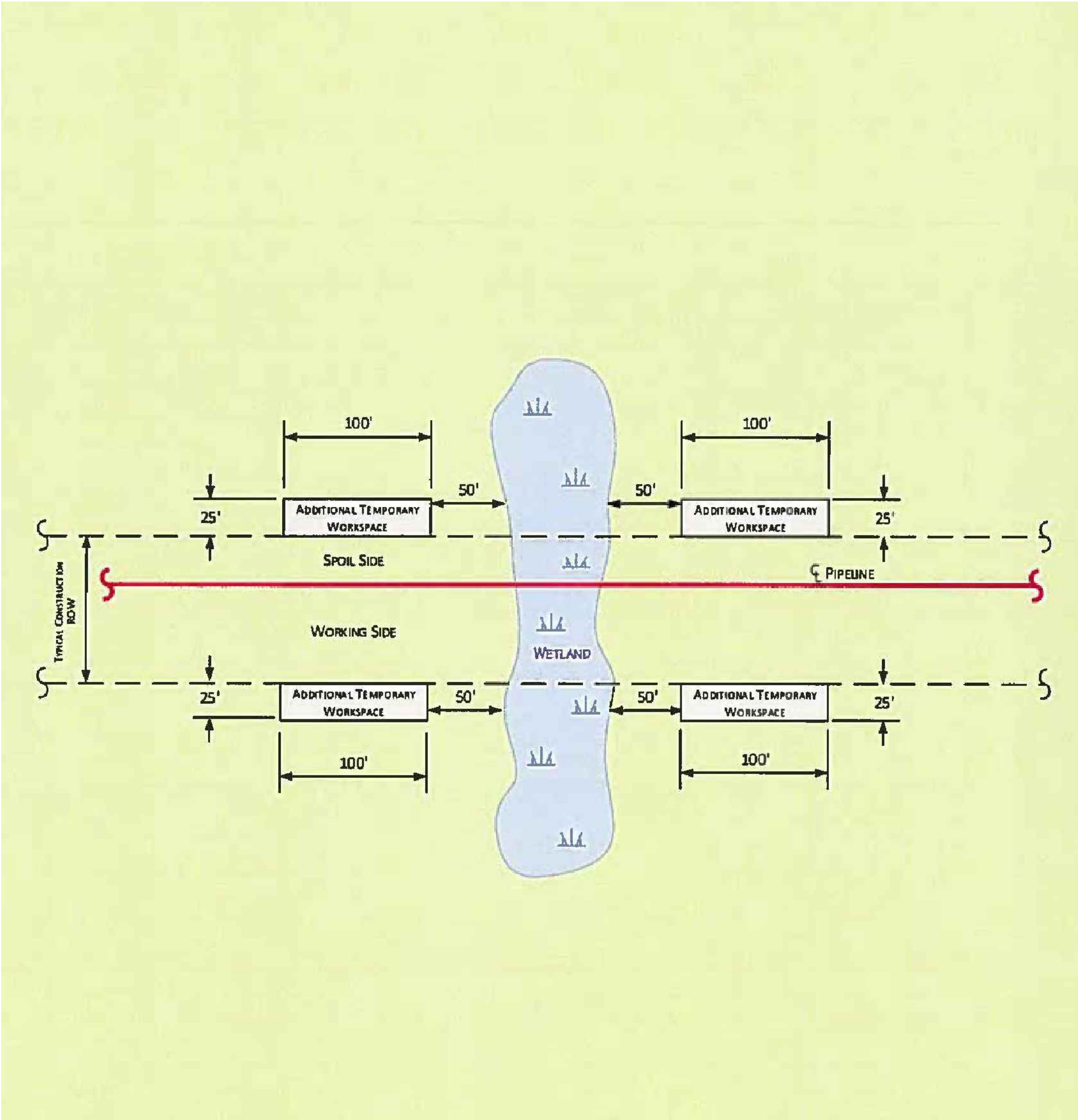
TITLE
TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-2 AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13H-2

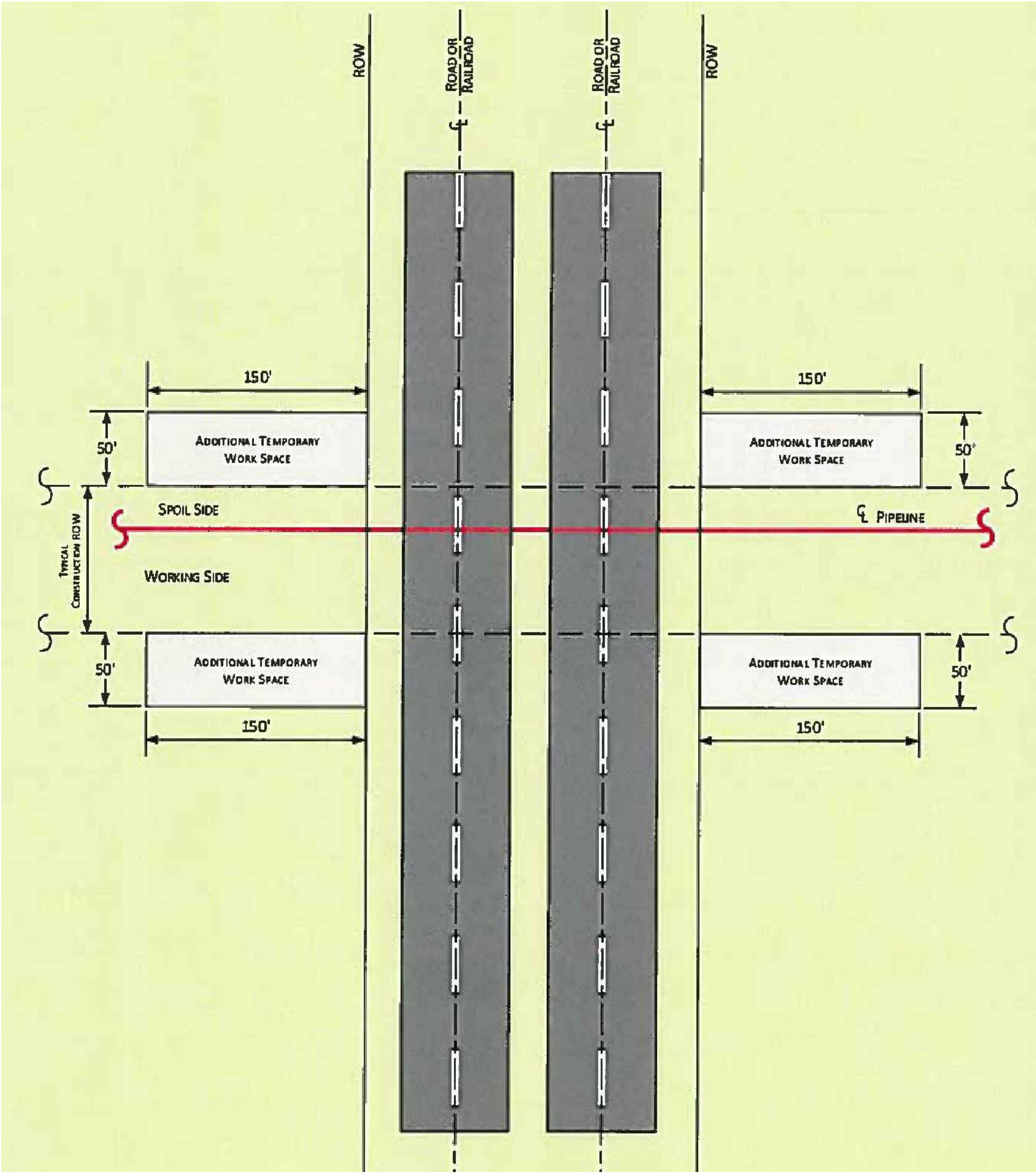
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0



CLIENT		PROJECT			
DOMINION		BIC/INCREMENTAL CONTROLS			
CONSULTANT	YYYY-MM-DD 2017-02-28	TITLE			
Golder Associates	PREPARED REDMOND	**TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS SHP TL-635 TL-636**			
	DESIGN DBC				
	REVIEW -	PROJECT No.	PHASE	Rev.	FIGURE
	APPROVED AQK	1535050	500	F	13H-3



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

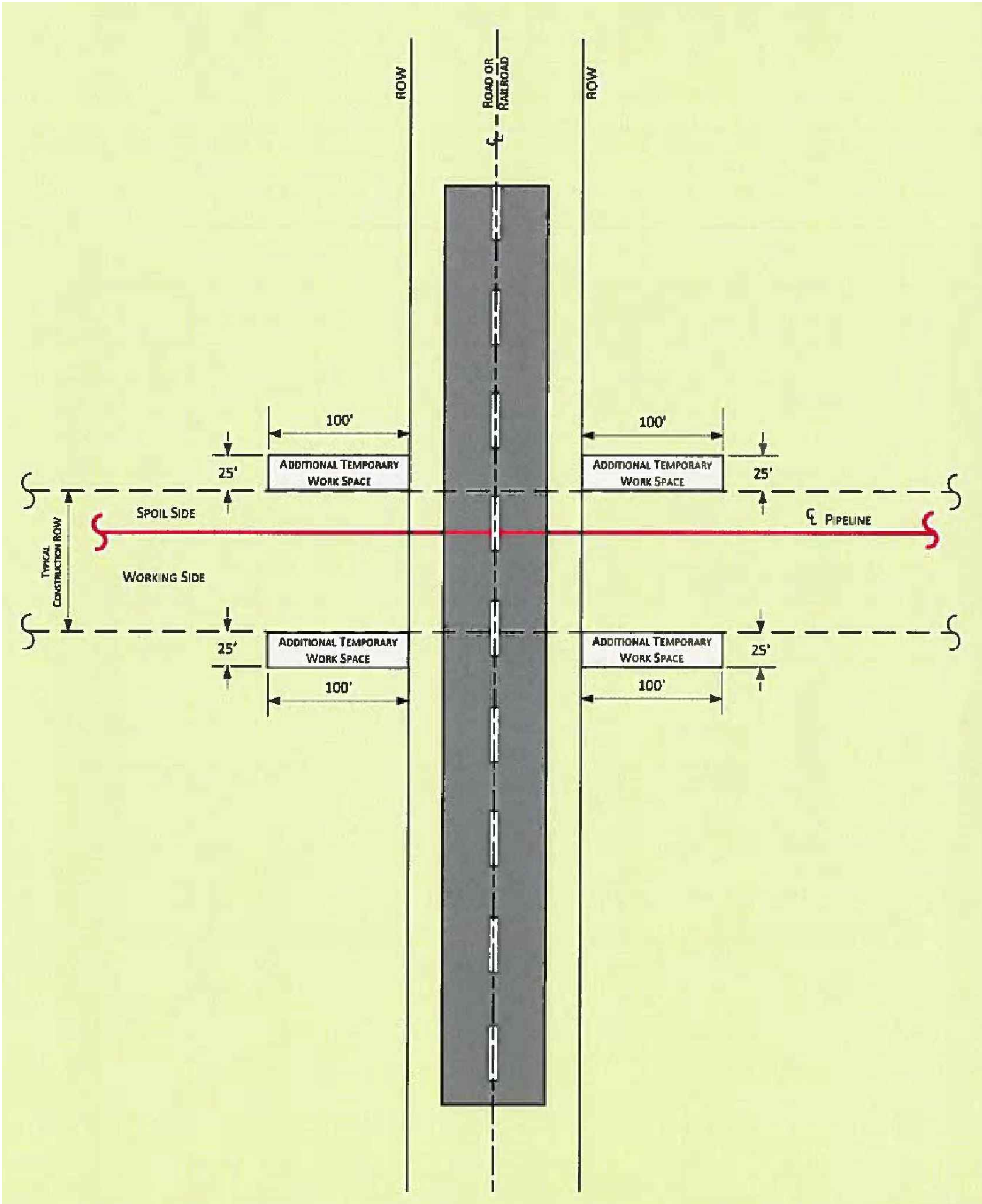
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
WORKSPACE AT BORED CROSSINGS FOR 2-LANE ROADS AND RAILROADS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13I-1

0 1 in



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

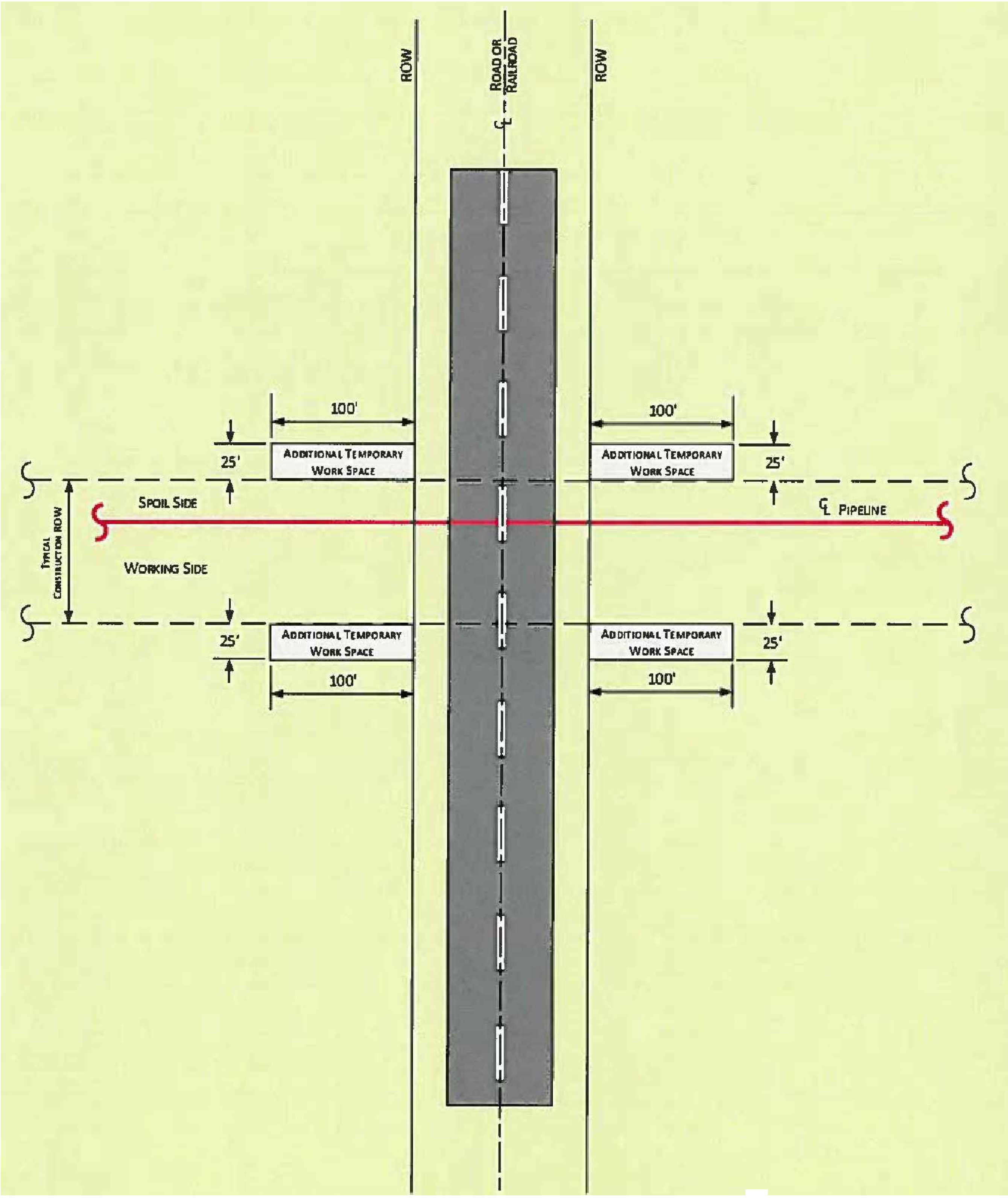
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT SINGLE-LANE ROADS AND BORED ROADS ACP AP-1 AP-2 AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13I-2



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

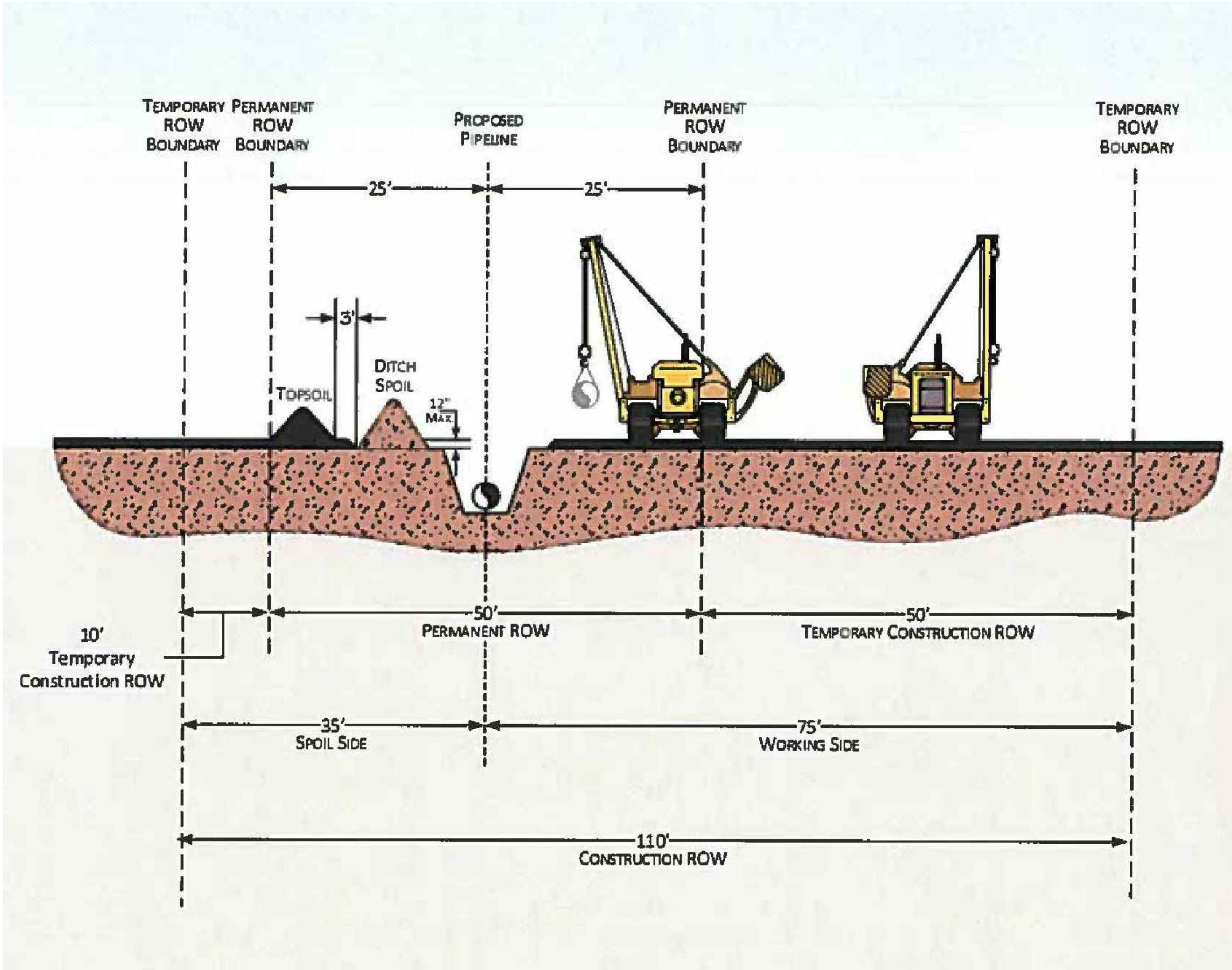
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT ALL BORED ROADS SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13I-3

1 in
0



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

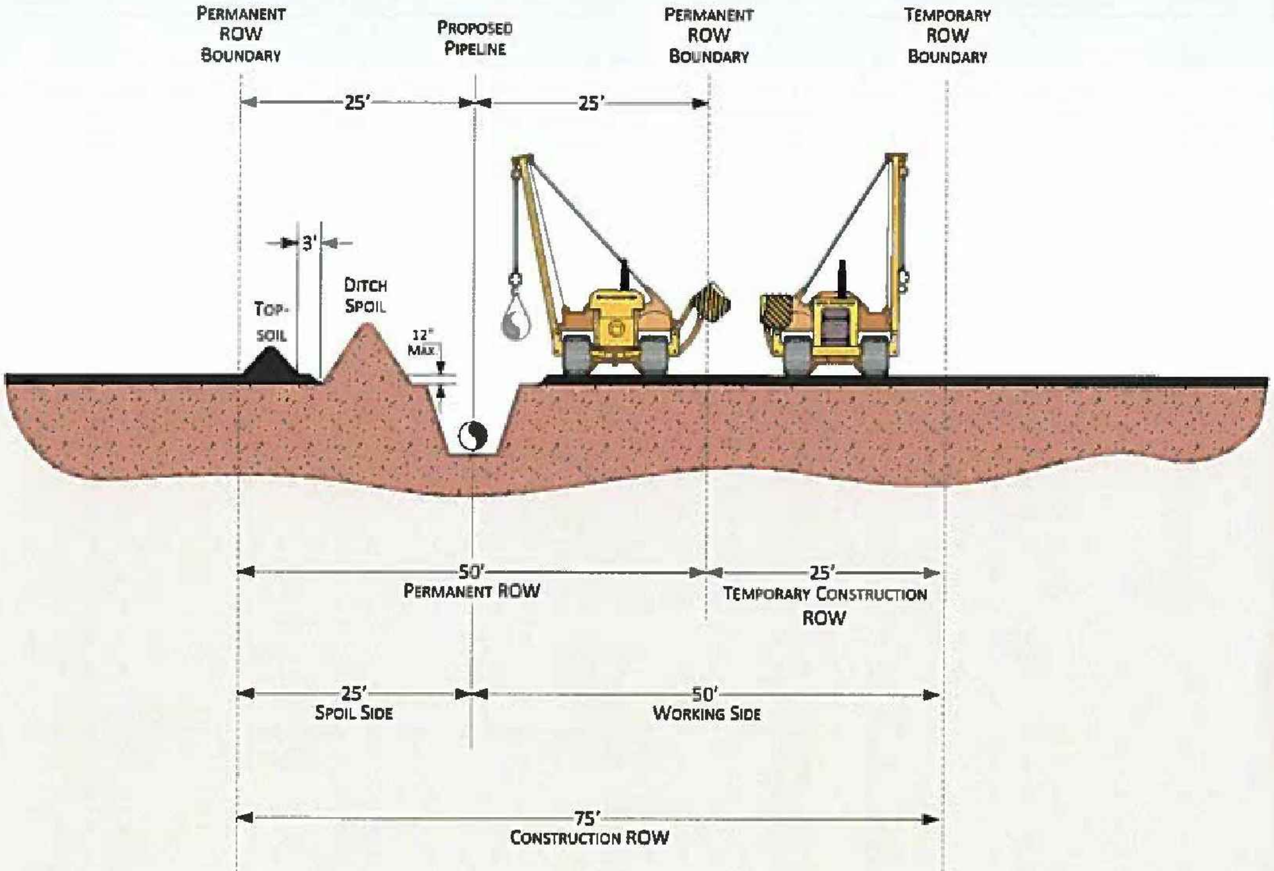
CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN NON-AG AREAS ACP AP-2

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13J-1



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT

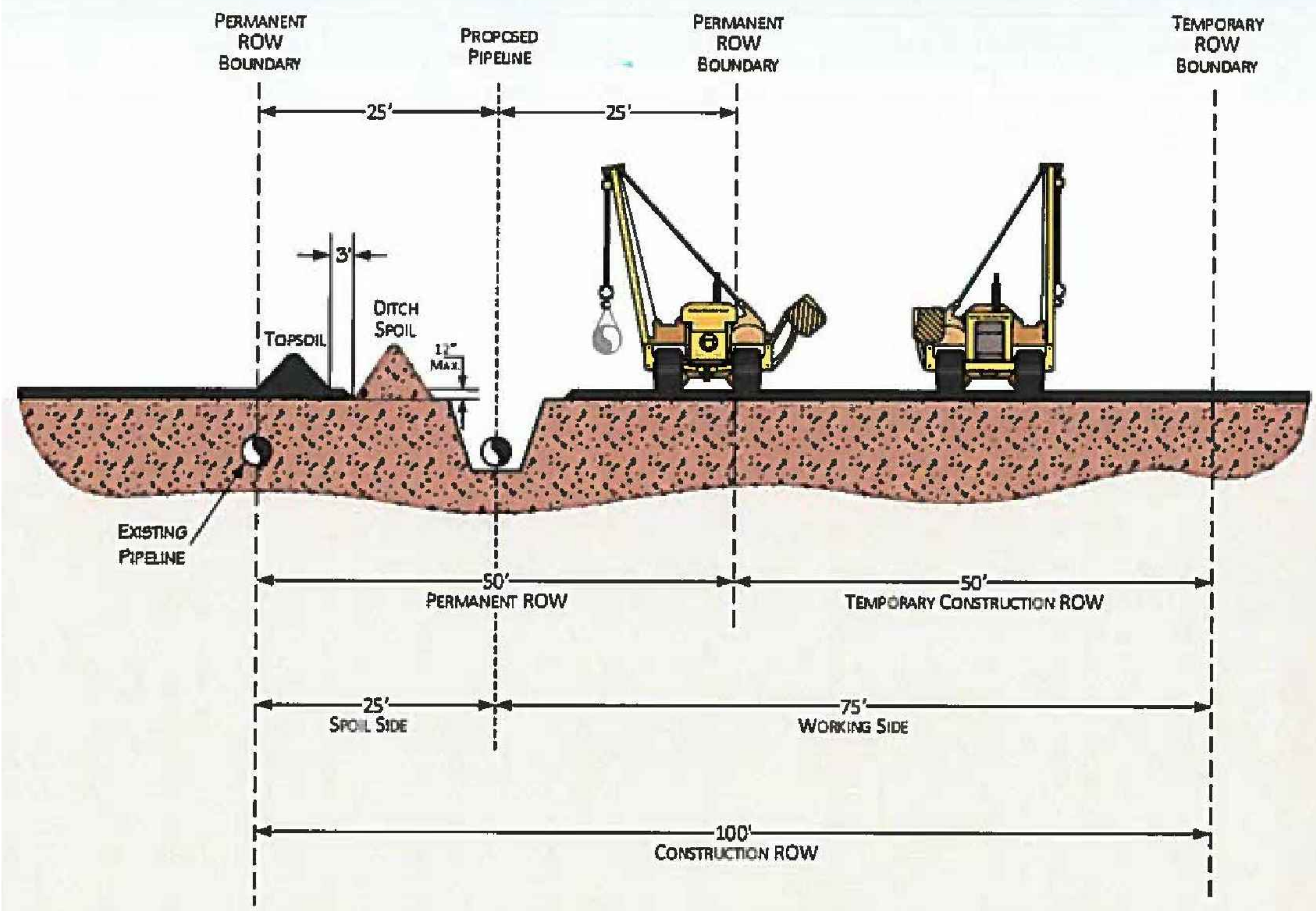
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE

TYP CONSTRUCTION ROW IN NON-AG AREAS AND WETLANDS ACP AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13J-2



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 100' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 50' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

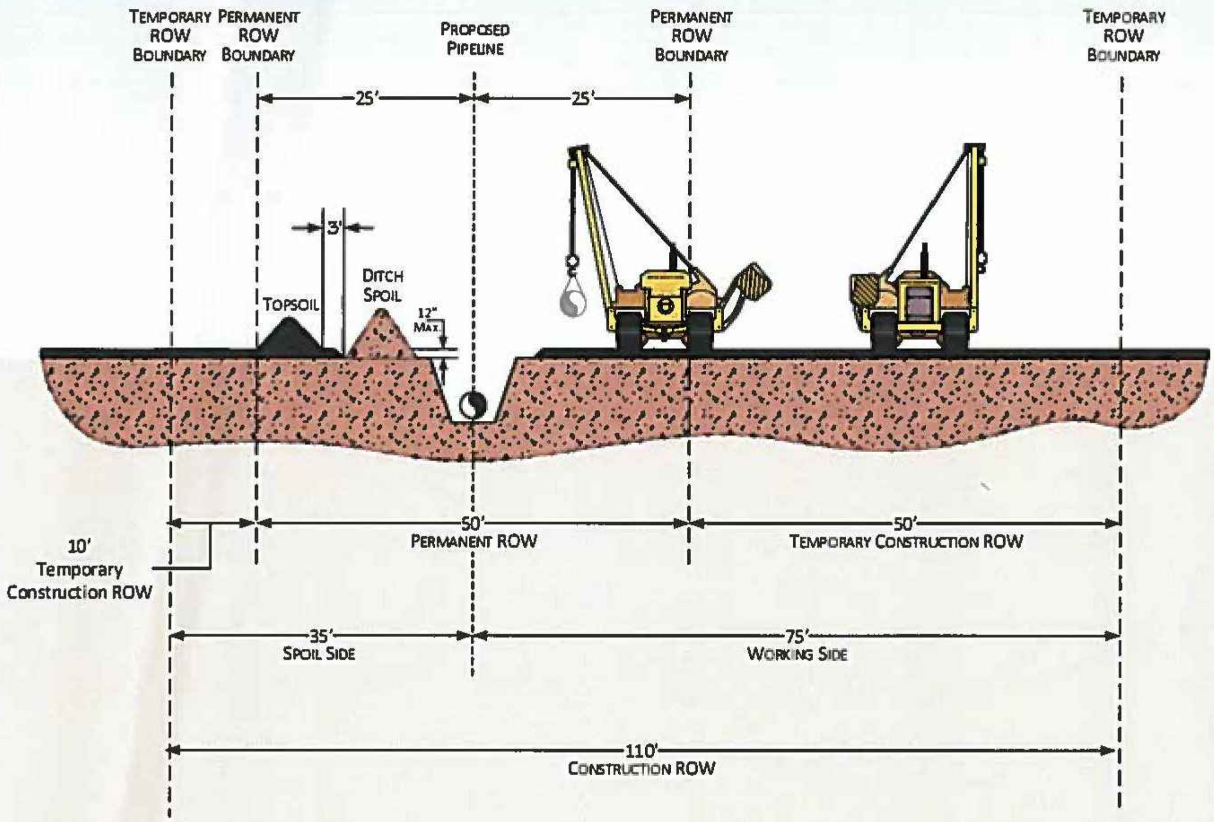
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN COLLOCATED NON-AG AREAS SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13J-3

0 1 in



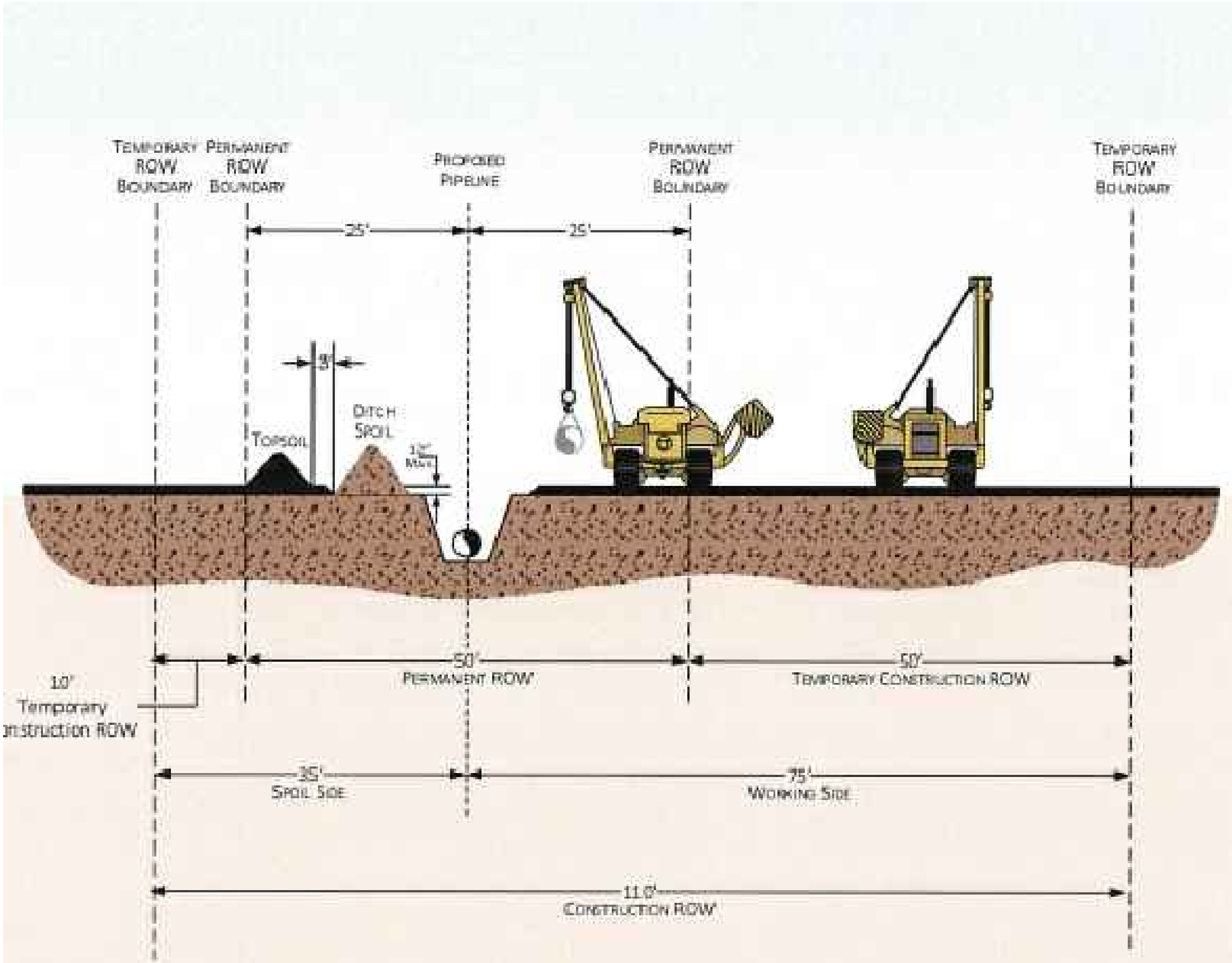
PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **TYP CONSTRUCTION ROW NOT-COLLOCATED IN NON-AG AREAS SHP TL-635 TL-636**	
		PROJECT No. 1535050	PHASE 500 · Rev. F · FIGURE 13J-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

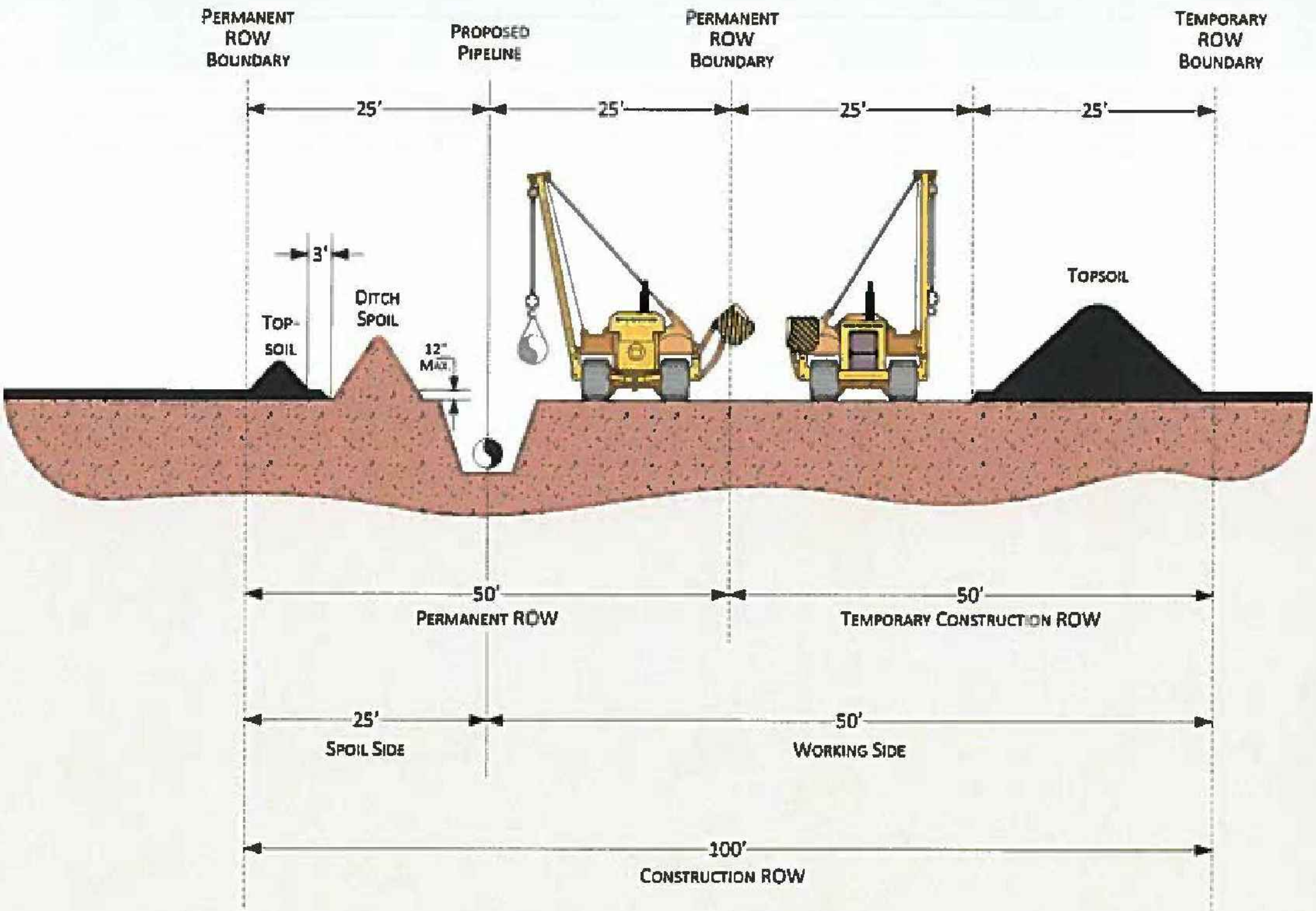


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE TYP CONSTRUCTION ROW IN AG AREAS ACP AP-2
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 13K-1
	APPROVED	AQK	

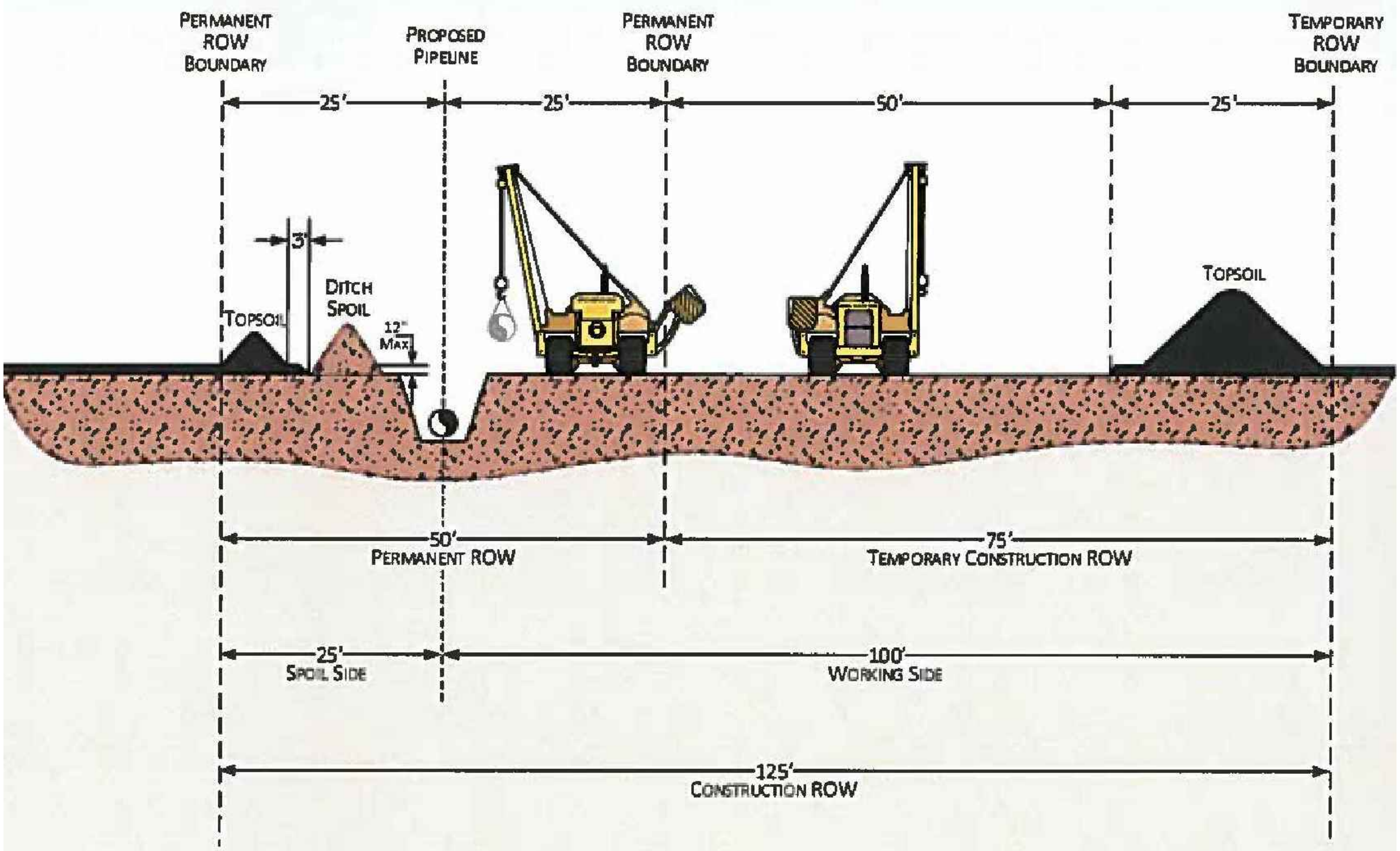


PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 100' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 50' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP CONSTRUCTION ROW IN AG AREAS ACP AP-3 AP-4 AP-5
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13K-2



PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 125' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 75' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

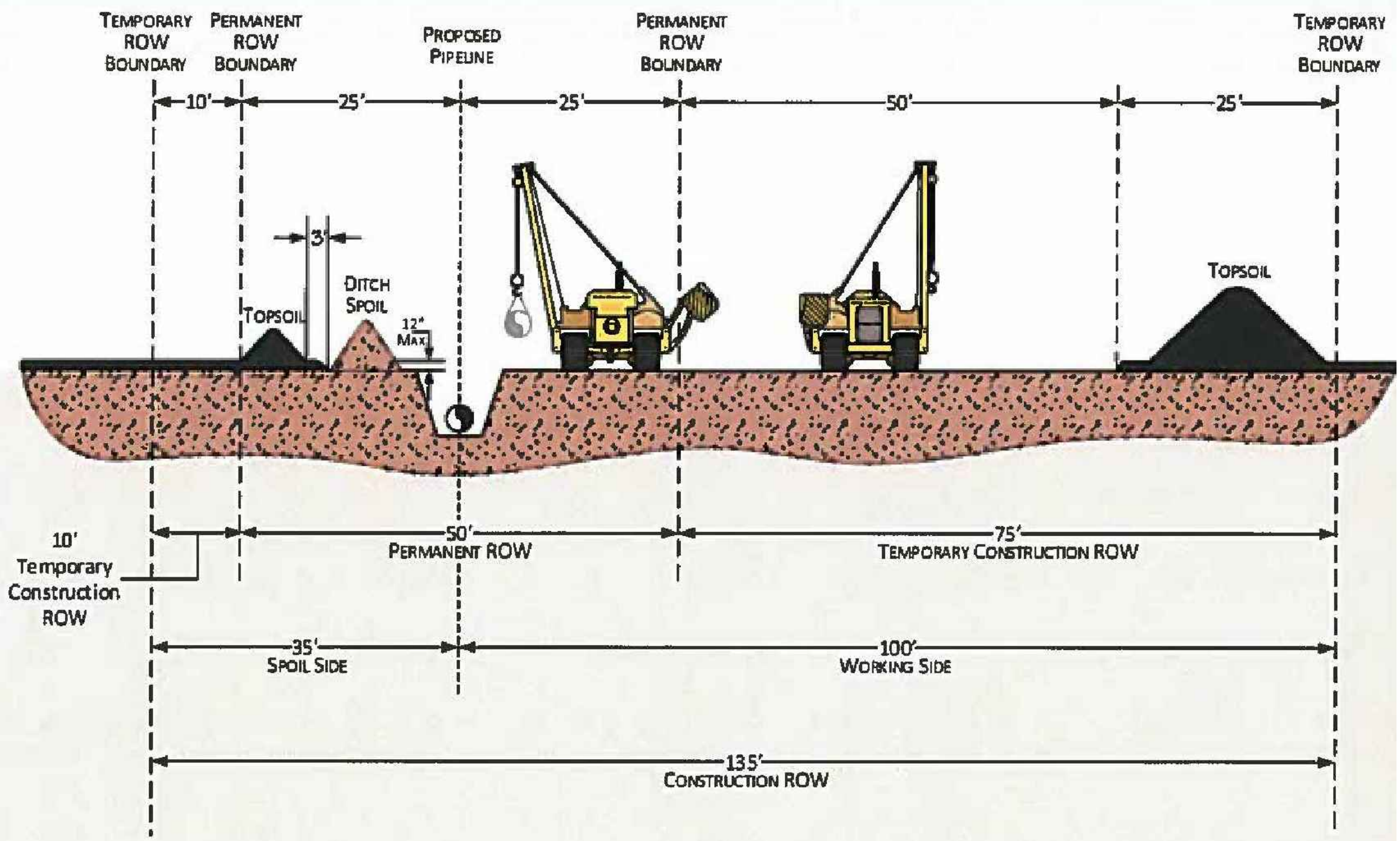
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW COLLOCATED IN AG AREAS SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13K-3

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 135' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 85' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

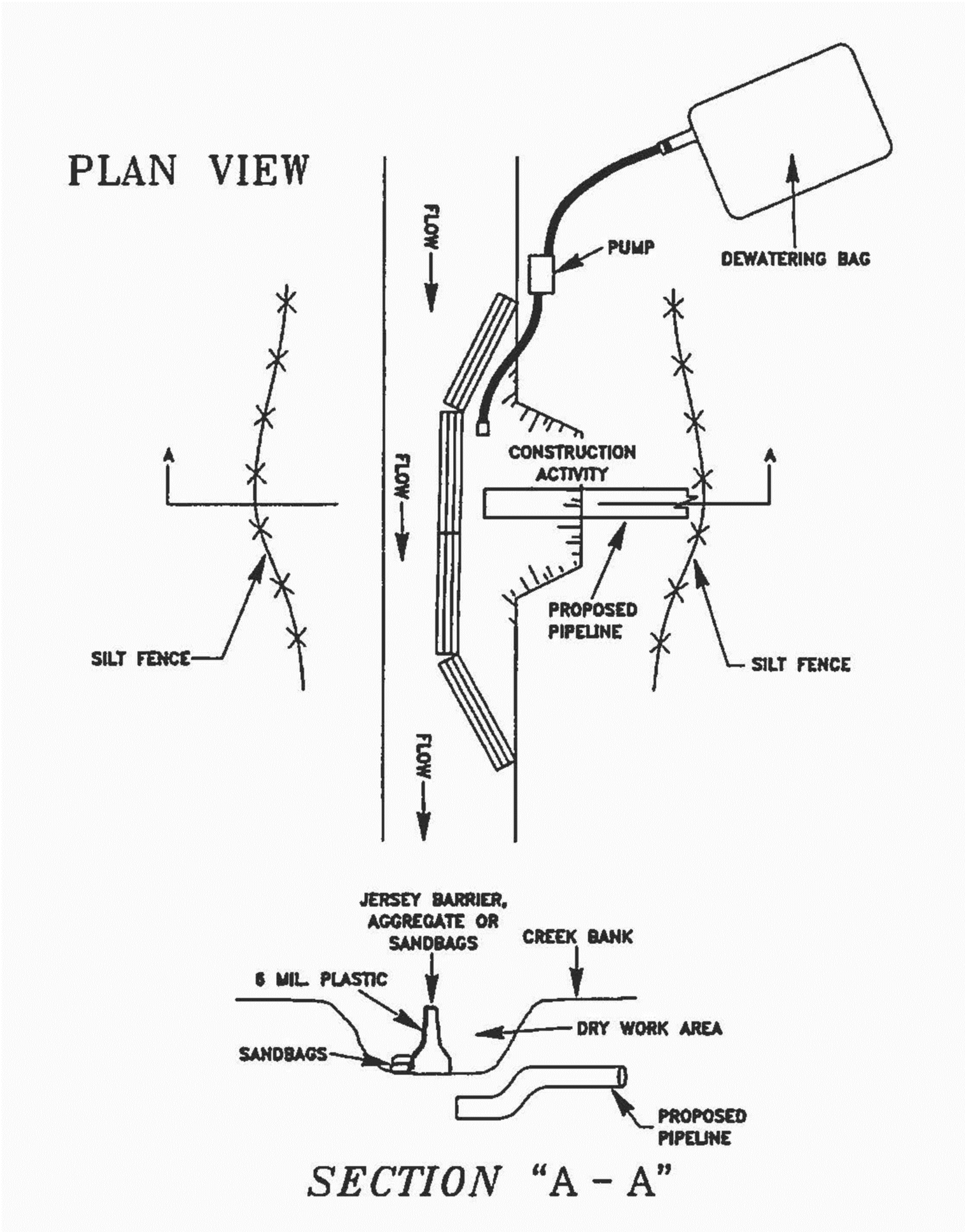
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW NOT-COLLOCATED IN AG AREAS SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13K-4

0 1 in



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP COFFERDAM CROSSING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13L

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. INCLUDES, BUT IS NOT LIMITED TO, SITE SPECIFIC INVESTIGATIONS, ASSESSMENTS, ANALYSIS, DETAILED ENGINEERING, AND DESIGN WORK DEVELOPED TO MITIGATE FOR SPECIALIZED SITE GEOTECHNICAL, HYDROTECHNICAL, OR GEOLOGIC CONDITIONS THAT MAY BE IMPOSED ON THE PIPELINE.

CLIENT
DOMINION

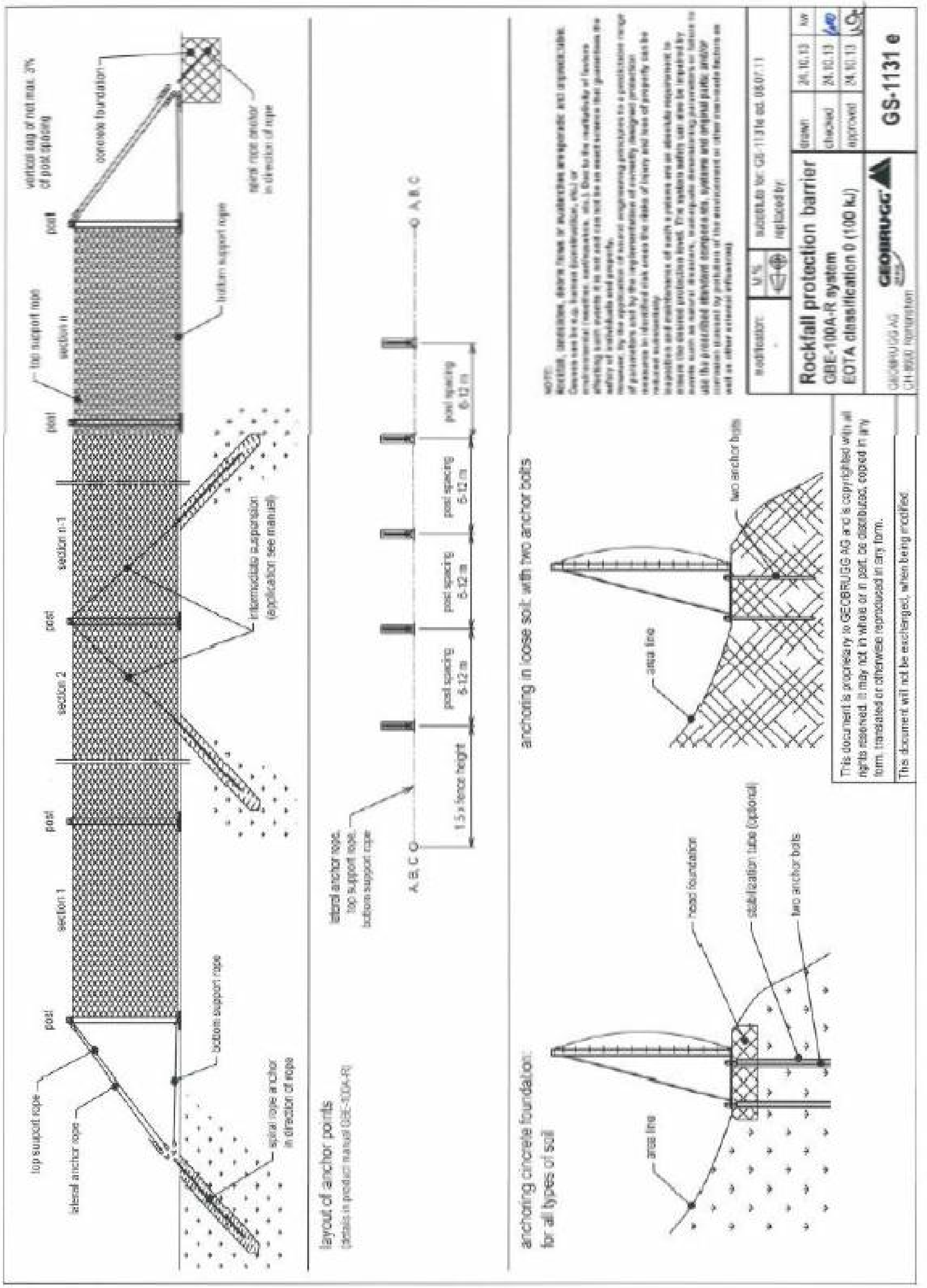
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SITE SPECIFIC DETAILED ENGINEERING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	14A



NOTE(S)

1. FINAL CONFIGURATION OF ROCK FALL PROTECTION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
MESH FENCE - ROCK FALL PROTECTION

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	14B

NOTE(S)

1. FINAL PLANNING, DESIGN, AND IMPLEMENTATION OF BLASTING ACTIVITIES TO BE DETERMINED BASED ON SITE SPECIFIC CONDITIONS, AND MUST FOLLOW SPECIFICATIONS AND REQUIREMENTS AS DIRECTED BY DOMINION.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
BLASTING PLANS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	14C

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. ADJUST ROUTING, ALIGNMENT, LOCATION (VERTICALLY OR HORIZONTALLY), OR POSITION WITHIN THE ROW OF THE PIPELINE TO AVOID IDENTIFIED HAZARDS. EXAMPLES MAY INCLUDE, BUT ARE NOT LIMITED TO, NEW ROW LOCATIONS THAT DEPART ENTIRELY FROM THE CURRENT ALIGNMENT BY SIGNIFICANT DISTANCES, RELATIVELY SMALLER ALIGNMENT SHIFTS THAT OFFSET FOR SHORTER DISTANCES FROM THE CURRENT ALIGNMENT, MINOR ADJUSTMENTS TO THE ALIGNMENT THAT REMAIN WITHIN THE ROW BOUNDARIES, LOWERING THE PIPELINE BELOW IDENTIFIED HAZARDS WHILE STAYING WITHIN THE ROW, ETC. CHANGING ROW ALIGNMENTS REQUIRES SITE SPECIFIC PLANNING, PERMITTING, ASSESSMENTS, LAND AND PROPERTY REVIEW AND COORDINATION, ENGINEERING DESIGN TO FIT THE NEW SITE CONDITIONS, AND OTHER TECHNICAL SUPPORT EFFORTS.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
AVOIDANCE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	15A

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SITE INVESTIGATIONS NEEDED TO CONFIRM LATERAL AND VERTICAL EXTENT OF IDENTIFIED LANDSLIDE OR OTHER UNSTABLE SLOPE CONDITIONS.

3. INVESTIGATION MAY INCLUDE PROBES, TEST PITS, EXCAVATIONS ALONG PIPELINE TRENCH, GEOPHYSICAL METHODS (I.E. NON-INTRUSIVE GPR, SEISMIC OR ELECTRICAL METHODS), OR MAY REQUIRE DEEPER SUBSURFACE DRILLING METHODS. FINAL INVESTIGATION METHONGS(S) TO BE DETERMINED BASED ON SITE CONDITIONS AND REQUIREMENTS OF SITE WORK.

4. EXCAVATIONS TO REMOVE IDENTIFIED LANDSLIDE OR OTHER UNSTABLE SLOPE CONDITIONS SHOULD BE COMPLETED FOR THE FULL EXTENT OF CHARACTERIZED HAZARD AREA, AT A MINIMUM MATCHING OR EXCEEDING THE UNDERLYING AND/OR LATERAL BOUNDING FAILURE SURFACE AND/OR SLIP PLANE. THE GOAL AND INTENT OF THIS MITIGATION APPROACH IS TO ESSENTIALLY REMOVE THE SLOPE HAZARD FROM THE SITE BY DIGGING OUT THE LIMITS OF THE IDENTIFIED HAZARD.

5. REMOVAL OF TARGETED LANDSLIDE AND/OR UNSTABLE SLOPE MATERIALS MAY REQUIRE SPECIAL CONSIDERATIONS FOR OTHER DIRECTLY OR INDIRECTLY RELATED OR CONNECTED SITE MITIGATION MEASURES AND/OR SITE ACTIVITIES TO ADDRESS SAFETY, SLOPE STABILITY, ACCESS, CONSTRUCTION FEASIBILITY, ETC, THEREFORE, PLANNING FOR IMPLEMENTATION OF THIS OPTION SHOULD INCLUDE A COMPREHENSIVE REVIEW OF EXISTING PROPOSED WORK AT THE SITE.

6. EXCAVATED MATERIALS SHOULD BE SPOILED IN LOCATION(S) THAT DO NOT ACCELERATE OR EXACERBATE THE TARGETED LANDSLIDE OR UNSTABLE SLOPE AREA, OR IMPACT OTHER NEIGHBORING LANDSLIDES OR UNSTABLE SLOPE AREAS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
EXCAVATION REMOVAL OF HAZARD

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	15B

NOTE(S)

1. ACCESS FOR PIPELINE ROW'S IN RUGGED AND REMOTE TERRAIN MAY BE LIMITED TO THE CONSTRUCTED ROW. IN THESE SCENARIOS, CONSTRUCTING INDEPENDENT ACCESS POINTS AND ROADS IS TYPICALLY MINIMIZED TO THEREBY ALSO MINIMIZE DISTURBANCE. AS SUCH, THE PRIMARY ACCESS IS COMMONLY ALONG THE TEMPORARY CONSTRUCTED ROW FOLLOWING THE PIPELINE ALIGNMENT, AND IS THEN NO LONGER AVAILABLE AFTER THE ROW IS RESTORED. THIS BIC MITIGATION MEASURE IS INTENDED TO IDENTIFY AREAS WHERE ACCESS MAY BE NEEDED TO SUPPORT MONITORING, OPERATION, AND MAINTENANCE OF THE ROW; AND TO COMPLETE THE PLANNING, PERMITTING, DESIGN, AND CONSTRUCTION FOR ACCESS TO THESE LOCATIONS. ADDITIONAL PLANNING, PERMITTING, LAND COORDINATION, ENVIRONMENTAL, AND TECHNICAL EFFORTS ARE REQUIRED TO SUPPORT THIS MITIGATION MEASURE, NOT SPECIFICALLY OUTLINED AND ADDRESSED HEREIN, BUT ANTICIPATED TO BE NEEDED TO IMPLEMENT THIS MITIGATION MEASURE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ACCESS TO REMOTE ROW LOCATIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	15C

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SITE SPECIFIC STUDIES FOR POTENTIAL KARST HAZARDS WILL BE COMPLETED TO IDENTIFY, CHARACTERIZE, AND DEVELOP MITIGATION RECOMMENDATIONS, AS NEEDED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

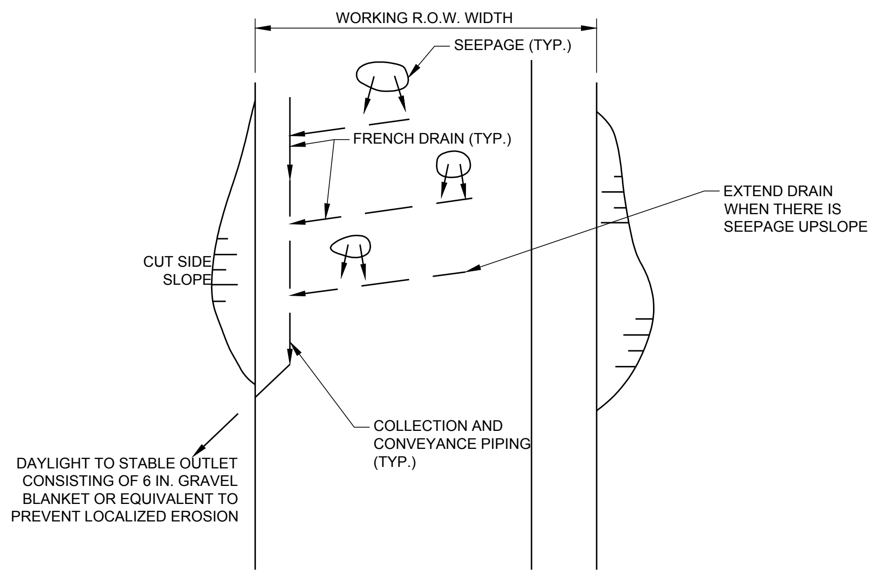
Golder Associates

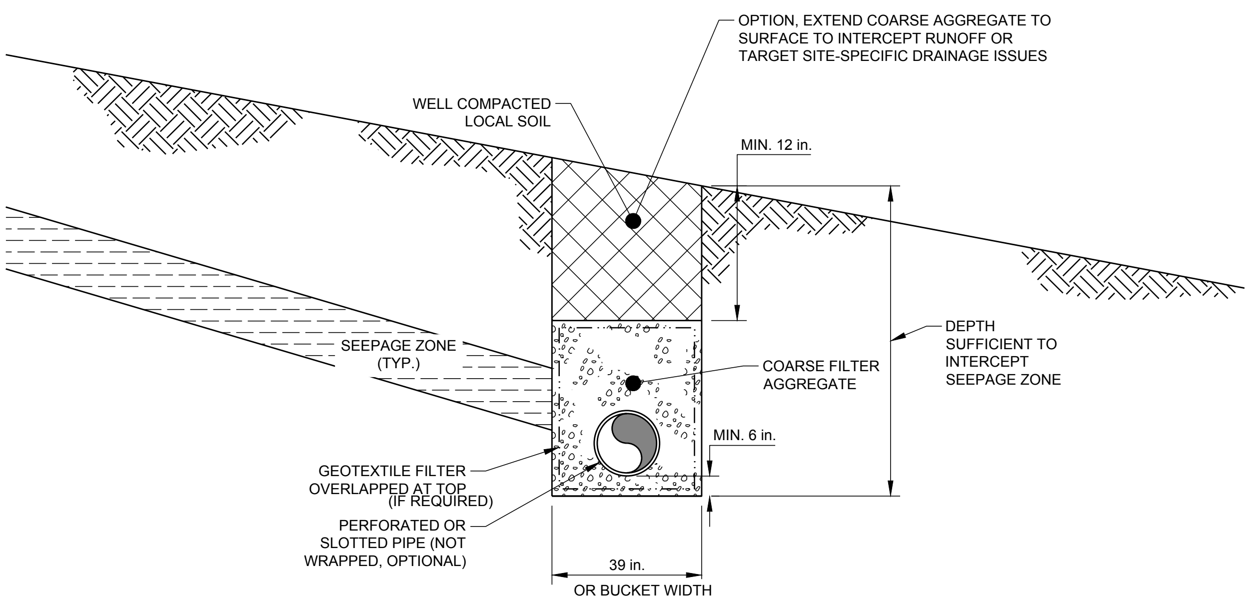
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
KARST HAZARDS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	16A

Site-Specific Designs
To Be Provided





NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

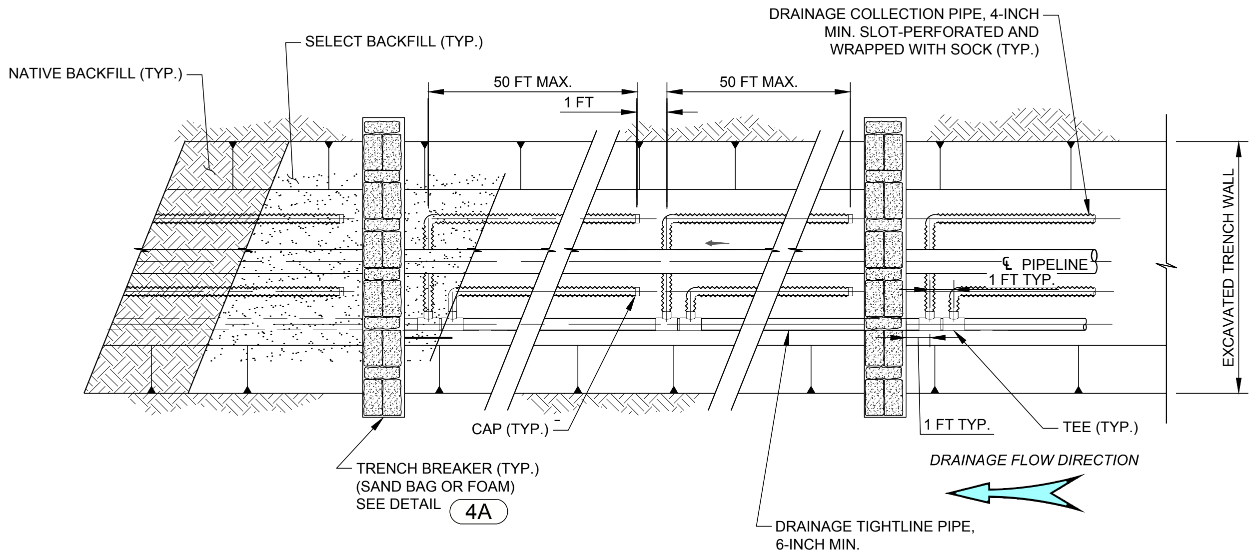
CONSULTANT

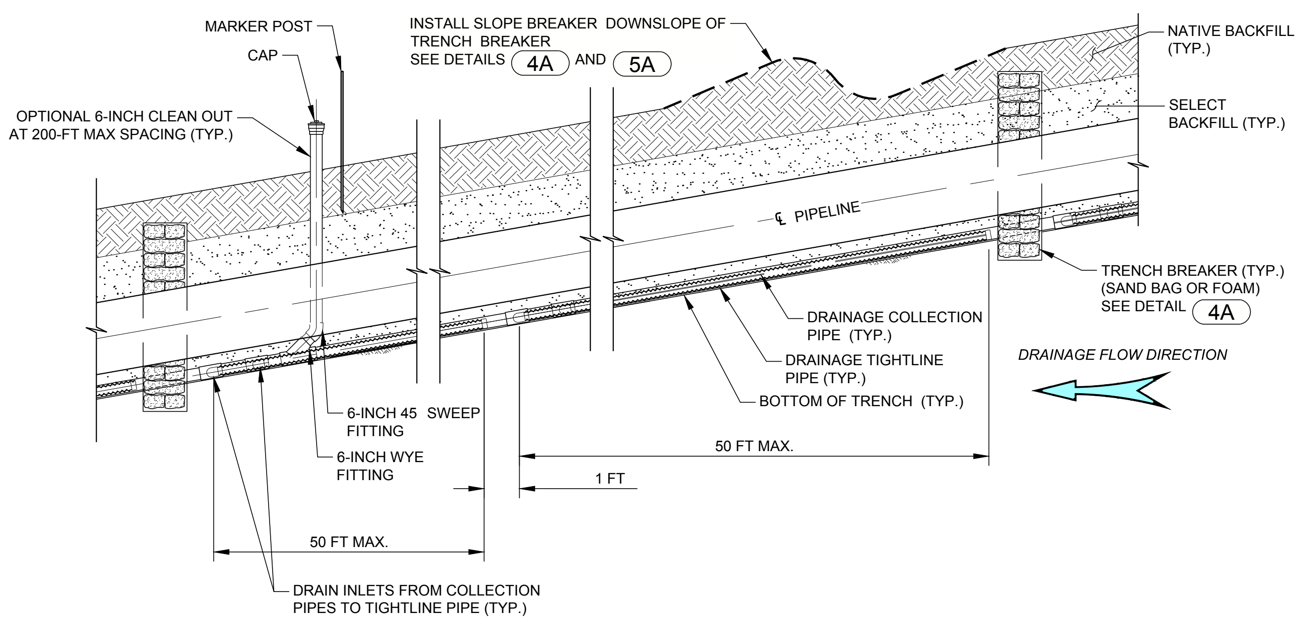
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
FRENCH DRAIN (SIMPLE)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1A





NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SPACING OF CLEAN-OUTS TO BE DETERMINED BASED ON SITE CONDITIONS AND OPERATION AND MAINTENANCE REQUIREMENTS.

CLIENT
DOMINION

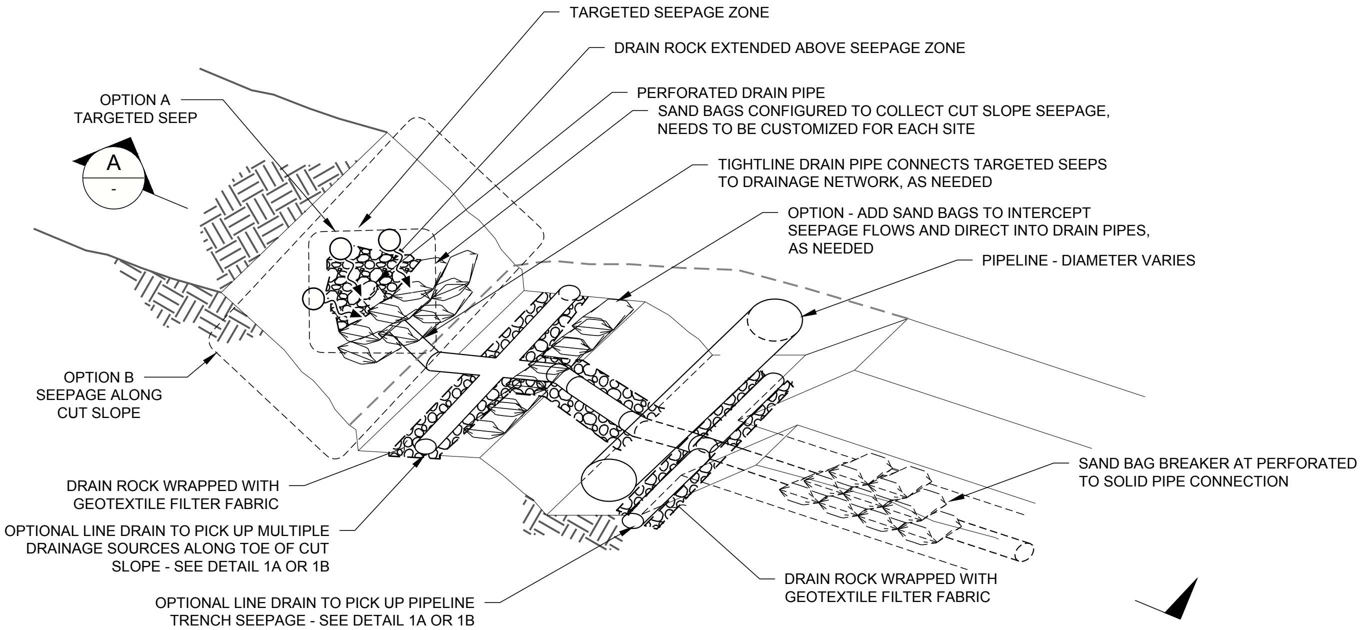
PROJECT
BIC/INCREMENTAL CONTROLS

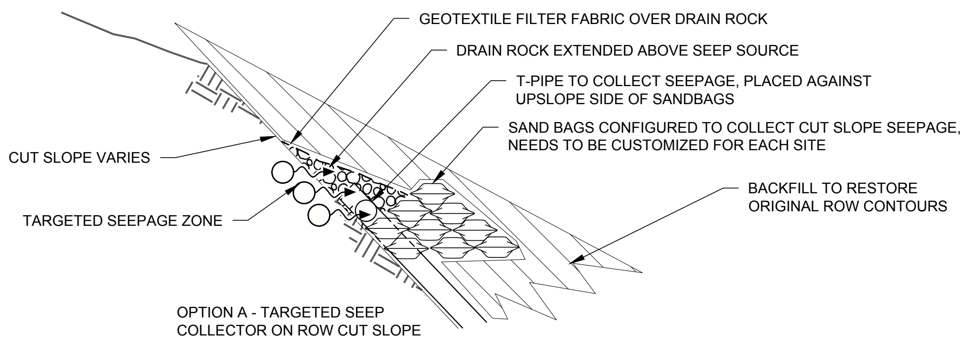
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

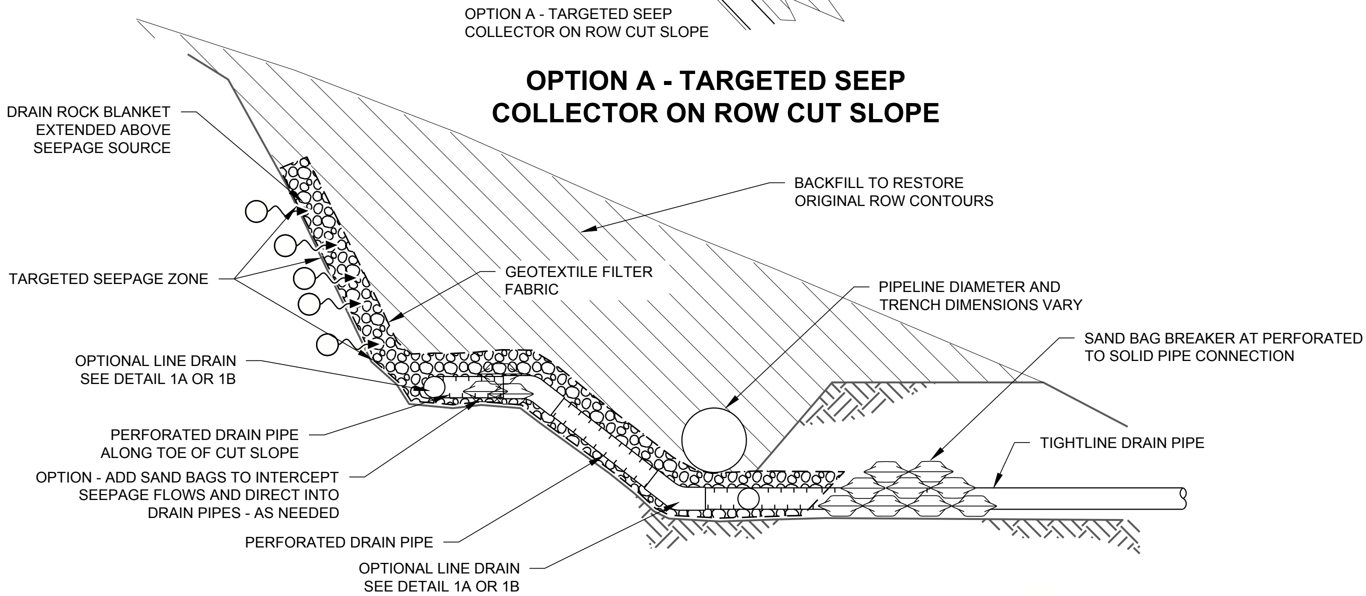
TITLE
ENHANCED DRAIN (GERMAN DRAIN)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1B





OPTION A - TARGETED SEEP COLLECTOR ON ROW CUT SLOPE



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-

OPTION B - TARGETED SEEP COLLECTOR ON ROW CUT SLOPE

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TARGETED SEEP DRAINS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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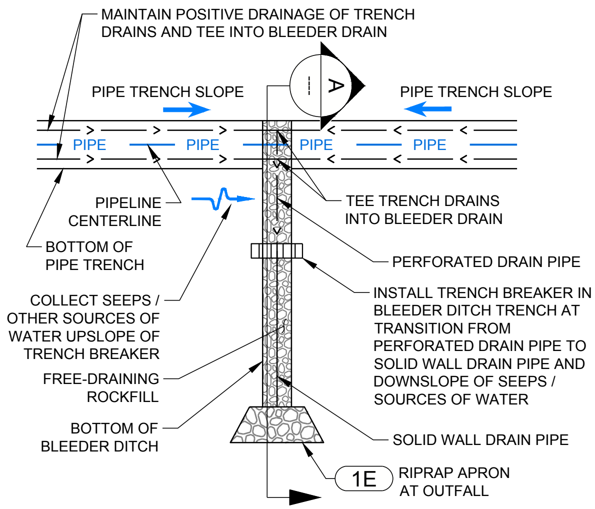
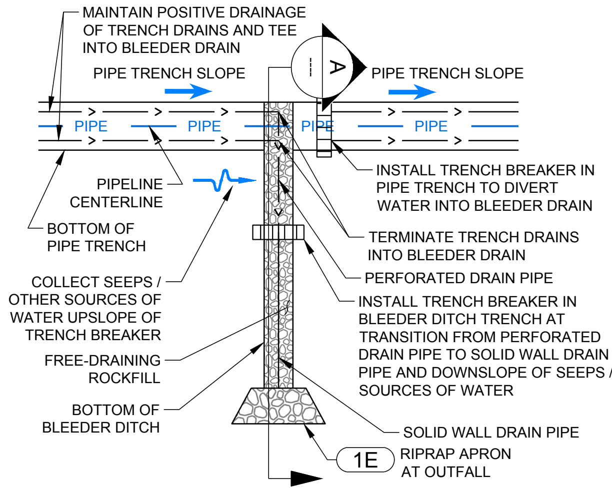
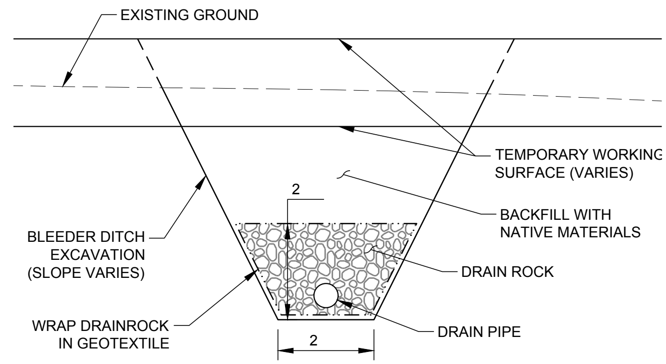


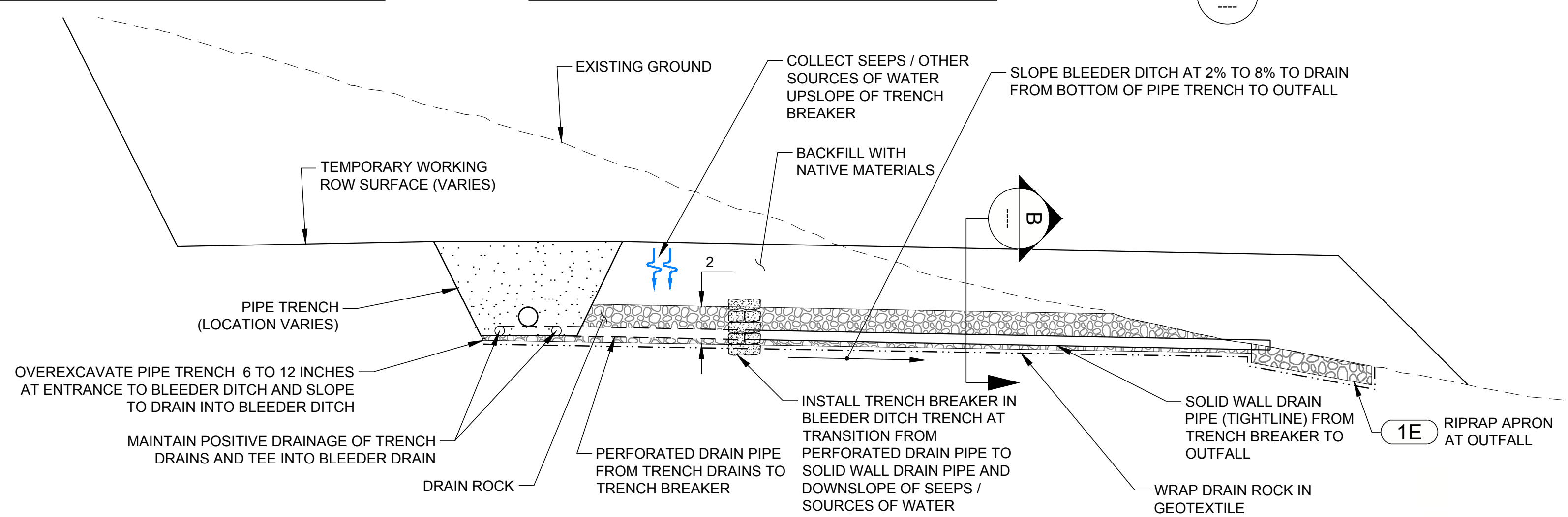
BLEEDER DRAIN WITH FLAT PIPE TRENCH



BLEEDER DRAIN WITH SLOPED PIPE TRENCH



B BLEEDER DRAIN DITCH SECTION



A BLEEDER DRAIN PROFILE

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. INSTALL BLEEDER DITCH IN SIDESLOPE SCENARIOS AT 100 FT INTERVALS, AT LOW POINTS IN THE PIPELINE TRENCH, OR AS NEEDED TO COLLECT SEEPS, SOURCES OF WATER, OR OTHER DRAINS.
3. NATIVE MATERIALS MAY BE USED DOWNSLOPE OF BLEEDER DITCH TRENCH BREAKER INSTEAD OF DRAINFILL PROVIDED THAT NATIVE BACKFILL MATERIALS ARE FREE-DRAINING AND NO SEEPS OR SOURCES OF WATER ARE IDENTIFIED DOWNSLOPE OF THE PIPE TRENCH.
4. LENGTH OF BLEEDER DRAIN WILL VARY AS NEEDED TO MAINTAIN POSITIVE DRAINAGE IN DITCH TO OUTFALL.

CLIENT
DOMINION

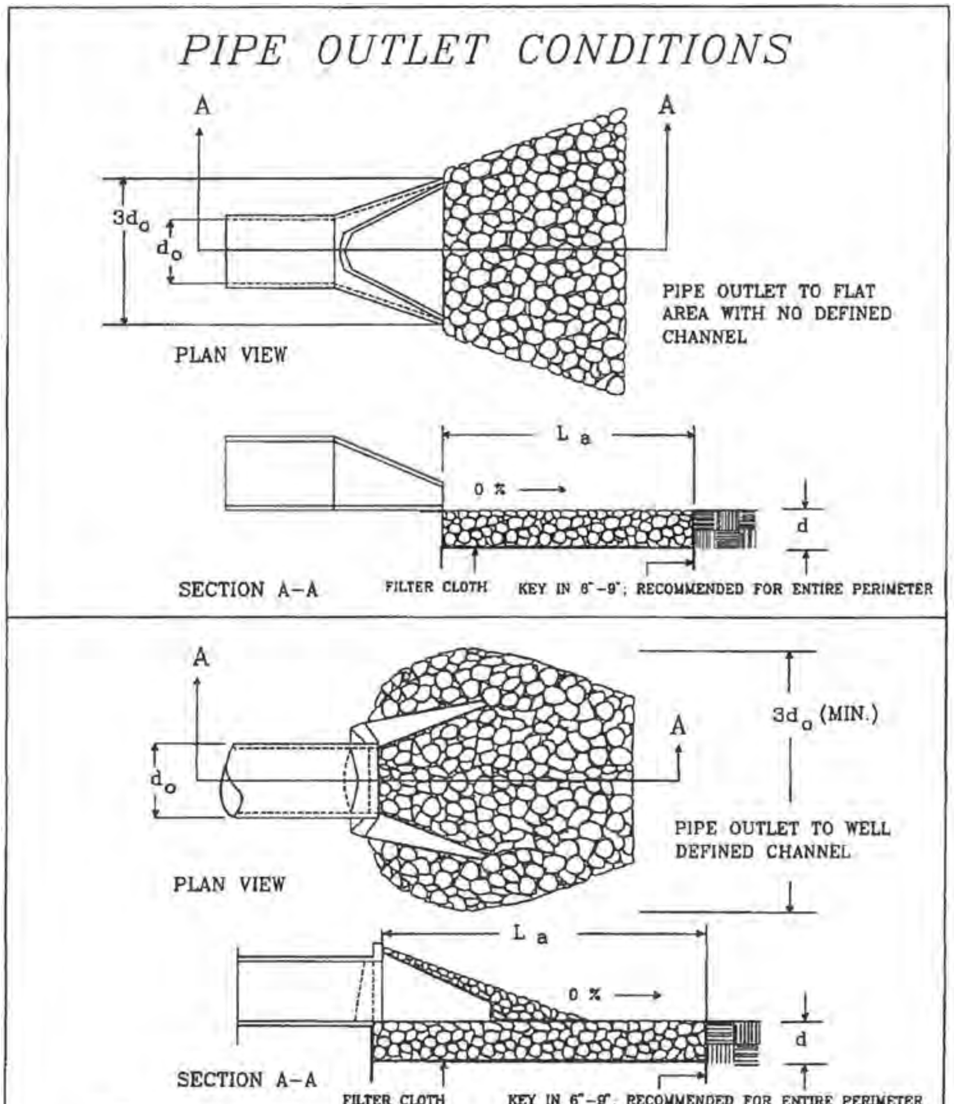
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
DESIGNED	DBC
PREPARED	REDMOND
REVIEWED	-
APPROVED	AQK

TITLE
BLEEDER DRAIN

PROJECT NO.	PHASE	REV.	FIGURE
1535050	500	F	1D



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

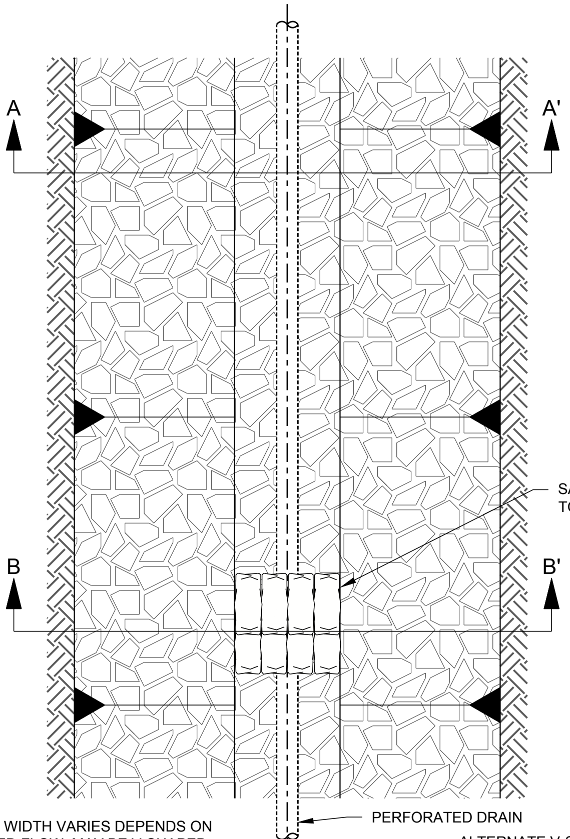
CONSULTANT

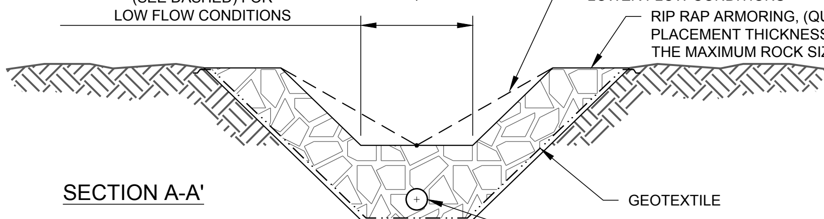
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

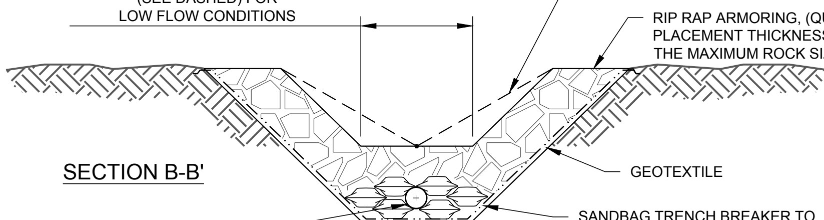
TITLE
DRAIN PIPE OUTFALL RIPRAP APRON

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1E





SECTION A-A'



SECTION B-B'

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. 100-FT MAX SPACING FOR BREAKERS.

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT: Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ARMORED CHANNEL WITH DRAIN PIPE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1F

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SPECIAL STUDIES MAY BE REQUIRED TO SUPPORT DESIGN AND IMPLEMENTATION OF SUBSURFACE DEWATERING MEASURES, WHICH MAY INCLUDE USING WELL POINTS, SUMPS, WELLS, DRAINS, DIVERSIONS, ETC.

CLIENT
DOMINION

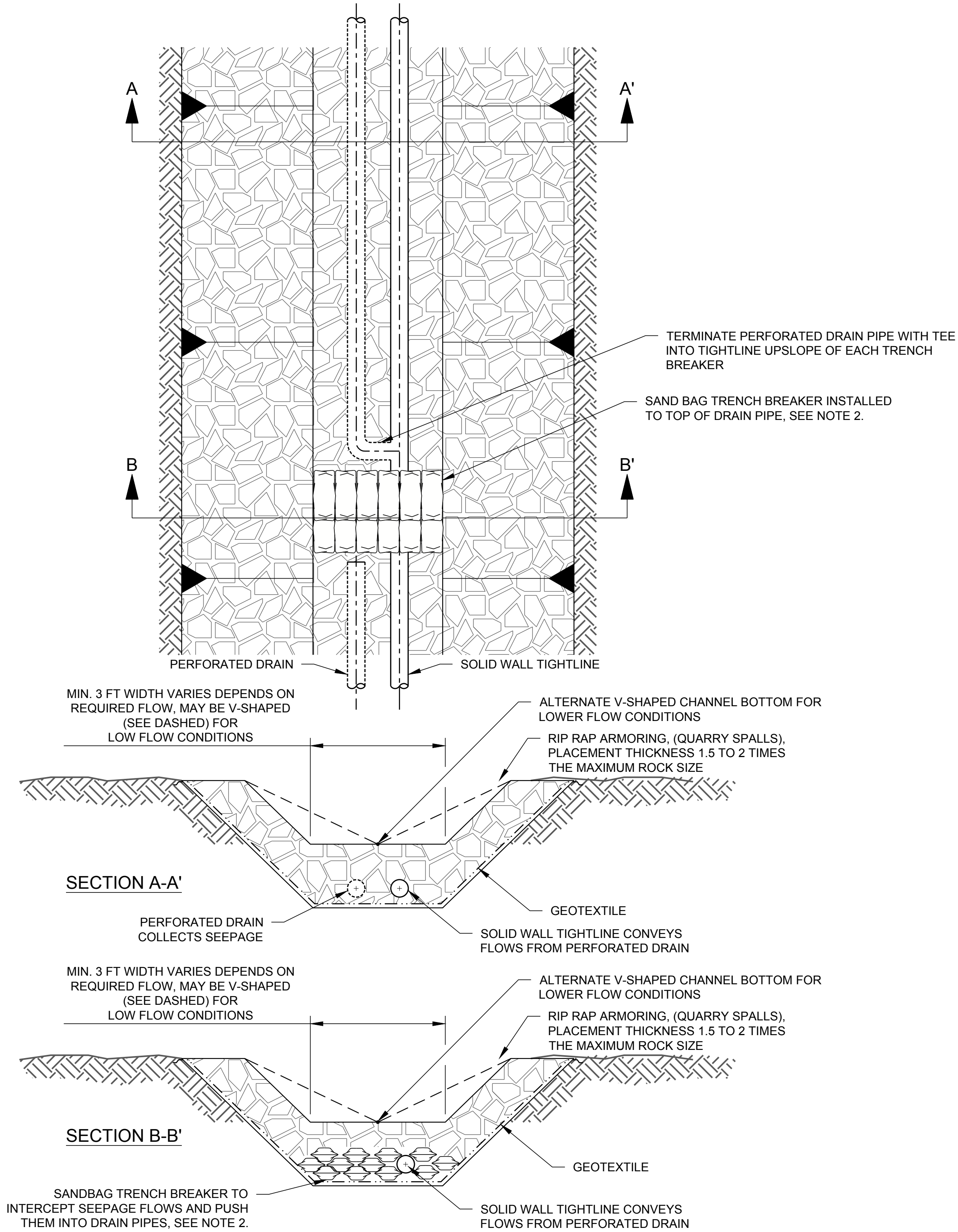
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
DEWATERING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1G



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. 100-FT MAX SPACING FOR BREAKERS.

CLIENT
DOMINION

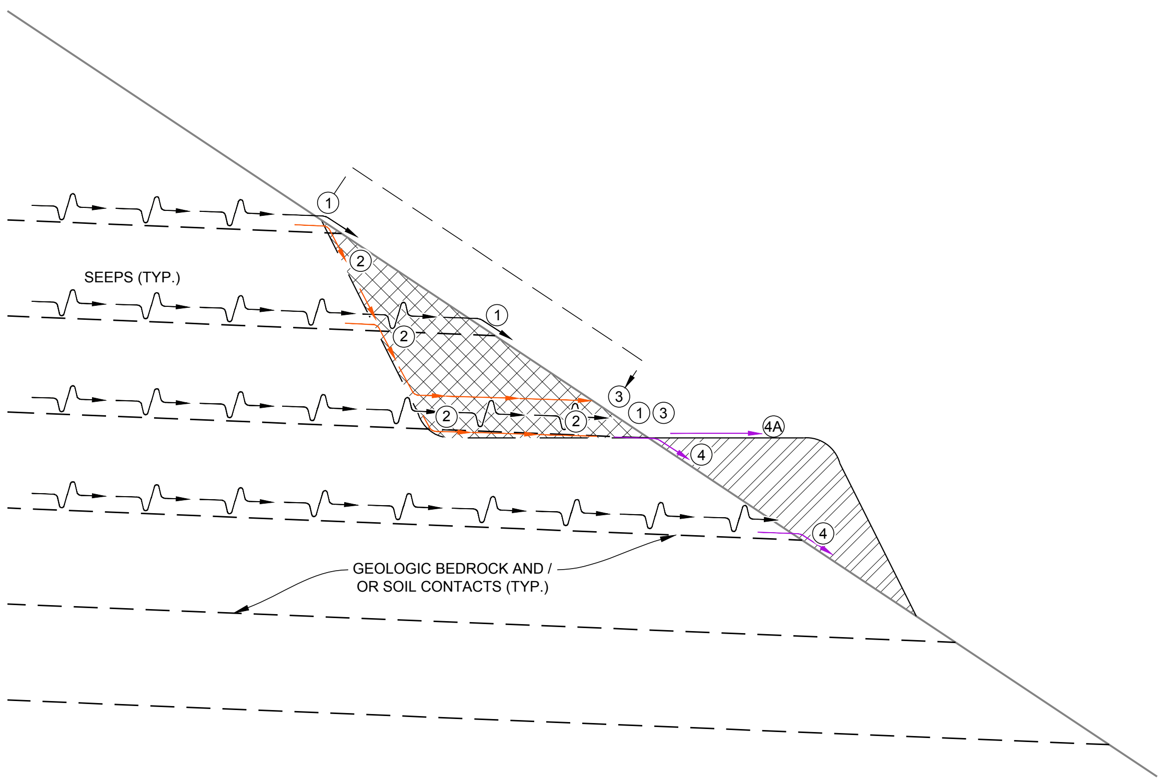
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STEEP CONVEYANCE CHANNEL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1H



NOTE(S)

1. INSTALL PERMANENT AND / OR TEMPORARY SEEP COLLECTORS AT THE LOWEST OR DEEPEST CUT INTO NATIVE GROUND, AND AT CONTACTS AND TRANSITIONS BETWEEN BEDROCK OR SOIL UNITS (SEE (2)).
2. INSTALL TEMPORARY SEEP COLLECTORS TO PROTECT AGAINST SATURATION OF SPOILS (SEE (4)).
3. SEEP COLLECTORS SHOULD NOT BE LOCATED AT BACKFILL FACE AFTER RIGHT-OF-WAY RESTORATION (SEE (1)), UNLESS THAT IS THE LOWEST OR DEEPEST LOCATION OF DISTRIBUTION IN THE FINAL RIGHT-OF-WAY RESTORATION (SEE (5)).
4. ADDITIONAL MITIGATION MEASURES MAY BE NEEDED TO ADDRESS SATURATED BACKFILL AND / OR SPOILS, BASED ON SITE SPECIFIC CONDITIONS.

KEY

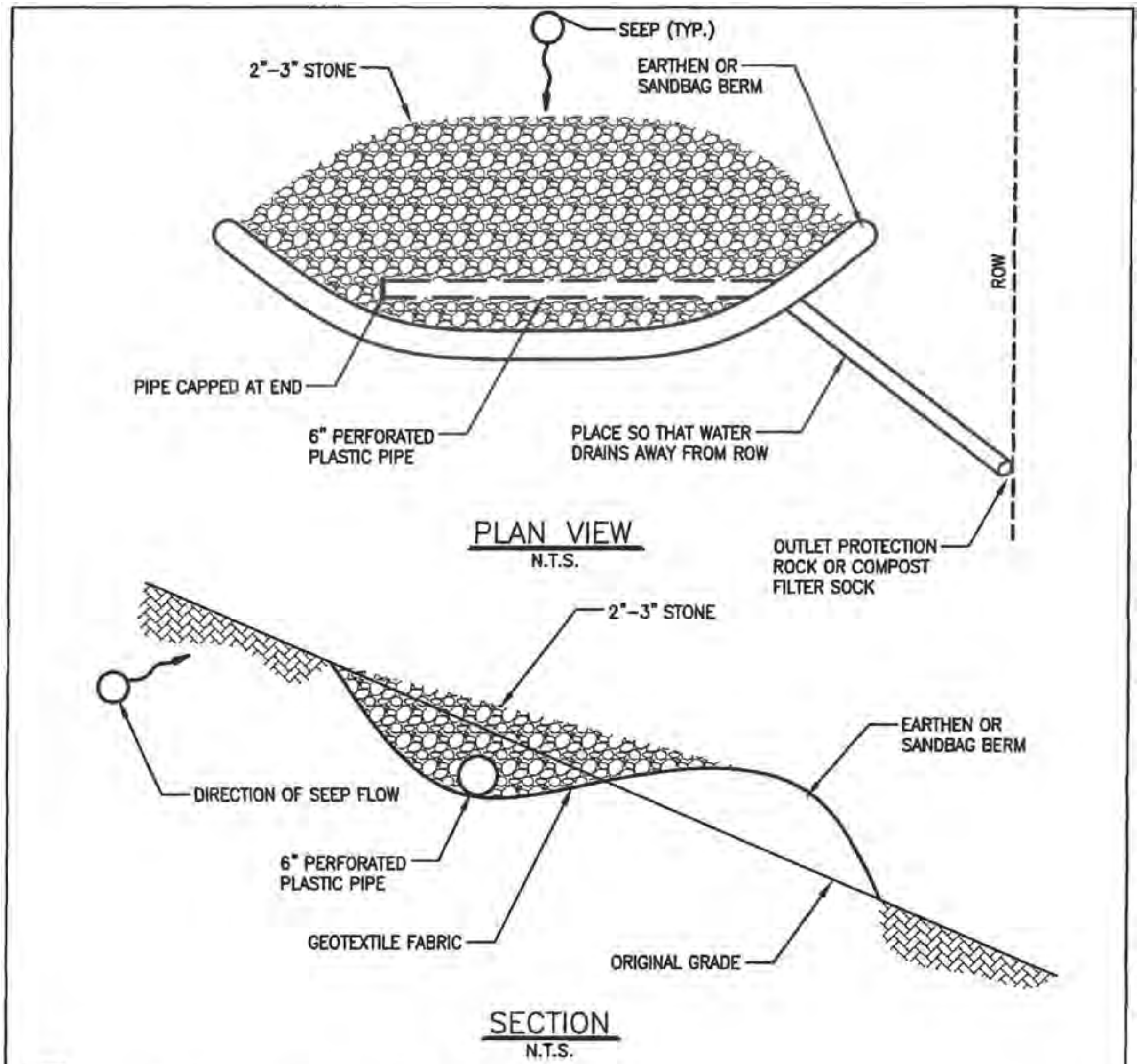
(1) SEEPS EXPOSED AT SURFACE BEFORE RIGHT-OF-WAY CONSTRUCTION.

(2) SEEP EXPOSED AFTER CONSTRUCTION OF THE RIGHT-OF-WAY, WITH POTENTIAL TO SATURATE BACKFILL, AND EXPRESSED IN DIFFERENT LOCATIONS AFTER CONSTRUCTION RESTORATION OF RIGHT-OF-WAY(3).

(4) SATURATES TEMPORARY SPOILS DURING CONSTRUCTION OF TEMPORARY RIGHT-OF-WAY, FROM BENEATH OR FROM SURFACE FLOWS (4A).

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **CHANGED SEEP CHARACTERISTICS**
Golder Associates	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1I



NOTE:
BERMS MAY BE CONSTRUCTED USING SANDBAGS TEMPORARILY DURING CONSTRUCTION. PERMANENT BERMS TO BE CONSTRUCTED USING COMPACTED EARTH.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

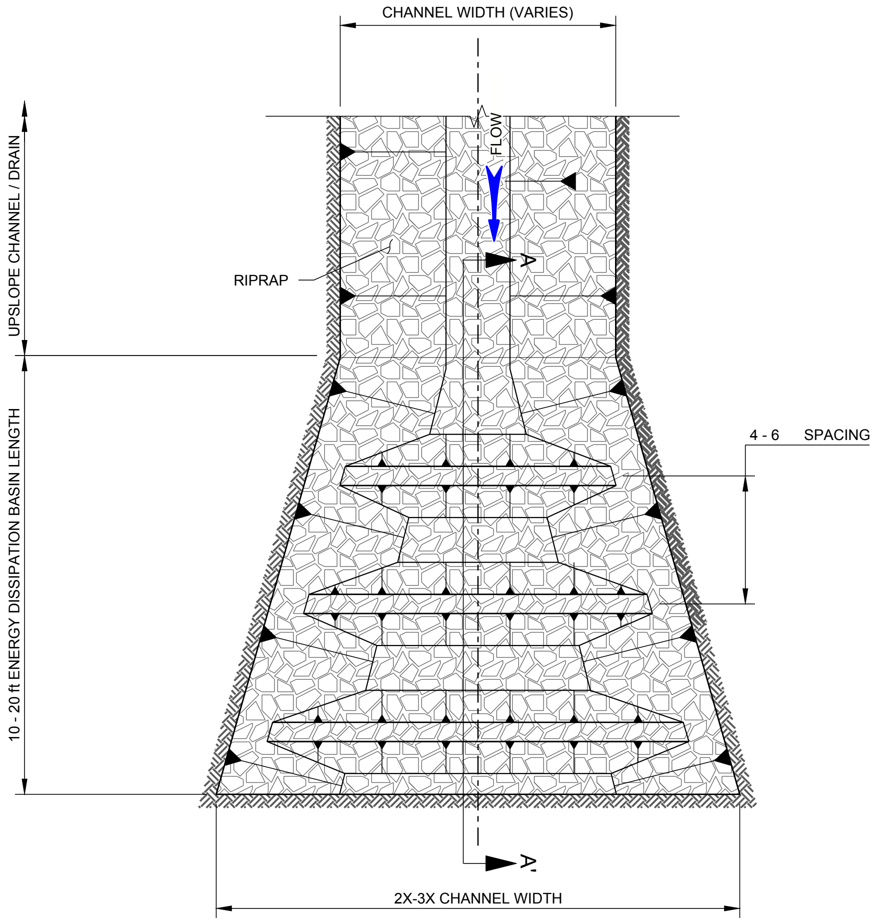
CONSULTANT
Golder Associates

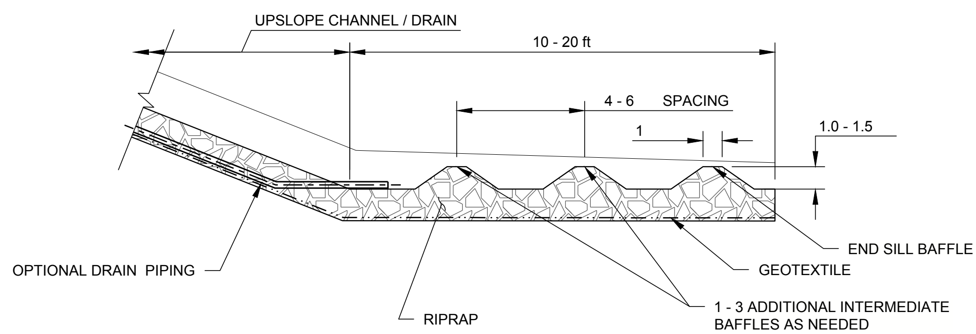
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TARGETED SEEP COLLECTOR

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1J

0 1 in





NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. ENERGY DISSIPATION BASIN SHOULD BE CONSTRUCTED AT THE DOWNSTREAM END OF CHANNELS AND DRAINS WHERE HIGH WATER VELOCITY MAY BE EXPECTED AND/OR DEBRIS MAY TRAVEL DOWN THE CHANNEL.
3. INTERMEDIATE BAFFLES SHOULD BE CONSTRUCTED AS NEEDED TO INTERCEPT DEBRIS FROM THE CHANNEL AND BELOW STEEP CHANNELS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

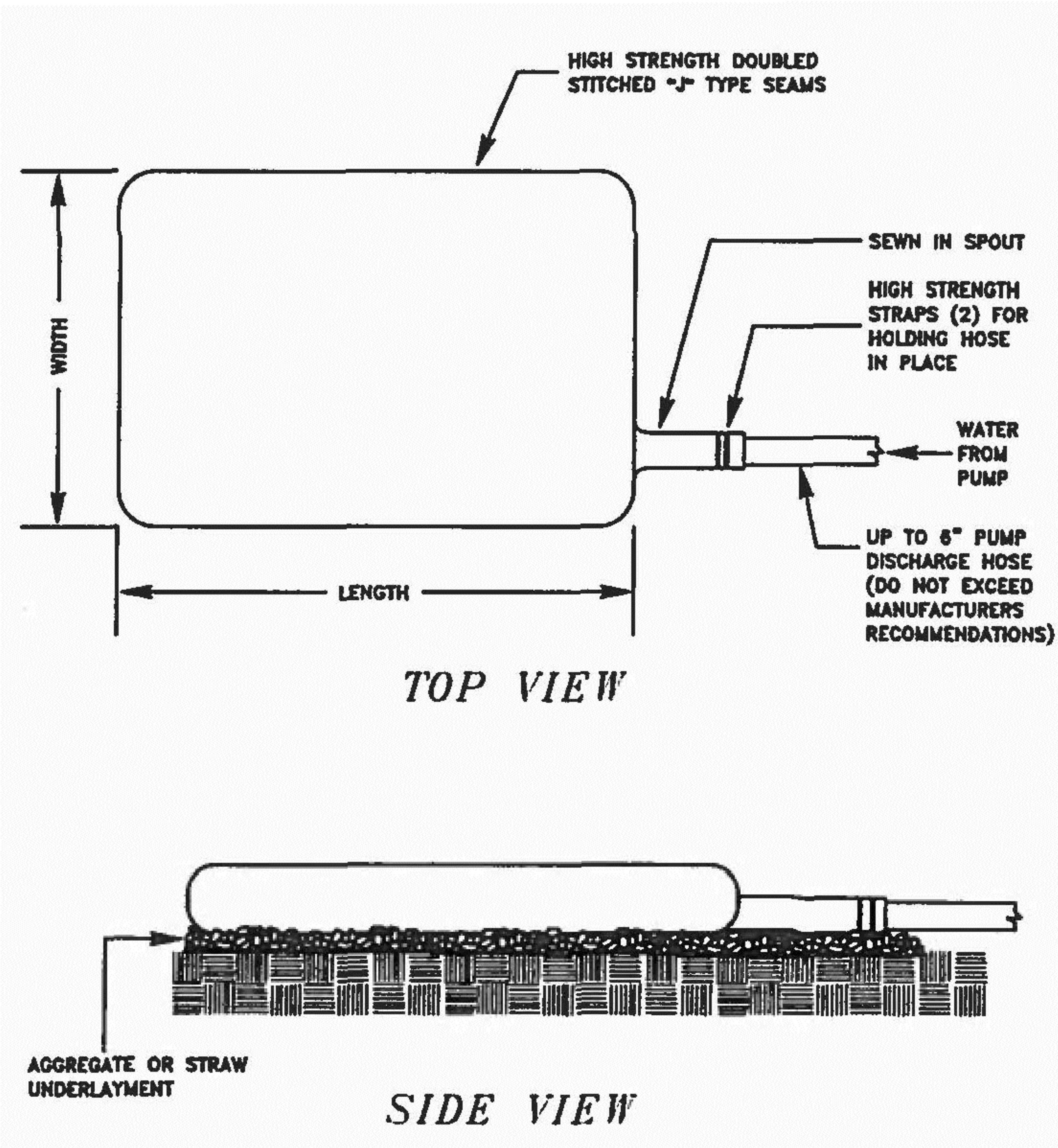
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

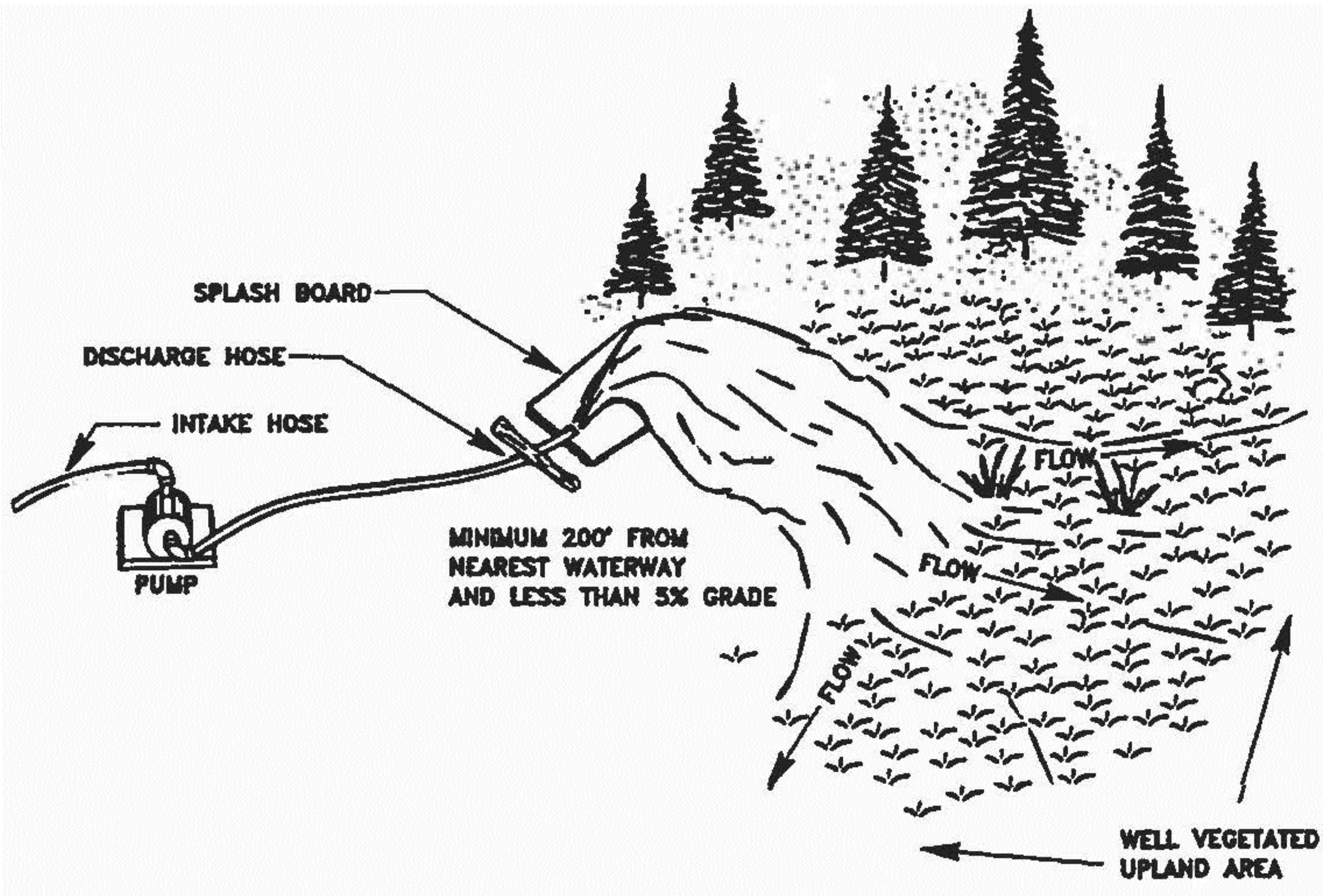
TITLE
ENERGY DISSIPATION BASIN

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1K

0 1 in



CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS		
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **DEWATERING DISCHARGE BAG**		
	PREPARED	REDMOND			
	DESIGN	DBC			
	REVIEW	-	PROJECT No. 1535050	PHASE 500	Rev. F
	APPROVED	AQK	FIGURE 1L		



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT

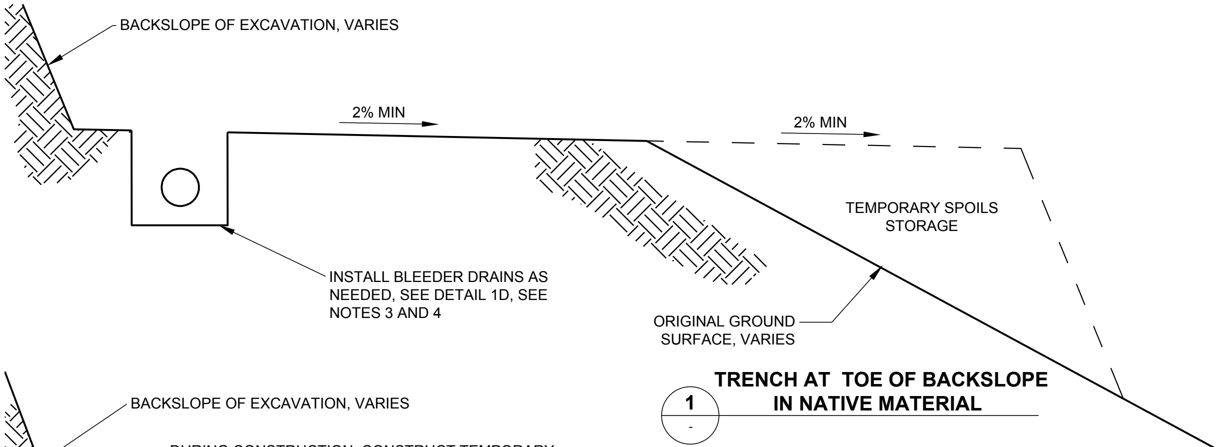
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
DEWATERING DISCHARGE IN UPLAND AREA

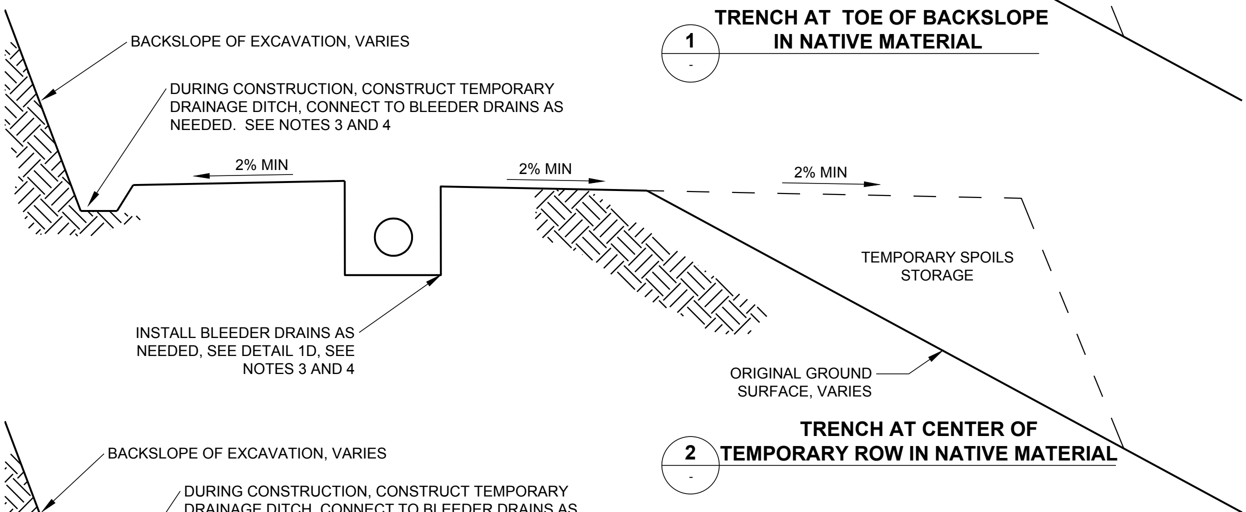
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	1M

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

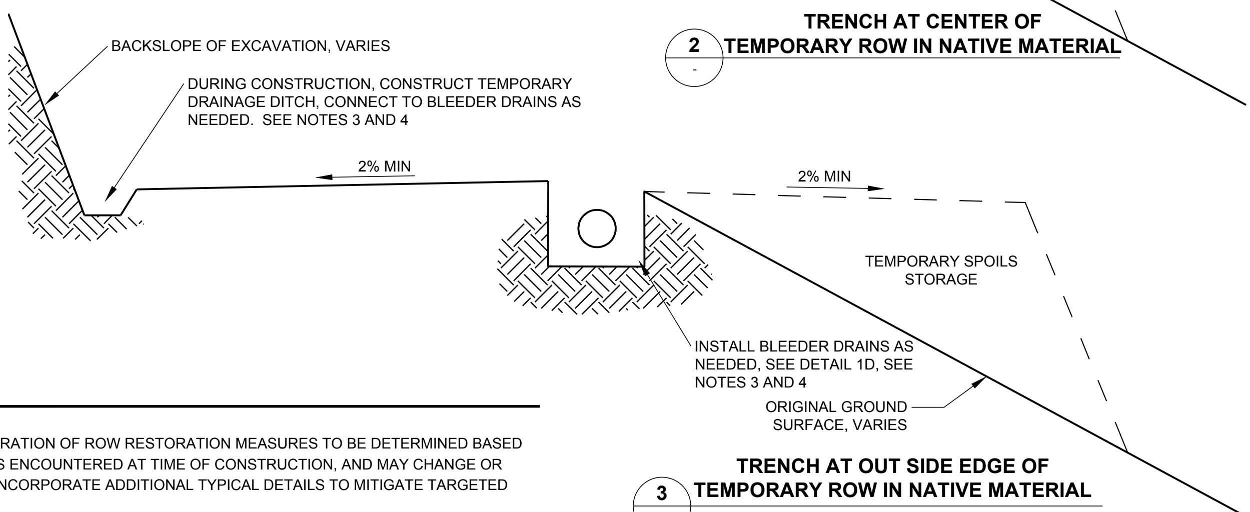
0 1 in



TRENCH AT TOE OF BACKSLOPE IN NATIVE MATERIAL



TRENCH AT CENTER OF TEMPORARY ROW IN NATIVE MATERIAL



TRENCH AT OUT SIDE EDGE OF TEMPORARY ROW IN NATIVE MATERIAL

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. THE TEMPORARY ROW SURFACE, WHEN IT IS INITIALLY CONSTRUCTED, ACTS AS A SURFACE THAT DIRECTS AND CONTROLS RUNOFF DURING CONSTRUCTION AS WELL AS CONTROLLING SEEPAGE AND SUBSURFACE FLOWS AFTER THE ROW IS RESTORED AND BACKFILLED. THEREFORE, CONSTRUCTION AND GRADING OF THE TEMPORARY ROW SURFACE SHOULD BE COMPLETED TO SO AS TO MAINTAIN POSITIVE DRAINAGE (I.E. APPROXIMATELY 2% SLOPE) AWAY FROM THE PIPELINE TRENCH, AND TO OUTBOARD SIDES OF THE ROW THAT DISCHARGE ONTO NATURAL SLOPES DIRECTED AWAY FROM THE ROW, SO THAT RUNOFF ON THE TEMPORARY ROW SURFACE DOES NOT ACCUMULATE OR POND.

3. FOR TEMPORARY CONSTRUCTION WORK PERIOD, WHERE THE TEMPORARY ROW SURFACE MUST SLOPE TO AN INSIDE AREA, WHERE ACCUMULATED RUNOFF CAN POND, THEN DRAINAGE MEASURES SHOULD BE IMPLEMENTED THAT COLLECT AND EVACUATE THE PONDED WATER DURING TEMPORARY CONSTRUCTION PERIODS AND FOR PERMANENT RESTORATION.

4. FOR PERMANENT RESTORATION, CONVERT TEMPORARY DRAINAGE DITCH TO FRENCH DRAINS AND/OR TARGETED SEEP COLLECTORS, AS NEEDED. SEE DETAILS 1A, 1C, 1D AND 1E.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
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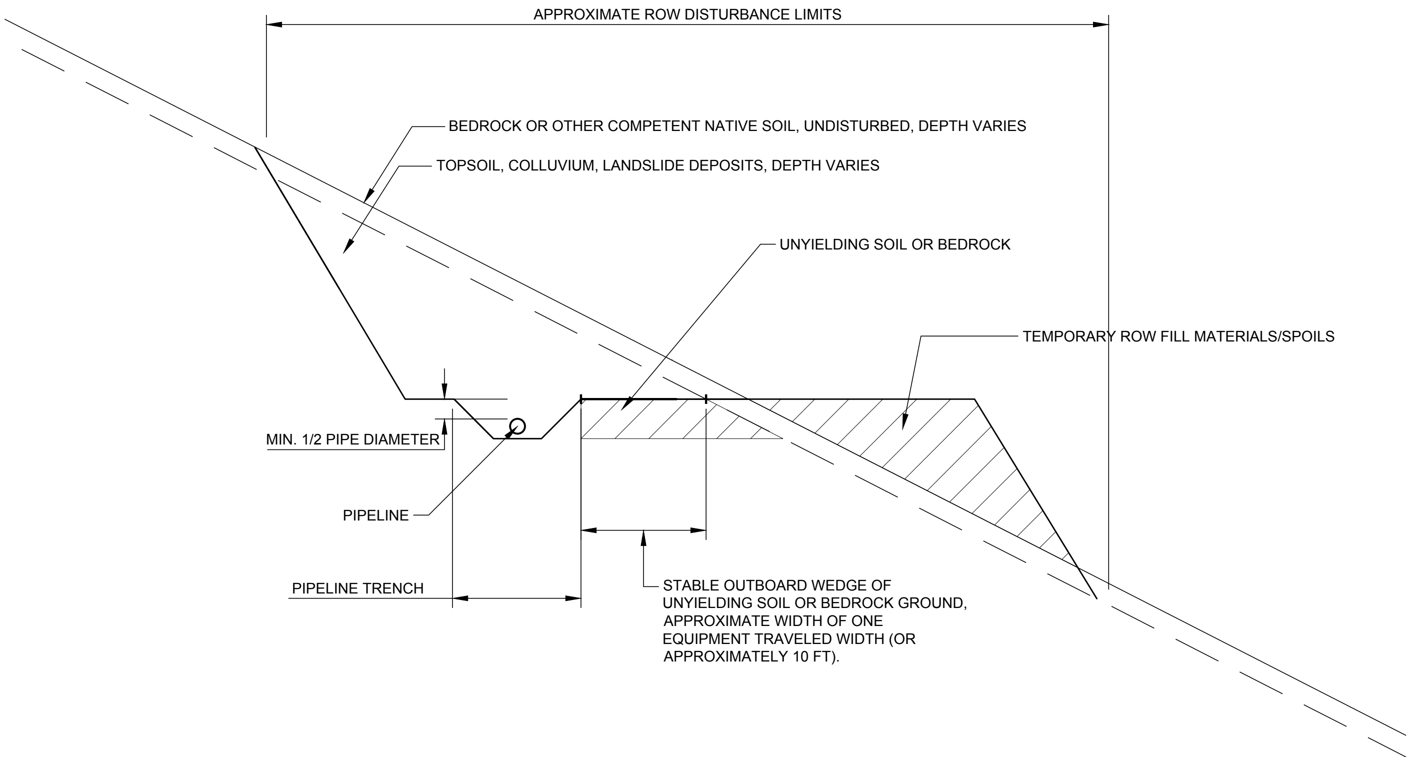
REVIEW	-
APPROVED	AQK

TITLE
GRADING TEMPORARY ROW SURFACE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

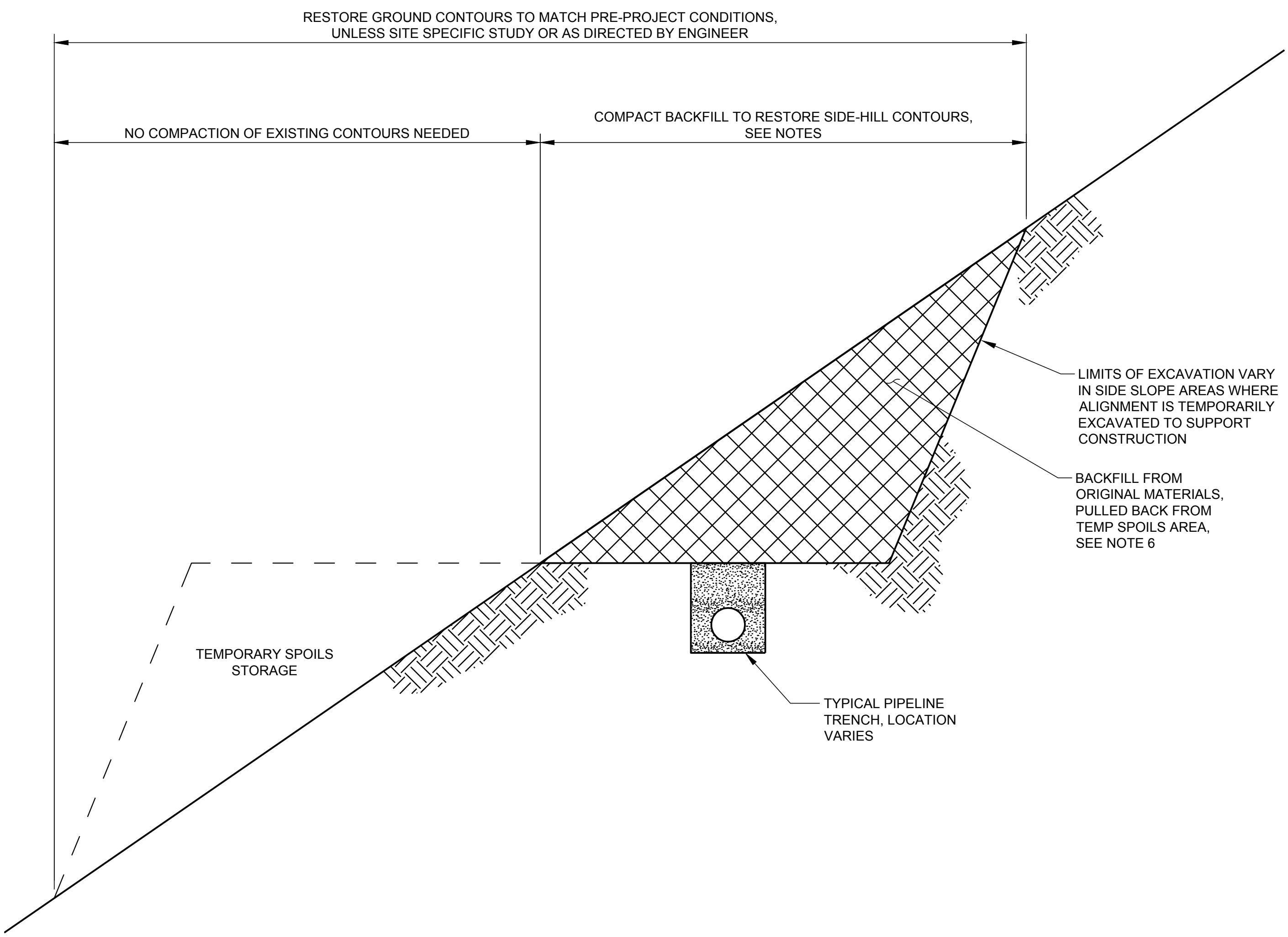
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GRADING TRENCH WITH STABLE OUTBOARD WEDGE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2B



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. RECOMMEND COMPACTING SIDE SLOPE AREAS USING SHEEP S FOOT COMPACTION EQUIPMENT IN HORIZONTAL LAYERS.

3. BACKFILL MATERIALS SHOULD BE AT OR NEAR OPTIMUM MOISTURE CONTENT (DRYING SOILS OR ADDING WATER AS NECESSARY), VISUALLY DETERMINED BY A COMPETENT ON-SITE REPRESENTATIVE. SEE TYPICAL DETAIL 2D FOR DRYING BACKFILL.

4. SOILS COMPACTION SHOULD BE COMPLETED IN LIFTS SUCH THAT BACKFILL MATERIALS ARE STABLE, SHED WATER AND DO NOT EASILY BECOME SATURATED, AND ARE AT APPROXIMATELY THE MAXIMUM DRY DENSITY, VISUALLY DETERMINED BY A COMPETENT ON-SITE REPRESENTATIVE.

5. ADDITIONAL COMPACTION REQUIREMENTS MAY APPLY AT ROAD CROSSINGS, AREAS IDENTIFIED BY THE ENGINEER, OR AT OTHER LOCATIONS AS MAY BE REQUIRED BY LAWS AND REGULATIONS. SEE TYPICAL DETAIL 2I FOR COMPACTION REQUIREMENTS ACROSS ROADS.

6. BACKFILL CONFIGURATION MAY VARY TO FIT SITE CONDITIONS, AND MAY BE USED IN OTHER ROW CROSS-SECTION BACKFILL GEOMETRIES, AS DIRECTED BY ENGINEER.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
COMPACT BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2C

0 1 in

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SATURATED ON-SITE SOILS MAY NEED TO BE DRIED BEFORE RE-USE AND PLACEMENT AS BACKFILL. DRYING MAY INCLUDE WIND-ROWING AND TURNING OVER IN FURROWS TO ALLOW FOR AIR EXCHANGE AND EVAPORATION TO DRY THE MATERIALS, OR ADDITION OF ADD-MIXTURES TO DRY THE SOILS.

3. THE USE OF ADD-MIXTURES TO SATURATED SOILS SHOULD BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO USE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
DRY SOILS AND BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2D

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. WHERE THE PLACEMENT OF SPOILS ON THE SITE MAY INITIATE OR EXACERBATE LANDSLIDES OR RESULT IN SLOPE INSTABILITY, THE MATERIALS SHOULD BE REMOVED FROM THE SITE AND SPOILED AT A SAFE AND OFF-SITE LOCATION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

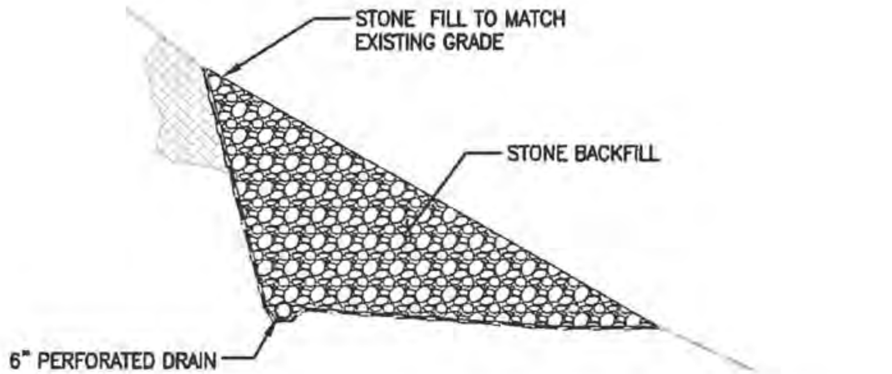
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

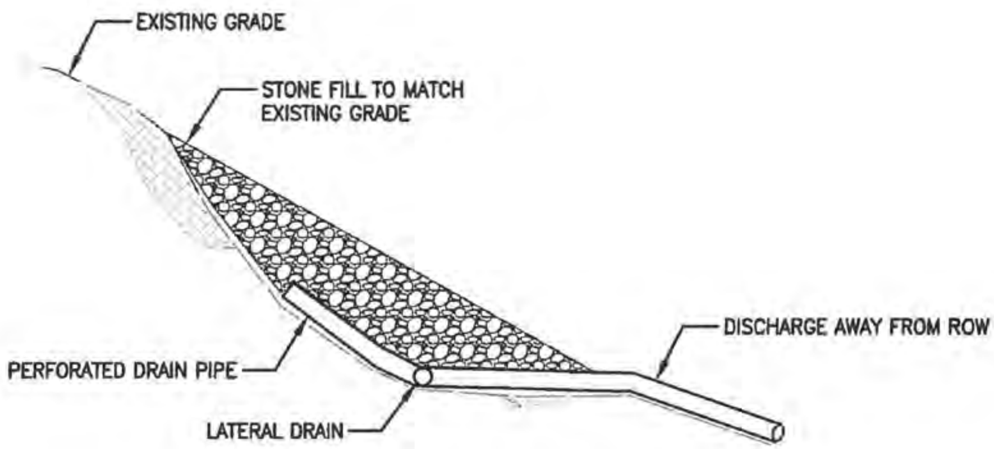
TITLE
REMOVE UNSUITABLE EXISTING SOILS AS BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2E



STONE WITH DRAIN TO RESTORE FAILING SLOPE

N.T.S.



SMALL SLIP REPAIR WITH LATERAL

N.T.S.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ROCK BACKFILL (WITH DRAIN)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2F

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

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NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. RESTORATION OF ROW SURFACES SHOULD GENERALLY RE-CONSTRUCT THE GROUND SURFACE TO MATCH THE PRE-PROJECT CONTOURS.

3. CHANGES IN THE FINAL GRADING MAY BE NEEDED TO ADDRESS SPECIFIC TARGETED GEOTECHNICAL OR HYDROTECHNICAL OR GEOLOGIC ENGINEERING ISSUES (I.E. CORRECT DRAINAGE PROBLEMS, MINIMIZE DELIVERY OF WATER TO LANDSLIDE SITES, ETC.).

4. FINAL GRADING TO BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO COMPLETION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GRADING TO MATCH EXISTING CONTOURS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2G

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. MINIMIZE THE PLACEMENT OF BACKFILL MATERIALS WHEN RESTORING AND RE-CONSTRUCTING LANDSLIDE SITES, IN ORDER TO REDUCE THE IMPOSED LOAD ON LANDSLIDE SITES.
3. MINIMIZE THE PLACEMENT OF SPOILS FROM GRADING WORK IN OTHER AREAS ALONG THE ROW THAT MAY OVERLAP OTHER LANDSLIDES, IN ORDER TO REDUCE THE POTENTIAL FOR INITIATING NEW LANDSLIDES.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in

CLIENT
DOMINION

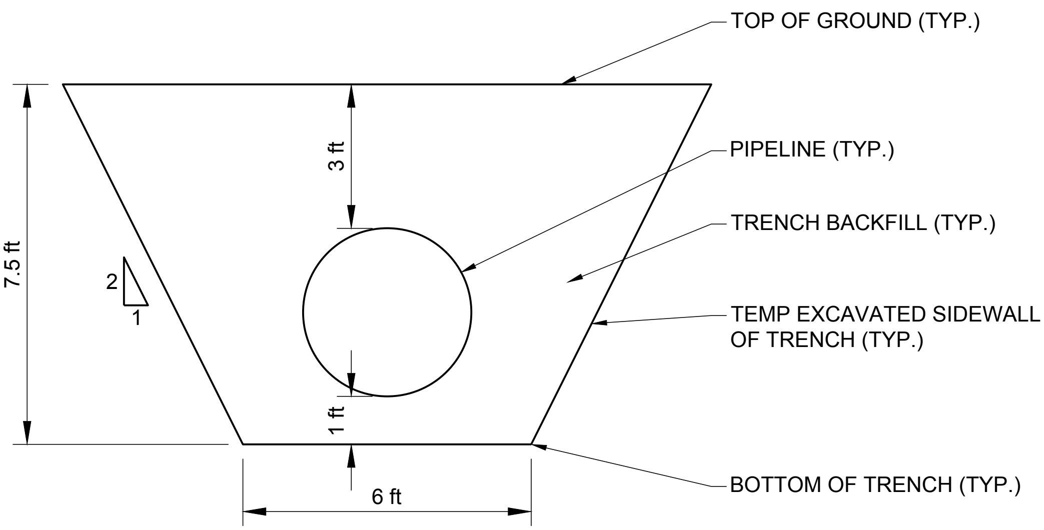
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GRADING TO MINIMIZE BACKFILL OVER LANDSLIDE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2H



NOT TO SCALE

NOTE(S)

1. REFER TO CONTRACT SPECIFIC REQUIREMENTS, FOR TYPICAL GRADING, BACKFILL, AND TRENCHING.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	**TYPICAL TRENCH DIMENSION IN GENERALLY FLAT TERRAIN**
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	2I

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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NOTE(S)

1. DEVELOP SPOILS MANAGEMENT PLAN THAT FITS THE SITE SPECIFIC CONDITIONS, AND MEETS THE PURPOSE OF THE DESIGN AND CONSTRUCTION PLANS FOR THE TARGETED SITE. THE FOLLOWING ARE INTENDED ONLY AS GENERAL GUIDELINES, TO BE CONSISTENT WITH THE SITE SPECIFIC PLAN. ADDITIONAL MEASURES ARE ANTICIPATED.

2. MINIMIZE THE PLACEMENT OF SPOILS FROM GRADING WORK IN OTHER AREAS ALONG THE ROW THAT MAY OVERLAP OTHER POTENTIAL UNSTABLE GROUND, IN ORDER TO REDUCE THE POTENTIAL FOR INITIATING NEW SLOPE INSTABILITIES.

3. MINIMIZE THE PLACEMENT OF SPOILS MATERIALS WHEN RESTORING AND RE-CONSTRUCTING THE ROW, IN ORDER TO REDUCE THE IMPOSED LOAD ON POTENTIALLY UNSTABLE GROUND SITES.

4. EXAMPLE SPOILS MANAGEMENT MEASURES MAY INCLUDE, BUT ARE NOT LIMITED TO: STACKING SPOILS ALONG THE ROW EDGE IN DRY CONDITIONS AND WITHIN ROW OR TEWA BOUNDARIES; USE TEMPORARY PILES AND MATS TO CREATE CRIBS .TO RETAIN SPOILS; USE LOCAL LARGE BOULDERS TO BUILD TEMPORARY CRIBS TO RETAIN SPOILS; BUILD TEMPORARY PIONEER ROADS OR EXCAVATED BERMS TO RETAIN SPOILS; SHORT-HAUL OR END-HAUL SPOILS TO OFF-SITE LOCATIONS FOR TEMPORARY STORAGE OR SPOILS; STACK SPOILS IN TRAVELED WAY TO TEMPORARILY STORE; COVER SPOILS WITH PLASTIC AND/OR GEOSYNTHETIC MATERIALS; ENCASE SPOILS IN GEOSYNTHETIC MATERIALS TO IMPROVE STABILITY OF SPOILS FOR TEMPORARY STORAGE.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

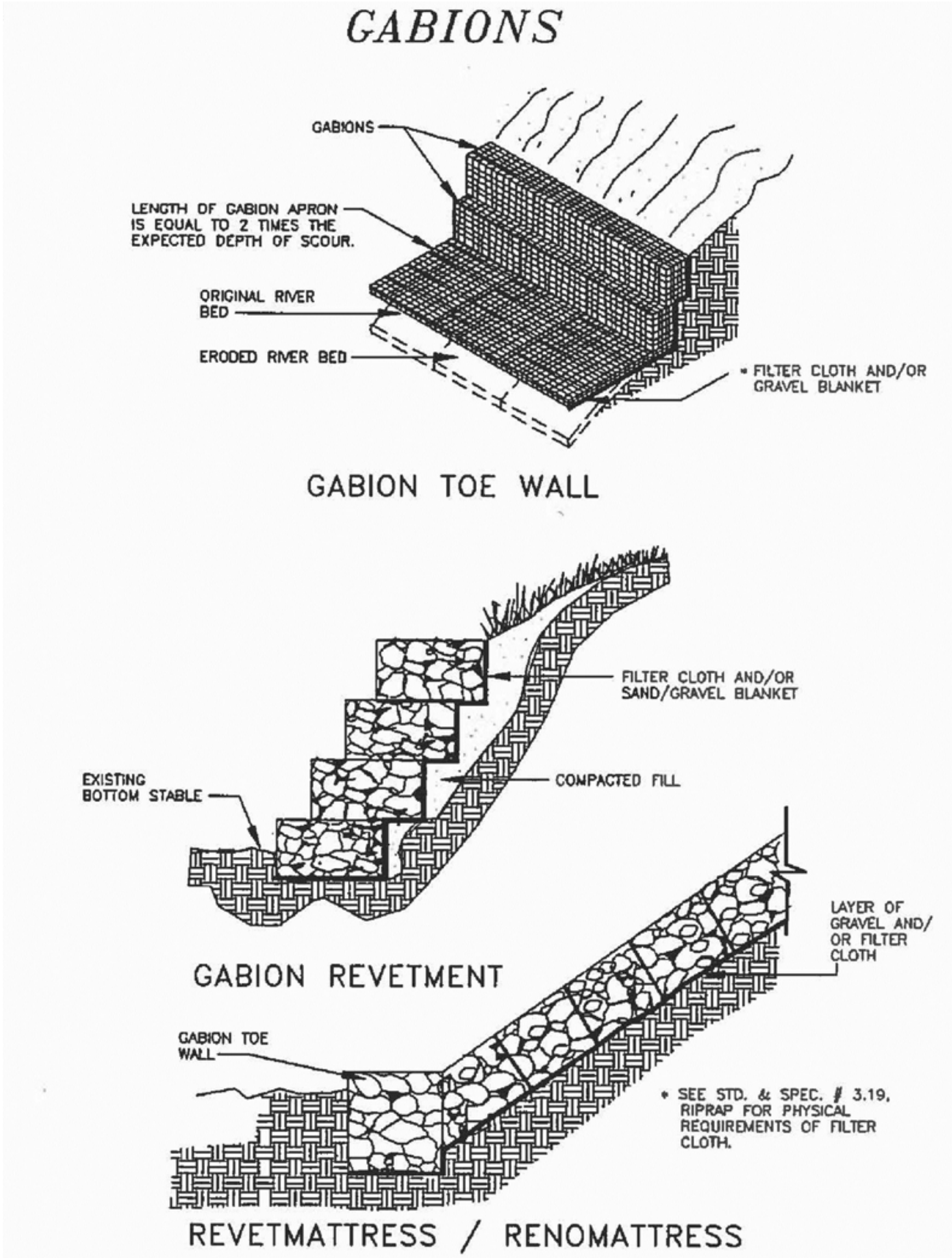
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SPOILS MANAGEMENT

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2J



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATIONS MEASURES TO BE DETERMINED BASED ON CONDITION ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GABIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2K

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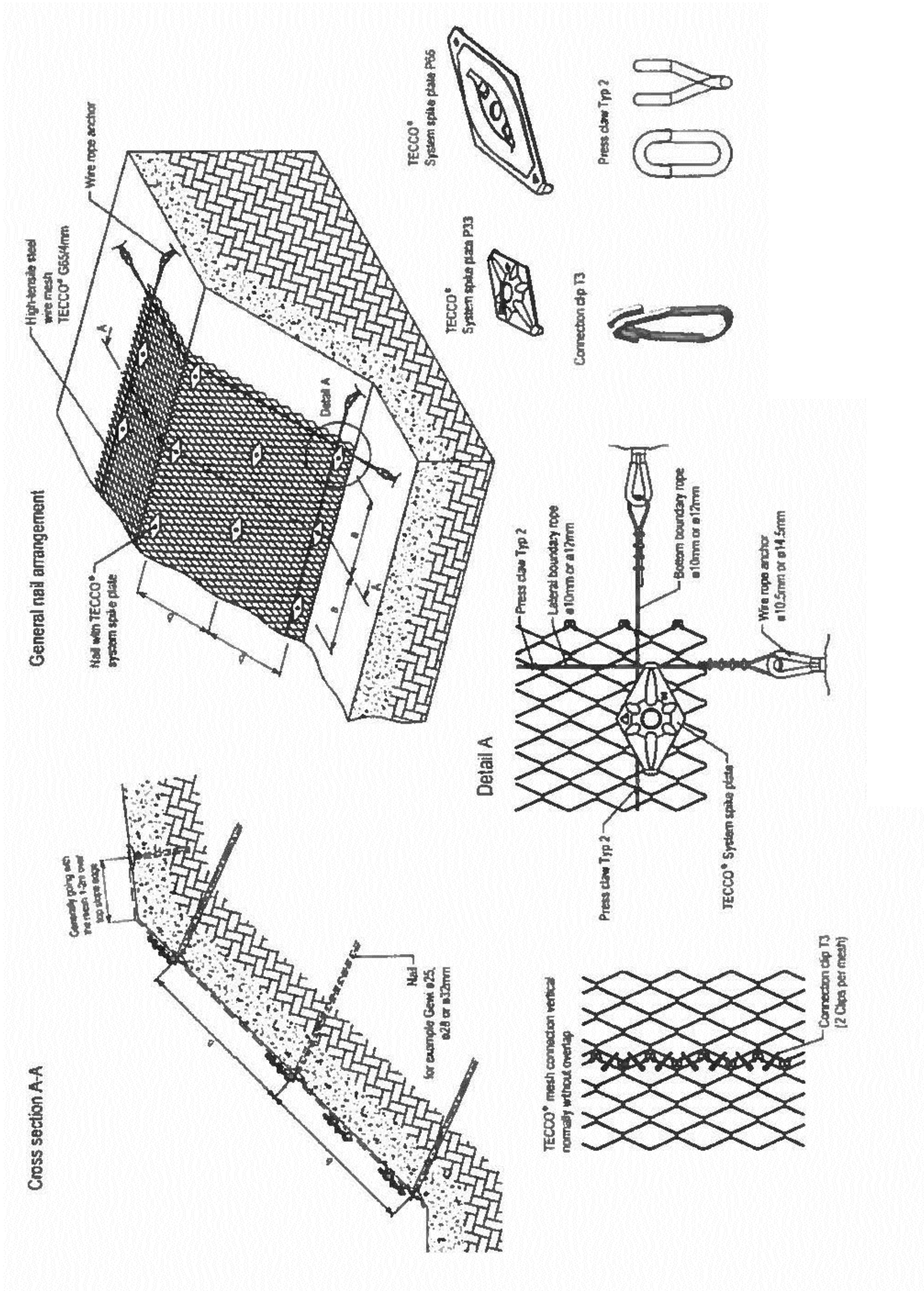


NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATIONS MEASURES TO BE DETERMINED BASED ON CONDITION ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

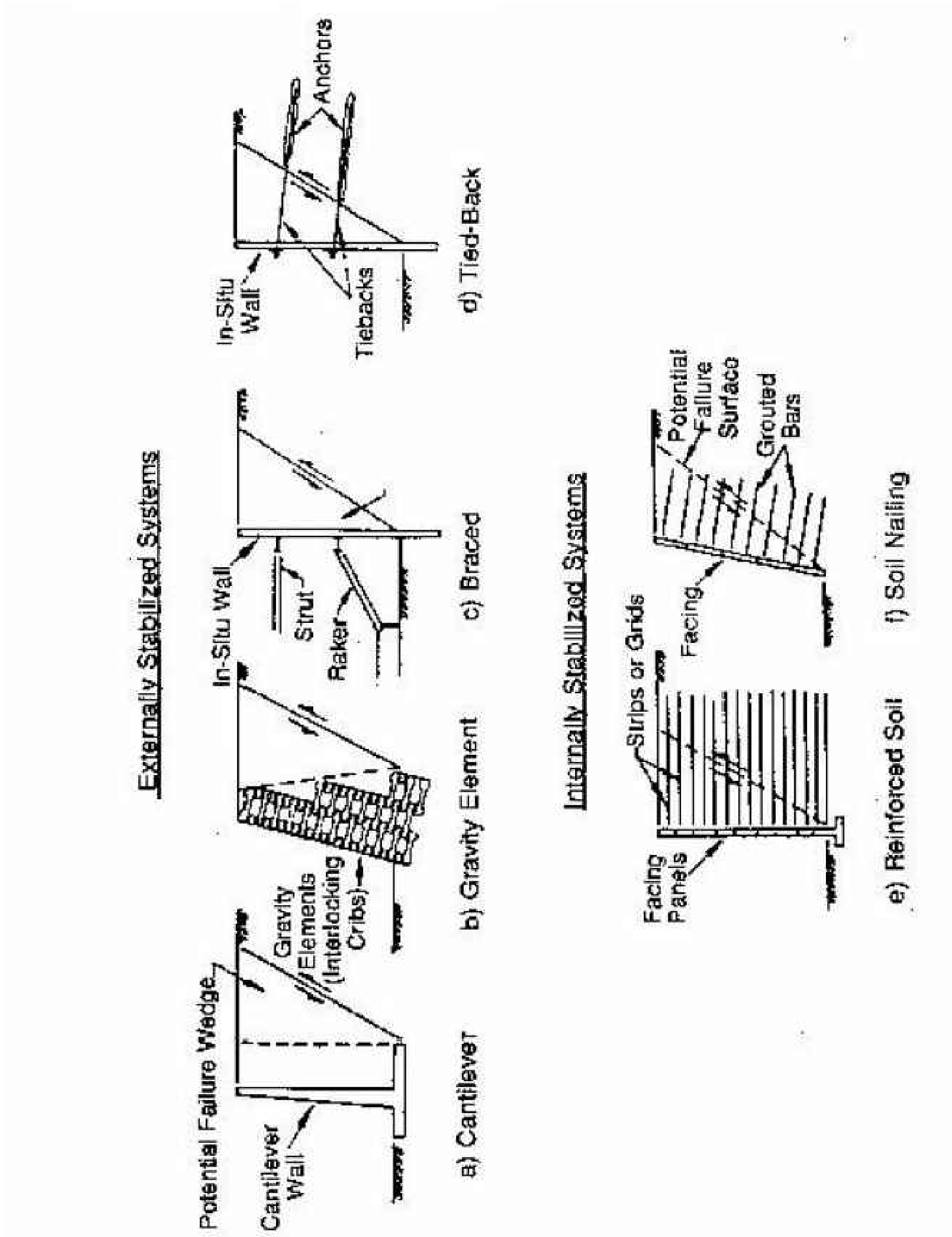
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SOIL-NAIL WITH TECCO MESH

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2L



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

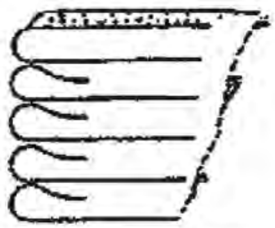
CONSULTANT

Golder Associates

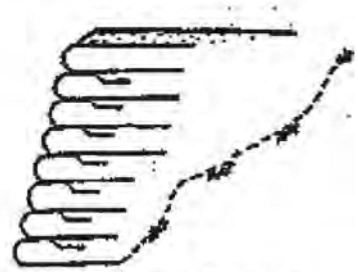
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
EXTERNALLY STABILIZED RETAINING WALL SYSTEMS

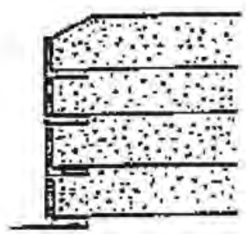
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2M



A) VERTICAL GEOTEXTILE FACING



E) SLOPING GEOTEXTILE FACING



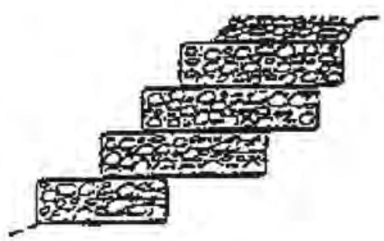
B) VERTICAL PRECAST CONCRETE ELEMENT FACING

F) SLOPING GUNITE OR STRUCTURAL FACING

C) VERTICAL CAST IN-PLACE CONCRETE/MASONRY FACING

G) SLOPING SOIL AND VEGETATION FACING

D) VERTICAL MASONRY FACING



H) GEOTEXTILE GABION

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

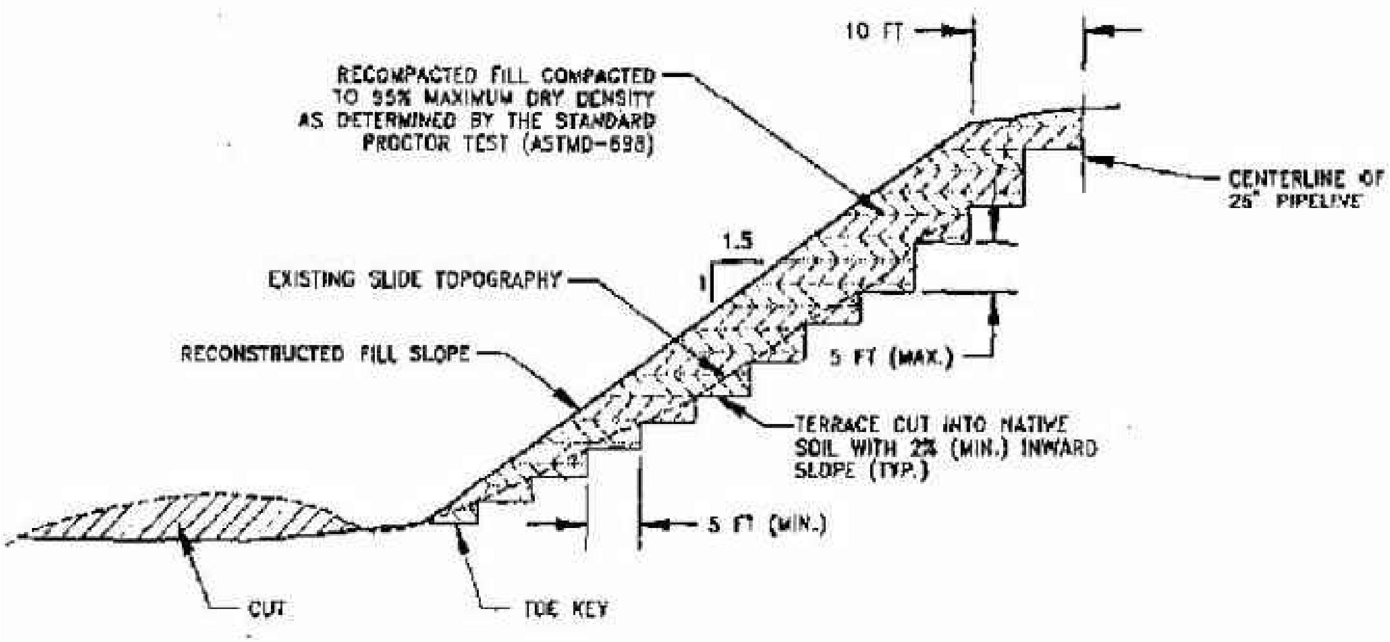
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GEOTEXTILE REINFORCED SYSTEMS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2N



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
BENCH AND REGRADE WITH BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2O

1 in

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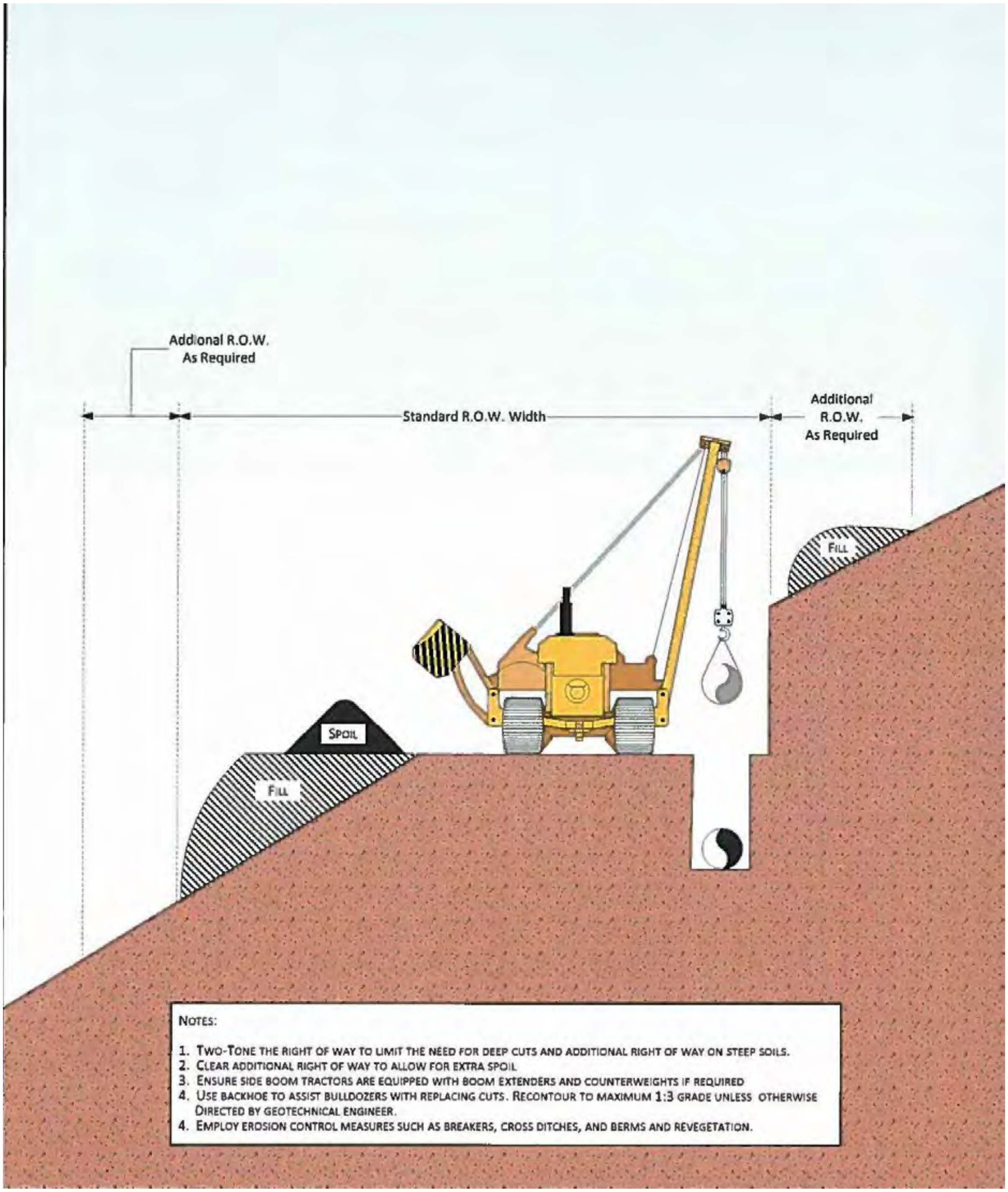
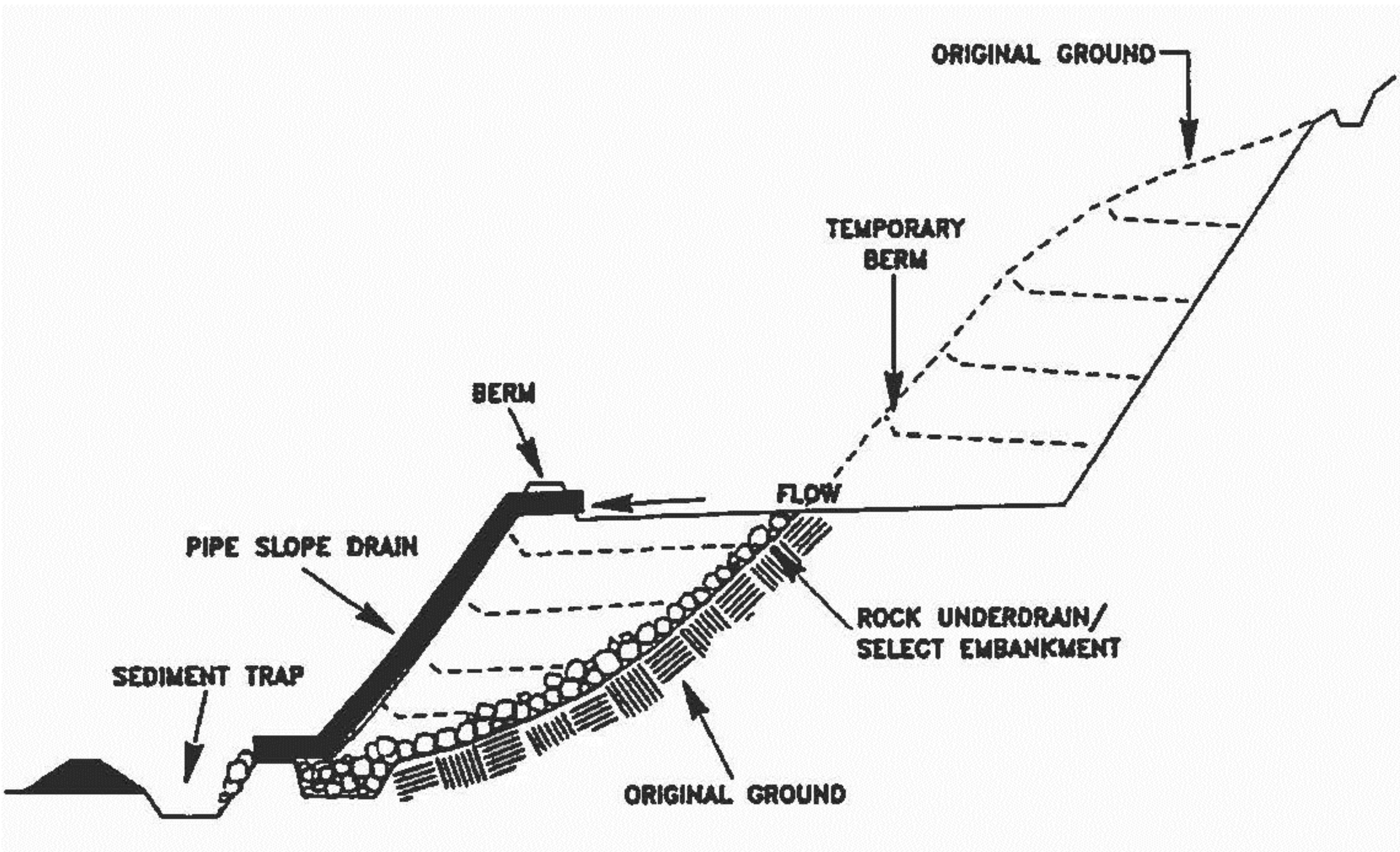


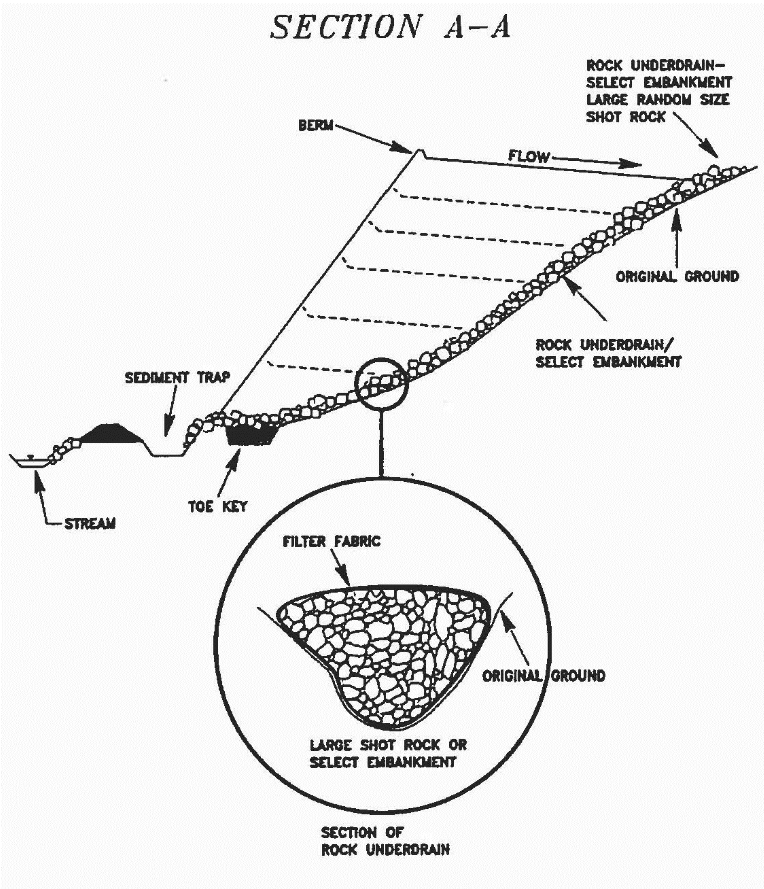
NOTE(S)

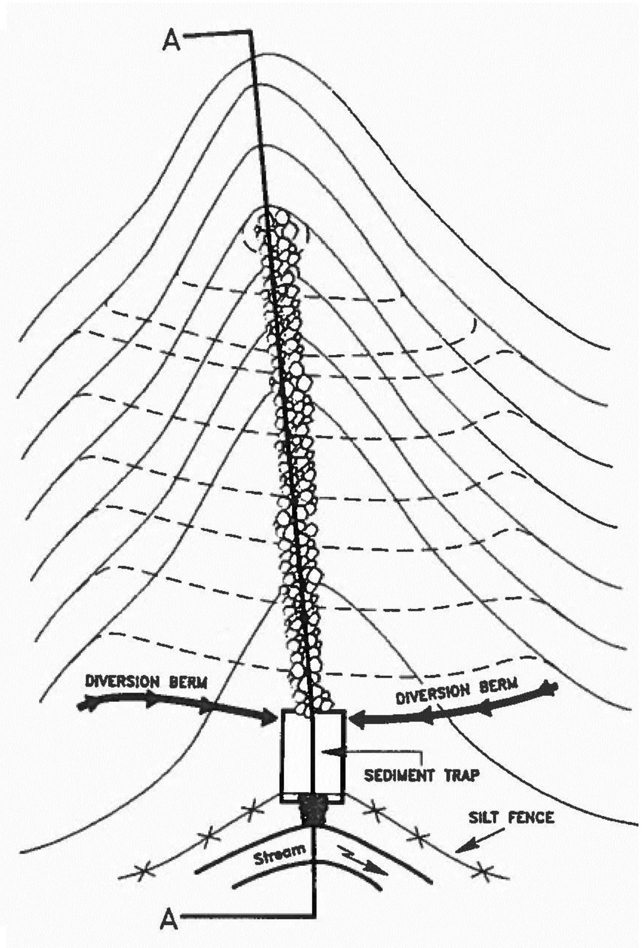
1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **CUT AND FILL CONSTRUCTION**	
		PROJECT No.: 1535050	PHASE: 500 | Rev.: F | FIGURE: 2P



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **TYP SIDE HILL CUT AND FILL**	
		PROJECT No. 1535050	PHASE 500 / Rev. F / FIGURE 2Q





CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

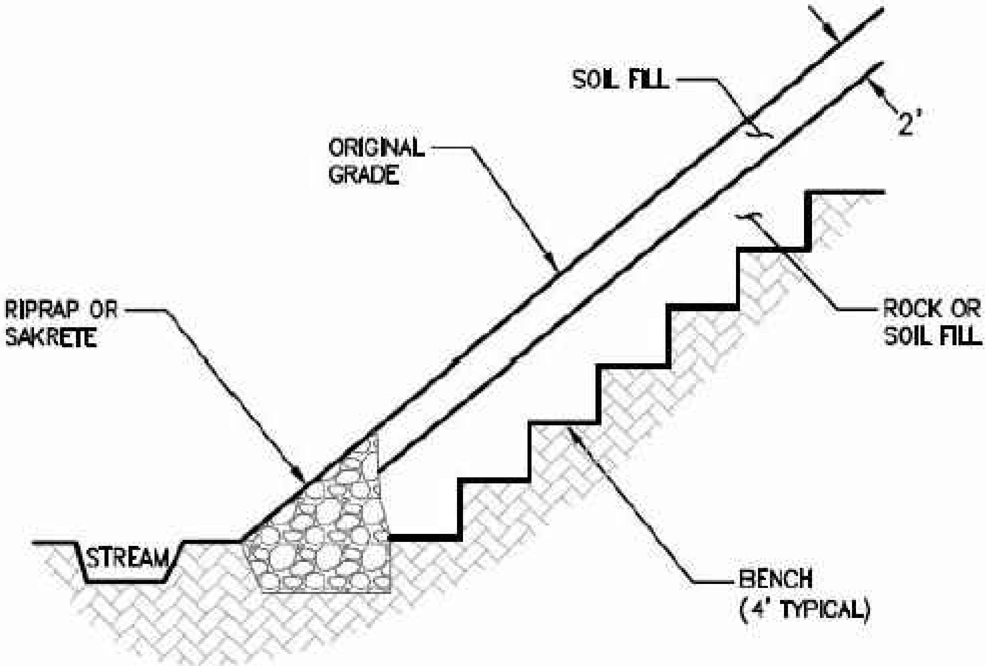
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE

TYP FILL WITH ROCK UNDER DRAIN

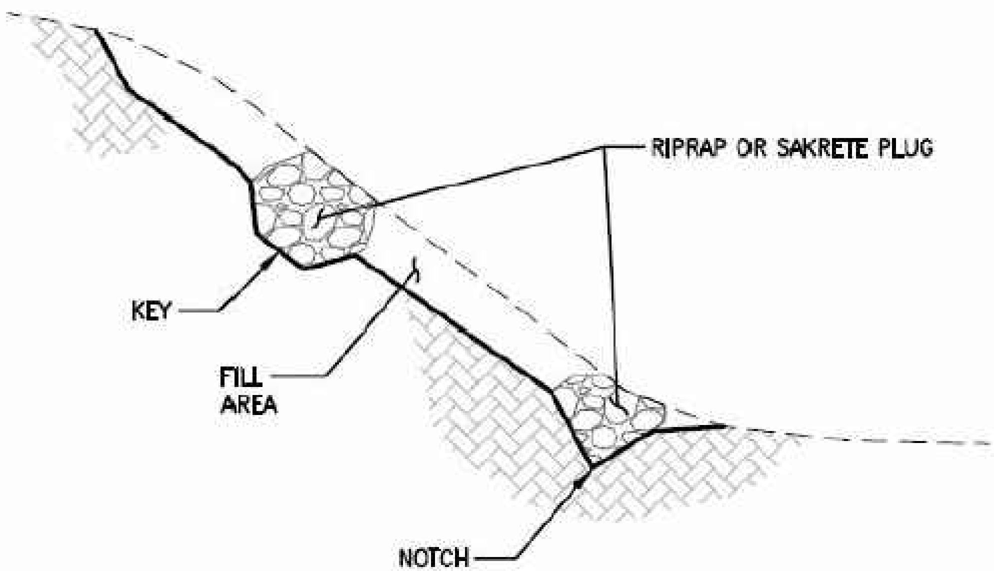
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2R

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



BENCH AND REGRADE TYPICAL

N.T.S.



KEYING TYPICAL

N.T.S.

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT: Golder Associates

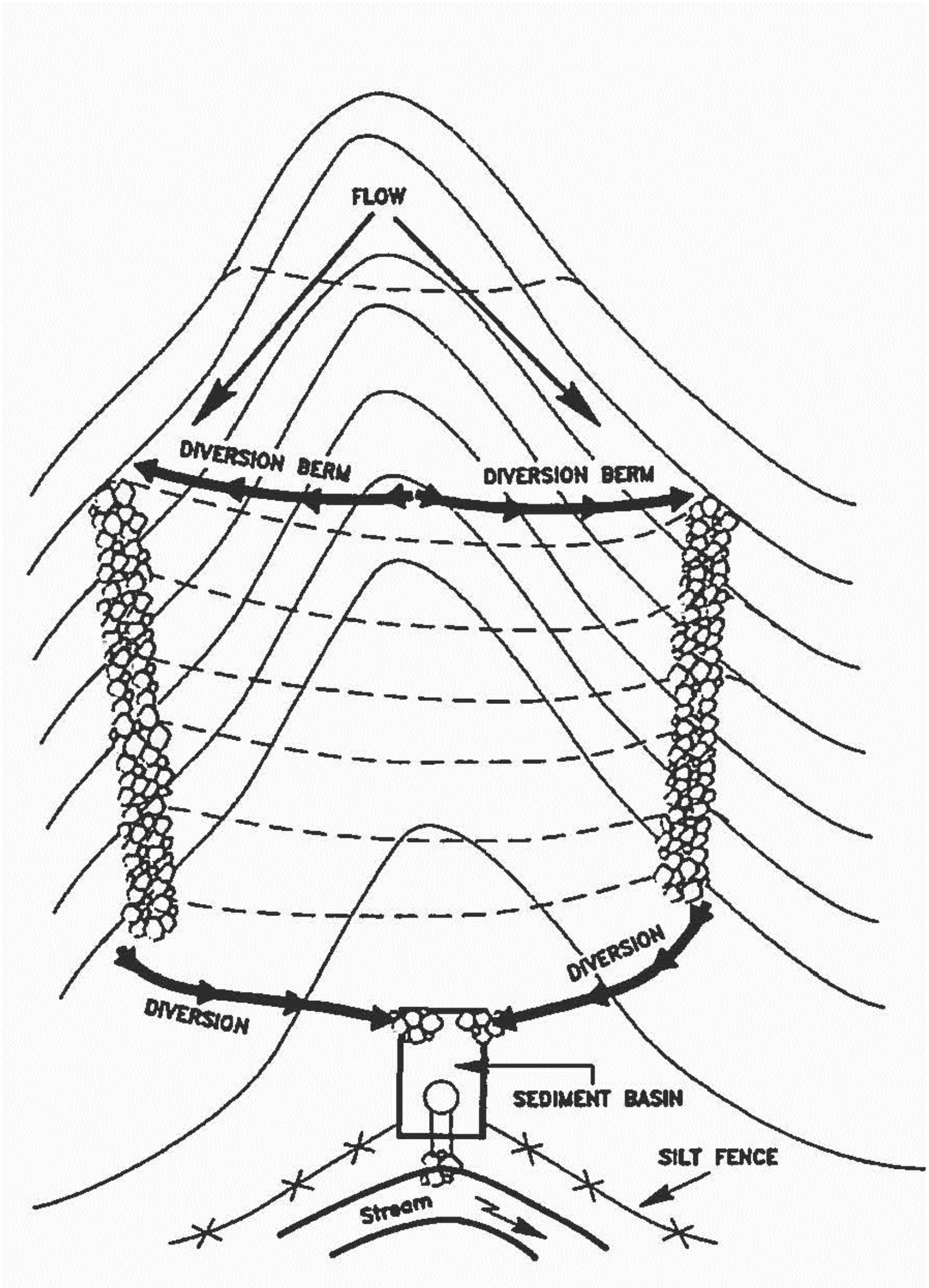
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP BENCH AND REGRADE BACKFILL WITH ROCK OR SACKCRETE KEYS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2S

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

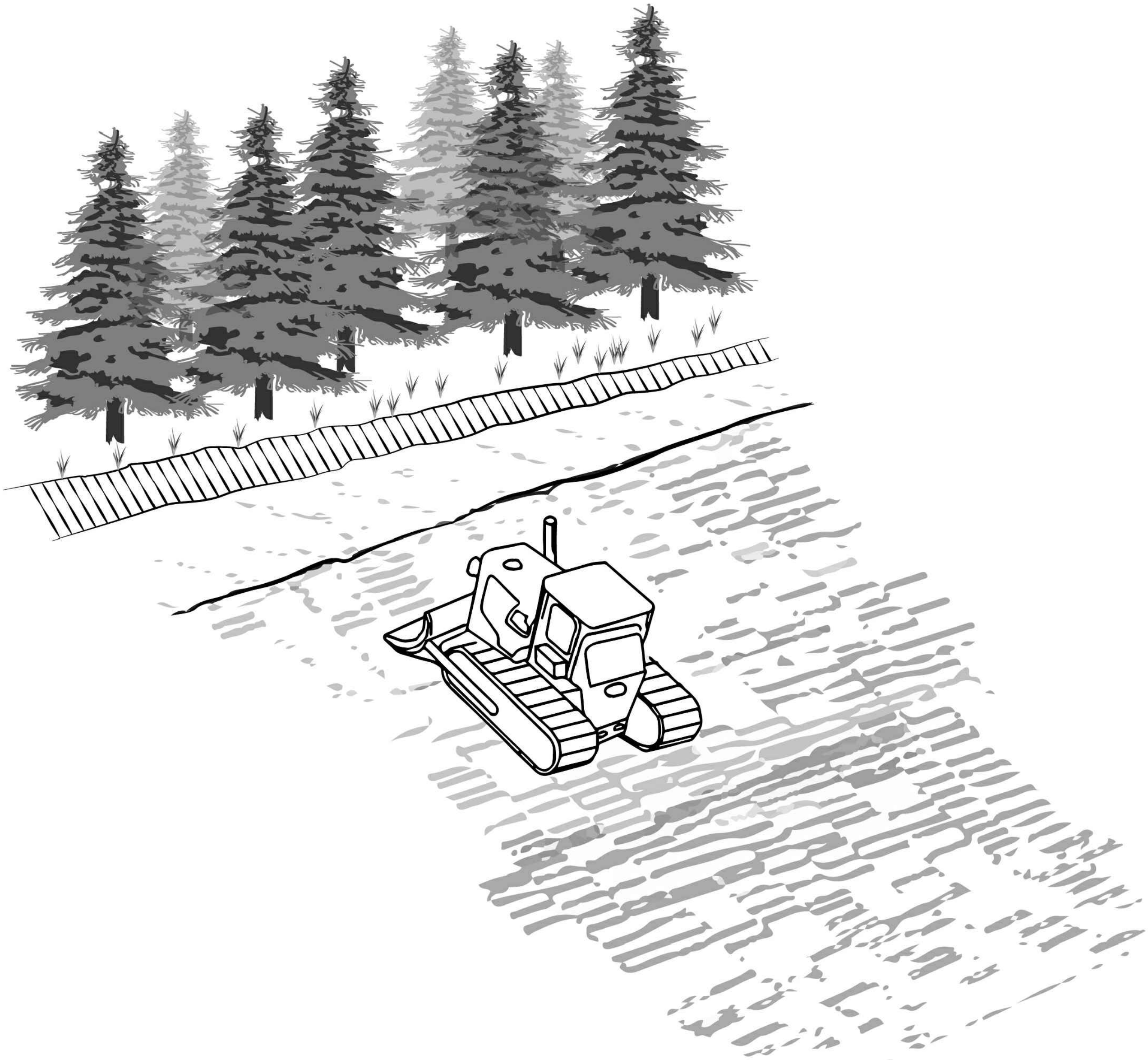
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP FILL WITH MULTIPLE ROCK CHANNELS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	2T



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. TRACKING SLOPES IS DONE BY RUNNING TRACKED MACHINERY UP AND DOWN THE SLOPE, LEAVING TREAD MARKS PERPENDICULAR TO THE SLOPE.
3. IF A BULLDOZER IS USED, THE BLADE MUST BE UP.
4. CARE SHOULD BE EXERCISED ON SOILS HAVING HIGH CLAY CONTENT TO AVOID OVER COMPACTION.

NOT TO SCALE

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TRACK DISTURBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3A

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. RE-VEGETATE DISTURBED SLOPES WITH NATIVE GRASS SEED MIX PER REGULATORY AND PERMIT REQUIREMENTS.
3. FINAL SEED MIX TO BE REVIEWED AND APPROVED BY ENGINEER PRIOR TO INSTALLATION.
4. GENERAL APPROACH CONSISTS OF, MAY INCLUDE, BUT IS NOT LIMITED TO, TEMPORARY SEEDING FOLLOWED BY PERMANENT SEEDING.
5. TEMPORARY SEEDING CONSISTS OF SEEDING AND MULCHING, OR MATTING USED TO PRODUCE A QUICK GROUND COVER TO REDUCE EROSION ON EXPOSED AND/OR DISTURBED SOIL THAT MAY BE REDISTURBED OR PERMANENTLY STABILIZED AT A LATER DATE. SELECT PLANTS APPROPRIATE TO THE SEASON AND SITE CONDITIONS, PER DOMINION SPECIFICATIONS AND CONTRACT REQUIREMENTS.
6. PERMANENT SEEDING ESTABLISHES PERENNIAL VEGETATION COVER ON EXPOSED AND/OR DISTURBED SOILS TO REDUCE EROSION AND DECREASE SEDIMENT YIELD FROM DISTURBED AREAS. SELECT PLANTS APPROPRIATE TO THE SEASON AND SITE CONDITIONS, PER DOMINION SPECIFICATIONS AND CONTRACT REQUIREMENTS.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

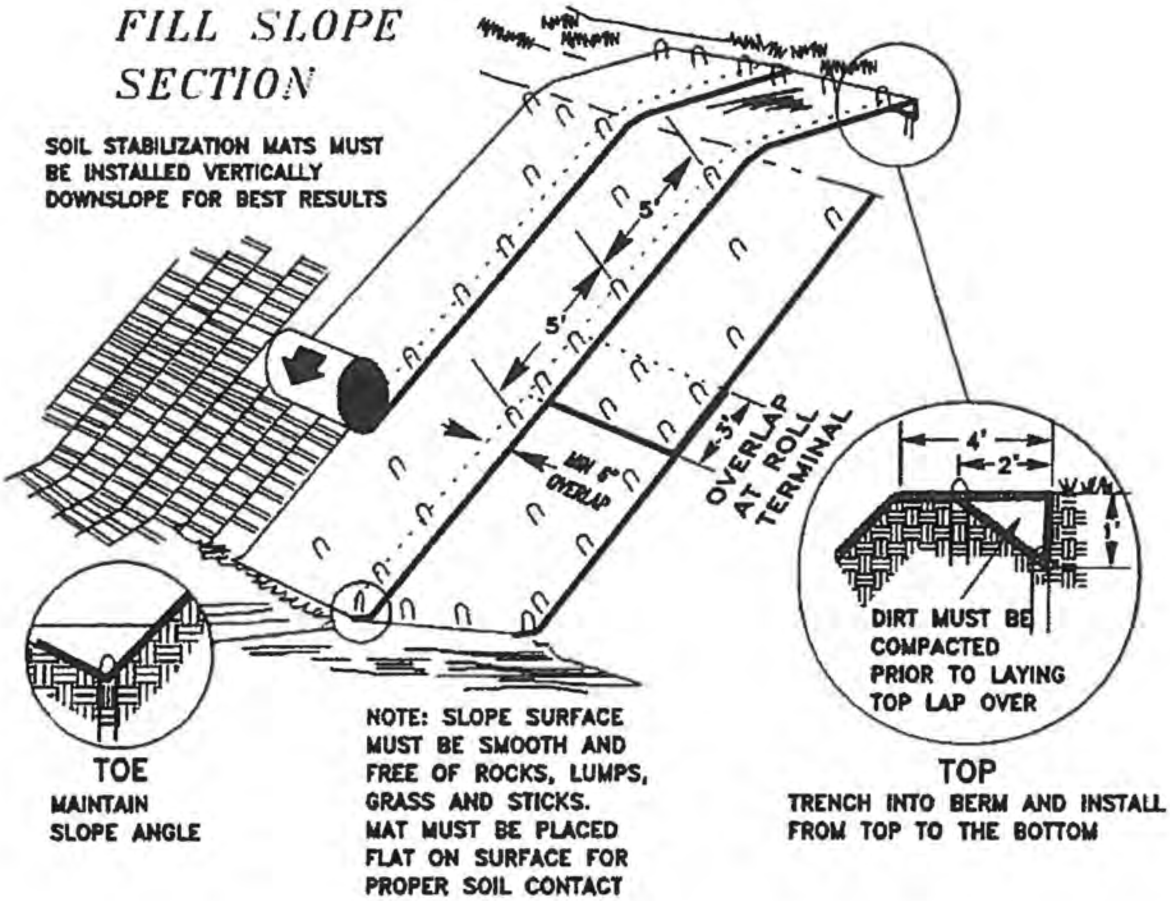
CONSULTANT

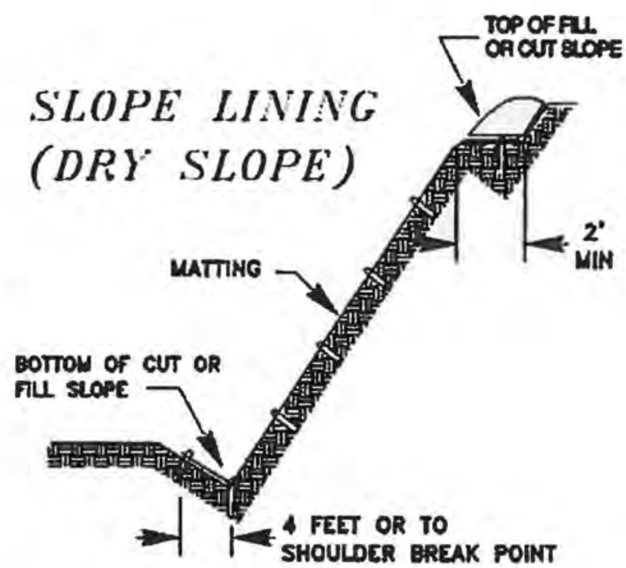
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
RE-VEGETATE DISTURBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3B





SOURCE: VDOT STANDARDS AND VIRGINIA DCR-DSWC

CLIENT
DOMINION

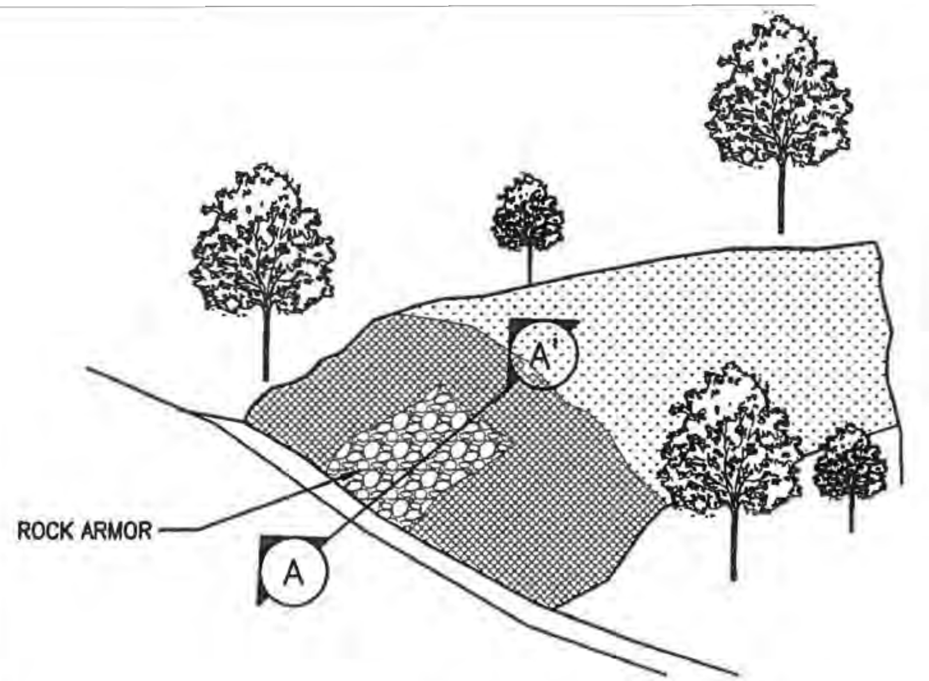
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

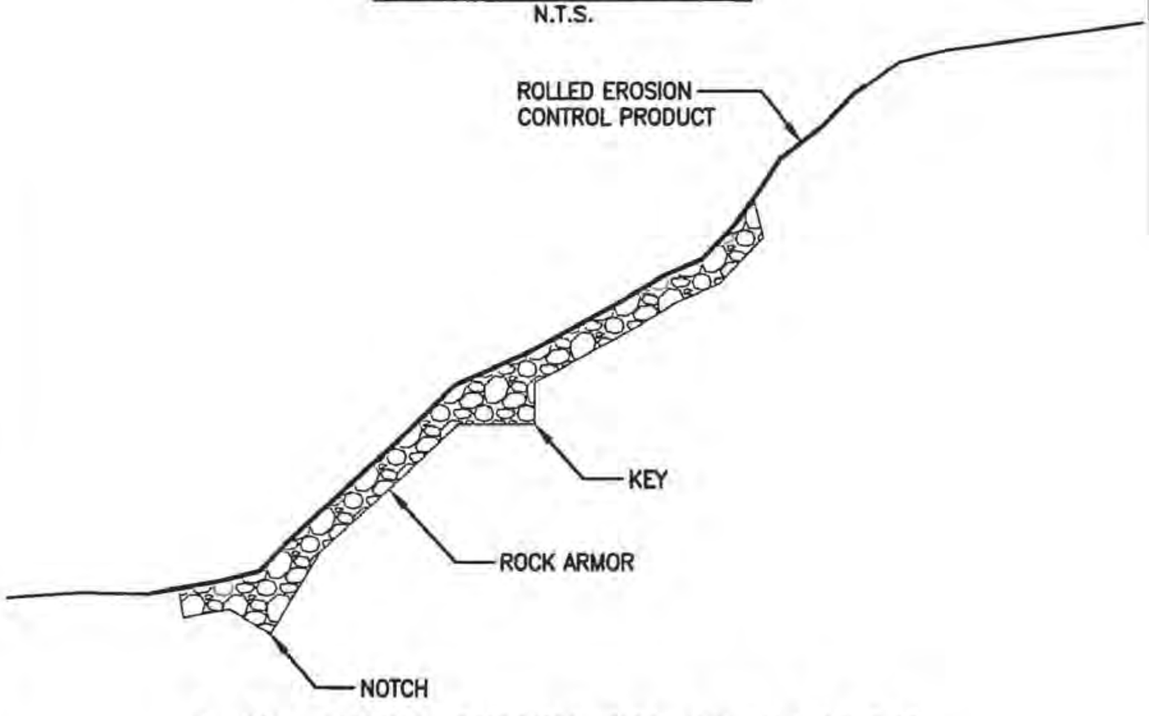
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
COIR CLOTH ON DISTRUBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3C



PERSPECTIVE VIEW
N.T.S.



A–A' ROCK ARMOR ON STEEP SLOPE
N.T.S.

CLIENT
DOMINION

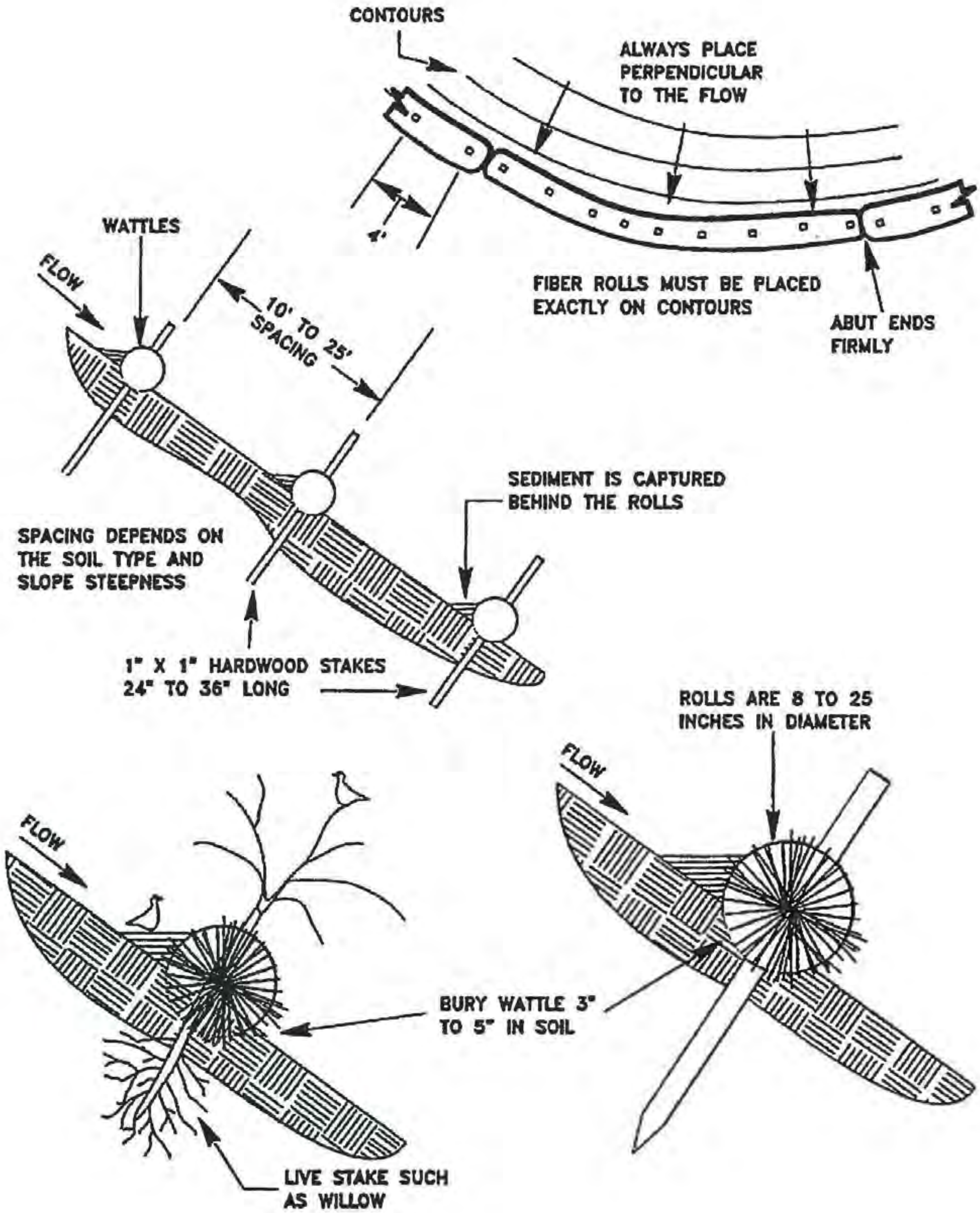
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ROCK ARMORING ON DISTRUBED SLOPES

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3D

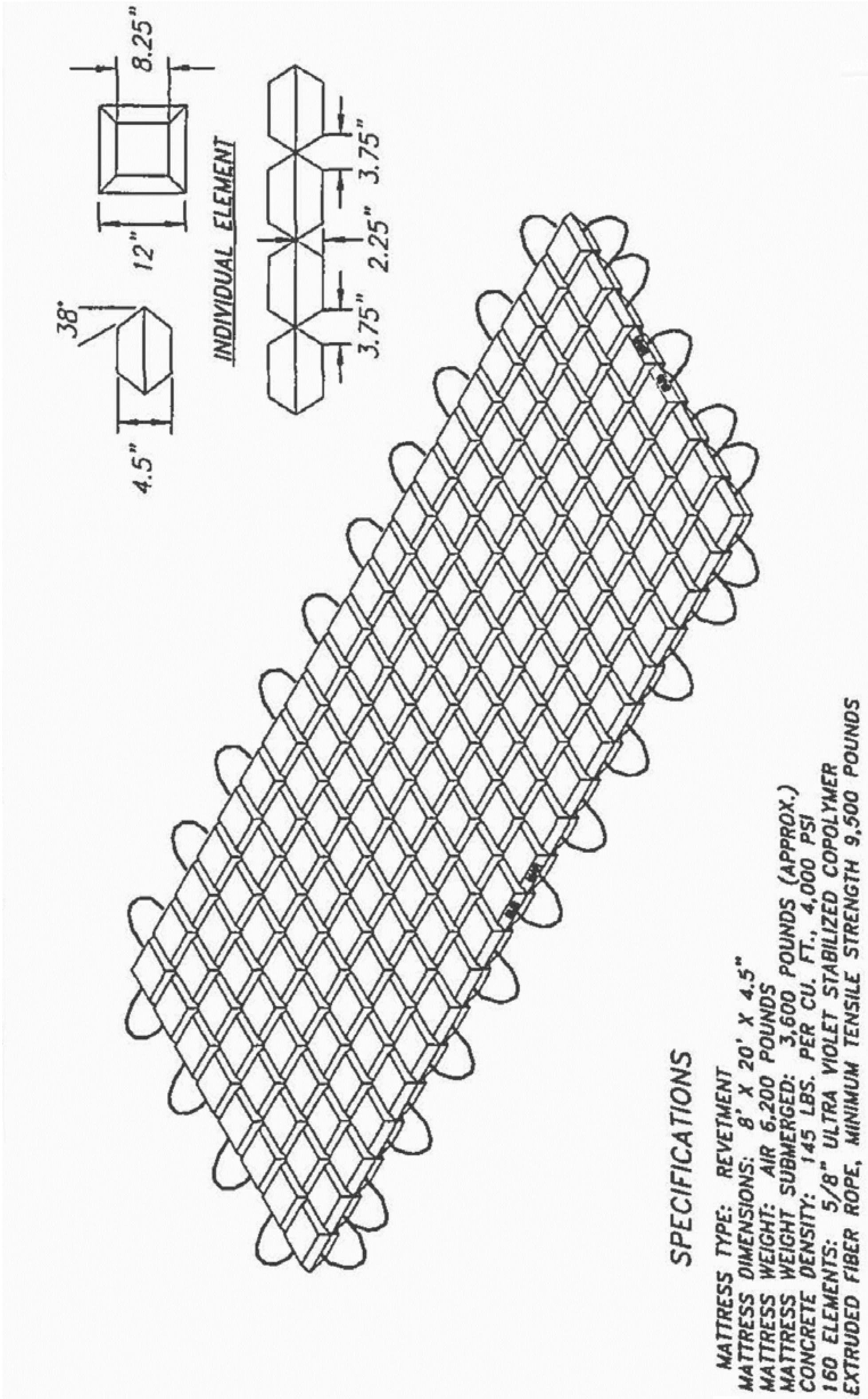


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE COIR LOGS ON DISTURBED SLOPES
Golder Associates	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3E



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

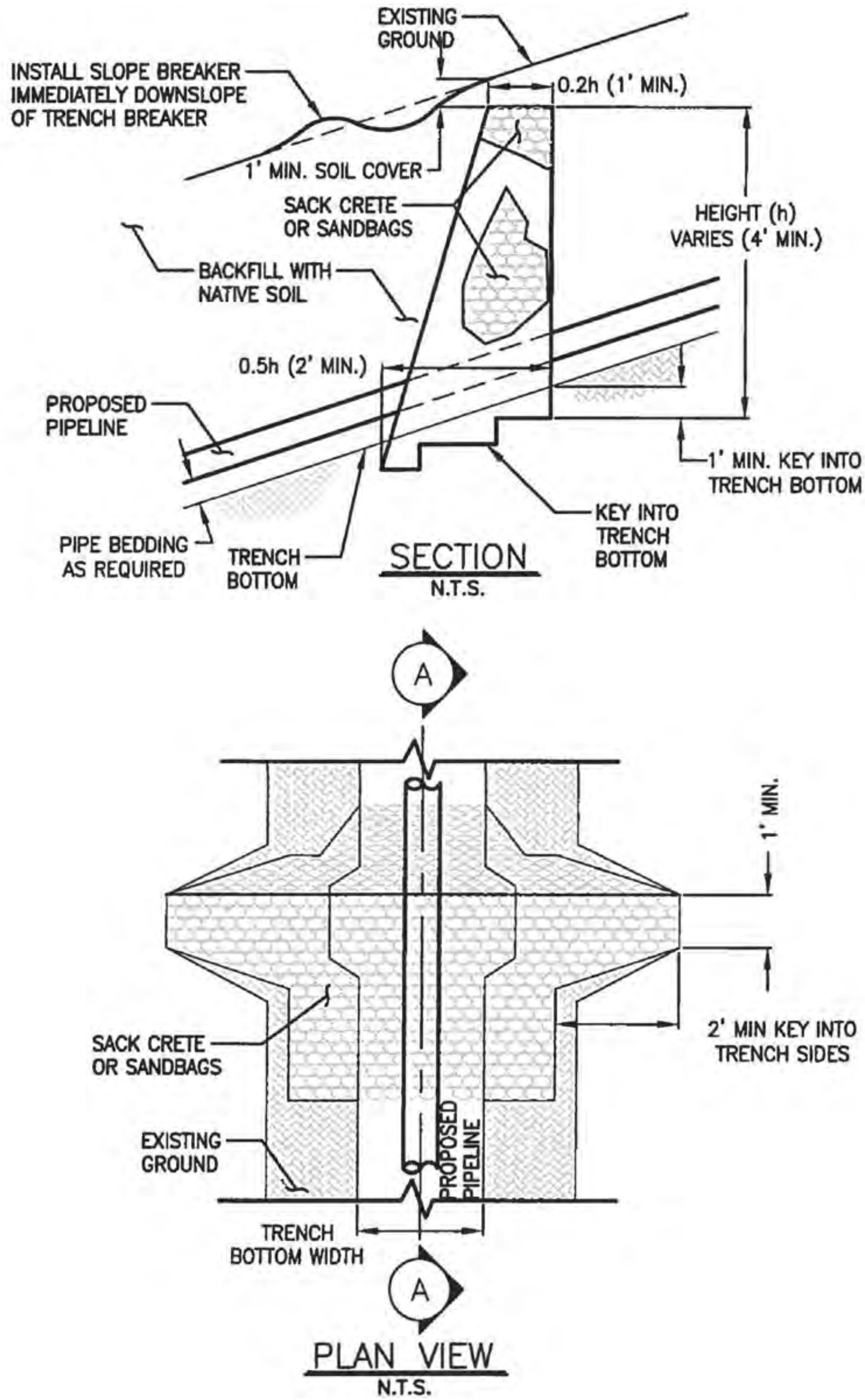
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SUBMAR MATTS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	3F



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

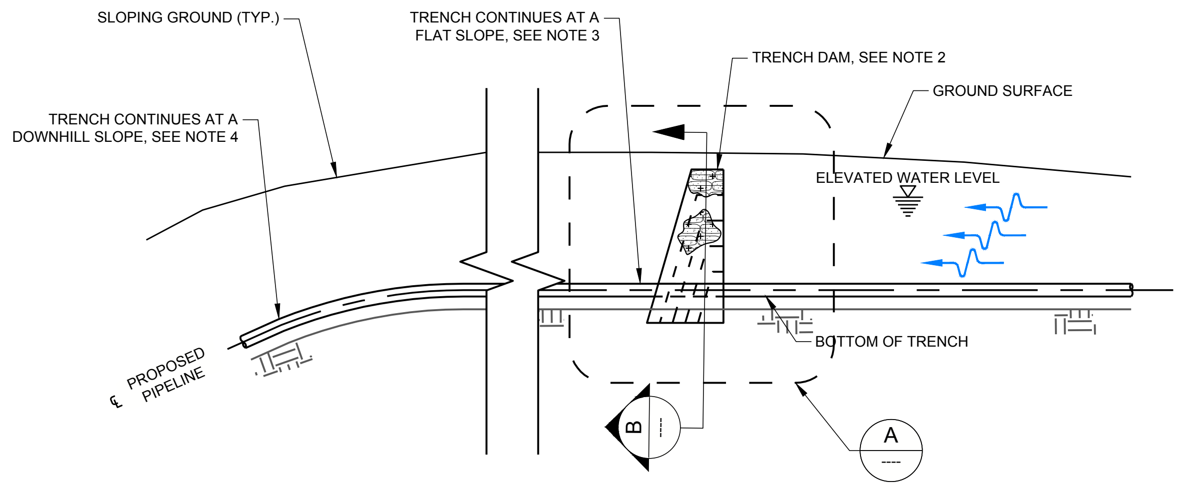
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

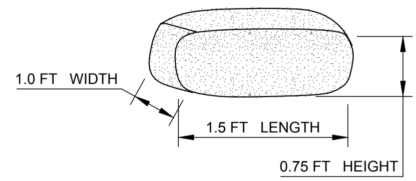
TITLE
TRENCH BREAKERS (FOAM AND SANDBAGS)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4A



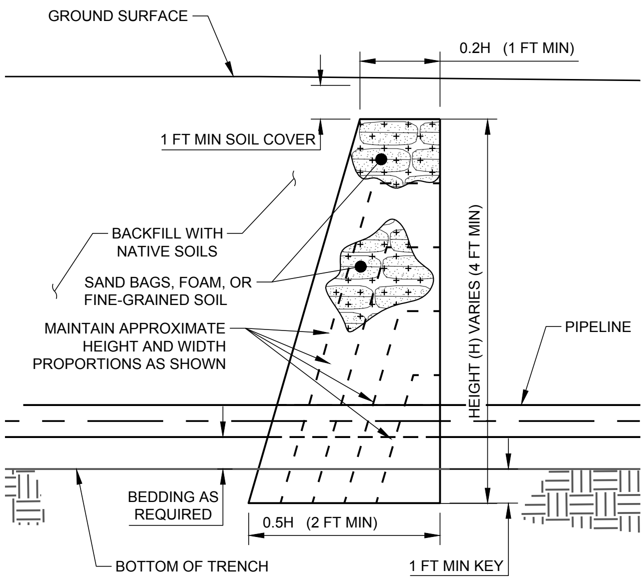
TRENCH DAM CONFIGURATION

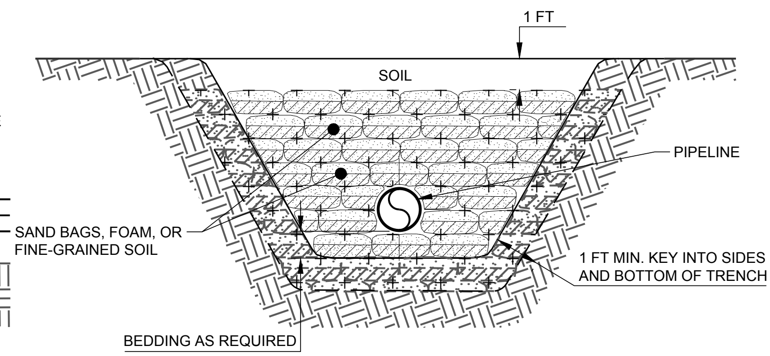
N.T.S.



SAND BAG DETAIL

N.T.S.





N.T.S A ---- TRENCH DAM DETAIL

N.T.S B --- SECTION

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. THE PURPOSE AND INTENT OF TRENCH DAMS IS TO STOP THE FLOW OF WATER IN THE TRENCH WHERE ELEVATED WATER SURFACES MAY EXIST (SUCH AS STREAM CROSSINGS OR PONDED AREAS).
3. INSTALL TRENCH DAM IN LOW / FLAT TERRAIN AREAS THAT MAY HAVE ELEVATED WATER LEVELS. THE PURPOSE OF THE TRENCH DAM IS TO STOP FLOW OF WATER FROM RUNNING DOWN THE FLAT TRENCH.
4. INSTALL TRENCH DAM AT THE TOP OF SLOPES AT AREAS THAT MAY HAVE ELEVATED WATER LEVELS. THE PURPOSE OF THE TRENCH DAM IS TO STOP FLOW OF WATER FROM RUNNING DOWN THE TRENCH ON THE HILL SLOPE.
5. AT LOCATIONS WHERE DAMS ARE SPECIFIED ON DETAILS, PLANS OR AS DIRECTED BY COMPANY REPRESENTATIVE, SOFT PLUGS (UNEXCAVATED SECTIONS ALONG TRENCH-LINE) MAY BE LEFT IN PLACE TO PERFORM FUNCTION OF PERMANENT DAMS PRIOR TO PIPE PLACEMENT.
6. THE TRENCH SHALL BE DEWATERED THROUGH A SEDIMENT TRAP, FILTER BAG, OR DEWATERING STRUCTURE.
7. PERMANENT TRENCH DAMS SHALL BE INSTALLED BEFORE THE TRENCH IS BACKFILLED.
8. TRENCH PLUGS SHALL BE INSTALLED AT THE BANKS OF ALL PERENNIAL STREAM CROSSINGS IMMEDIATELY AFTER TRENCH EXCAVATION. THE PLUGS MAY BE TEMPORARILY REMOVED DURING PIPE PLACEMENT, BUT THEN REPLACED.
9. THE TRENCH SHALL BE DEWATERED THROUGH A SEDIMENT TRAP, FILTER BAG, OR DEWATERING STRUCTURE REFER TO TRENCH DEWATERING DETAIL (TWD).
10. PERMANENT TRENCH DAMS SHALL BE INSTALLED BEFORE THE TRENCH IS BACKFILLED.

CLIENT
DOMINION

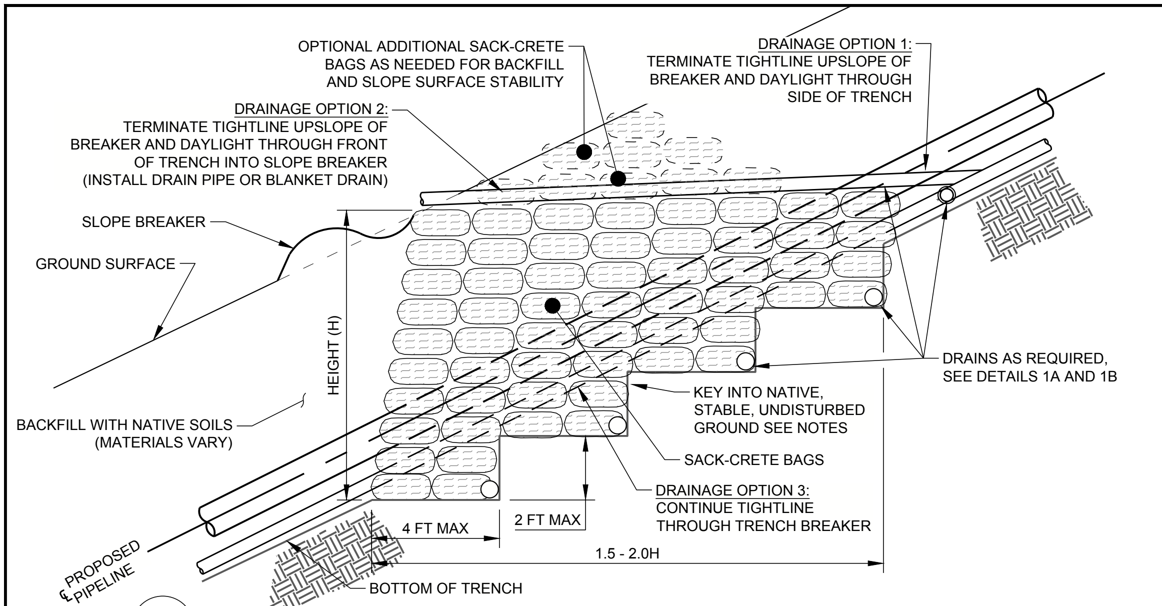
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

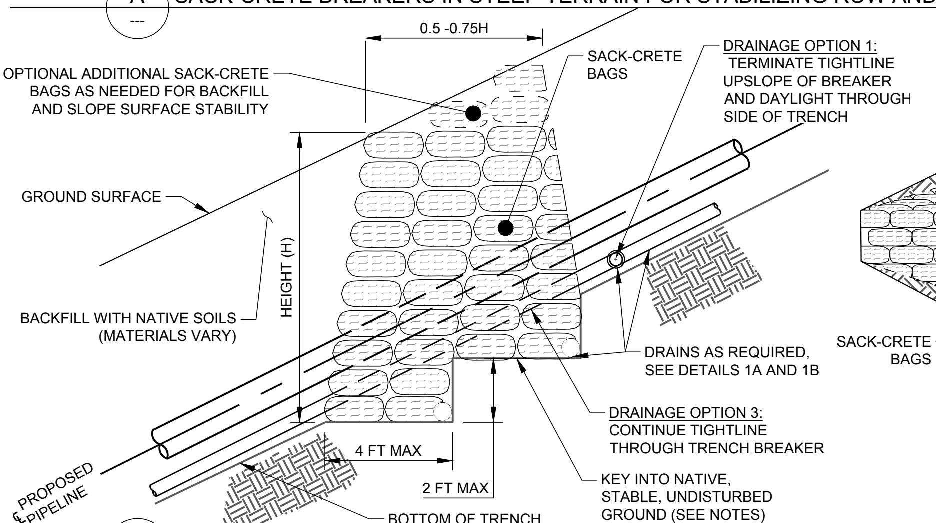
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TRENCH DAMS (FOAM, BAGS, OR FINE GRAINED SOILS)

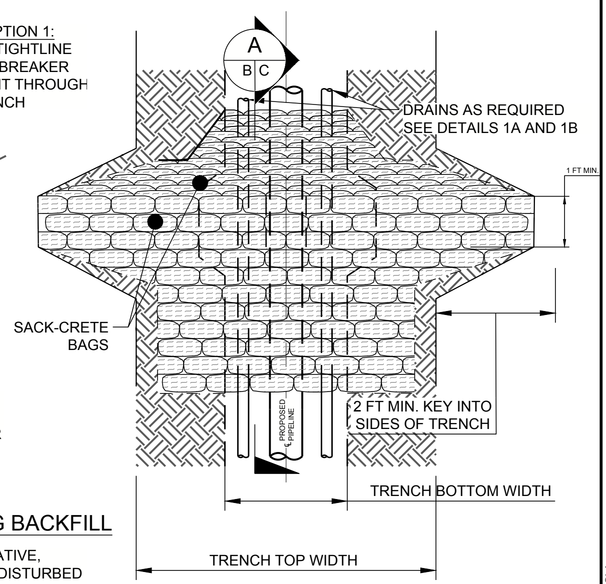
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4B



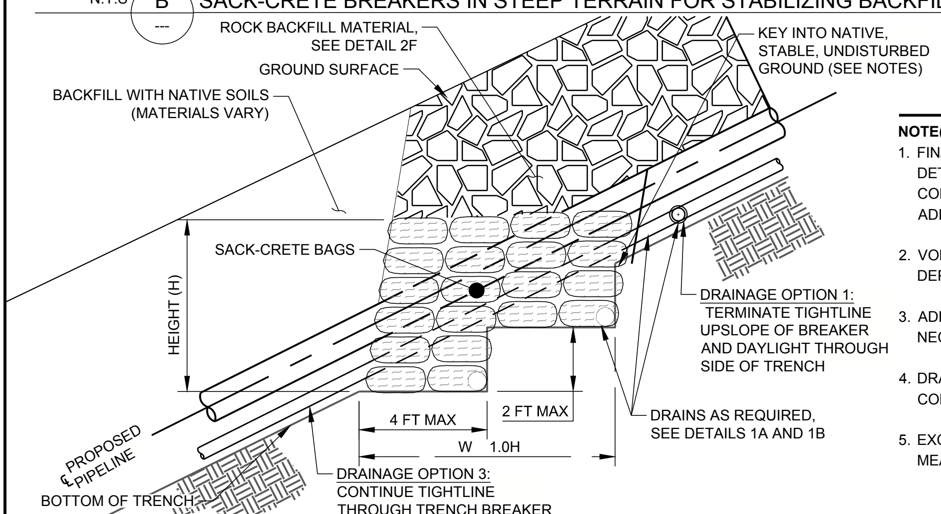
N.T.S A --- SACK-CRETE BREAKERS IN STEEP TERRAIN FOR STABILIZING ROW AND TRENCH BACKFILL



N.T.S B --- SACK-CRETE BREAKERS IN STEEP TERRAIN FOR STABILIZING BACKFILL



PLAN VIEW
N.T.S.



N.T.S C --- SACK-CRETE KEYWAY FOR ROCK BACKFILL IN STEEP TERRAIN

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. ADD OR EXTEND KEYS OR PLACE ADDITIONAL SACK-CRETE BAGS AS NECESSARY TO MAINTAIN STABILITY.
4. DRAINAGE OPTION TO BE SELECTED AT THE TIME OF CONSTRUCTION BASED ON CONDITIONS ENCOUNTERED.
5. EXCAVATE KEY WITH OUTBOARD SLOPE, AND INCLUDE DRAINAGE MEASURES THAT EVACUATE ACCUMULATED SEEPAGE.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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CLIENT
DOMINION

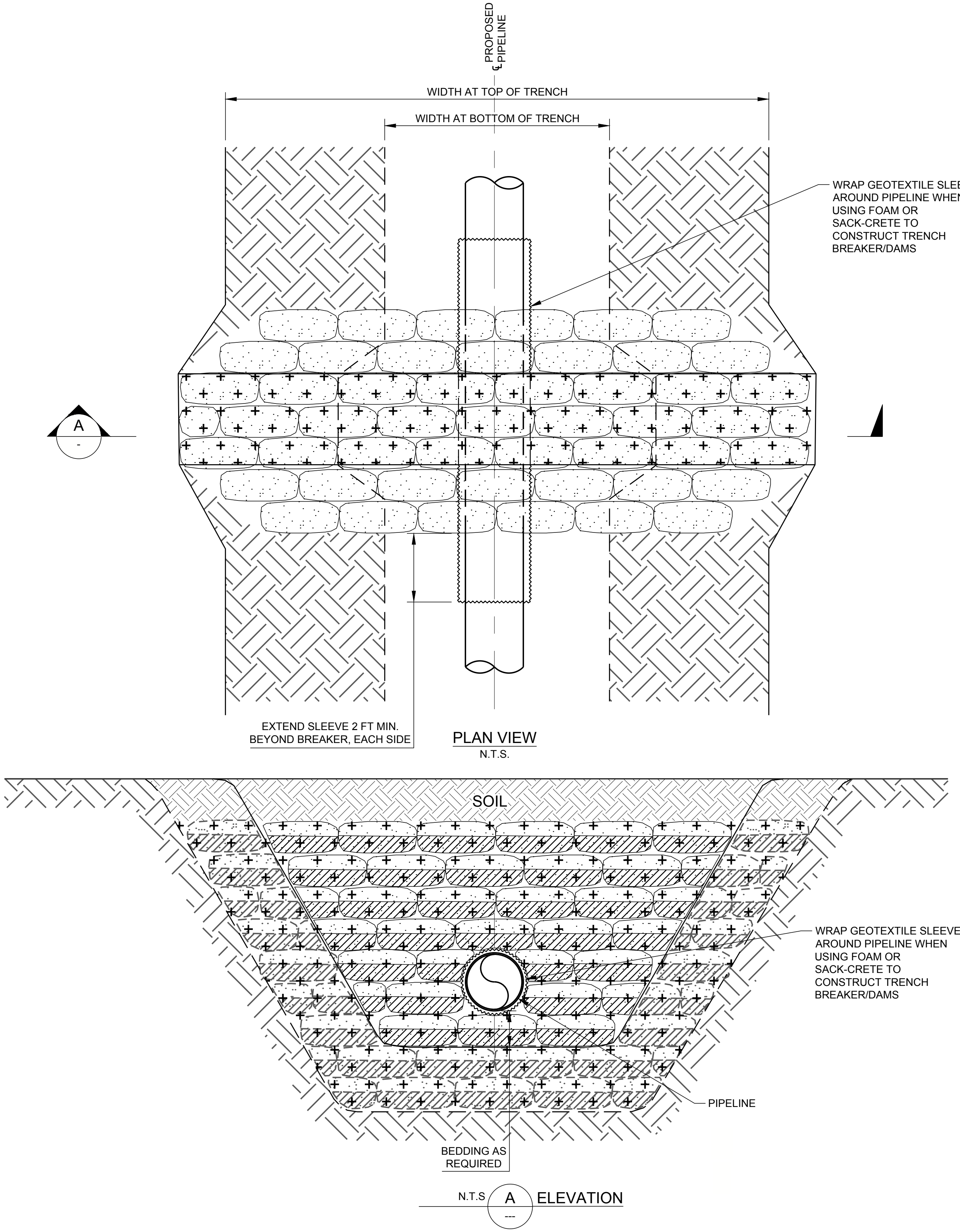
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

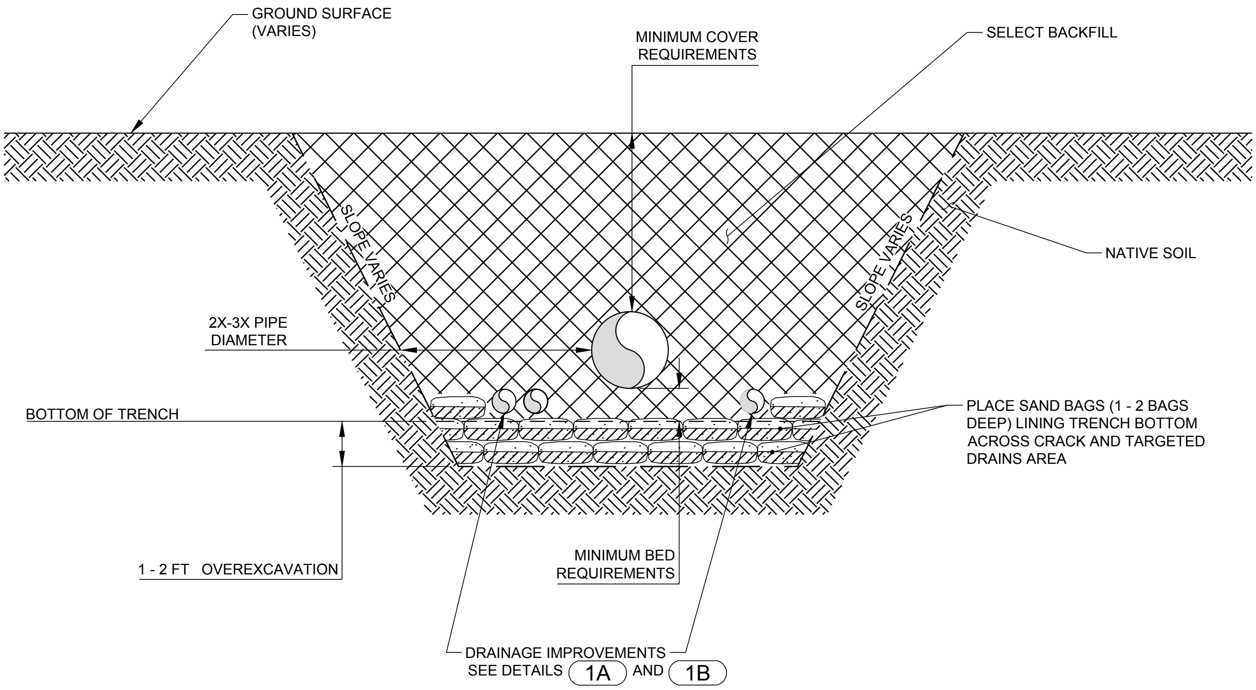
TITLE
SACK-CRETE BREAKERS (STRUCTURAL BREAKER)

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4C



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **SLEEVE INTERFACE BETWEEN PIPELINE AND BREAKER**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 4D



TYPICAL TRENCH SECTION WITH SEALED BOTTOM

SCALE: N.T.S.

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. MAINTAIN POSITIVE DRAINAGE IN TRENCH ACROSS AREAS SEALED WITH SANDBAGS, DRAINS SHOULD BE PLACED OVER THE SEAL. WATER SHOULD NOT POND BEHIND SEAL.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

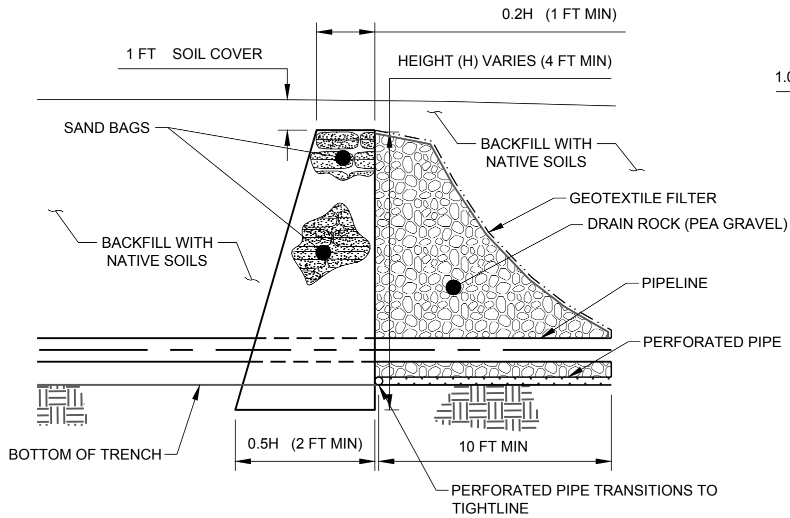
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SEAL BOTTOM OF TRENCH WITH SANDBAGS

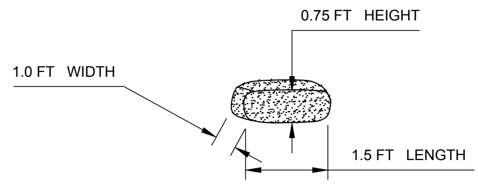
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4E

0 1 in



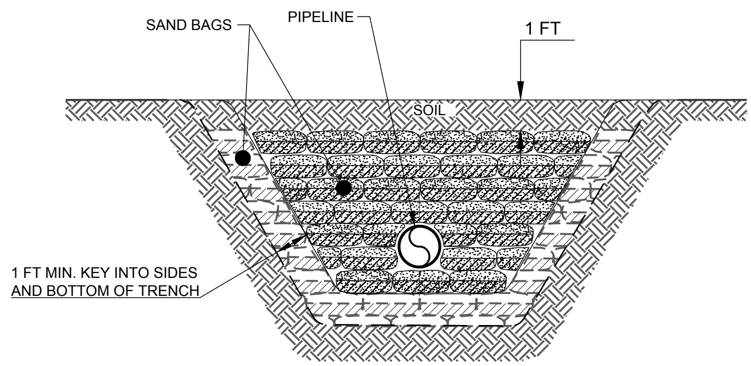
TRENCH BREAKER PROFILE VIEW

SCALE: N.T.S.



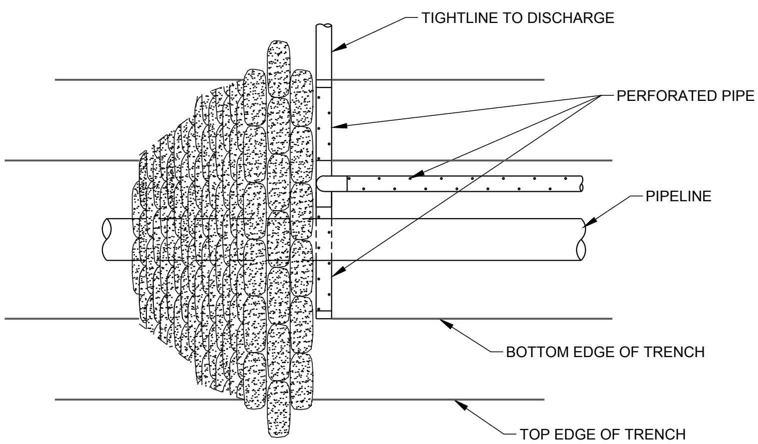
SAND BAG DETAIL

SCALE: N.T.S.



TRENCH BREAKER SECTION VIEW

SCALE: N.T.S.



TRENCH BREAKER PLAN VIEW

SCALE: N.T.S.

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

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DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

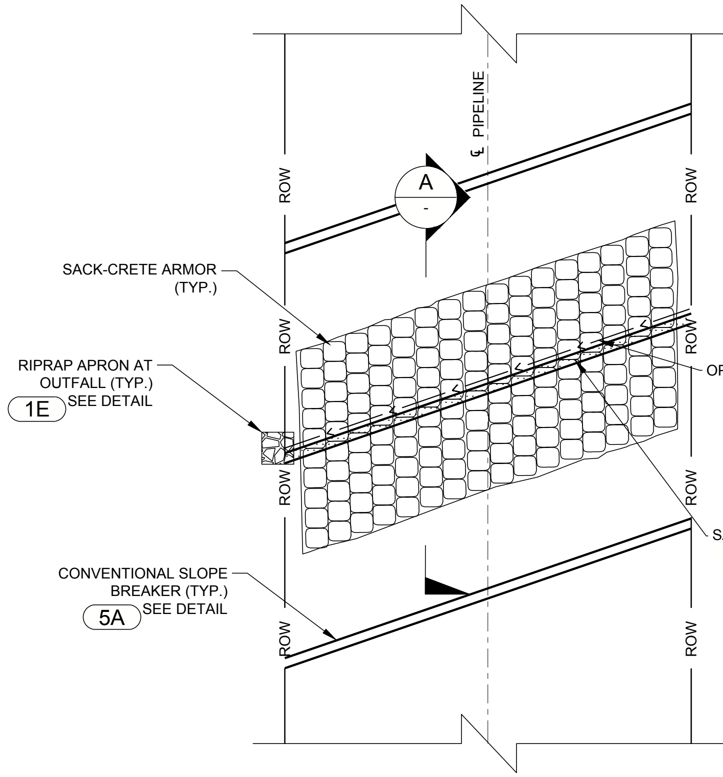
CONSULTANT

Golder Associates

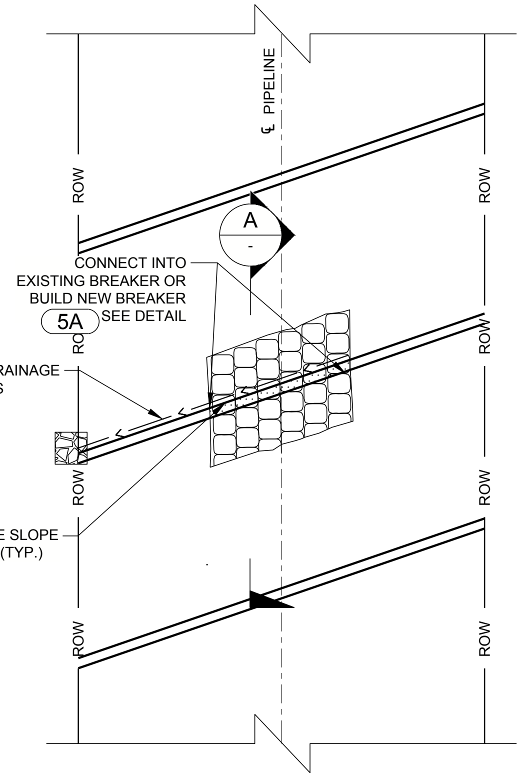
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TRENCH BREAKER WITH DRAINAGE

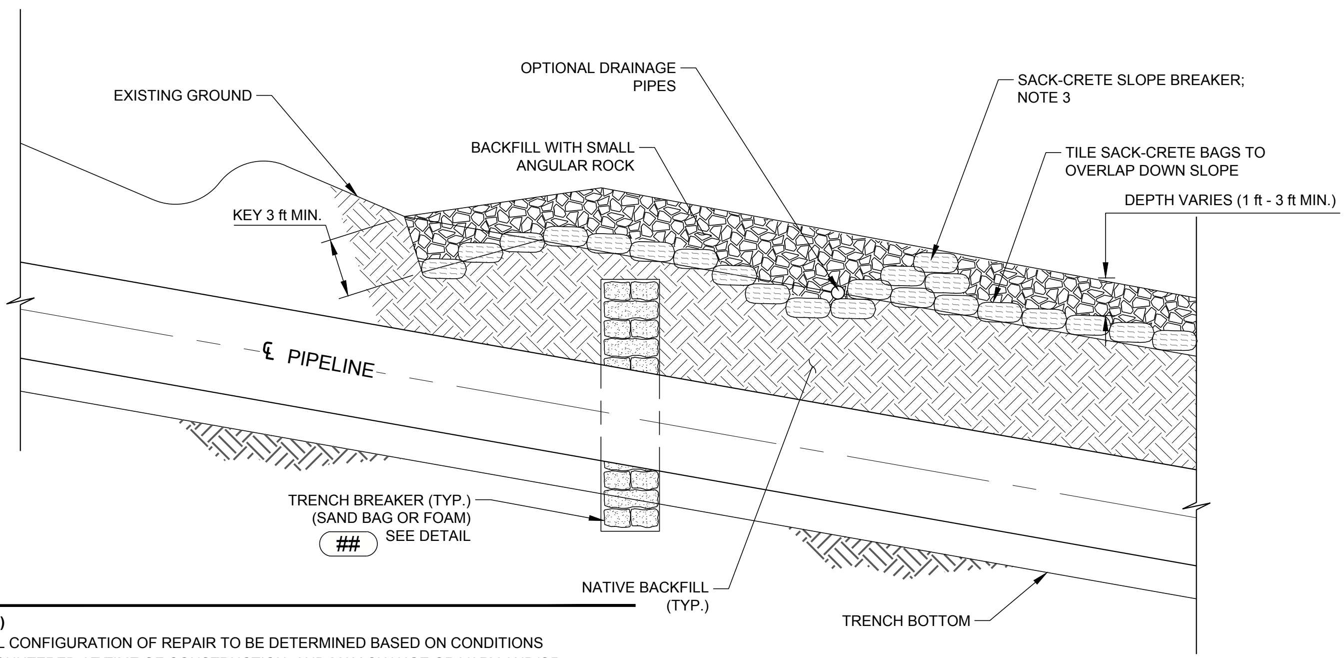
PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4F



OPTION A - EXTEND FULL WIDTH OF ROW



OPTION B - TARGETED REPAIR AREA



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SECTION

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. CONSTRUCT SLOPE BREAKER USING SACK-CRETE BAGS (1-4 HIGH) AND SLOPE ALONG ROW TO CONNECT TO EXISTING BREAKERS OR BUILD NEW BREAKERS TO INTERCEPT AND/OR DIVERT SURFACE RUNOFF TO TARGETED LOCATIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SACK-CRETE ARMOR WITH BREAKERS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4G

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. FLOWABLE FILL IS A SELF-COMPACTING LOW STRENGTH MATERIAL WITH FLOWABLE CONSISTENCY THAT IS USED AS AN FILL OR BACKFILL MATERIAL AS AN ALTERNATIVE TO COMPACTED GRANULAR FILL (ACI 229R, AMERICAN CONCRETE INSTITUTE). FLOWABLE FILL IS NOT INTENDED AS A CONCRETE MATERIAL, HENCE THE LOW STRENGTH PARAMETERS.

3. REFER TO MANUFACTURER SPECIFICATIONS FOR DESIGN AND PLACEMENT, EXAMPLE TECHNICAL REFERENCES INCLUDE, BUT ARE NOT LIMITED TO: "RECOMMENDED GUIDE SPECIFICATION FOR CLSM (FLOWABLE FILL)", NRMCA 2PFFGS, NATIONAL READY MIXED CONCRETE ASSOCIATION; ASTM BOOK OF STANDARDS, VOLUMES 04.09 AND 04.02, AMERICAN SOCIETY FOR TESTING AND MATERIALS; "CONTROLLED LOW STRENGTH MATERIALS", ACP SP-150, "THE DESIGN AND APPLICATION OF CONTROLLED LOW STRENGTH MATERIALS (FLOWABLE FILL)", ASTM STP 1331, "CONTROLLED LOW-STRENGTH MATERIALS", AMERICAN CONCRETE INSTITUTE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
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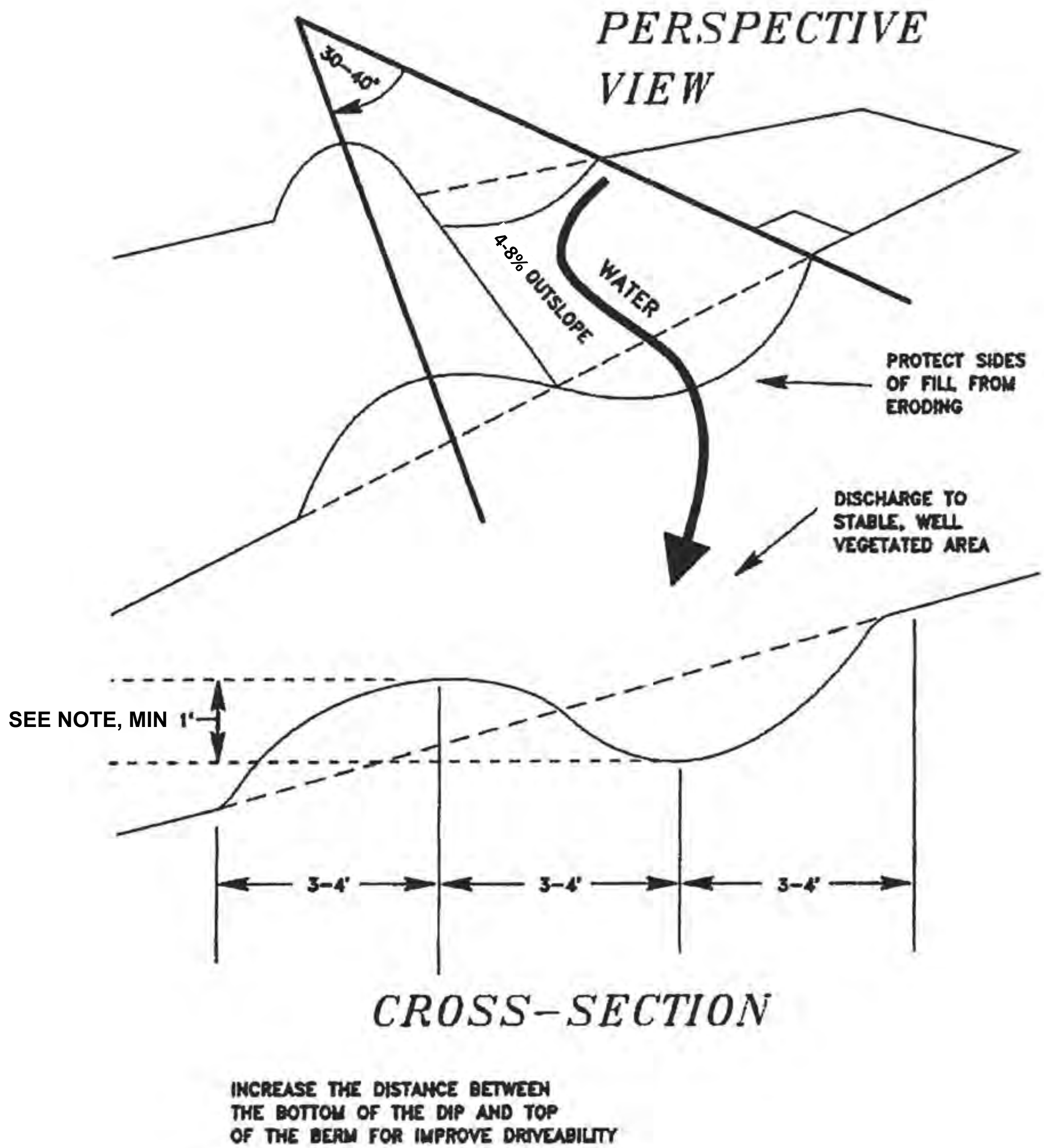
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
FLOWABLE FILL FOR TRENCH BACKFILL

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	4H

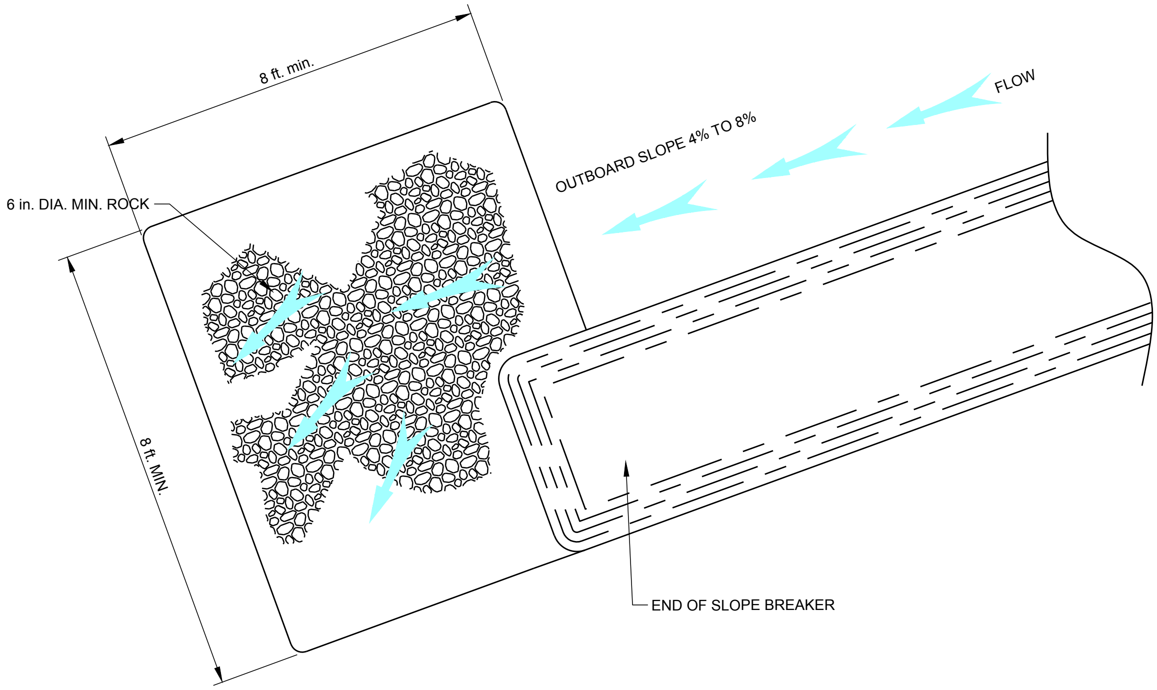
0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION.
2. DEPTH BETWEEN BOTTOM OF DIP AND TOP OF BERM MAY INCREASE, AS DIRECTED BY DOMINION.

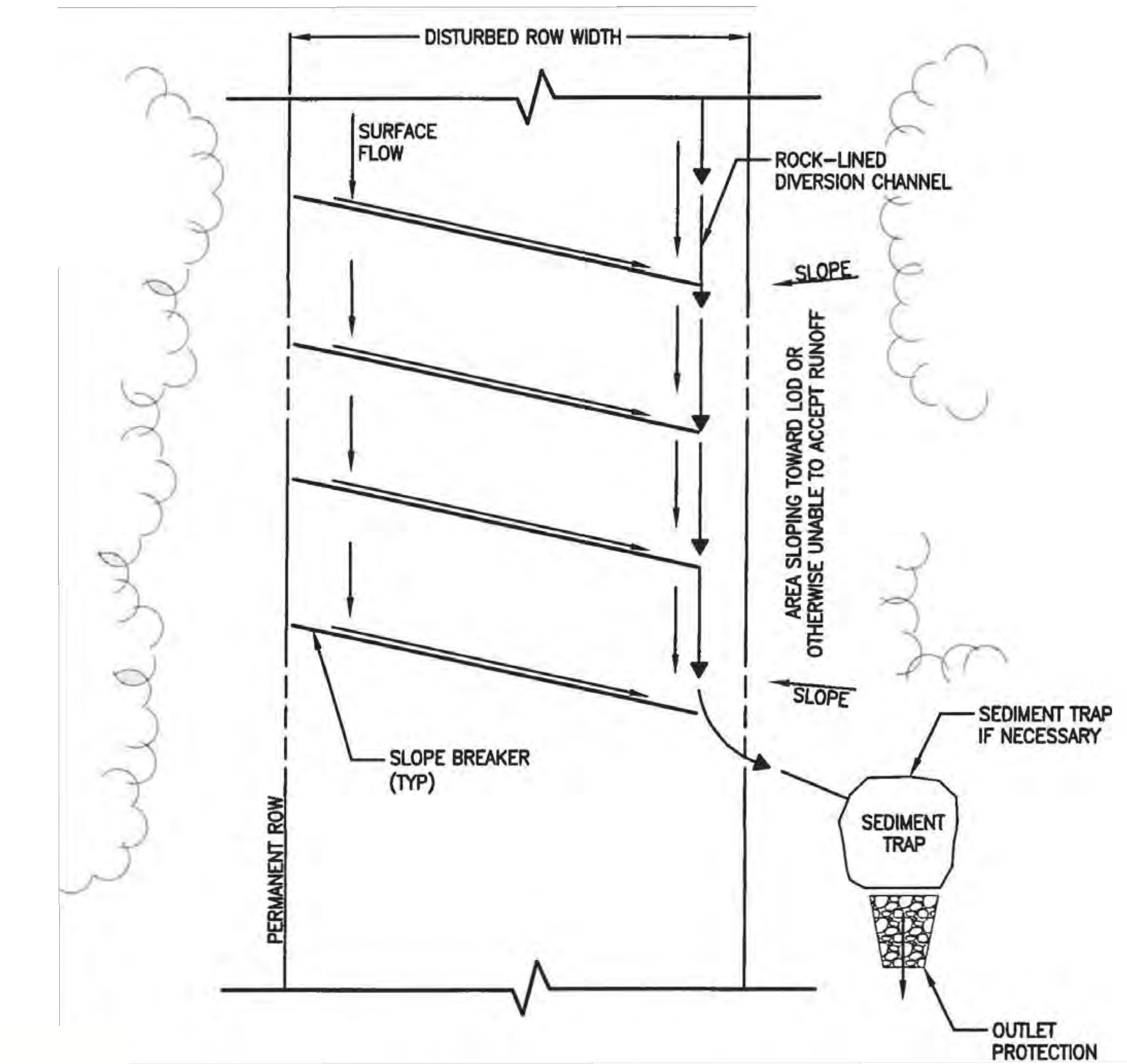
CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **SLOPE BREAKERS (TEMP AND PERMANENT)**	
		PROJECT No. 1535050	PHASE 500 · Rev. F · FIGURE 5A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **SLOPE BREAKER ARMORED OUTLET**	
		PROJECT No. 1535050	PHASE 500
		Rev. F	FIGURE 5B



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. CHANNEL(S) MAY REQUIRE STONE CHECK DAMS, EROSION CONTROL CLOTH, OR OTHER SITE SPECIFIC MITIGATION MEASURES, TO FIT SITE CONDITIONS.
3. SEDIMENT TRAP AND OUTLET PROTECTION REQUIRES SIZING.
4. DRAINS MAY BE ADDED TO THE UPSLOPE SIDE OF SLOPE BREAKERS (SEE BIC 1A) TO IMPROVE COLLECTION/CONVEYANCE OF FLOWS.
5. DIVERSION CHANNEL MAY BE ROCK LINED, EROSION CONTROL CLOTH LINED, OR VEGETATED TO FIT SITE CONDITIONS, AND MAY INCLUDE DRAINAGE PIPES TO IMPROVE COLLECTION/CONVEYANCE OF FLOWS (SEE BIC 1F OR 1H).

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE BREAKERS WITH DIVERSION CHANNELS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5C

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SPECIAL CARE AND CONSIDERATION IS REQUIRED TO CONSTRUCT DRAINAGE MEASURES FOR EXISTING, PERMANENT, AND TEMPORARY ACCESS ROADS ON A SITE-SPECIFIC BASIS. ACCESS ROADS MAY COLLECT RUNOFF FROM UPSLOPE AREAS AND DELIVER WATER TO THE ROW, PIPE TRENCH, OR TO OTHER GEOTECHNICAL, GEOLOGIC, OR HYDROTECHNICAL AREAS OF CONCERN. RECOMMENDED DRAINAGE MEASURES FOR ACCESS ROADS INCLUDE THE FOLLOWING:

A. DRAINAGE MEASURE MAY REQUIRE SITE SPECIFIC DESIGN WITH REGARD FOR SLOPE, DRAINAGE AREA, EROSION PROTECTION , DISCHARGE ARMORED PAD, CHECK DAMS, ETC.
B. INSTALL WATER BARS (I.E. SLOPE BREAKERS) EVERY 100-200 FEET ALONG THE ACCESS ROAD, PROVIDED THAT WATER IS NOT DISCHARGED ONTO OR ABOVE GEOTECHNICALLY SENSITIVE AREAS (LANDSLIDES, AREAS OF FILL, POTENTIALLY UNSTABLE SLOPES, ETC.) OR THE ROW.
C. INSTALL INBOARD SLOPES WITH BAR DITCH (LINED OR ARMORED AS NECESSARY) UPSLOPE OF GEOTECHNICALLY SENSITIVE AREAS AND/OR THE ROW TO CONVEY WATER TO A STABLE DISCHARGE POINT.
D. INSTALL FRENCH DRAINS AS NEEDED TO COLLECT WATER IN AREAS WHERE WATER BARS AND BAR DITCHES CAN NOT BE USED OR WOULD RESULT IN DIRECTING WATER INTO THE ROW OR PIPE TRENCH. FRENCH DRAINS SHOULD CONVEY COLLECTED WATER IN A TIGHTLINE (SOLID WALL PIPE) TO A STABLE DISCHARGE POINT.
E. INSTALL EROSION PROTECTION FOR CONCENTRATED FLOWS AND DISCHARGE POINTS/OUTLETS AS NECESSARY (I.E. CHANNEL LINING, RIPRAP APRON, ETC.).
F. DO NOT ALLOW WATER DELIVERED FROM ACCESS ROADS TO CROSS OR ENTER THE PIPE TRENCH.
G. SPECIAL STUDY MAY BE REQUIRED FOR COMPLEX SITES OR AREAS OF CONCERN.

3. CHANGES IN THE FINAL GRADING MAY BE NEEDED TO ADDRESS SPECIFIC TARGETED GEOTECHNICAL OR HYDROTECHNICAL OR GEOLOGIC ENGINEERING ISSUES (I.E. CORRECT DRAINAGE PROBLEMS, MINIMIZE DELIVERY OF WATER TO LANDSLIDE SITES, ETC.)

4. FINAL GRADING TO BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO COMPLETION.

CLIENT
DOMINION

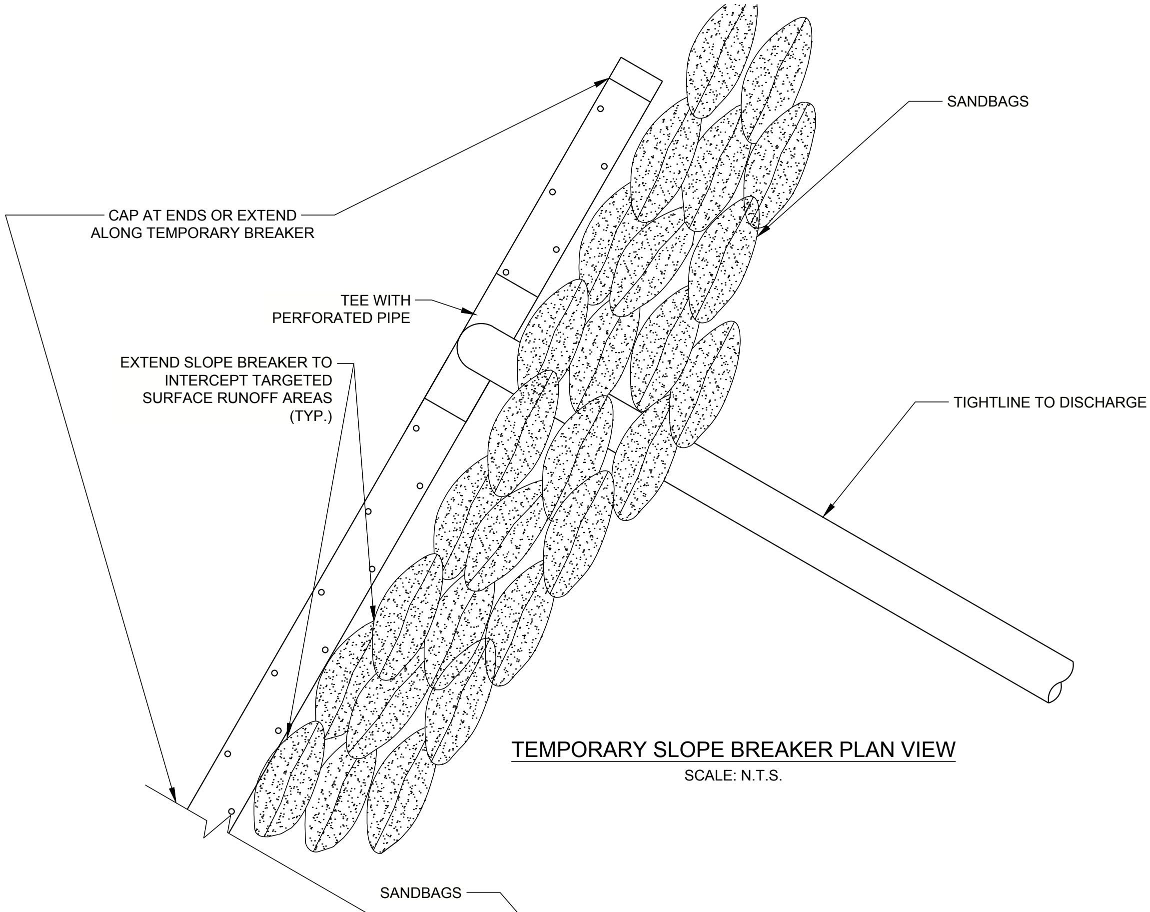
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

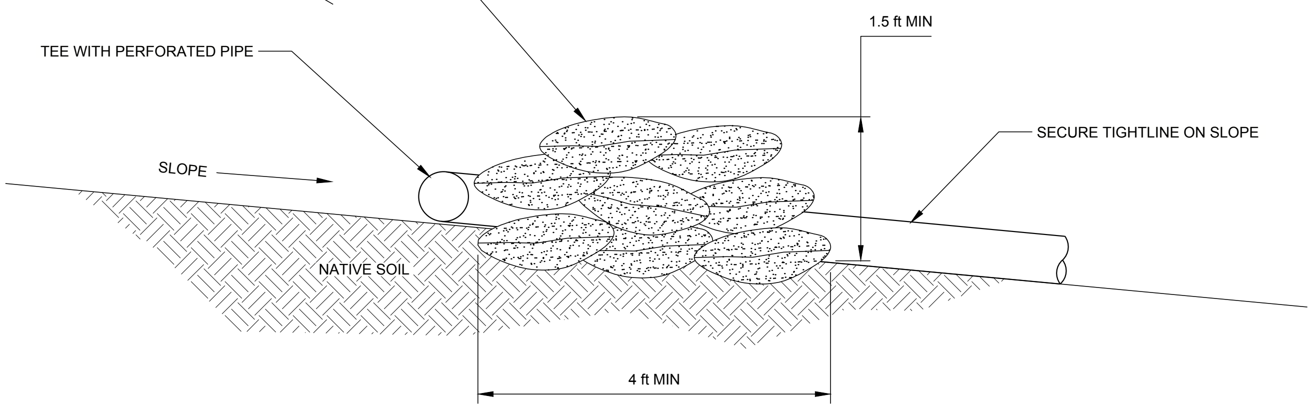
TITLE
ACCESS ROADS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5D



TEMPORARY SLOPE BREAKER PLAN VIEW

SCALE: N.T.S.



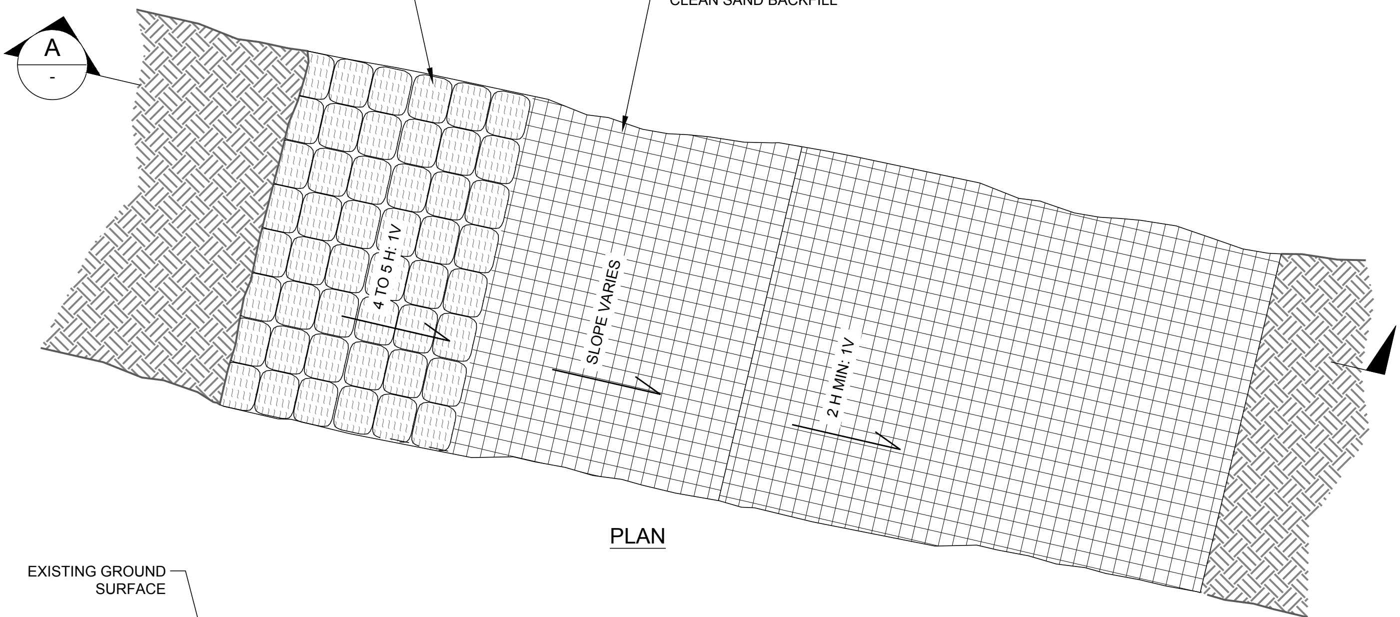
TEMPORARY SLOPE BREAKER PROFILE VIEW

SCALE: N.T.S.

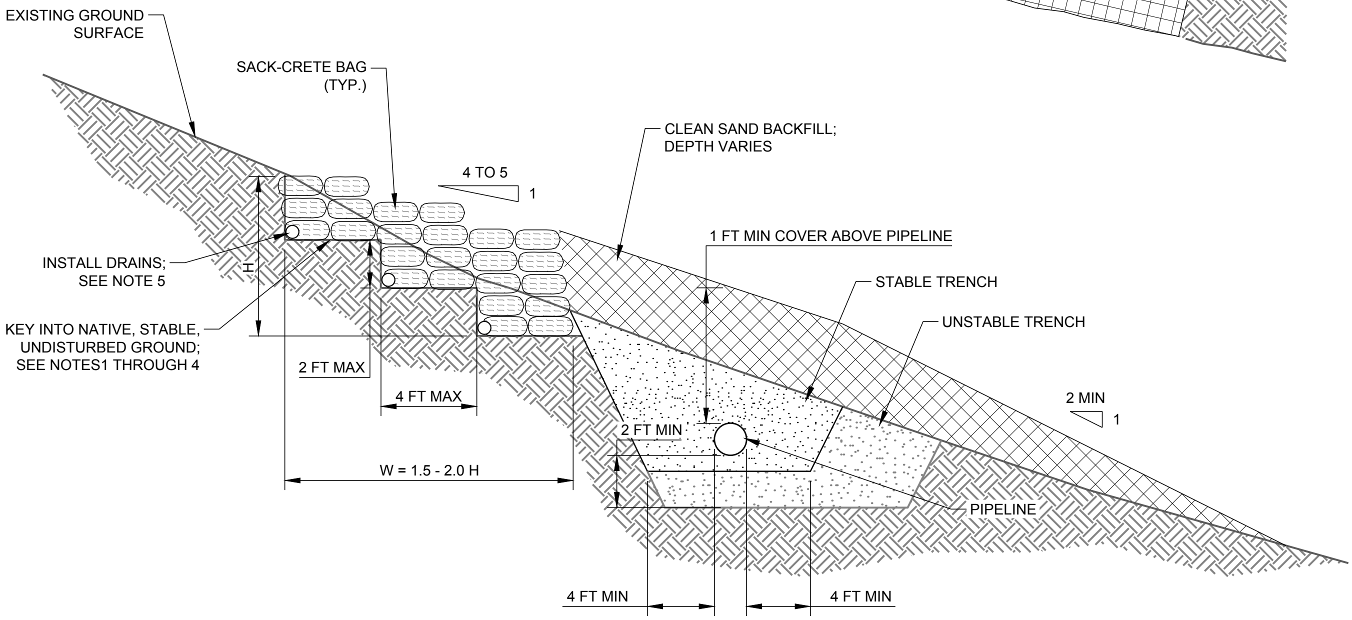
NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	**TEMPORARY SLOPE BREAKER WITH DRAIN PIPE**
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	5E



PLAN



A
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SECTION

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. VOLUMES, GRADES, ELEVATIONS AND QUANTITIES, WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.
3. ADD OR EXTEND KEYS OR PLACE ADDITIONAL SACK-CRETE BAGS AS NECESSARY TO MAINTAIN STABILITY.
4. EXCAVATE KEY WITH OUTBOARD SLOPE, AND INCLUDE DRAINAGE MEASURES THAT EVACUATE ACCUMULATED SEEPAGE.
5. DRAINAGE OPTION AND CONFIGURATION TO BE SELECTED AT THE TIME OF CONSTRUCTION BASED ON CONDITIONS ENCOUNTERED. CONSTRUCT DISCHARGE OUTFALL AT A LOCATION THAT DOES NOT IMPACT SITE CONDITIONS (LOCATION WITH POSITIVE DRAINAGE FROM THE ROW AND LANDSLIDE / POTENTIALLY UNSTABLE AREAS).

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT: Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SACK-CRETE WEDGE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5F

NOTE(S)

1. FINAL CONFIGURATION OF REPAIR TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. NO WOOD CHIPS OR GROUND-UP WOODY/ORGANIC DEBRIS, OR SIMILAR IS ALLOWED TO BE PLACED OR SPREAD ON THE ROW, UNLESS DIRECTED BY DOMINION.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

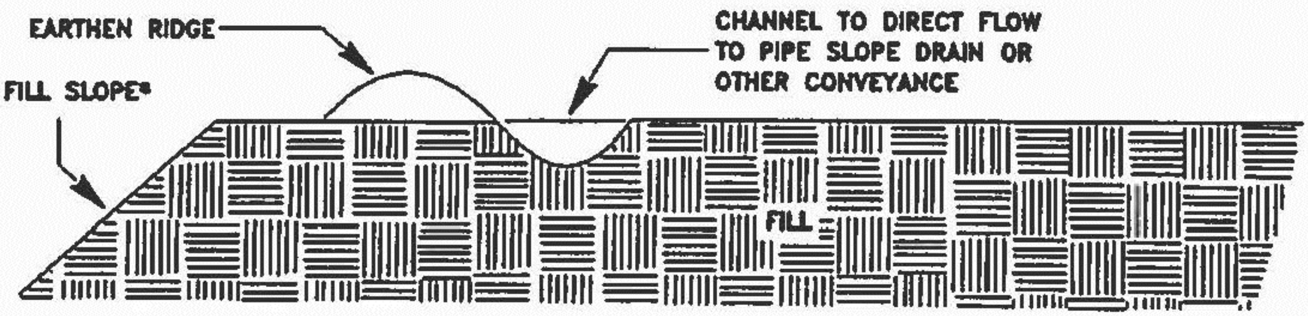
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

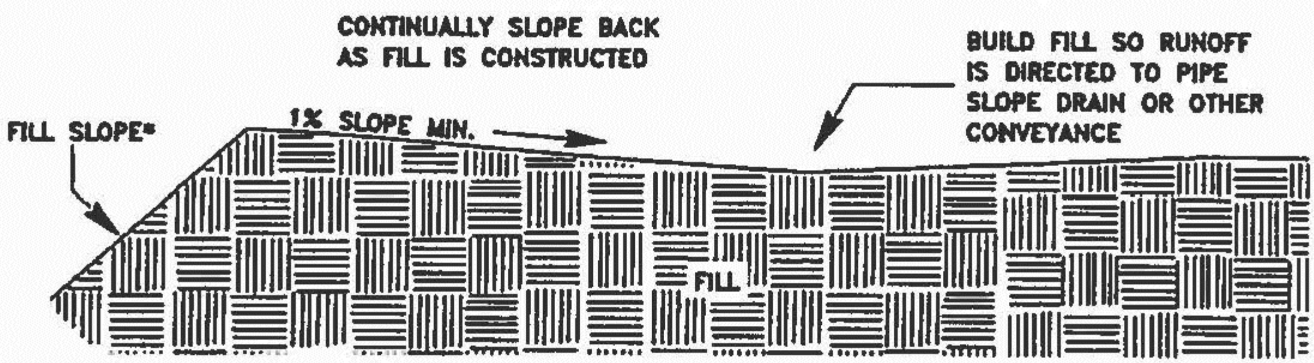
TITLE
NO WOOD CHIPS IN ROW

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	5G



TEMPORARY BERM

*SEED AND MULCH FILL SLOPE EVERY 10 FEET OF FILL OR EVERY 7 DAYS, WHICHEVER COMES FIRST

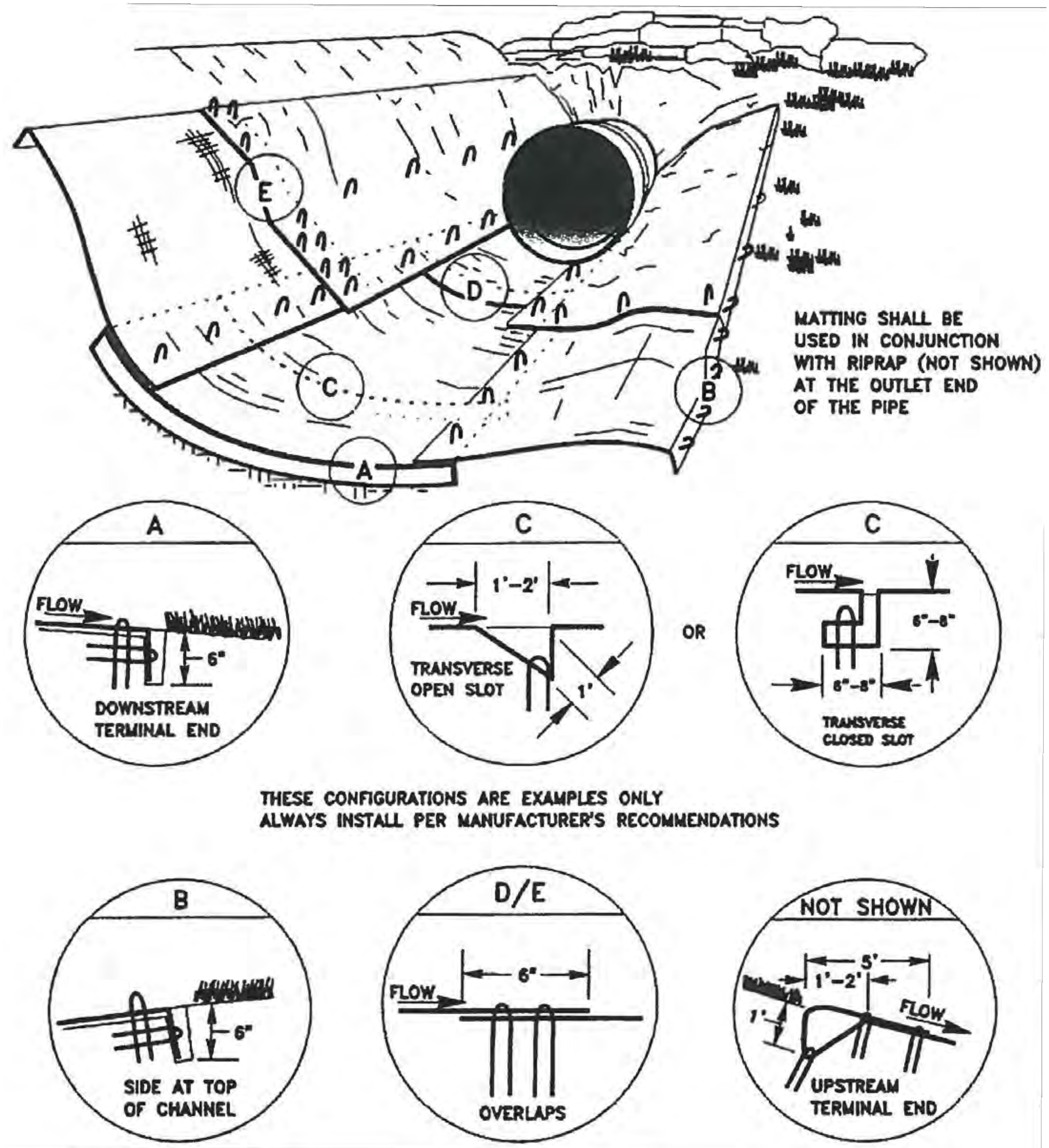


GRADING

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	SURFACE WATER DIVERSIONS
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	5H

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



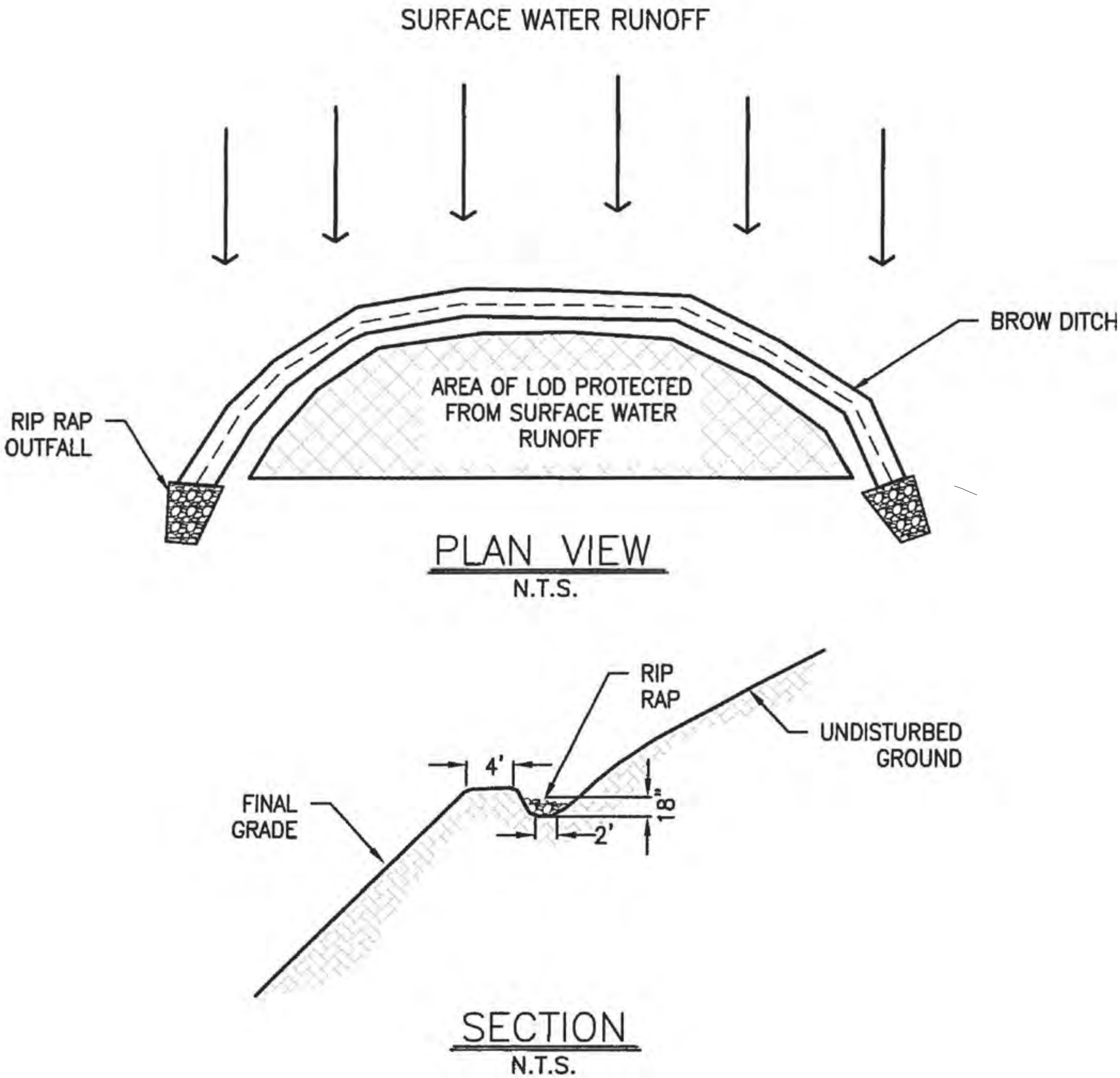
CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **COIR-LINED VEGETATED DIVERSION CHANNEL**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

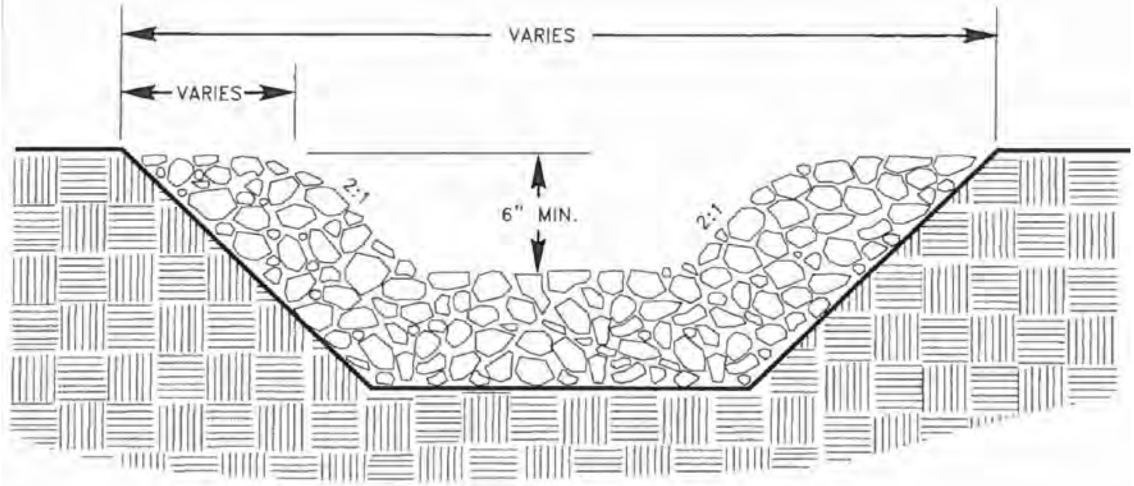
1 in

0

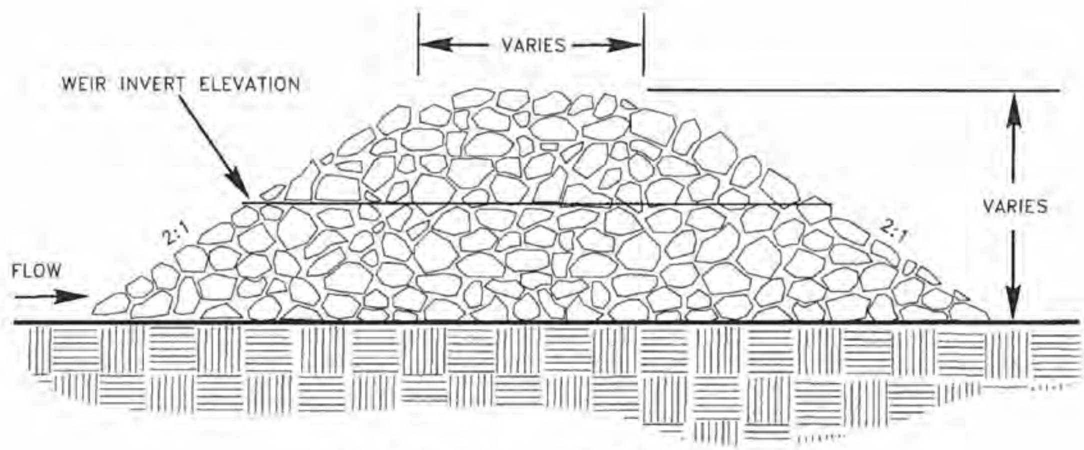


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **BROW DITCH**	
		PROJECT No. 1535050 · PHASE 500 · Rev. F	FIGURE 6B



ELEVATION

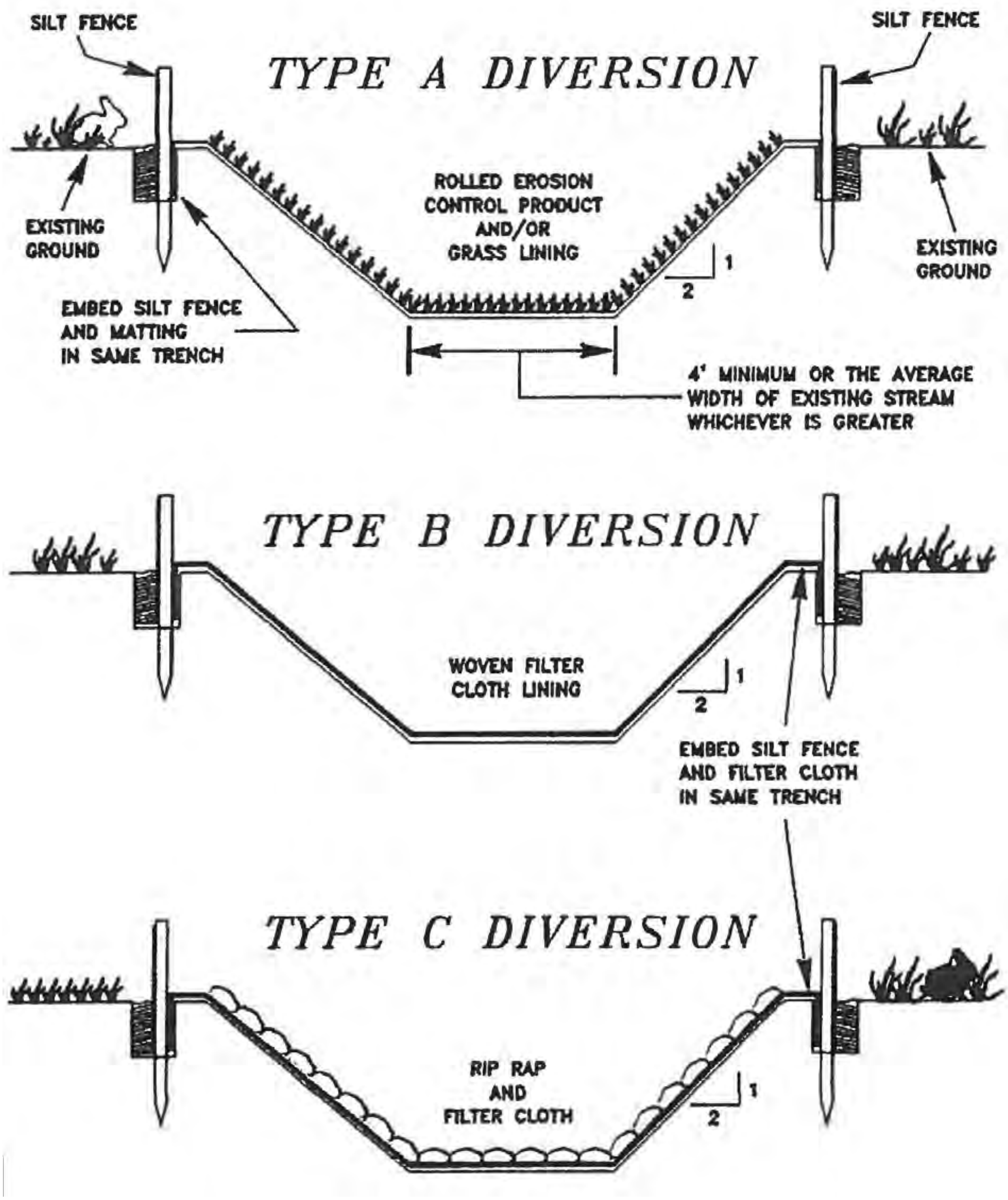


CROSS SECTION

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD: 2017-02-28	TITLE **ROCK FILTER IN TRENCH**	
Golder Associates	PREPARED: REDMOND		
	DESIGN: DBC		
	REVIEW: -	PROJECT No.: 1535050	PHASE: 500
	APPROVED: AQK	Rev.: F	FIGURE: 6C

1 in
0

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

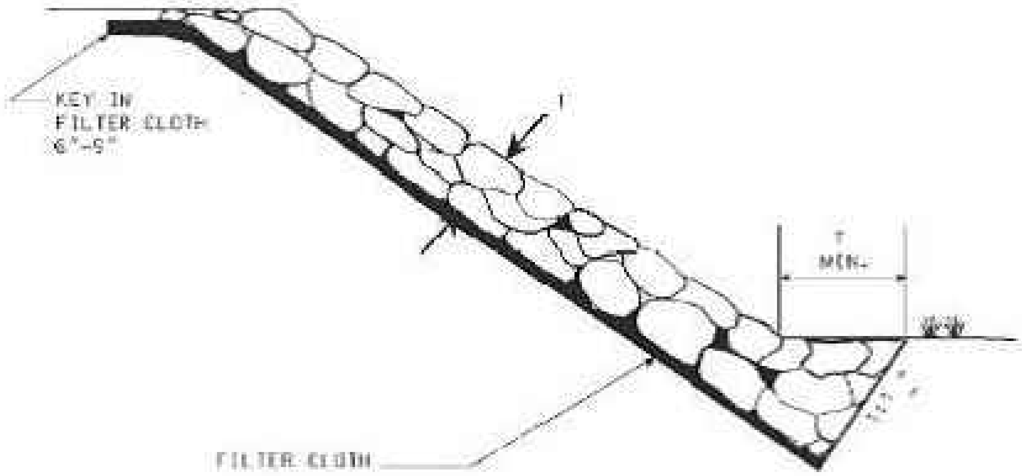


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

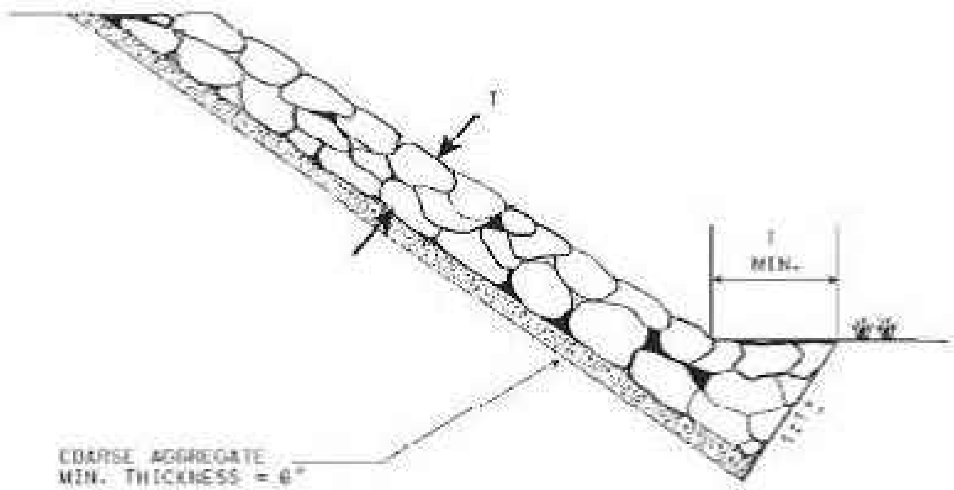
CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE ARMORED CHANNEL
Golder Associates	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 / PHASE 500 / Rev. F / FIGURE 6D
	APPROVED	AQK	

FILTER CLOTH UNDERLINER

(PREFERRED)



GRANULAR FILTER



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **TYP BANK ARMORING**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6E

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. REFER TO THE FOLLOWING FOR EXAMPLE RIPRAP SPECIFICATIONS:

NSA No.	GRADING ROCK SIZE (INCHES)			FILTER BLANKET REQUIEMENTS		VMAX (ft./SEC.)
	MAX.	d_{50}	MIN.	SIZE NSA NO.	PLACEMENT THICKNESS	
R-1	1.5	0.75	NO.8	FS-1	N/A	2.5
R-2	3	1.5	NO.1	FS-1	N/A	4.5
R-3	6	3	NO.2	FS-1	3	6.5
R-4	12	6	NO.3	FS-2	4	9
R-5	18	9	NO.5	FS-2	6	11.5
R-6	24	12	NO.7	FS-3	8	13
R-7	30	15	NO.12	FS-3	10	14.5

3. FINAL RIPRAP SPECIFICATIONS AS DIRECTED BY DOMINION.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

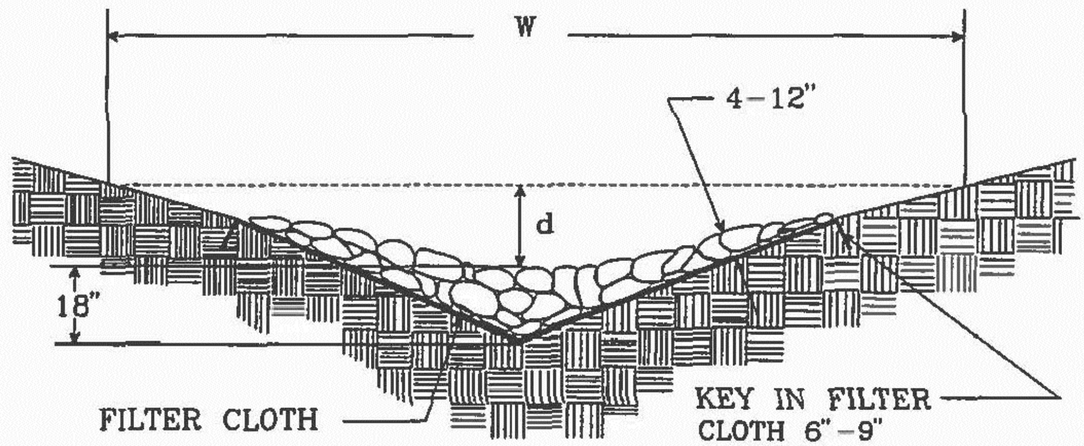
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

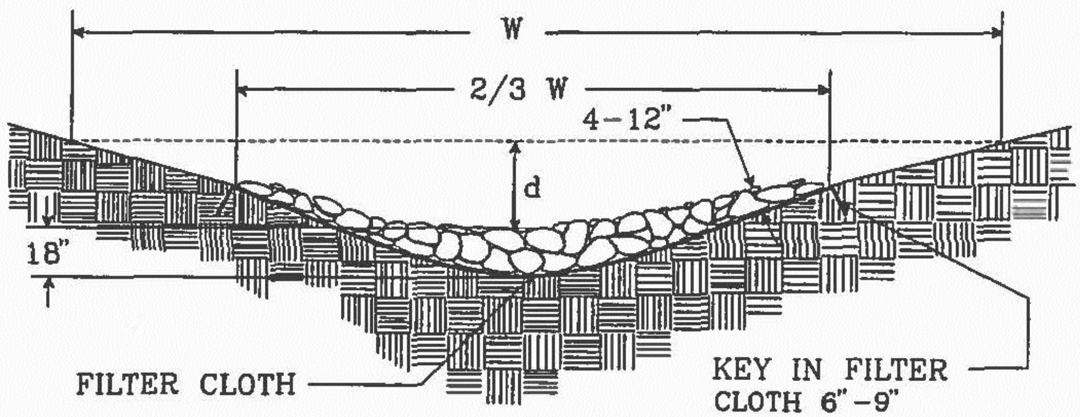
TITLE
RIPRAP GRADATIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6F



V–SHAPED WATERWAY WITH STONE CENTER DRAIN

NOTE: A GRANULAR FILTER MAY BE SUBSTITUTED FOR FILTER CLOTH.



PARABOLIC WATERWAY WITH STONE CENTER DRAIN

NOTE: A GRANULAR FILTER MAY BE SUBSTITUTED FOR FILTER CLOTH.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

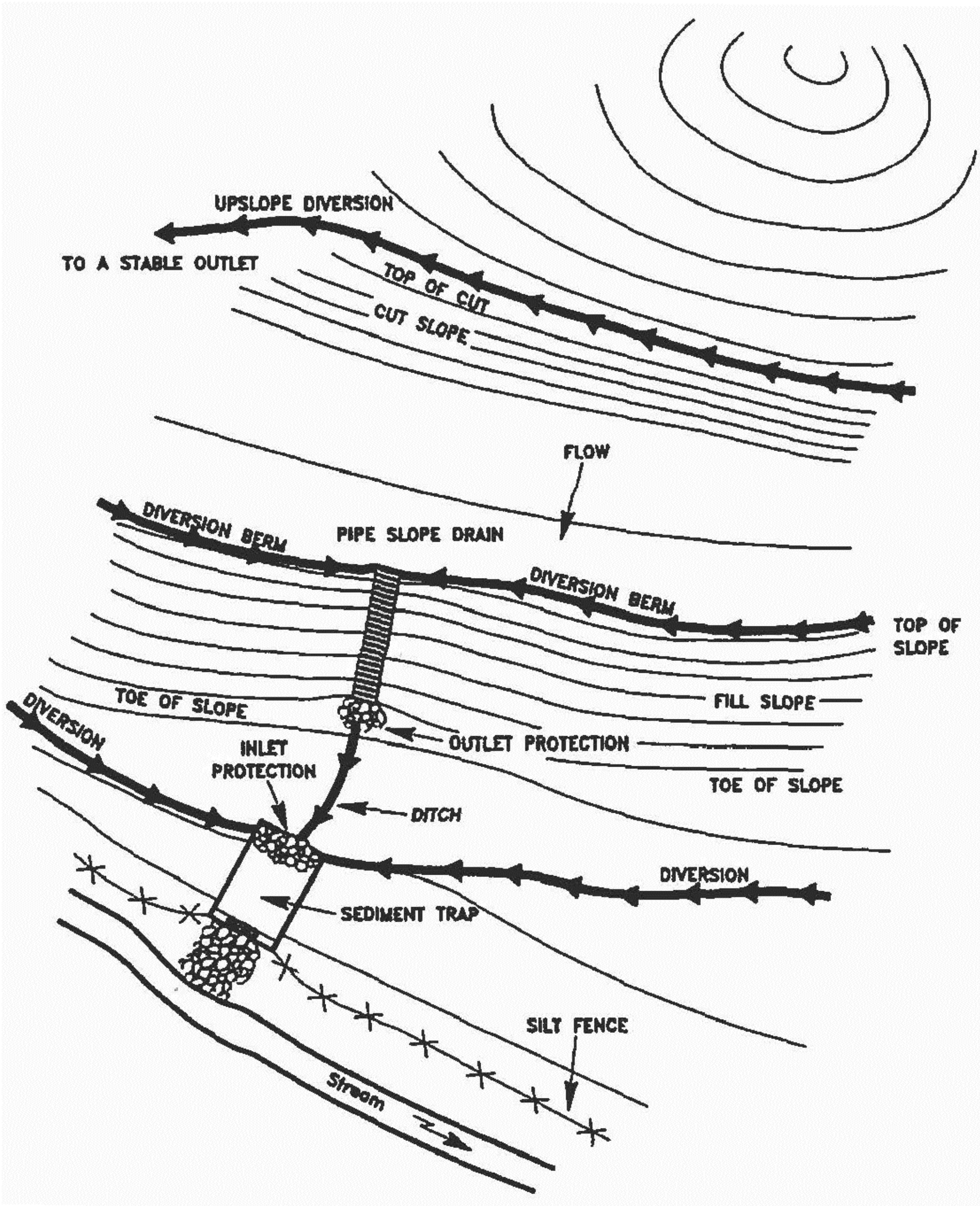
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ARMORED V-SHAPED AND U-SHAPED CHANNELS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6G



CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

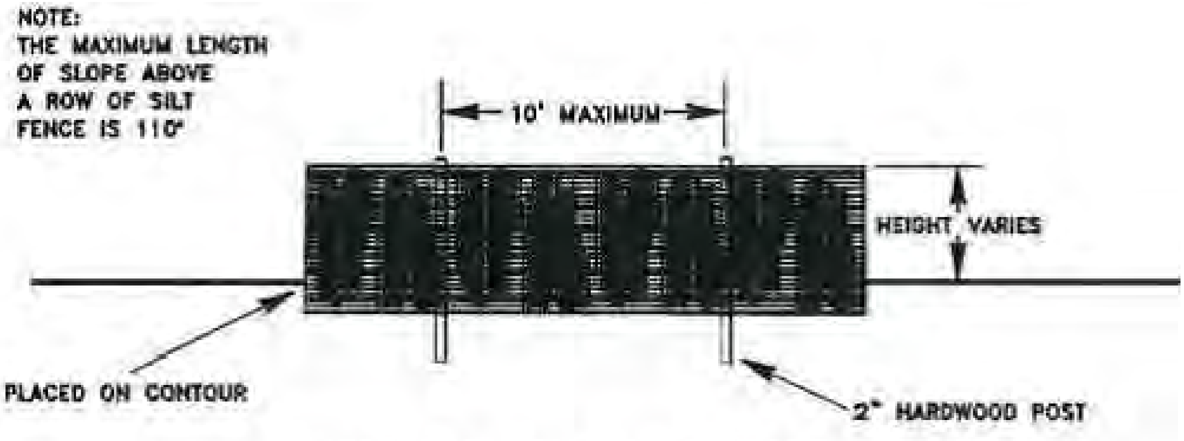
CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

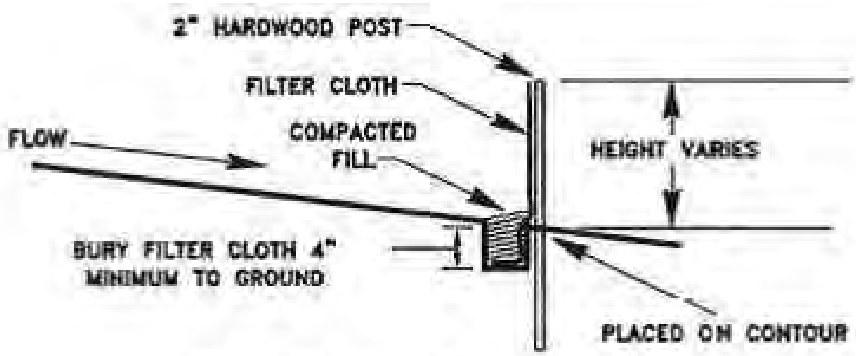
TITLE
TYP SURFACE WATER CONTROL LAYOUT

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	6H

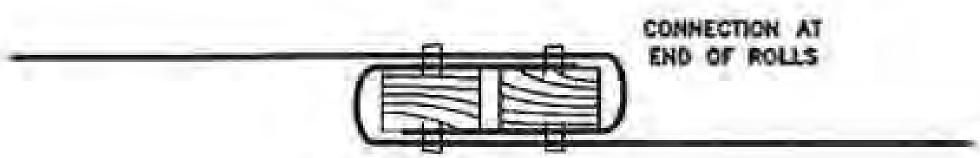
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



FRONT ELEVATION



SIDE ELEVATION



TOP VIEW

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

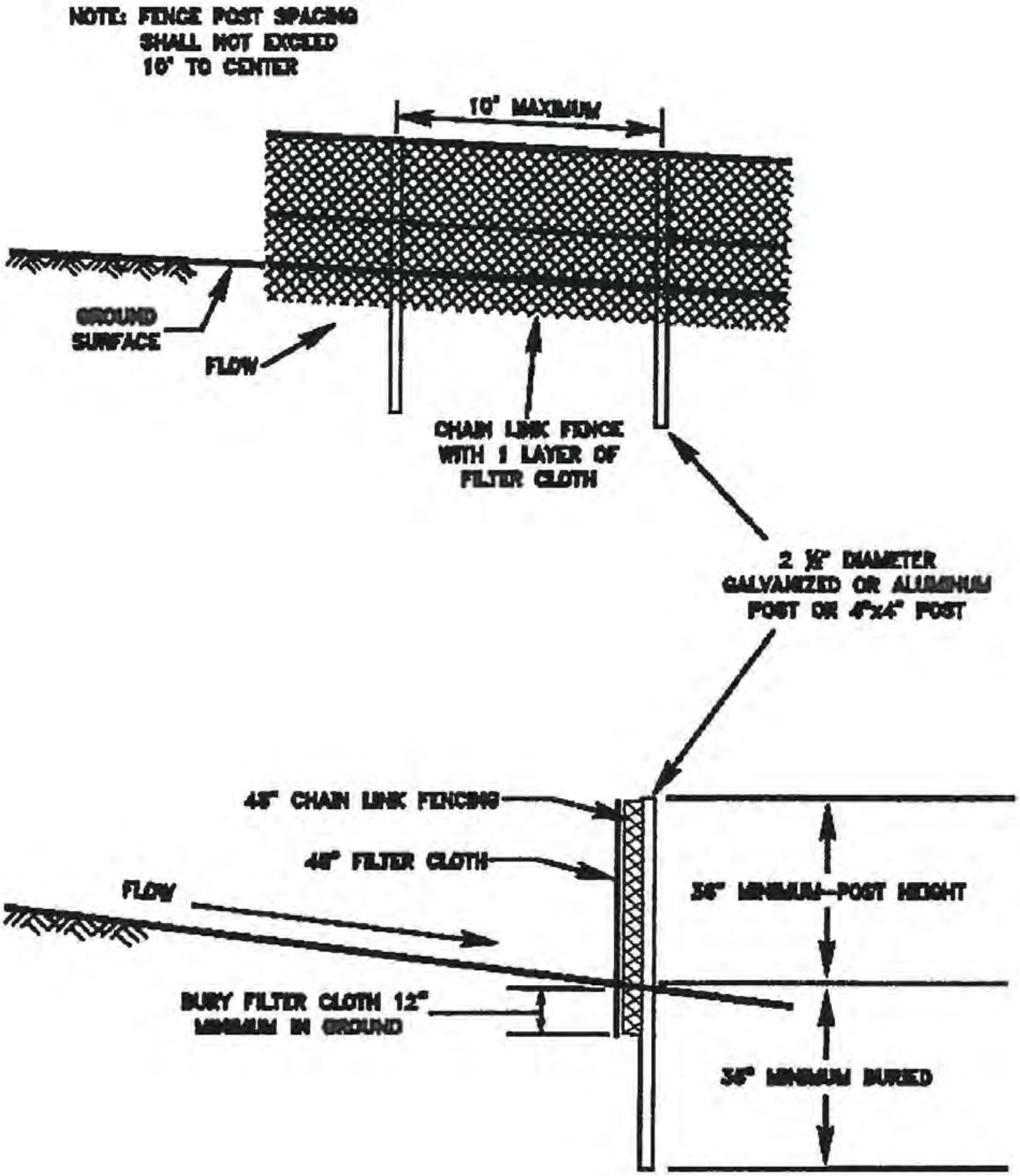
CONSULTANT		
	YYYY-MM-DD	2017-02-28
	PREPARED	REDMOND
	DESIGN	DBC
	REVIEW	-
	APPROVED	AQK

TITLE
SILT FENCE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	7A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SUPER SILT FENCE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	7B

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

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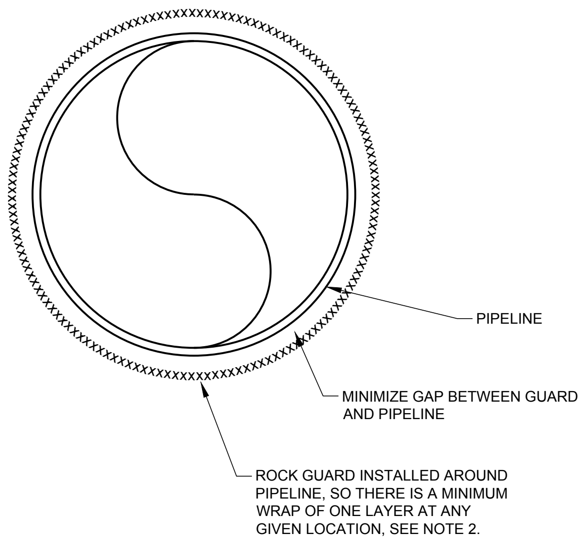


NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SECURE ROCK GUARD PER MANUFACTURER SPECIFICATIONS , OR AS DIRECTED BY THE ENGINEER.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ROCK GUARD ON PIPELINE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	8A

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.
2. OPTIONS FOR BUOYANCY CONTROL INCLUDE THE USE OF CONCRETE COATING, SET-ON CONCRETE WEIGHTS, SET-ON BAGS FILLED ROCK MATERIALS, ANCHORS WITH BANDING OVER THE PIPELINE, OR DEEP BURIAL.
3. FINAL SELECTION OF BUOYANCY CONTROL SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO IMPLEMENTATION.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

0

CLIENT
DOMINION

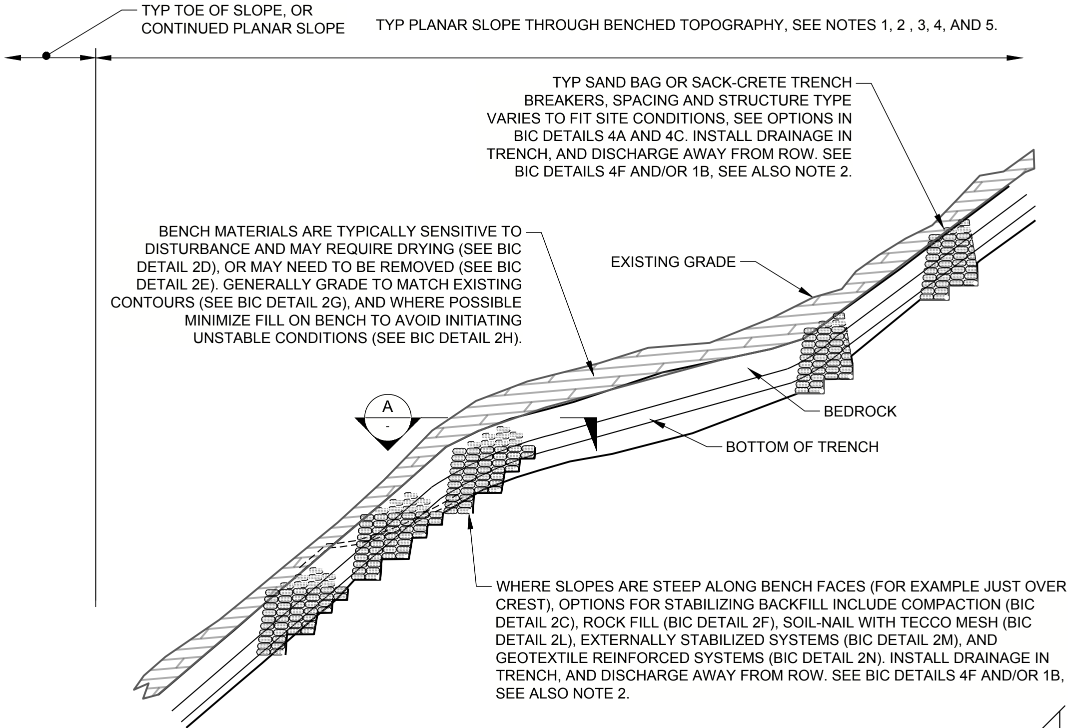
PROJECT
BIC/INCREMENTAL CONTROLS

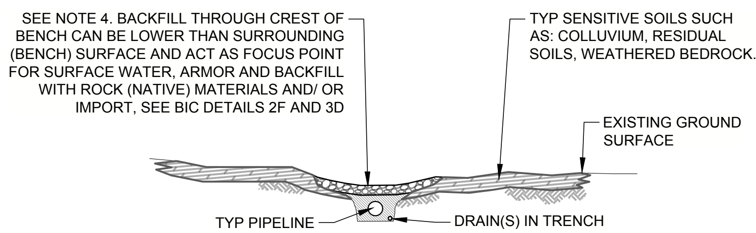
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

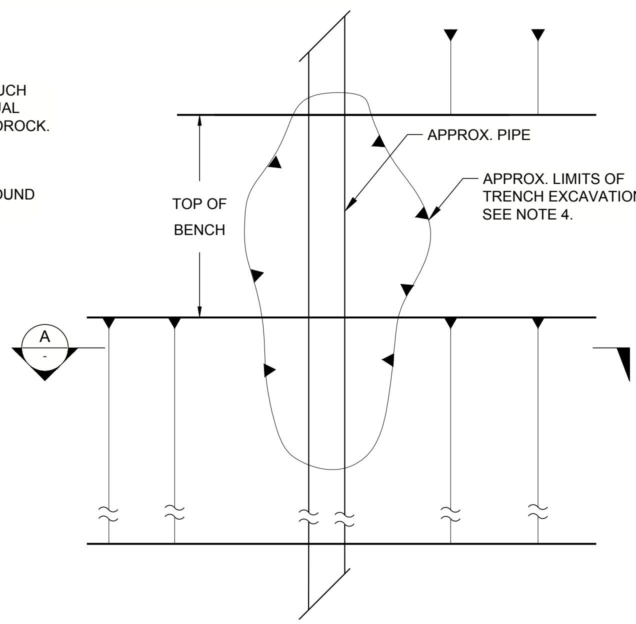
TITLE
BUOYANCY MITIGATION

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	9A





A / - **TYP SECTION VIEW**



A / - **TYP PLAN VIEW**

NOTE(S)

1. TRENCH EXCAVATIONS INTO SHALLOW BEDROCK IN AREAS MAY RESULT IN INSUFFICIENT AMOUNTS OF BACKFILL AND PADDING/BEDDING DUE TO LARGER, ANGULAR SPOIL MATERIAL. ROCK GUARD MATERIALS MAY BE NEEDED TO PROTECT THE PIPELINE, SEE BIC DETAIL 8A.
2. TRENCH EXCAVATIONS INTO BEDROCK IN STEEPLY SLOPED TERRAIN (PLANAR SLOPES & INCLINED RIDGES) MAY REQUIRE TRENCH BREAKERS WITH SUFFICIENT MASS AND GEOTECHNICAL PERFORMANCE TO RETAIN BACKFILL SOILS AND/OR ROCK MATERIALS. USE OF FOAM BREAKERS IN THESE CONDITIONS IS NOT RECOMMENDED.
3. ALTERNATING LAYERS OF WEAKER BEDROCK AND STRONGER BEDROCK MATERIALS OFTEN CREATES A "BENCHED" OR "STAIR-STEPPED" APPEARANCE TO EXISTING HILL SLOPES. MAINTAIN POSITIVE DRAINAGE ACROSS BENCHES WHEN RESTORING OR MODIFYING ROW CONTOURS TO ALLOW POSITIVE DRAINAGE AND TO AVOID ACCUMULATION OF WATER ON BENCH SURFACES (WHICH CAN INFILTRATE AND SATURATE LOCAL SOILS).
4. EXCAVATIONS THROUGH BENCH CREST CREATES WIDER CUT WHERE TRENCH DEPTH INCREASES, REQUIRES RESTORATION OF INCREASED DEPTH EXCAVATIONS; MAY REQUIRE SACK-CRETE BREAKERS TO BUILD AND STABILIZE BACKFILL.
5. SHALLOW BEDROCK MAY REQUIRE BLASTING, HAMMERING, AND/OR CHIPPING TO EXCAVATE ROW AND TRENCH.

CLIENT
DOMINION

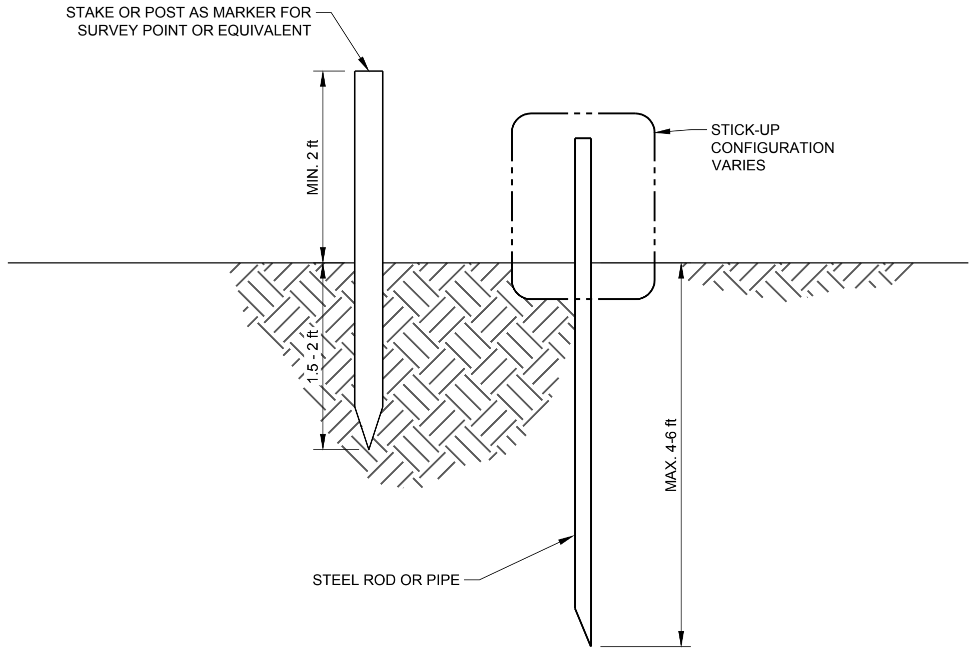
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP BENCH RE-CONSTRUCTION

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	10A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

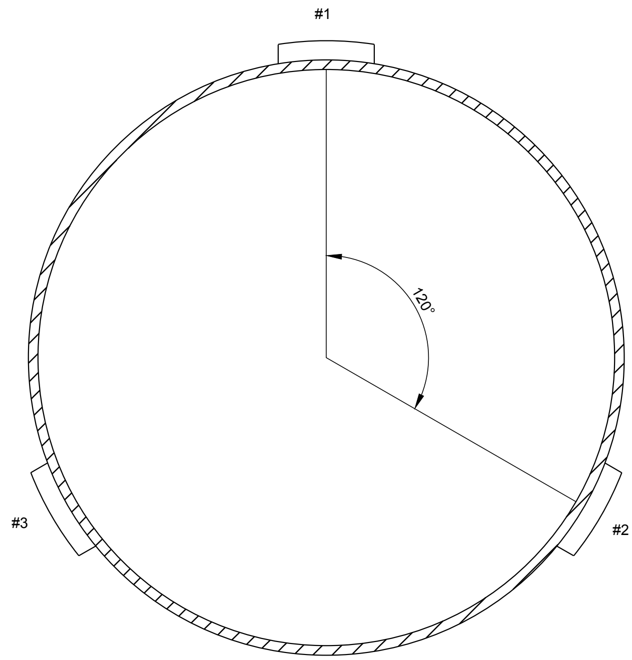
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
GEODETIC MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11A



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

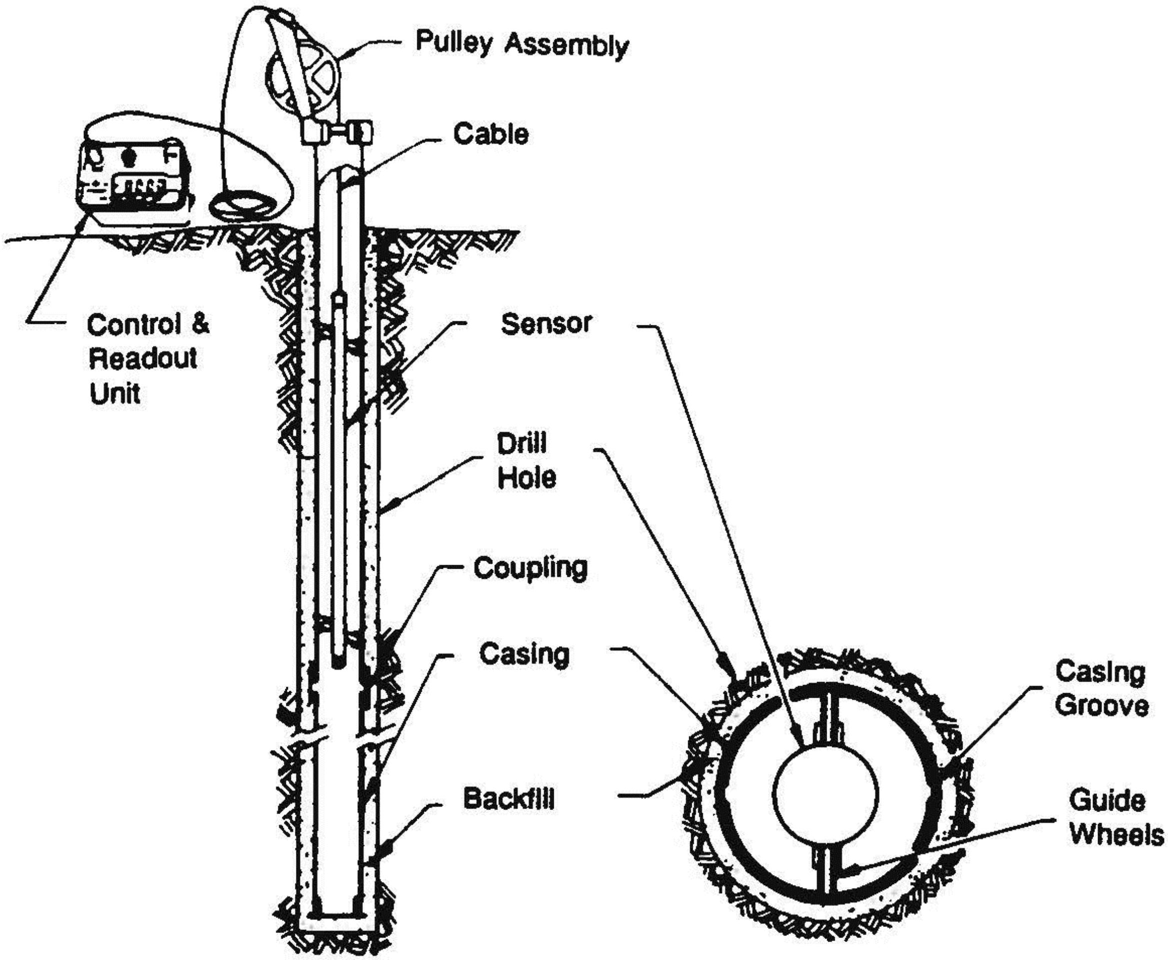
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STRAIN GAUGE MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11B



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

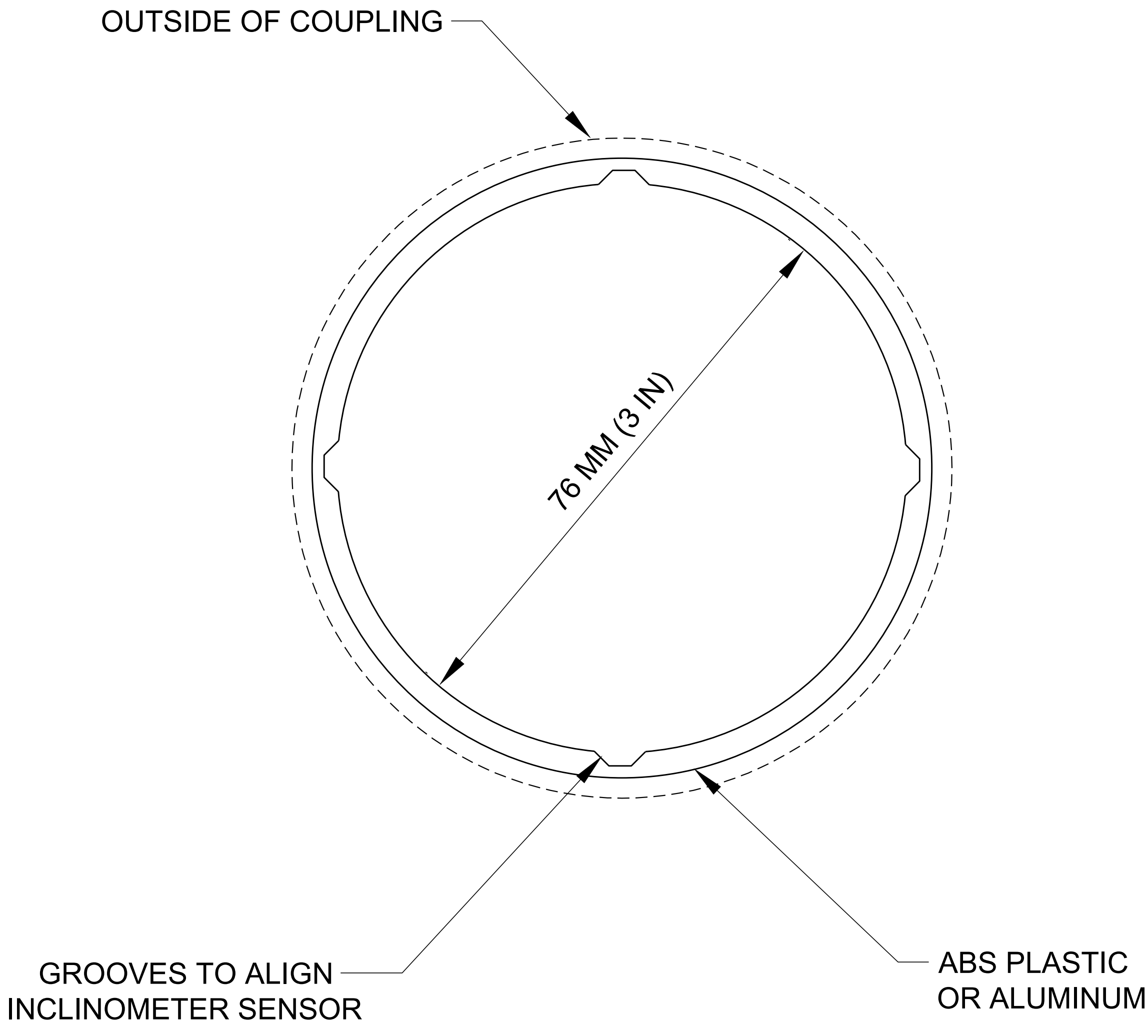
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE INCLINOMETER MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11C



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

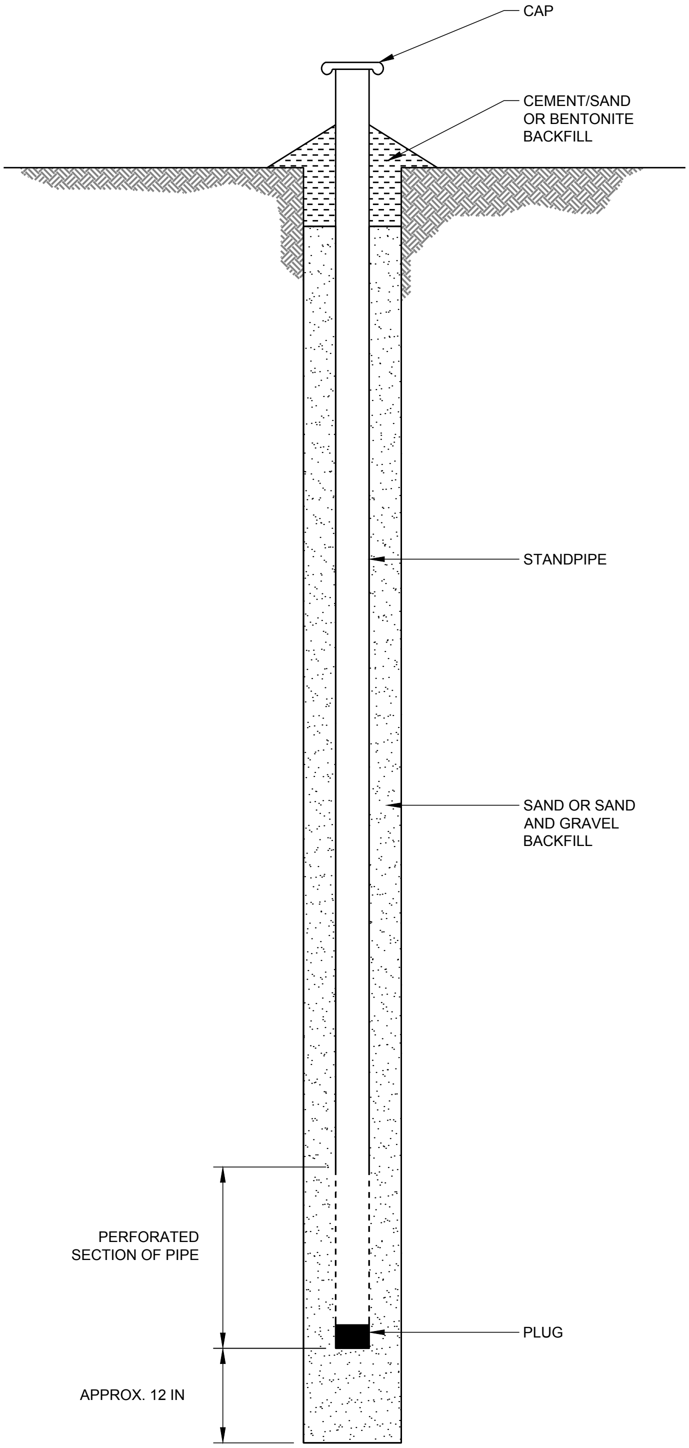
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SLOPE INCLINOMETER CASING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11D

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STANDPIPE PIEZOMETER MONITORING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11E

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. COMPLETE AS-BUILT SURVEY OF INSTALLED TRENCH BREAKERS LOCATIONS, SO THAT SLOPE BREAKERS (WHICH ARE CONSTRUCTED LATER DURING ROW RESTORATION) CAN BE LOCATED TO CORRESPOND TO INSTALLED TRENCH BREAKERS. SLOPE BREAKERS TYPICALLY ARE LOCATED CLOSE TO AND JUST DOWNSLOPE OF TRENCH BREAKERS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

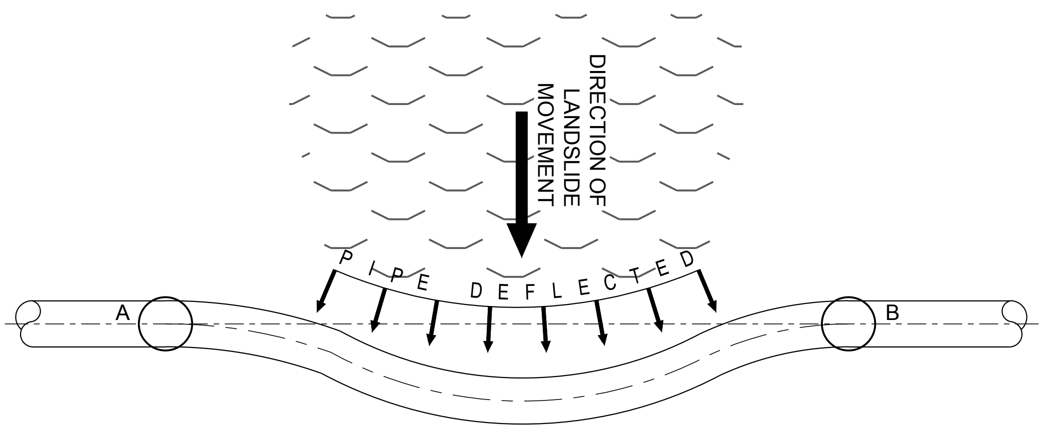
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

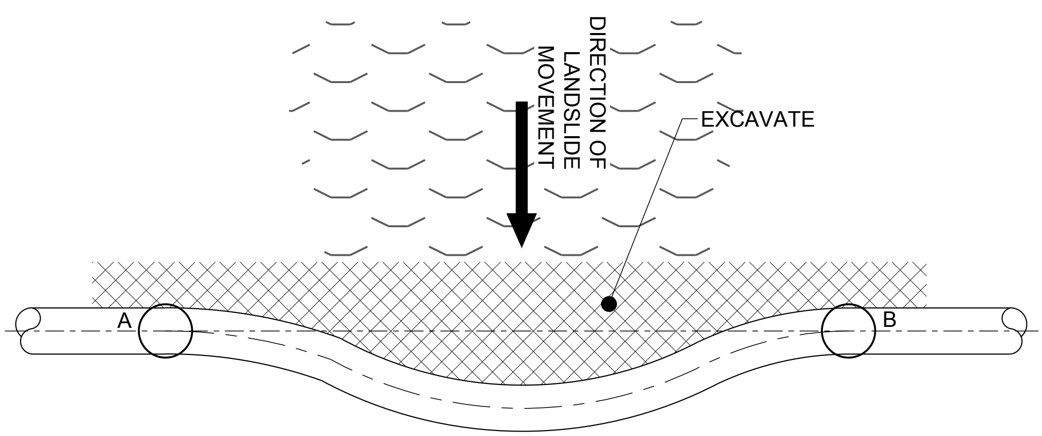
TITLE
AS-BUILT SURVEY TRENCH AND SLOPE BREAKERS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	11F

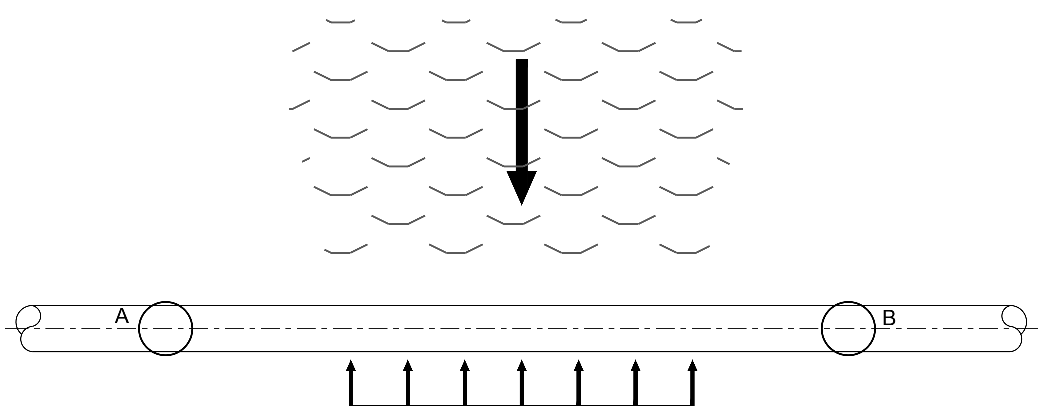
BEFORE STRAIN RELIEF EXCAVATION



DURING STRAIN RELIEF EXCAVATION



AFTER STRAIN RELIEF EXCAVATION



NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT
DOMINION

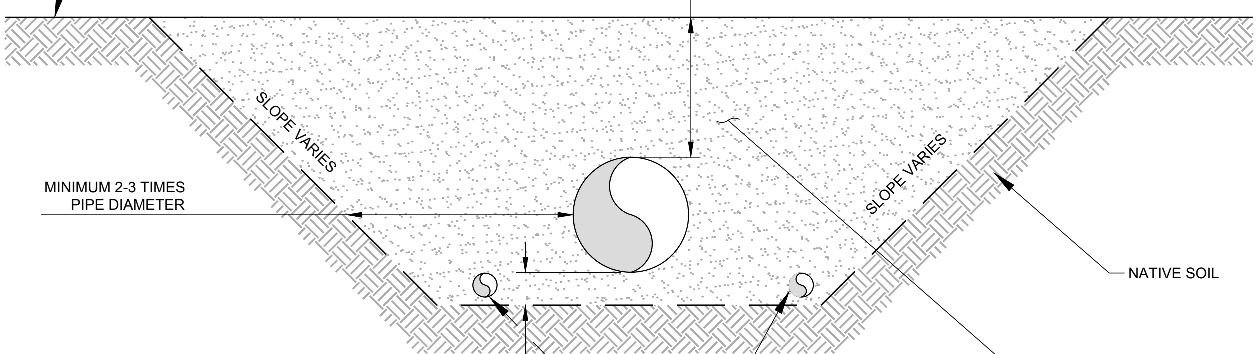
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
STRESS RELIEF EXCAVATIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	12A



GRAIN SIZE TABLE

PERCENT PASSING	MINIMUM
$\frac{3}{8}$ INCH	100
U.S. NO. 4	96
8	78
16	60
30	34
50	14
100	2
200	0

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SELECT BACKFILL SHALL CONSIST OF SANDY. INVERT GRANULAR MATERIAL, EITHER NATURALLY OCCURRING OR PROCESSED. IT SHALL BE FREE FROM ORGANICS, SILT CLAY, SWELLING SOILS, GARBAGE, WOOD, OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.

3. SAND SHALL BE WELL GRADED FROM COARSE TO FINE. THE GRAIN SIZE DISTRIBUTION SHALL CONFORM TO THE FOLLOWING.

CLIENT
DOMINION

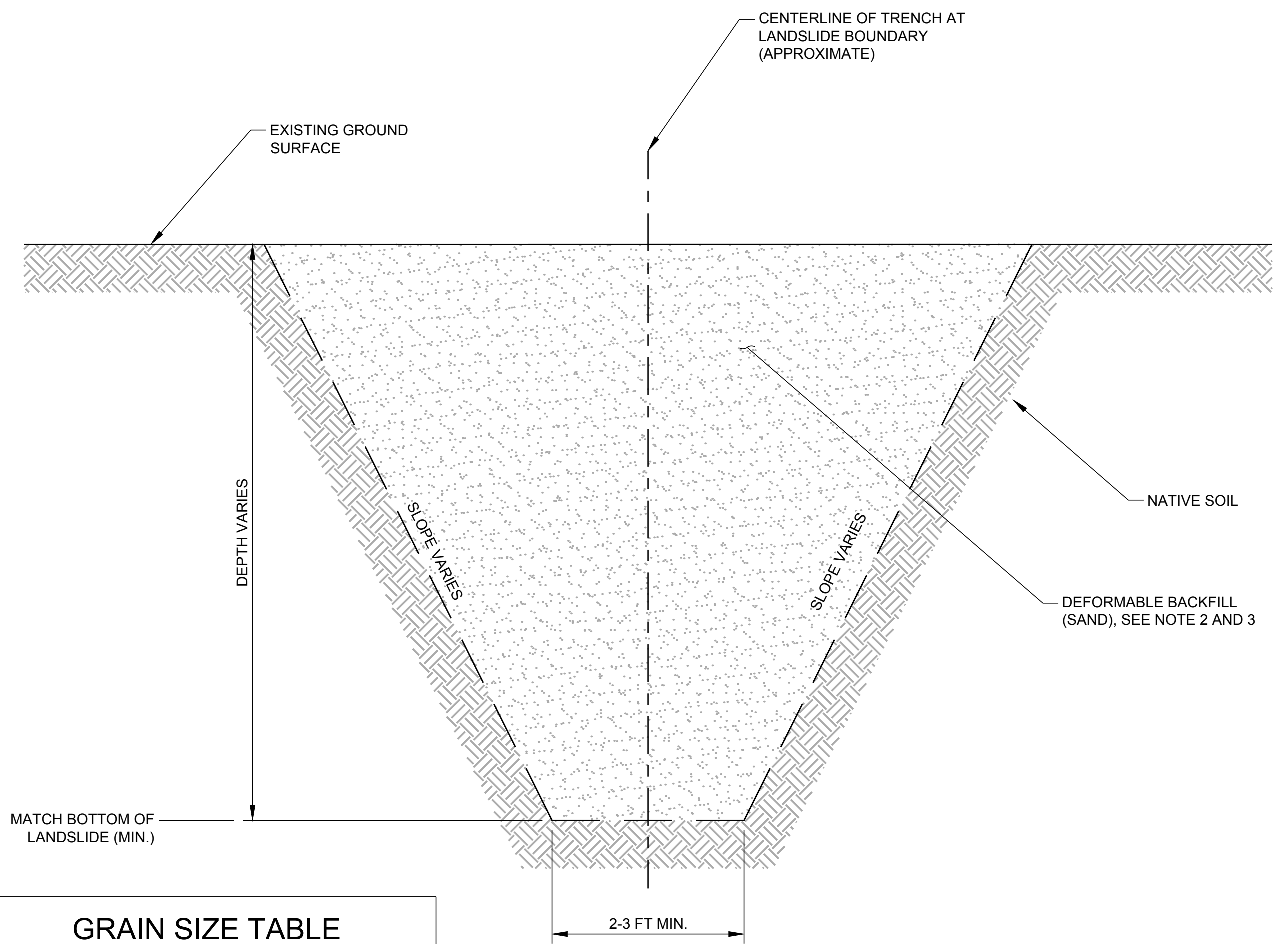
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SELECT (DEFORMABLE) BACKFILL AROUND PIPELINE IN LANDSLIDE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	12B



GRAIN SIZE TABLE

PERCENT PASSING	MINIMUM
$\frac{3}{8}$ INCH	100
U.S. NO. 4	96
8	78
16	60
30	34
50	14
100	2
200	0

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SELECT BACKFILL SHALL CONSIST OF SANDY. INVERT GRANULAR MATERIAL, EITHER NATURALLY OCCURRING OR PROCESSED. IT SHALL BE FREE FROM ORGANICS, SILT CLAY, SWELLING SOILS, GARBAGE, WOOD, OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.

3. SAND SHALL BE WELL GRADED FROM COARSE TO FINE. THE GRAIN SIZE DISTRIBUTION SHALL CONFORM TO THE FOLLOWING.

CLIENT
DOMINION

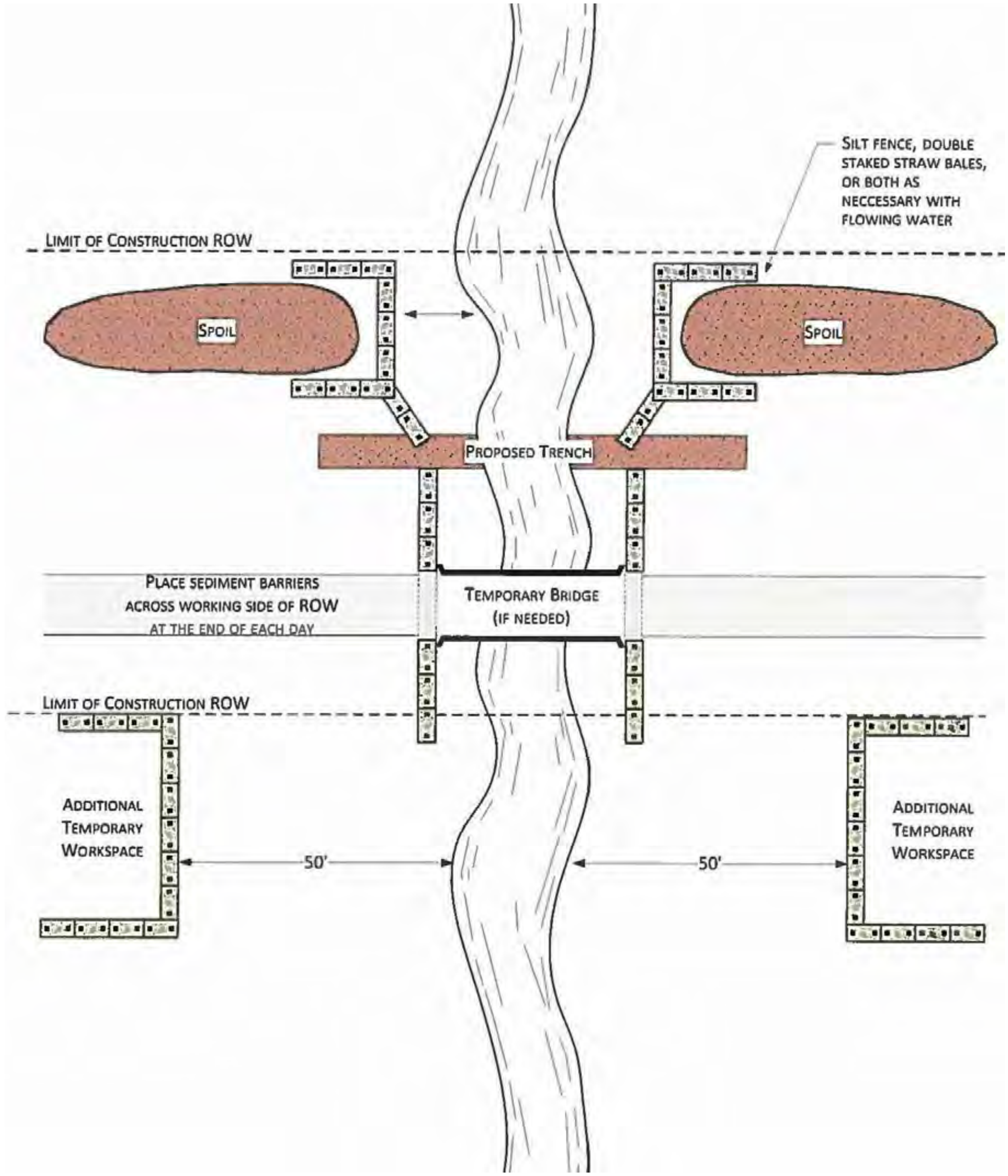
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

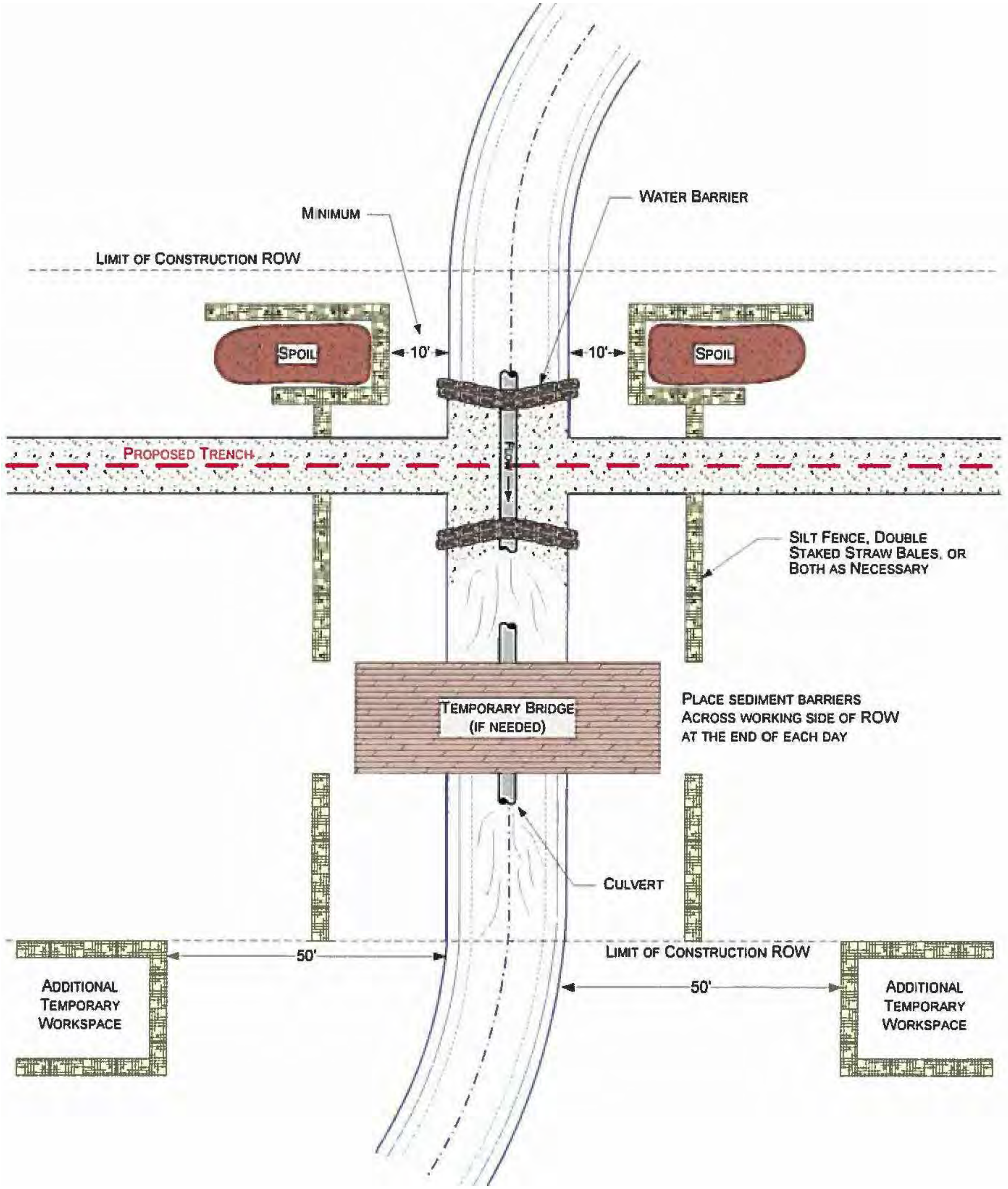
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SHEAR TRENCH

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	12C



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD: 2017-02-28	TITLE **TYP WATERBODY OPEN CUT**	
Golder Associates	PREPARED: REDMOND		
	DESIGN: DBC		
	REVIEW: -		
	APPROVED: AQK	PROJECT No. 1535050 / PHASE 500 / Rev. F	FIGURE 13A



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD: 2017-02-28	TITLE **TYP WATERBODY FLUME METHOD**	
Golder Associates	PREPARED: REDMOND		
	DESIGN: DBC		
	REVIEW: -	PROJECT No. 1535050	PHASE 500
	APPROVED: AQK	Rev. F	FIGURE 13B

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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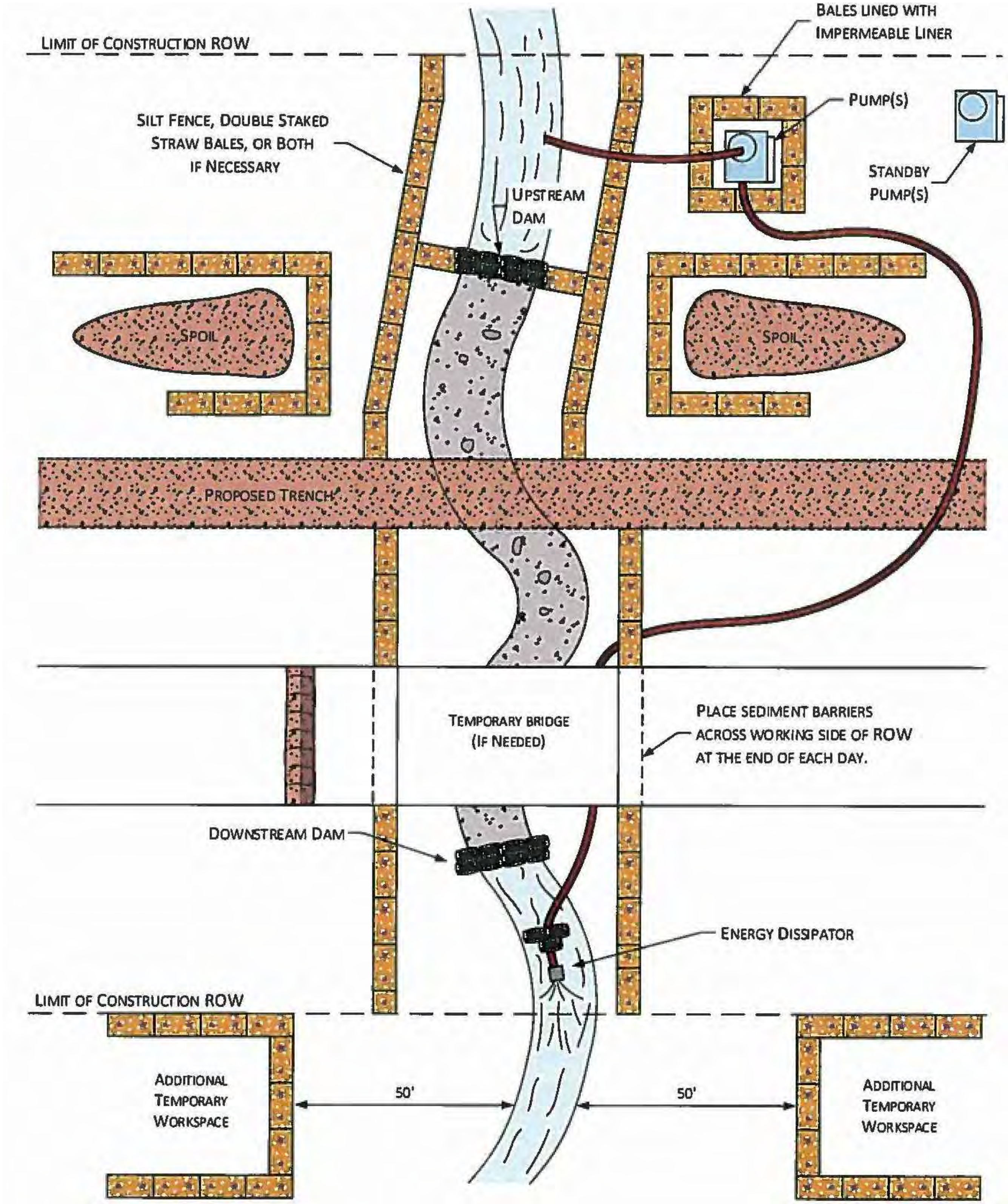
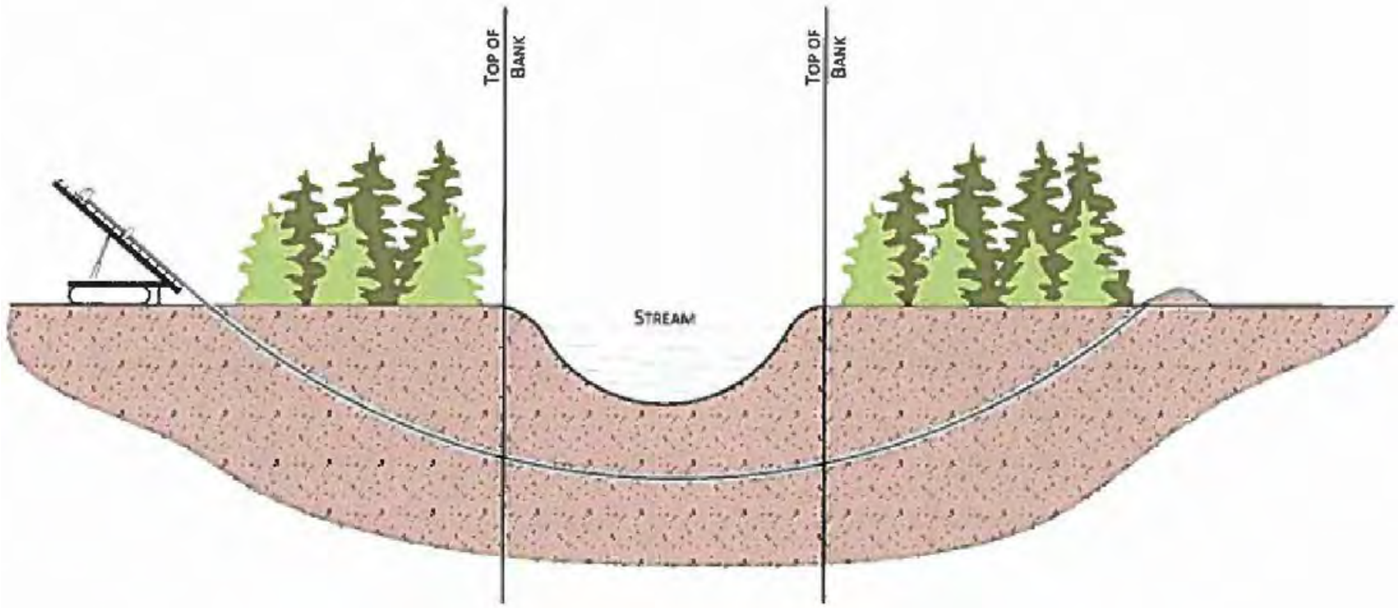


CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE TYP WATERBODY DAM AND PUMP
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13C



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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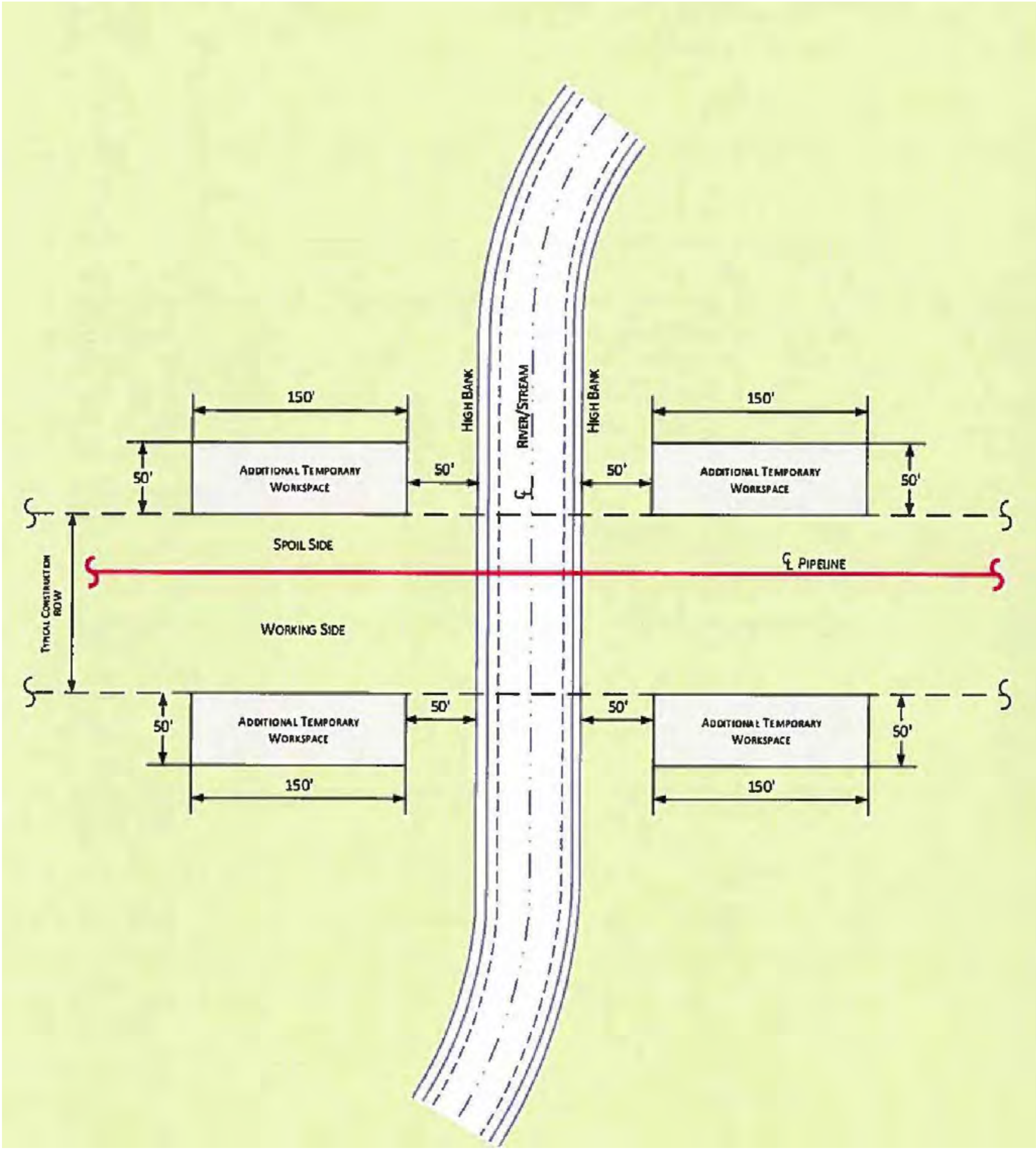
CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **TYP WATERBODY HDD METHOD**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	
	APPROVED	AQK	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 13D



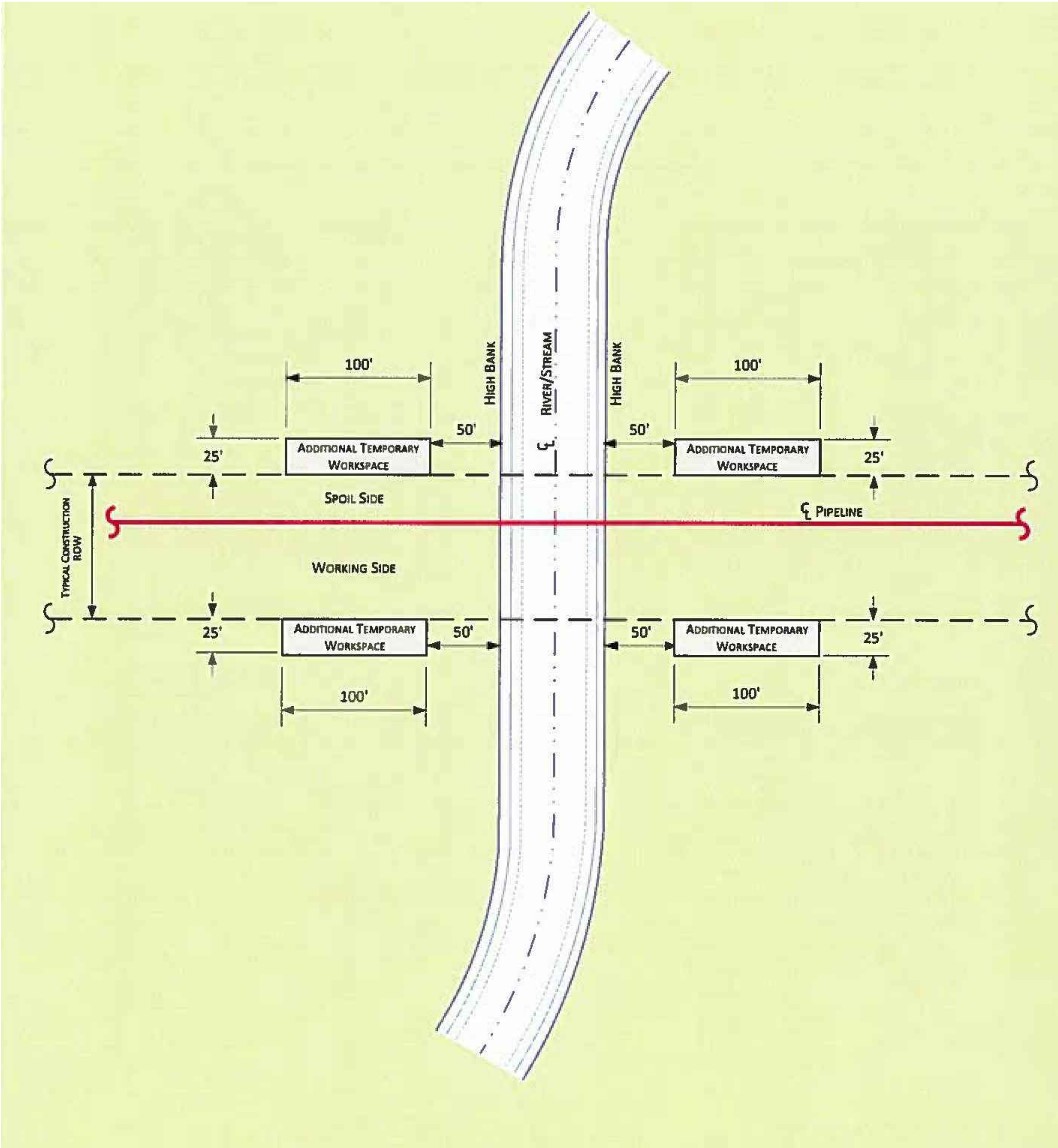
CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT		
Golder Associates	YYYY-MM-DD	2017-02-28
	PREPARED	REDMOND
	DESIGN	DBC
	REVIEW	-
	APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13E-1

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

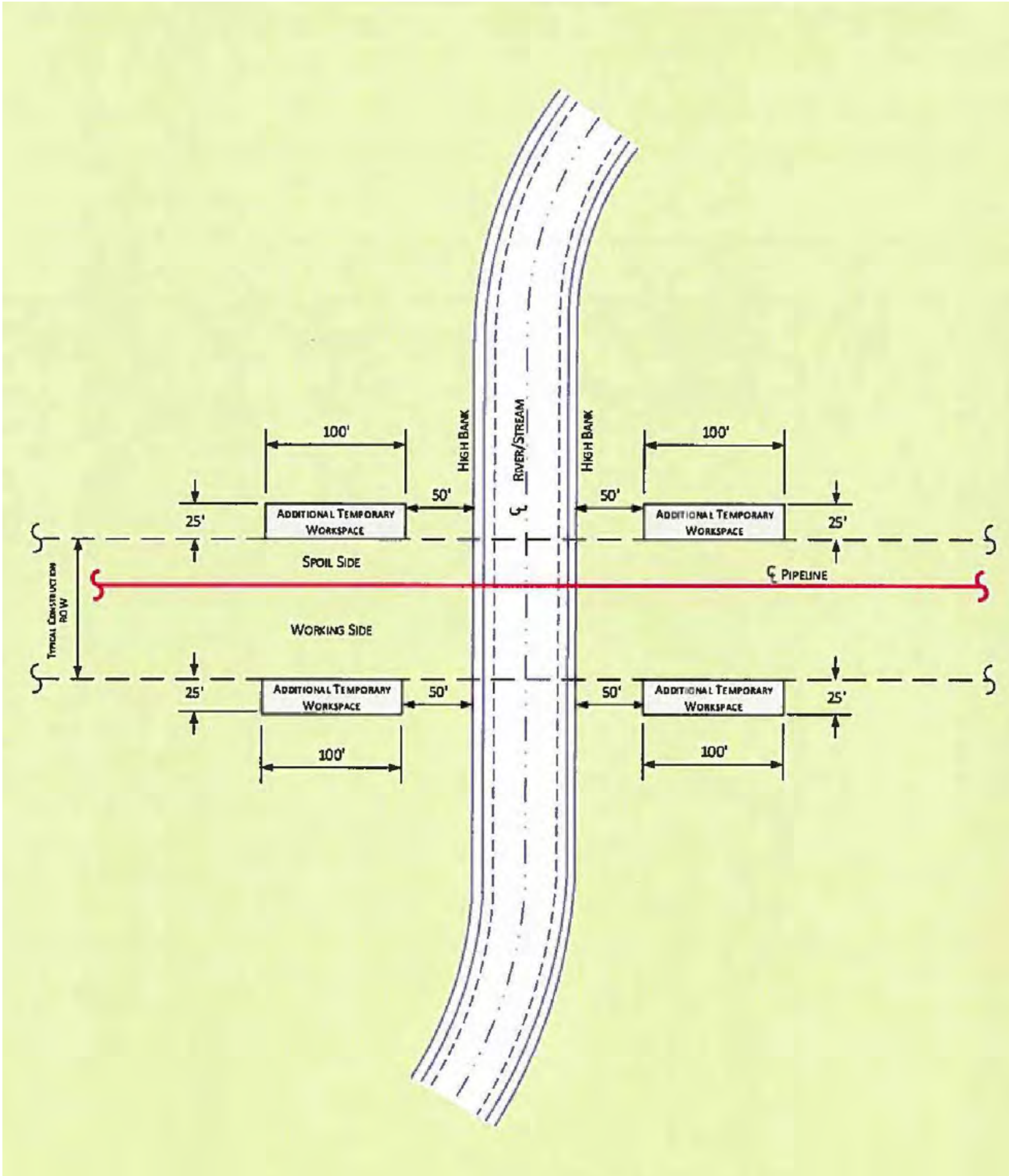
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT WATERBODY ACP AP-1 AP-2 AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13E-2

0 1 in



CLIENT DOMINION	PROJECT BIC/INCREMENTAL CONTROLS

CONSULTANT		
Golder Associates	YYYY-MM-DD	2017-02-28
	PREPARED	REDMOND
	DESIGN	DBC
	REVIEW	-
	APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT WATERBODY SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13E-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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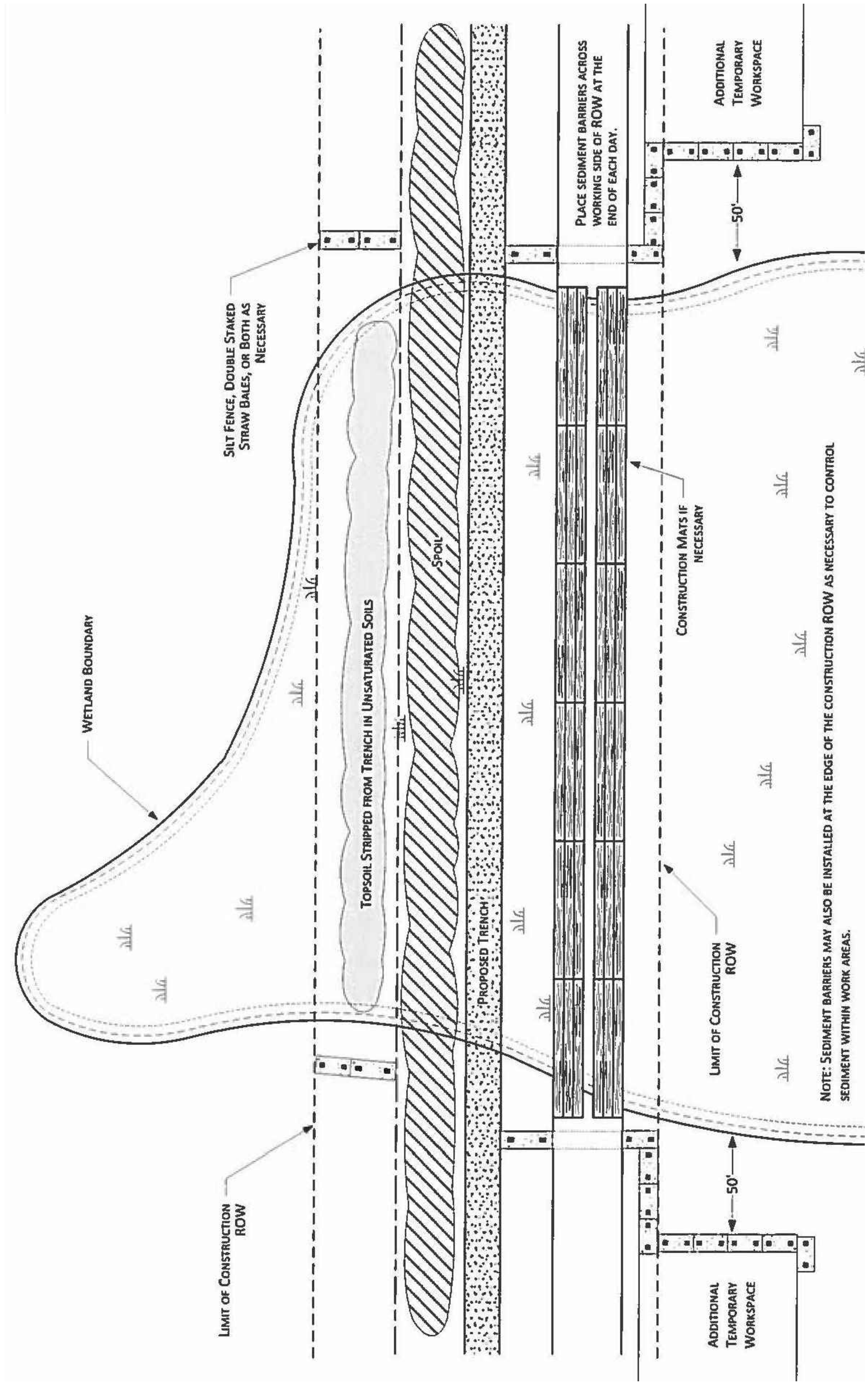


CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

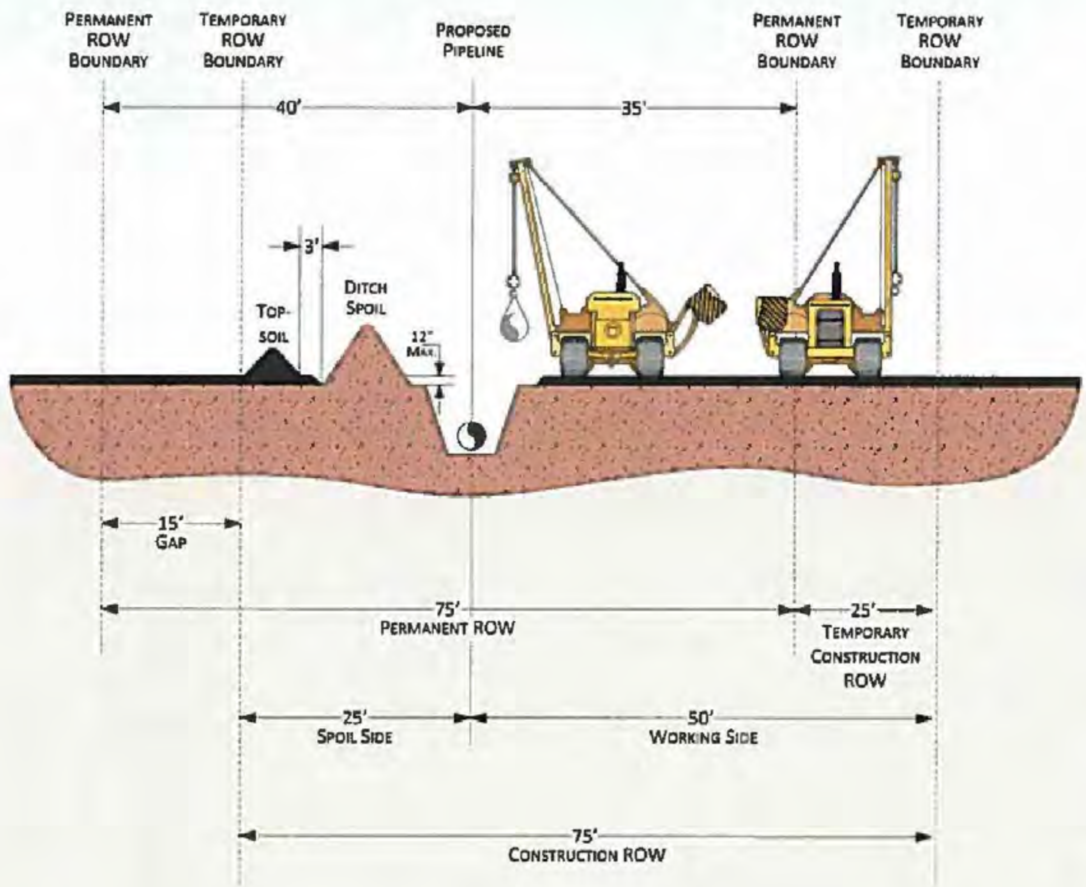
CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP WETLAND OPEN CUT METHOD ACP AP-1 AP-2 AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13F

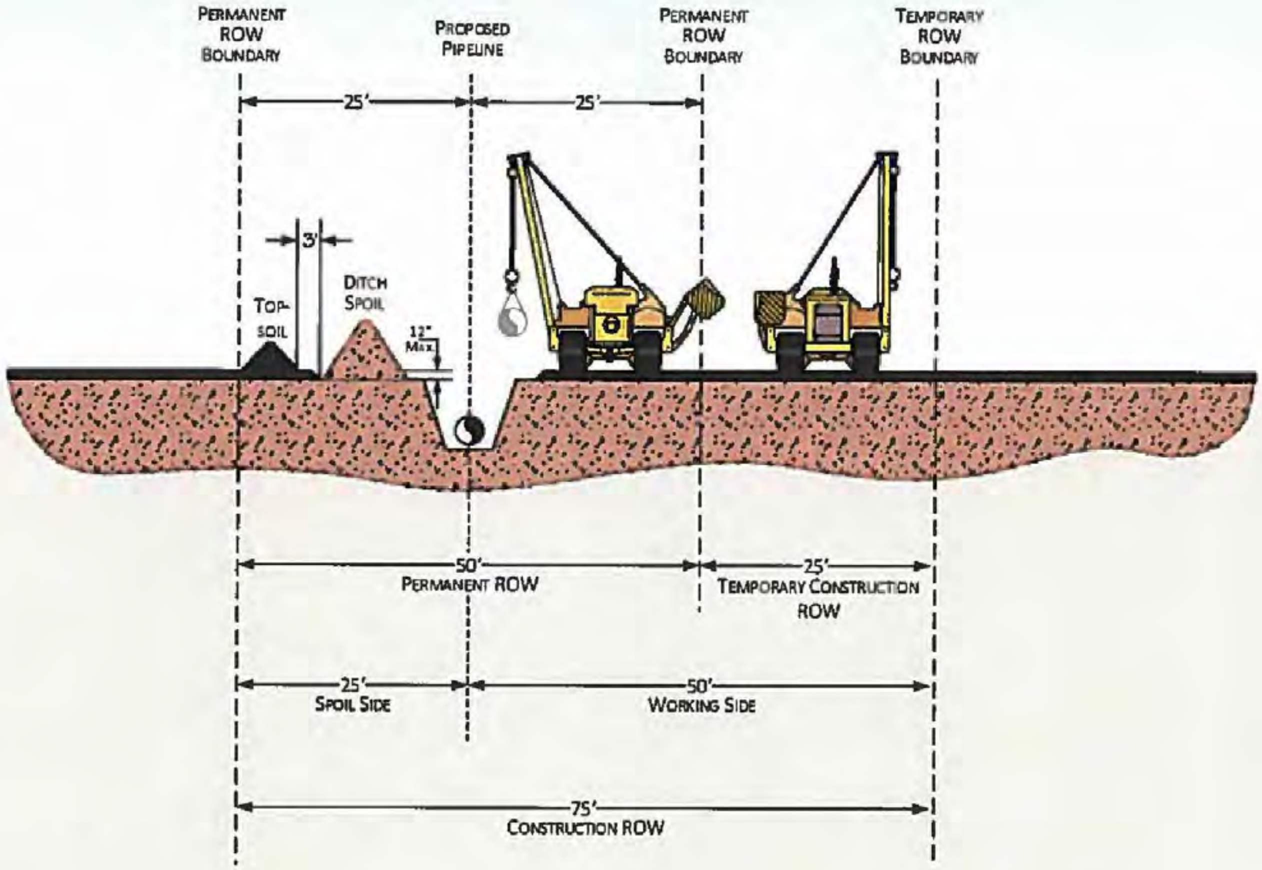


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE WITH 25' ON THE SPOIL SIDE AND 50' ON THE WORKING SIDE. THE PERMANENT ROW WILL BE 75' WIDE WITH 40' ON THE SPOIL SIDE AND 35' ON THE WORKING SIDE. THIS WILL LEAVE A 15' GAP BETWEEN THE AREA OF DISTURBANCE DURING CONSTRUCTION AND THE BOUNDARY OF THE PERMANENT ROW. NO IMPACT IS EXPECTED IN THIS AREA.
2. DURING CONSTRUCTION, A WORKING SIDE OF 50 FEET IN WETLANDS WILL BE NECESSARY GIVEN THE DIAMETER OF THE PIPE.
3. DURING OPERATIONS, ATLANTIC PROPOSES A STANDARD PERMANENT EASEMENT IN WETLANDS CONSISTENT WITH OTHER SEGMENTS OF THE PIPELINE. MAINTENANCE ACTIVITIES IN THE PERMANENT EASEMENT WILL BE CONSISTENT WITH THE PROCEDURES.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP CONSTRUCTION ROW IN WETLANDS ACP AP-1
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13G-1

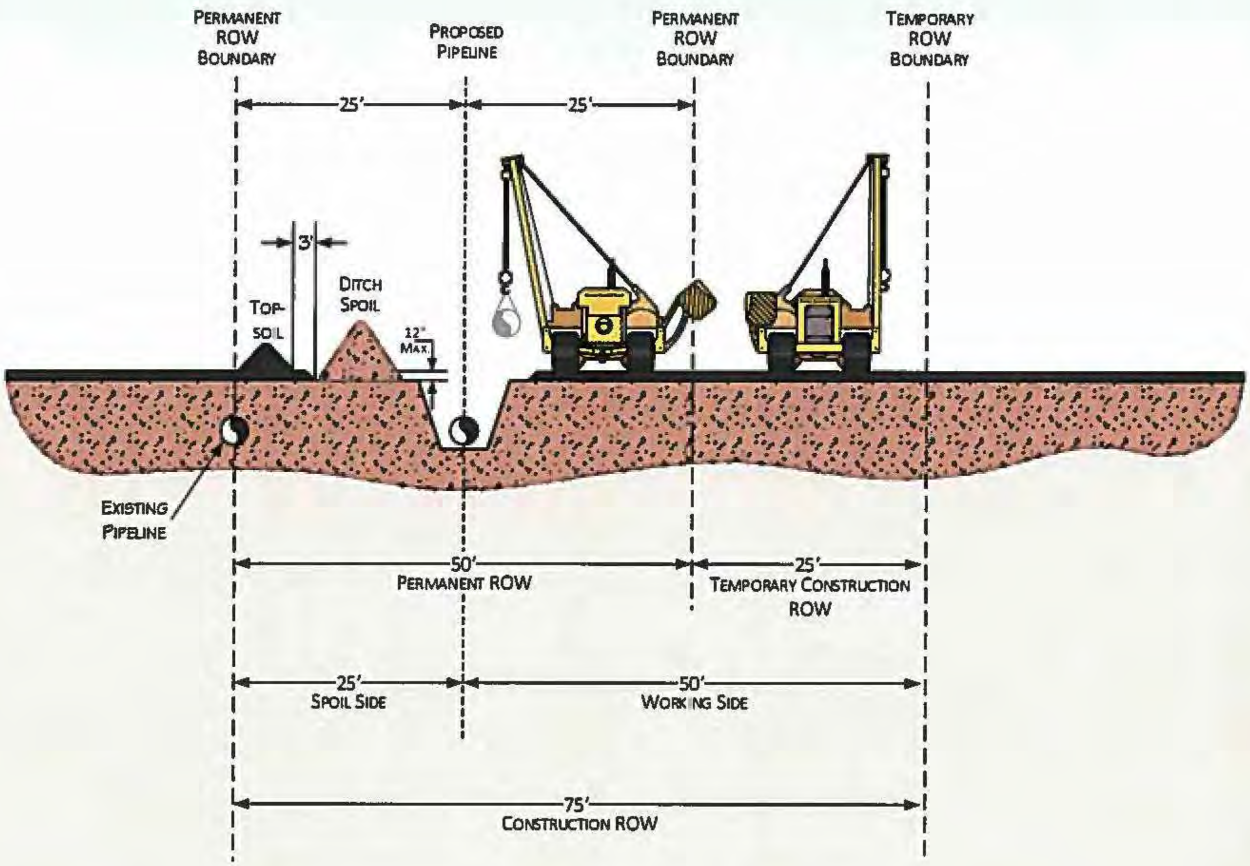


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP CONSTRUCTION ROW IN WETLANDS ACP AP-2
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13G-2



PROFILE

NOTES:

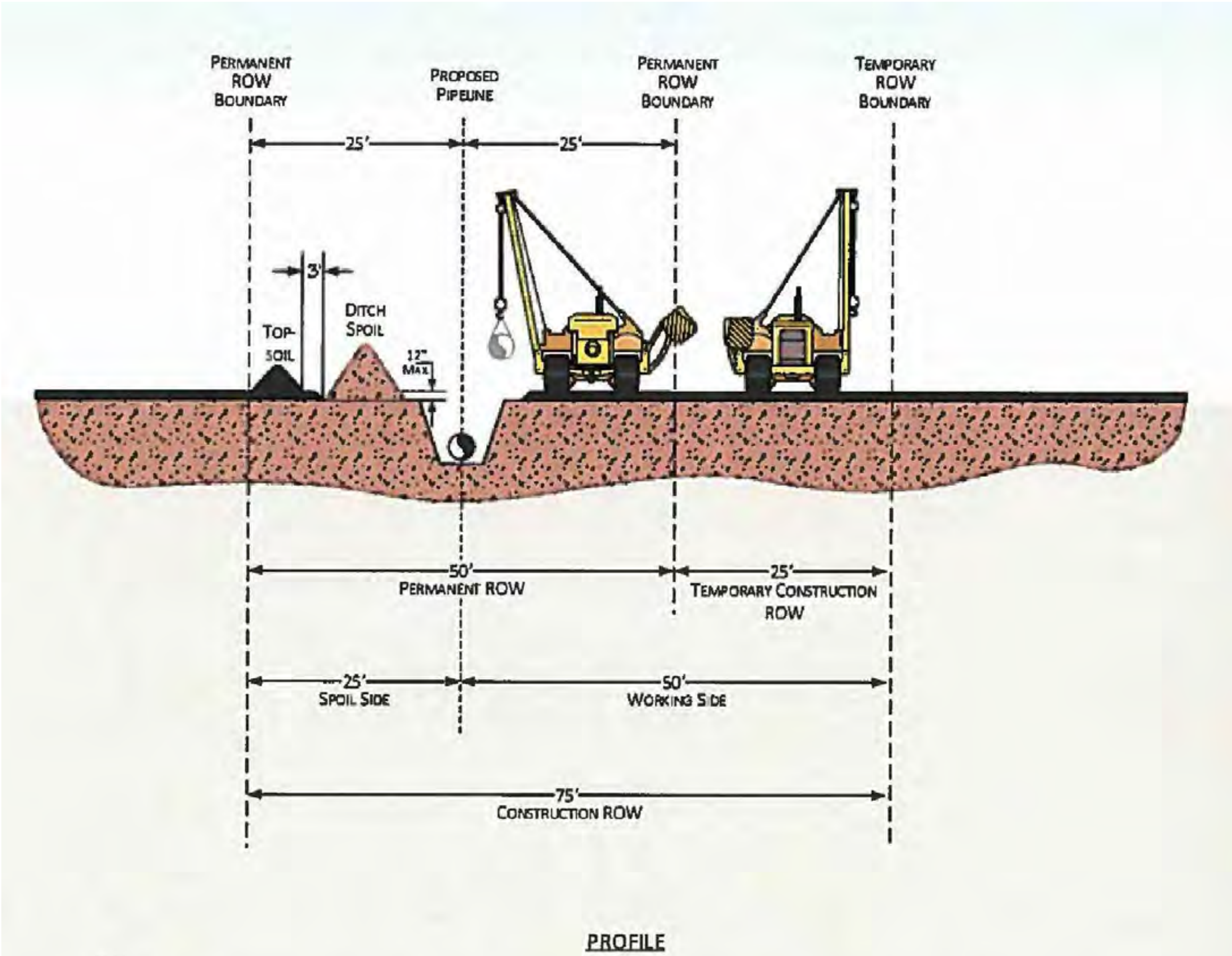
1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	PROJECT
DOMINION	BIC/INCREMENTAL CONTROLS

CONSULTANT		
Golder Associates	YYYY-MM-DD	2017-02-28
	PREPARED	REDMOND
	DESIGN	DBC
	REVIEW	-
	APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN WETLANDS COLLOCATED SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13G-3

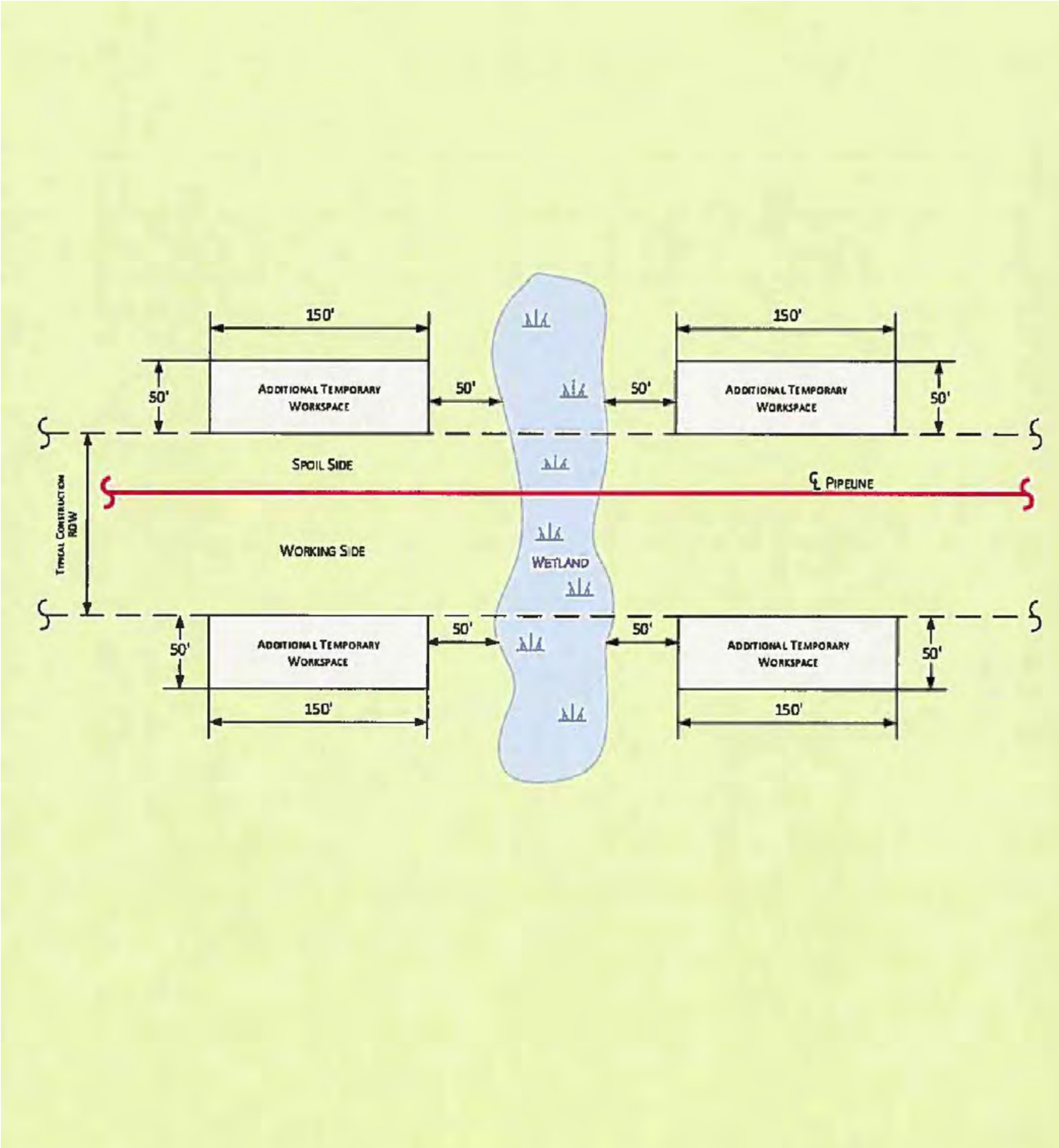


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **TYP CONSTRUCTION ROW IN WETLANDS NOT-COLLOCATED SHP TL-635 TL-636**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 13G-4
	APPROVED	AQK	



CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-1** PROJECT No. 1535050 — PHASE 500 — Rev. F — FIGURE 13H-1

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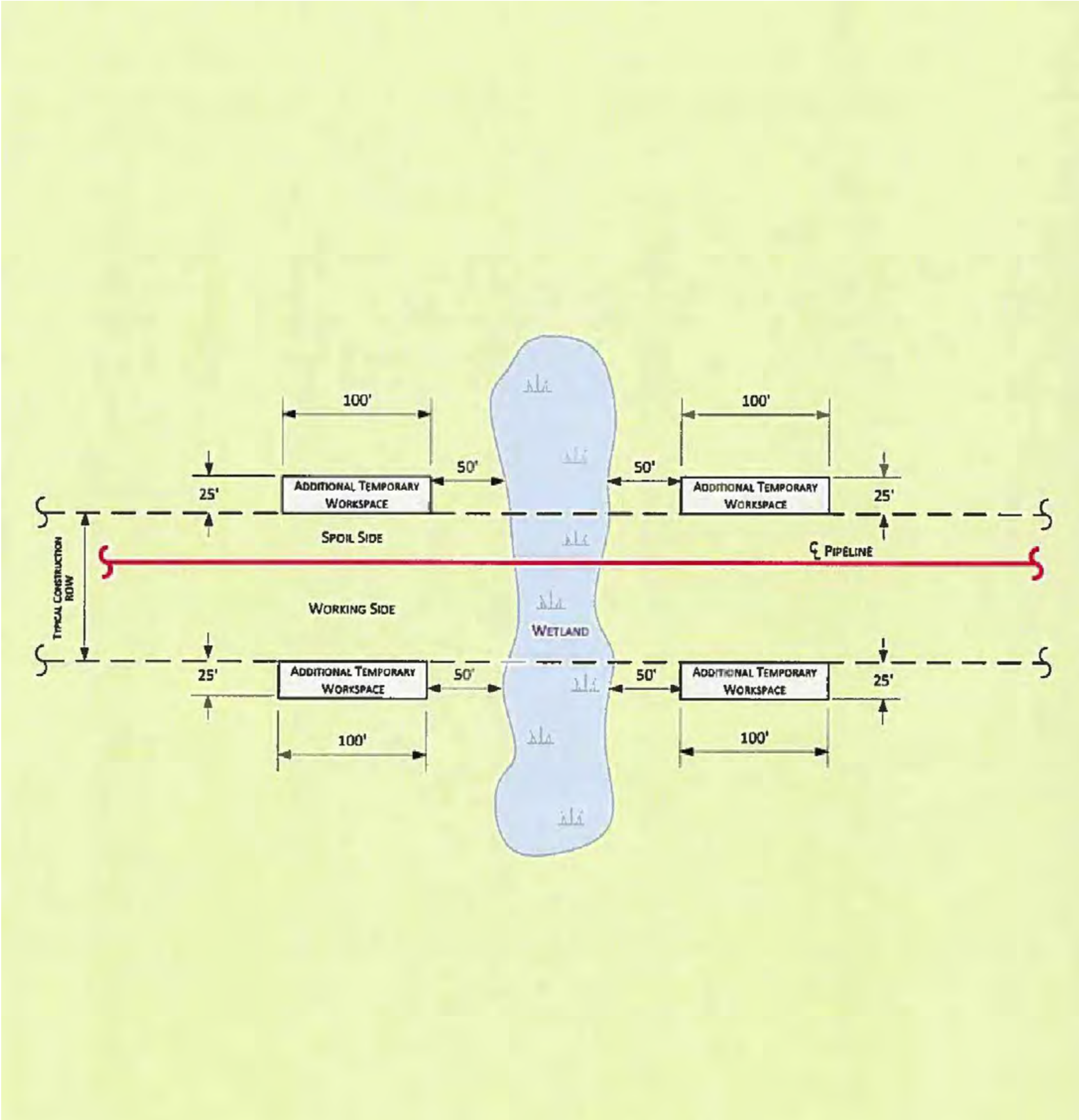

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS ACP AP-2 AP-3 AP-4 AP-5**	
		PROJECT No. 1535050 / PHASE 500	Rev. F / FIGURE 13H-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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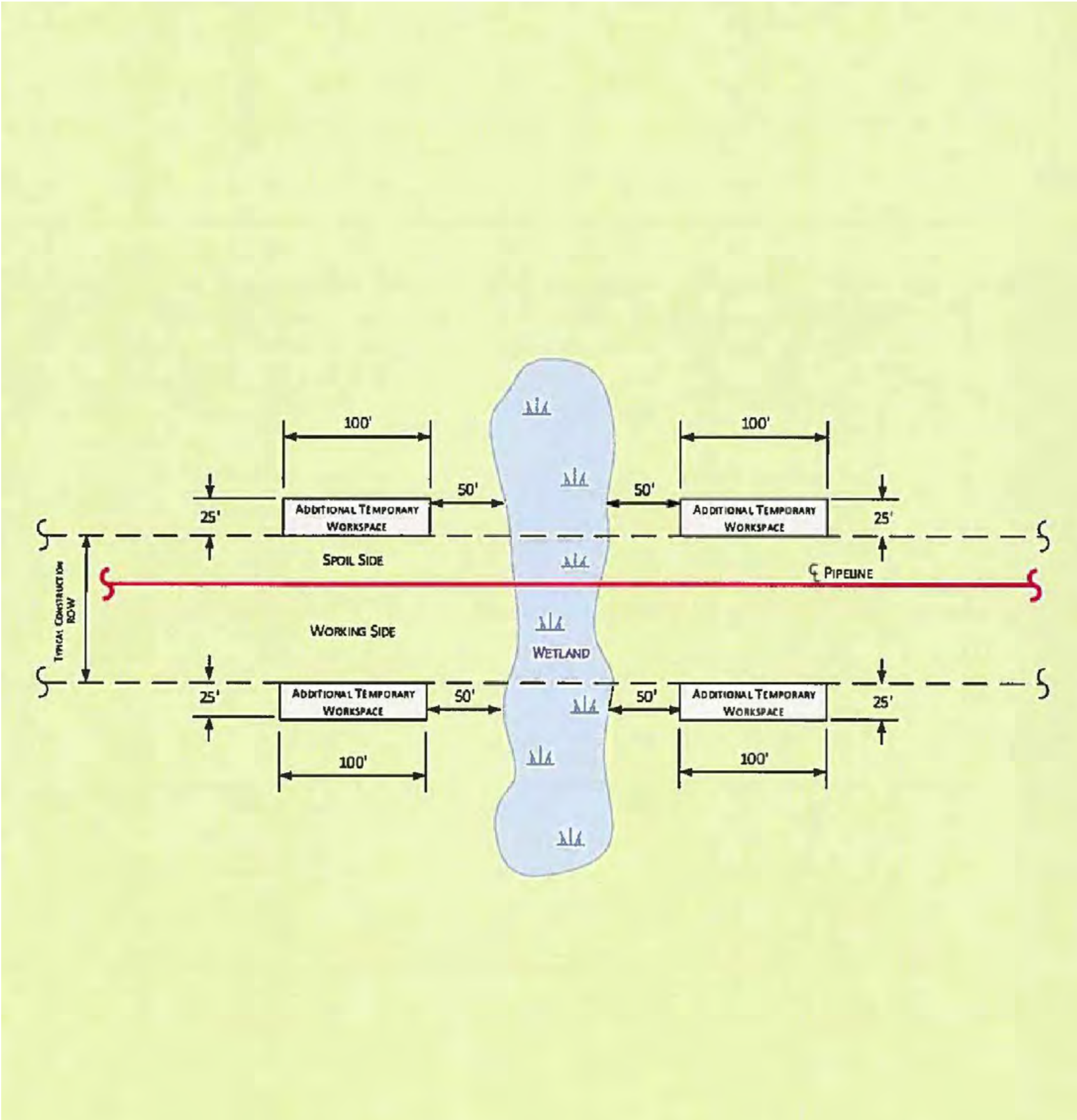
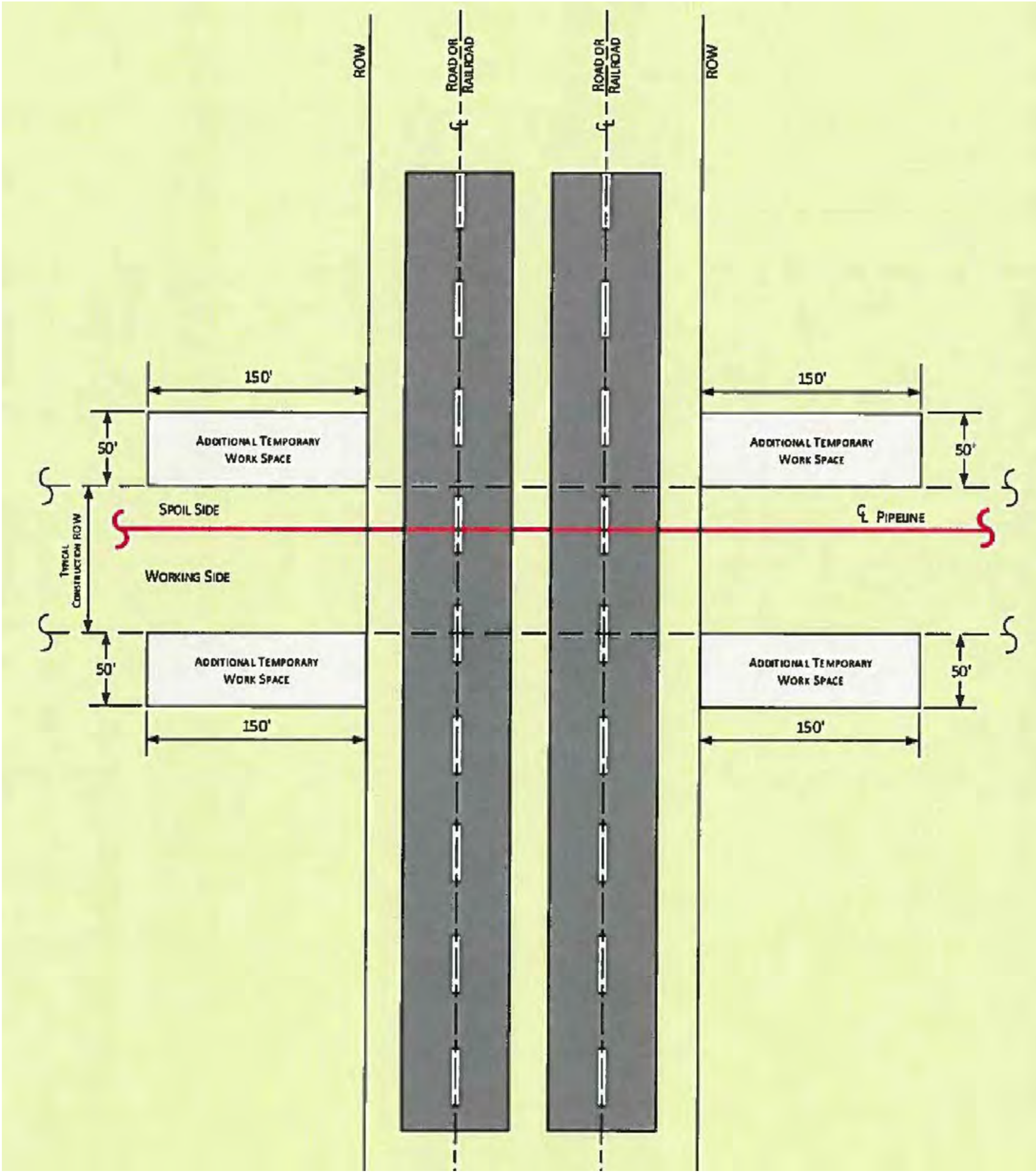


CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT	YYYY-MM-DD	2017-02-28	TITLE **TYP ADDITIONAL WORKSPACE AT WETLAND CROSSINGS SHP TL-635 TL-636**
Golder Associates	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 · PHASE 500 · Rev. F · FIGURE 13H-3
	APPROVED	AQK	



CLIENT
DOMINION

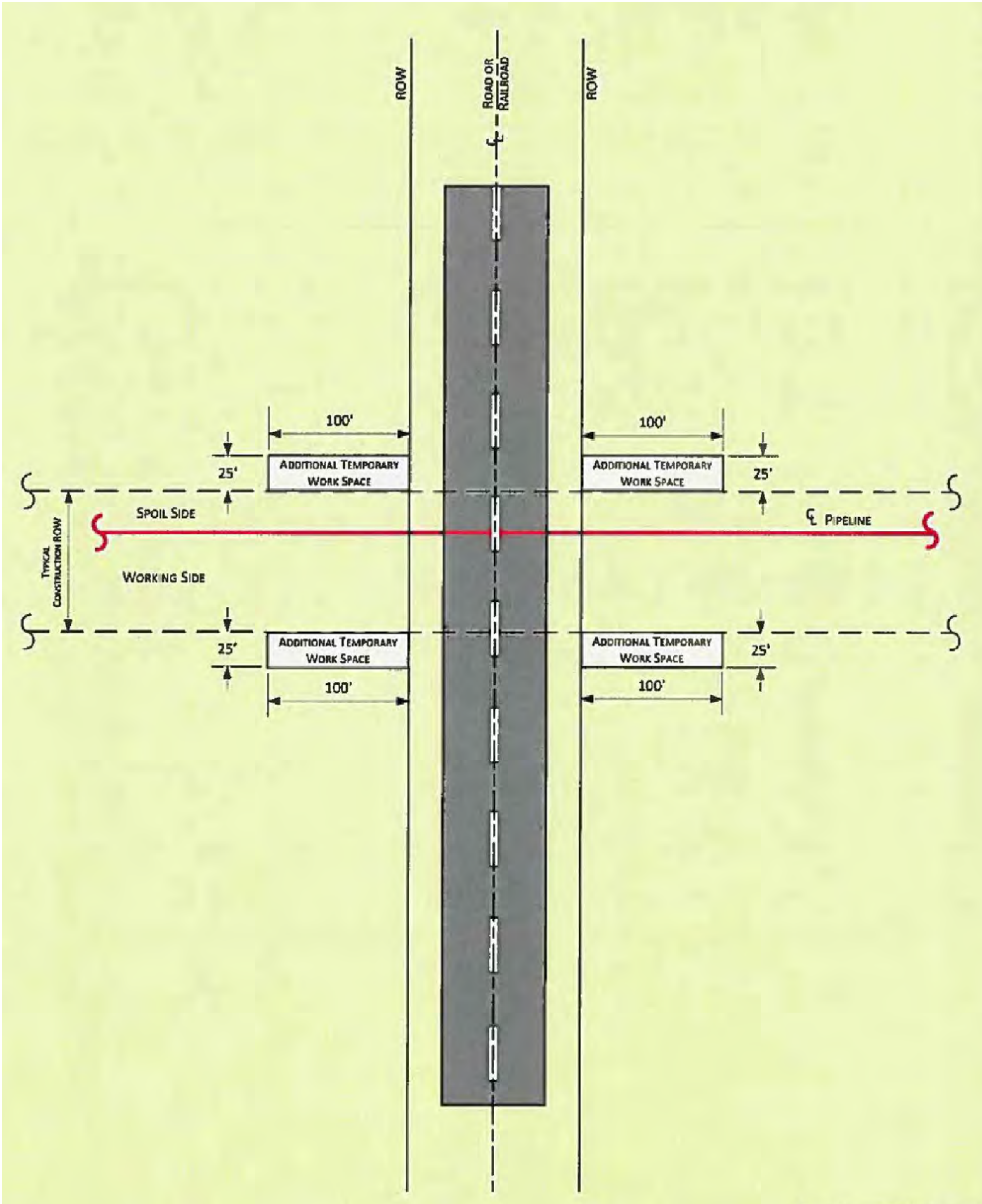
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
WORKSPACE AT BORED CROSSINGS FOR 2-LANE ROADS AND RAILROADS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13I-1



CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

Golder Associates

TITLE
TYP ADDITIONAL WORKSPACE AT SINGLE-LANE ROADS AND BORED ROADS ACP AP-1 AP-2 AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13I-2

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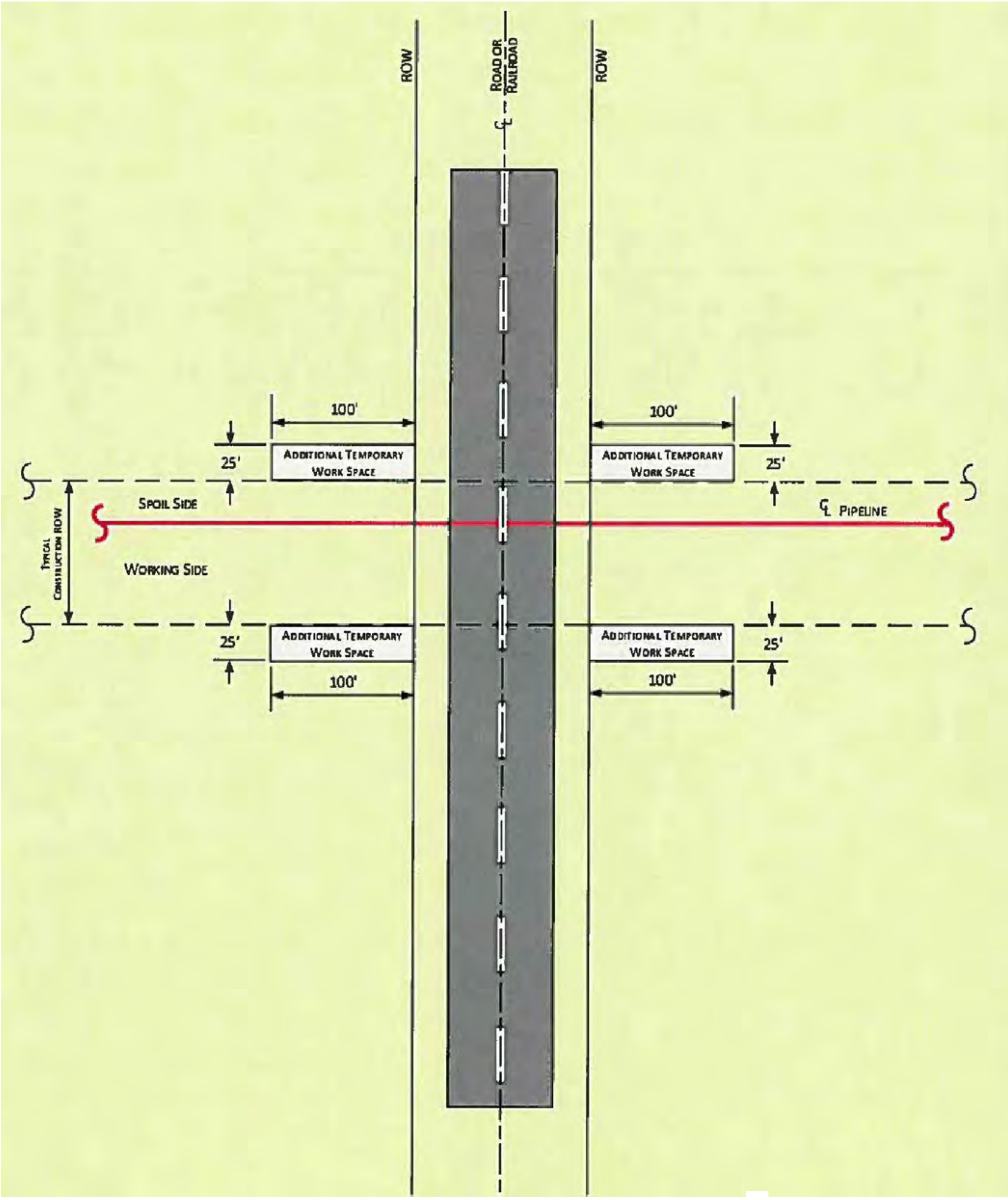

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP ADDITIONAL WORKSPACE AT ALL BORED ROADS SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13I-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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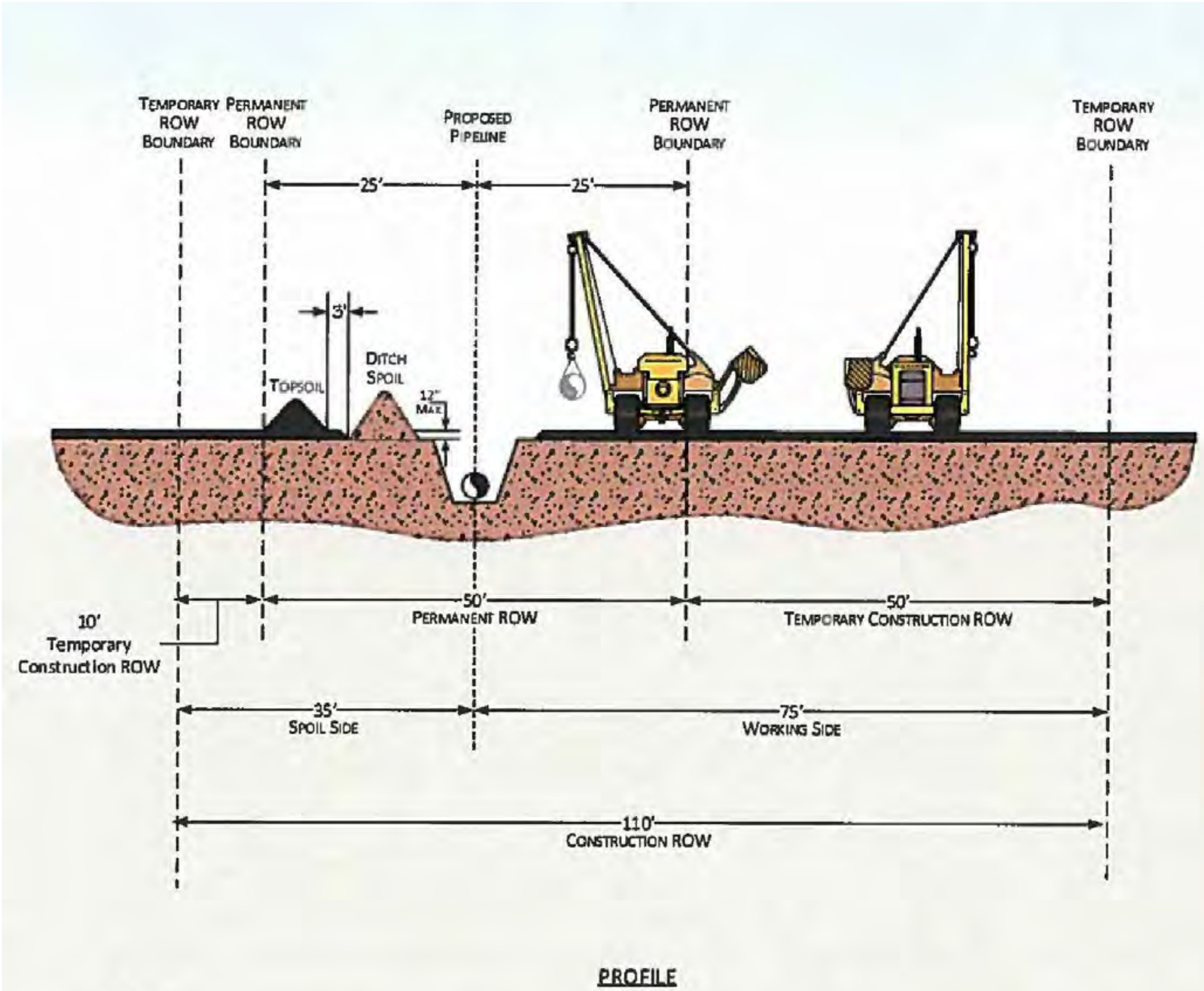


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

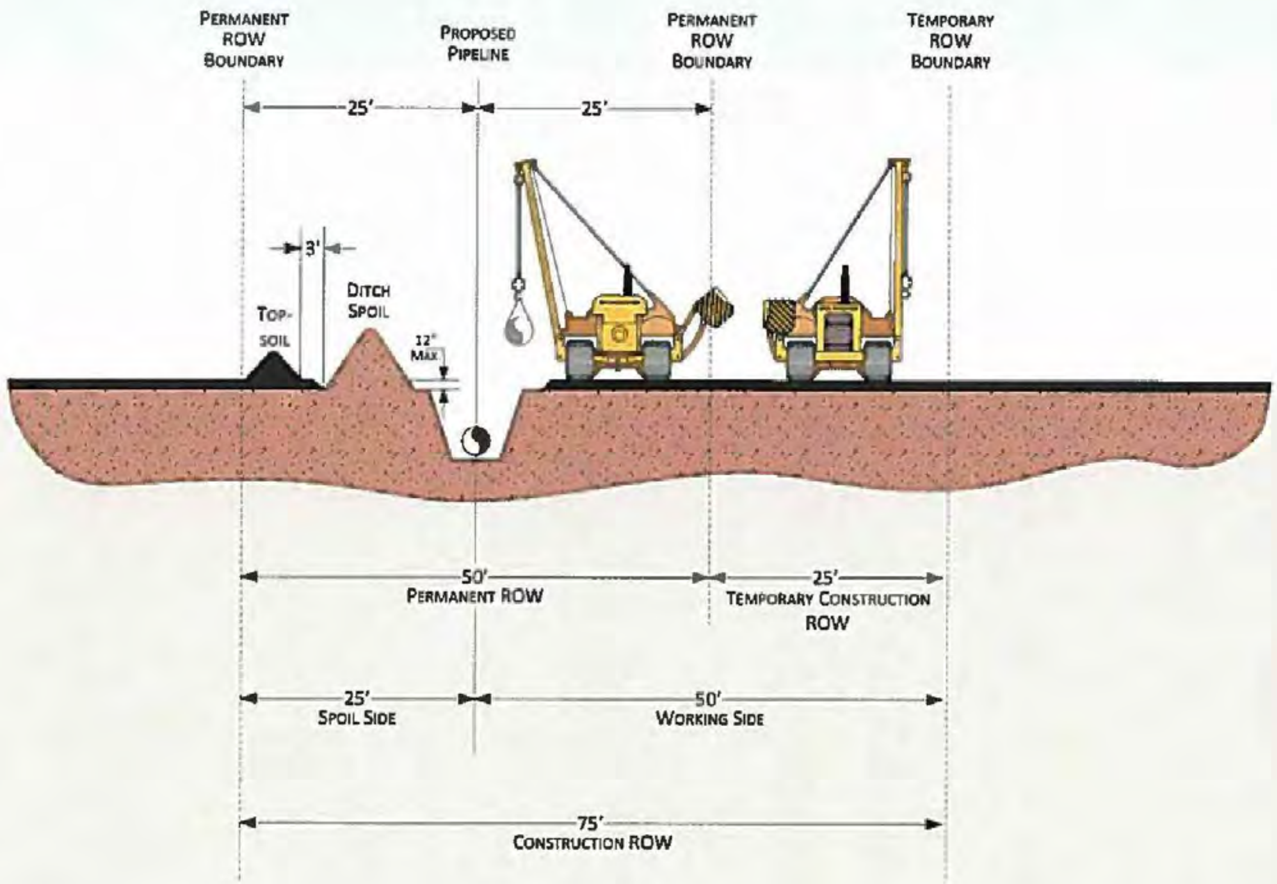
PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN NON-AG AREAS ACP AP-2

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13J-1



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 75' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 25' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP CONSTRUCTION ROW IN NON-AG AREAS AND WETLANDS ACP AP-3 AP-4 AP-5
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13J-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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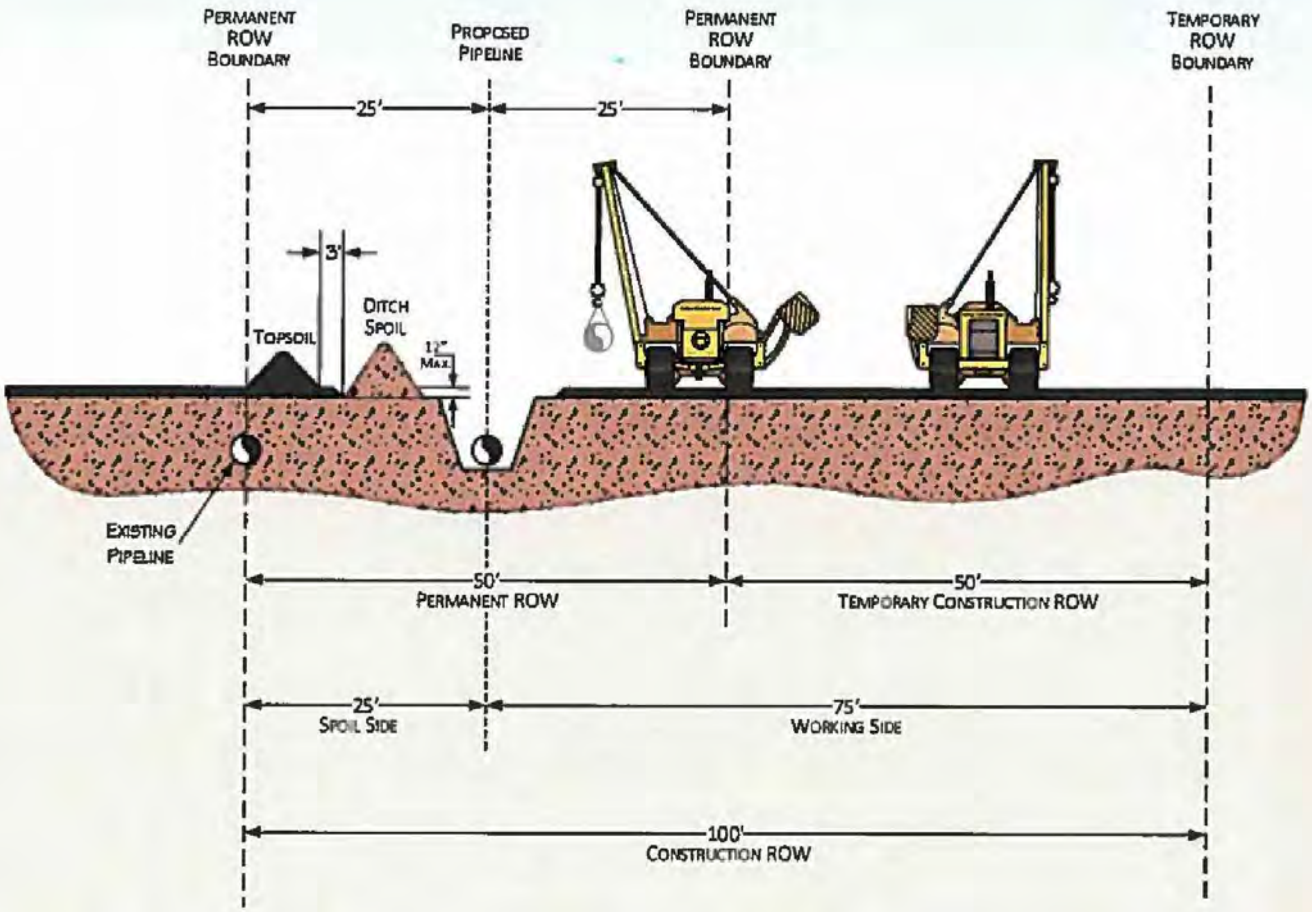
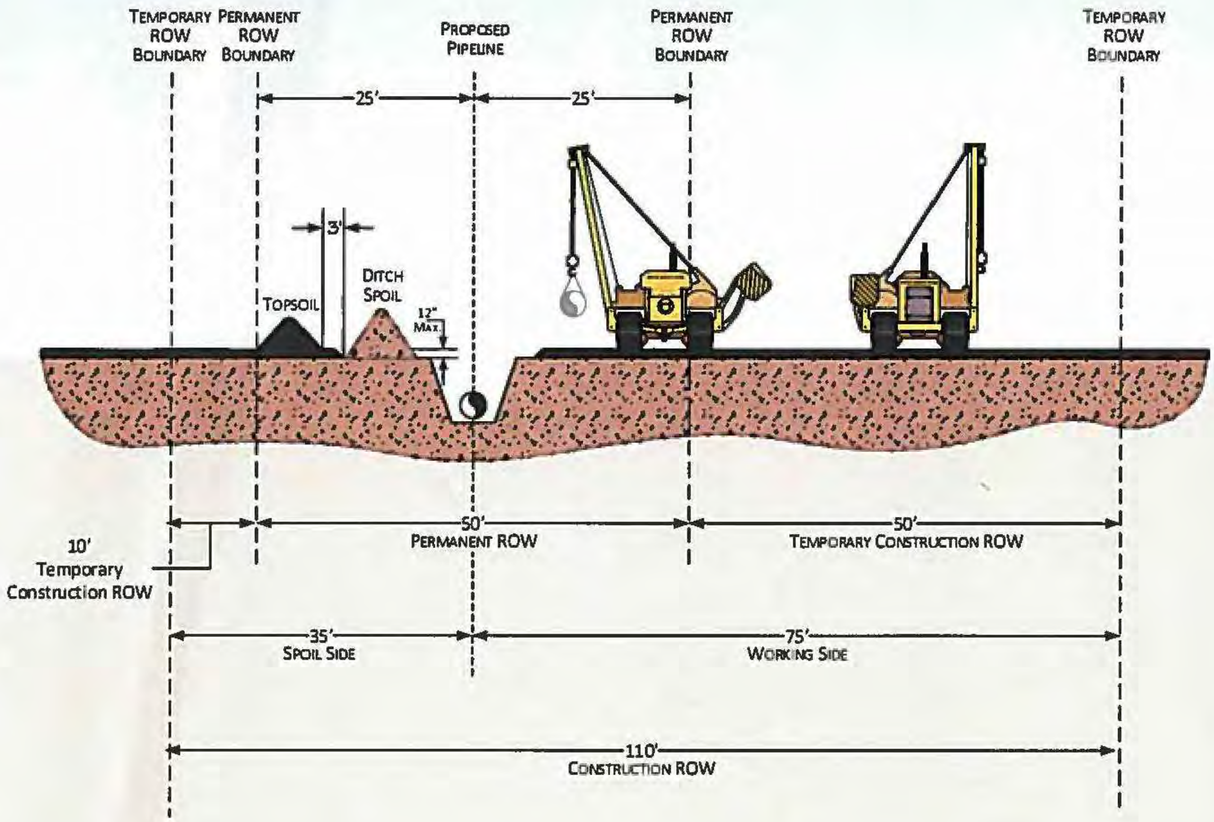


PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 100' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 50' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	TYP CONSTRUCTION ROW IN COLLOCATED NON-AG AREAS SHP TL-635 TL-636
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13J-3



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

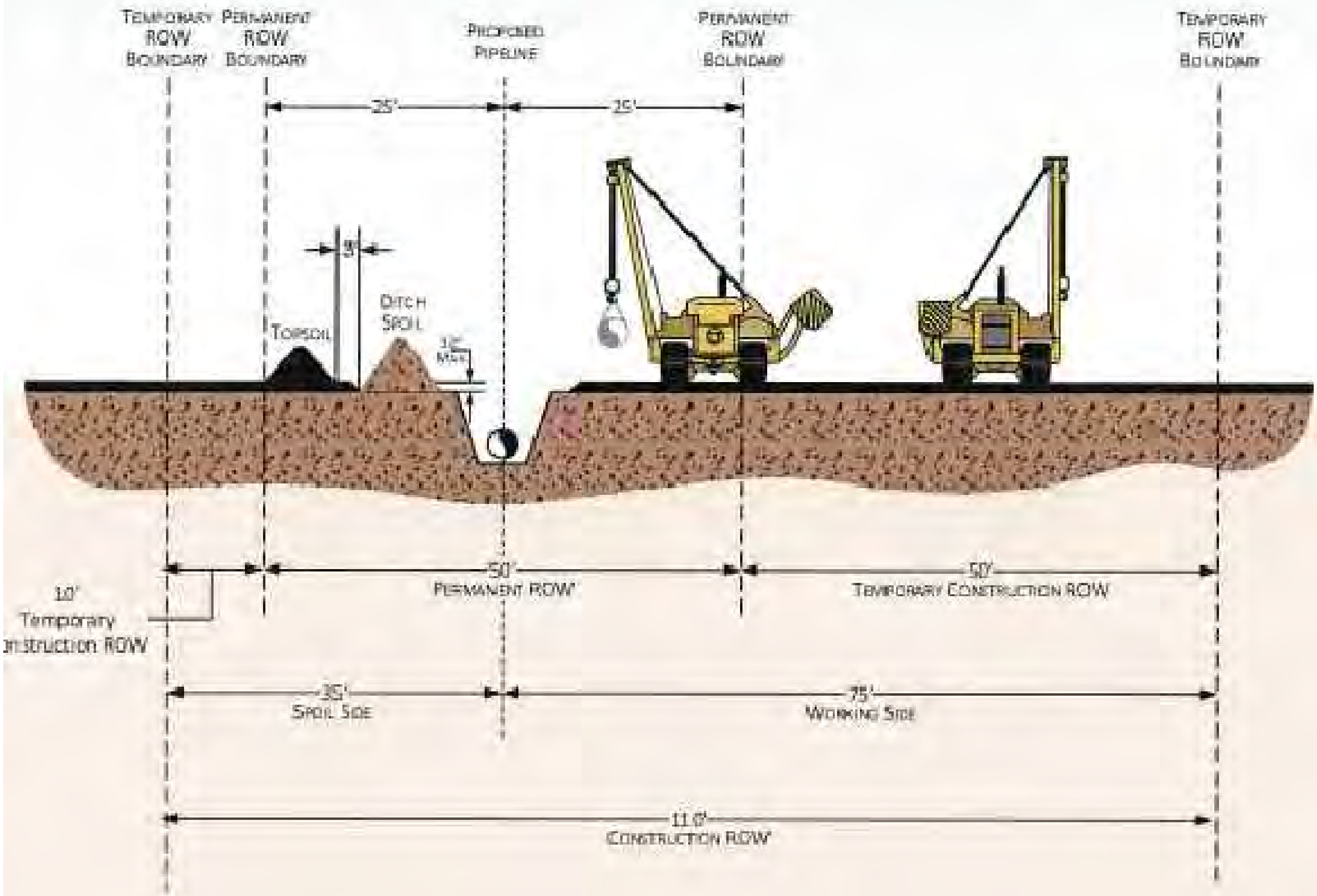
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW NOT-COLLOCATED IN NON-AG AREAS SHP TL-635 TL-636

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13J-4

0 1 in



PROFILE

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 110' WIDE CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 60' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN AG AREAS ACP AP-2

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13K-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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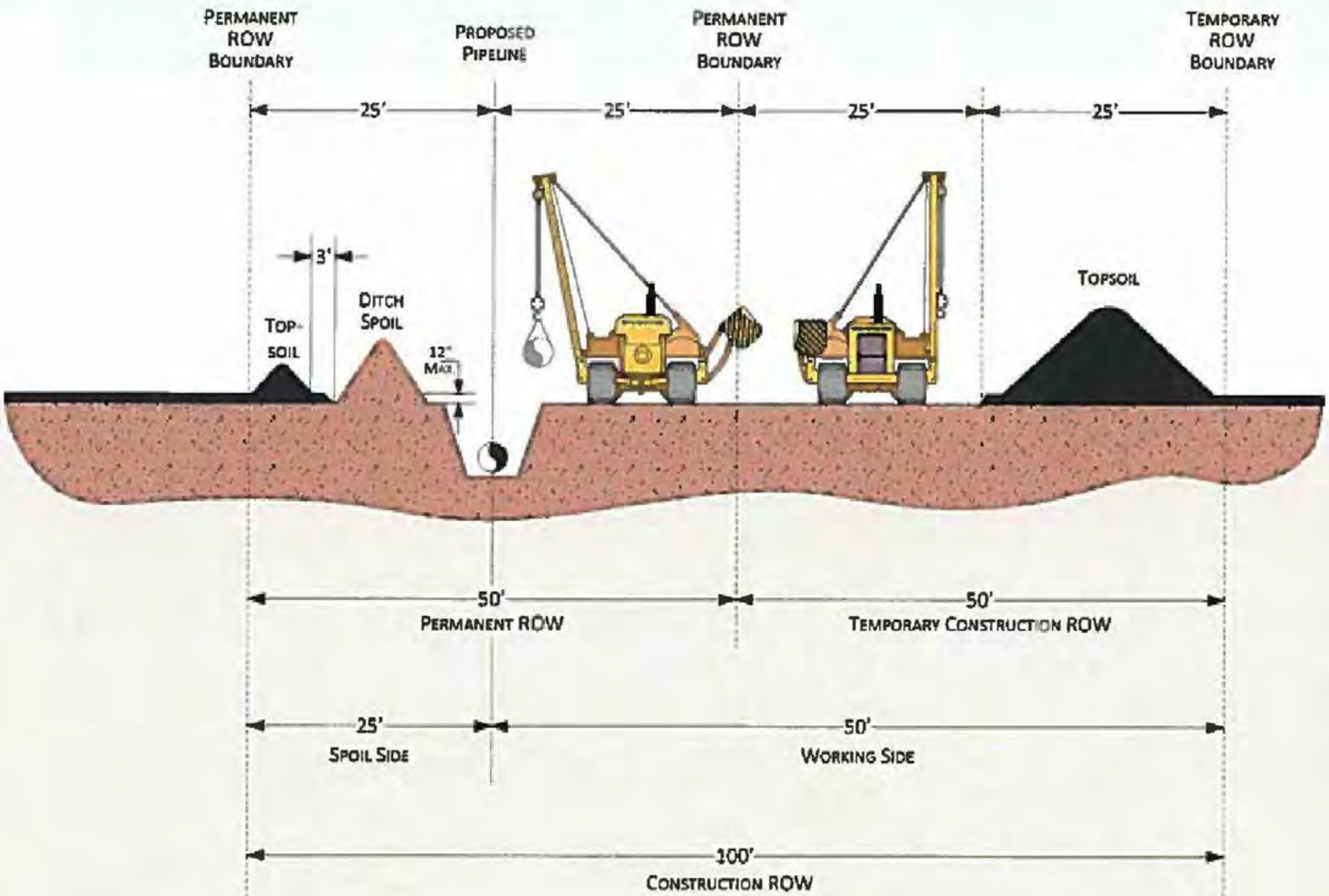

PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 100' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 50' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
TYP CONSTRUCTION ROW IN AG AREAS ACP AP-3 AP-4 AP-5

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	13K-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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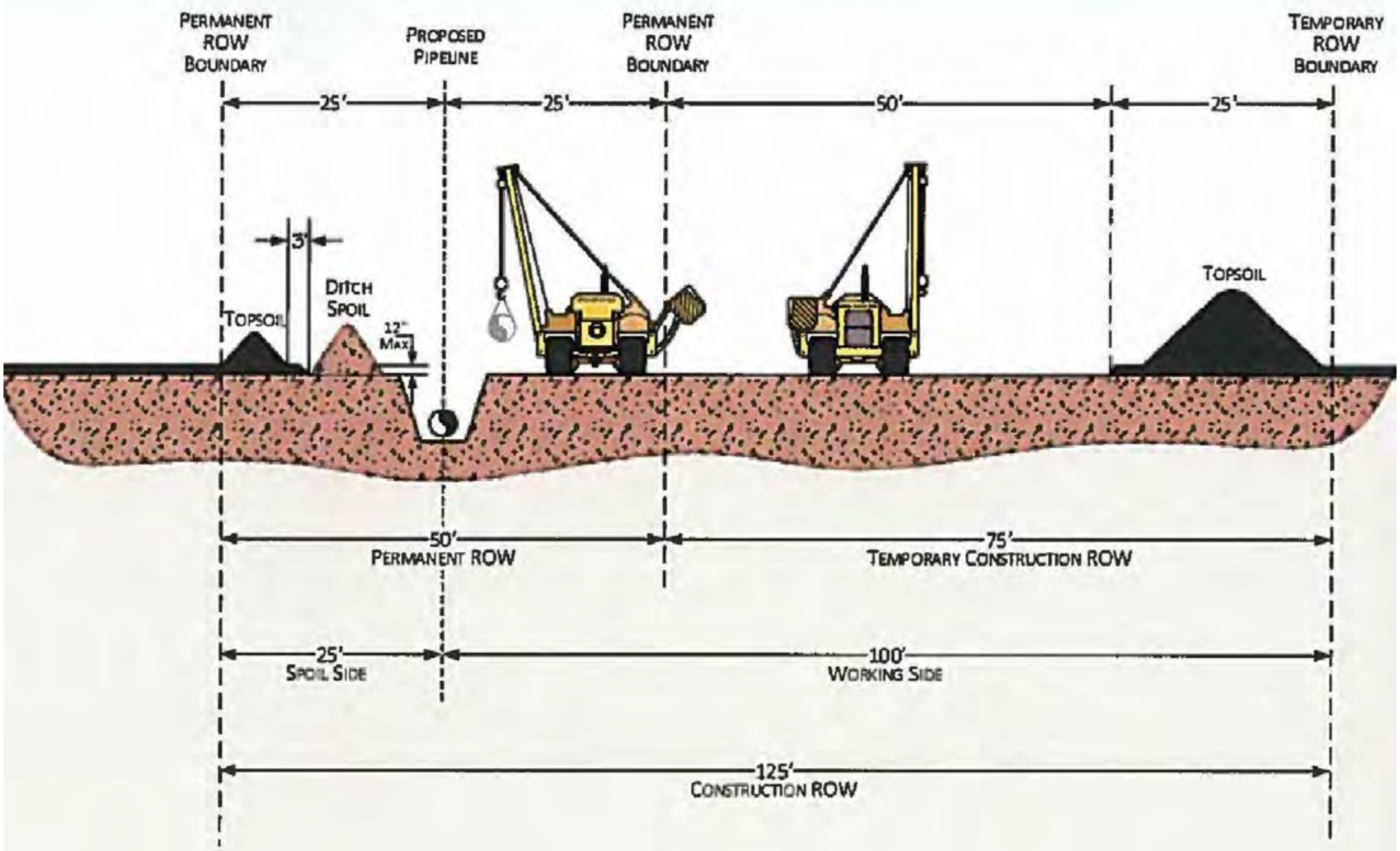
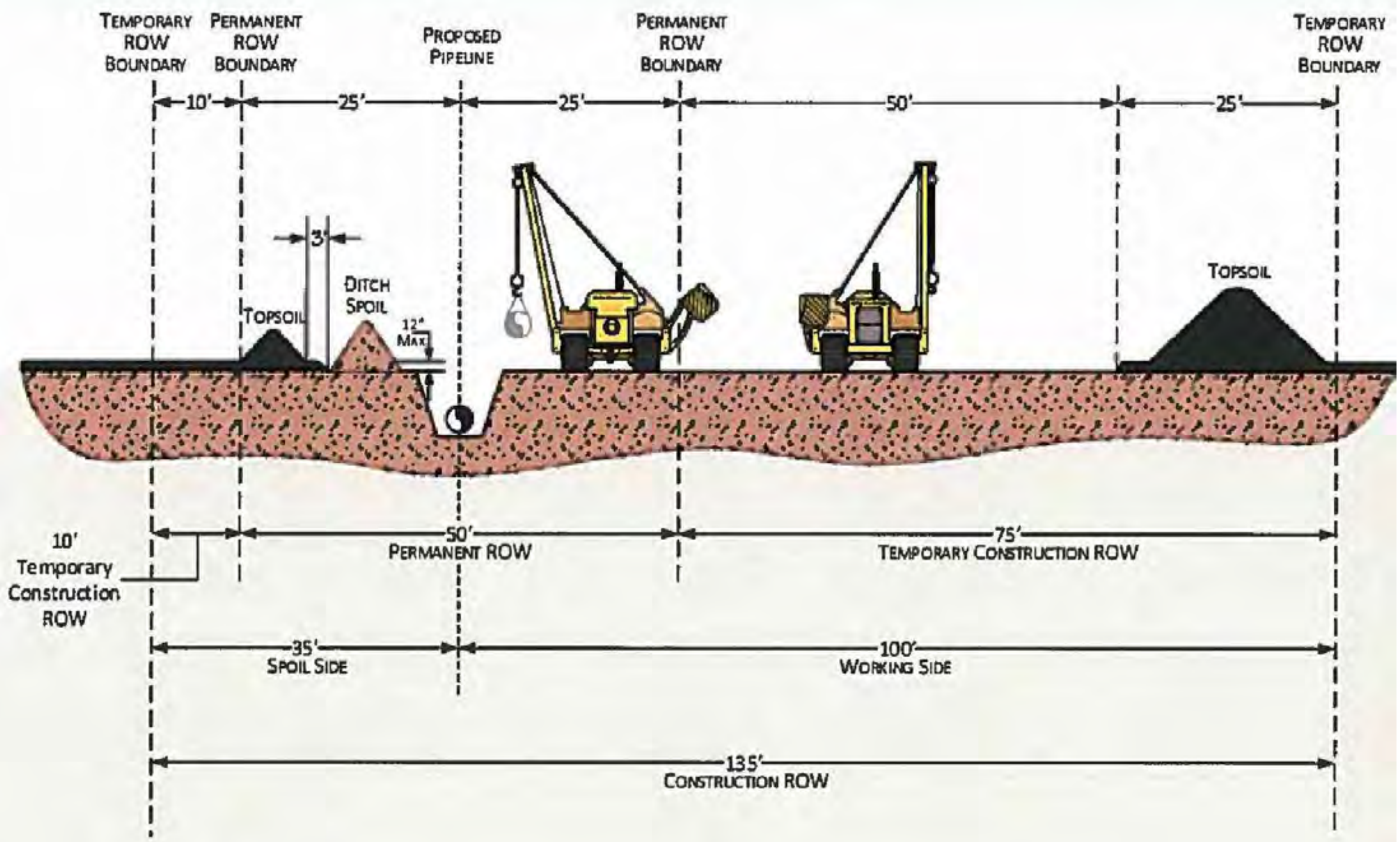


PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 125' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 75' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT DOMINION		PROJECT BIC/INCREMENTAL CONTROLS	
CONSULTANT Golder Associates	YYYY-MM-DD: 2017-02-28 PREPARED: REDMOND DESIGN: DBC REVIEW: - APPROVED: AQK	TITLE **TYP CONSTRUCTION ROW COLLOCATED IN AG AREAS SHP TL-635 TL-636**	
		PROJECT No. 1535050	PHASE 500
		Rev. F	FIGURE 13K-3

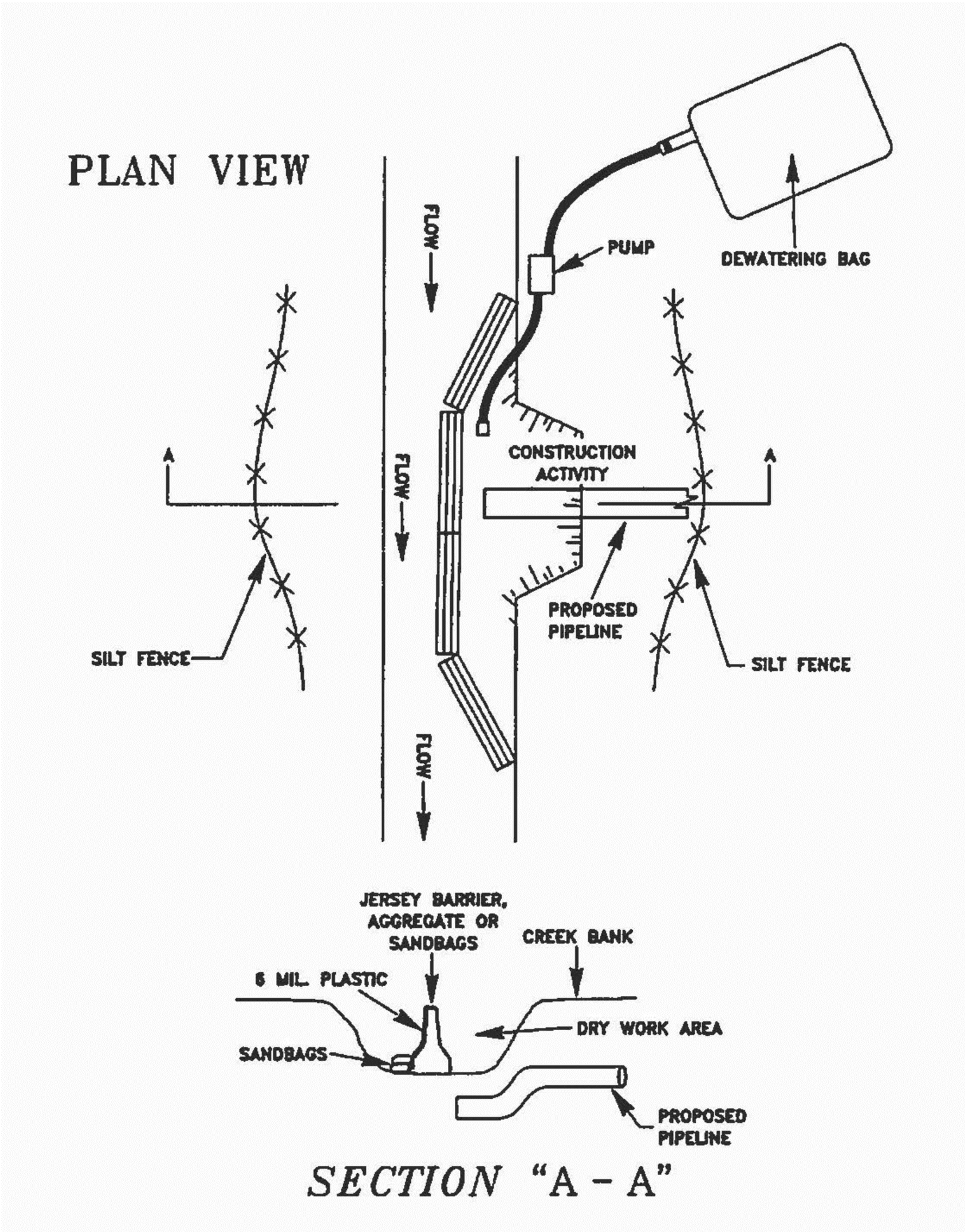


PROFILE

NOTES:

1. IN AGRICULTURAL AREAS WHERE FULL WIDTH TOPSOIL STRIPPING IS REQUIRED, AN ADDITIONAL 25' OF TEMPORARY WORKSPACE WILL BE REQUIRED. IN THIS SCENARIO, THE CONSTRUCTION RIGHT-OF-WAY WILL BE 135' WIDE, CONSISTING OF 50' OF PERMANENT RIGHT-OF-WAY AND 85' OF TEMPORARY CONSTRUCTION RIGHT-OF-WAY. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDESLOPES, AND OTHER SPECIAL CIRCUMSTANCES AS REQUIRED.

CLIENT DOMINION			PROJECT BIC/INCREMENTAL CONTROLS
CONSULTANT Golder Associates	YYYY-MM-DD	2017-02-28	TITLE **TYP CONSTRUCTION ROW NOT-COLLOCATED IN AG AREAS SHP TL-635 TL-636**
	PREPARED	REDMOND	
	DESIGN	DBC	
	REVIEW	-	PROJECT No. 1535050 / PHASE 500 / Rev. F / FIGURE 13K-4
	APPROVED	AQK	



CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	**TYP COFFERDAM CROSSING**
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	13L

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. INCLUDES, BUT IS NOT LIMITED TO, SITE SPECIFIC INVESTIGATIONS, ASSESSMENTS, ANALYSIS, DETAILED ENGINEERING, AND DESIGN WORK DEVELOPED TO MITIGATE FOR SPECIALIZED SITE GEOTECHNICAL, HYDROTECHNICAL, OR GEOLOGIC CONDITIONS THAT MAY BE IMPOSED ON THE PIPELINE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
SITE SPECIFIC DETAILED ENGINEERING

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	14A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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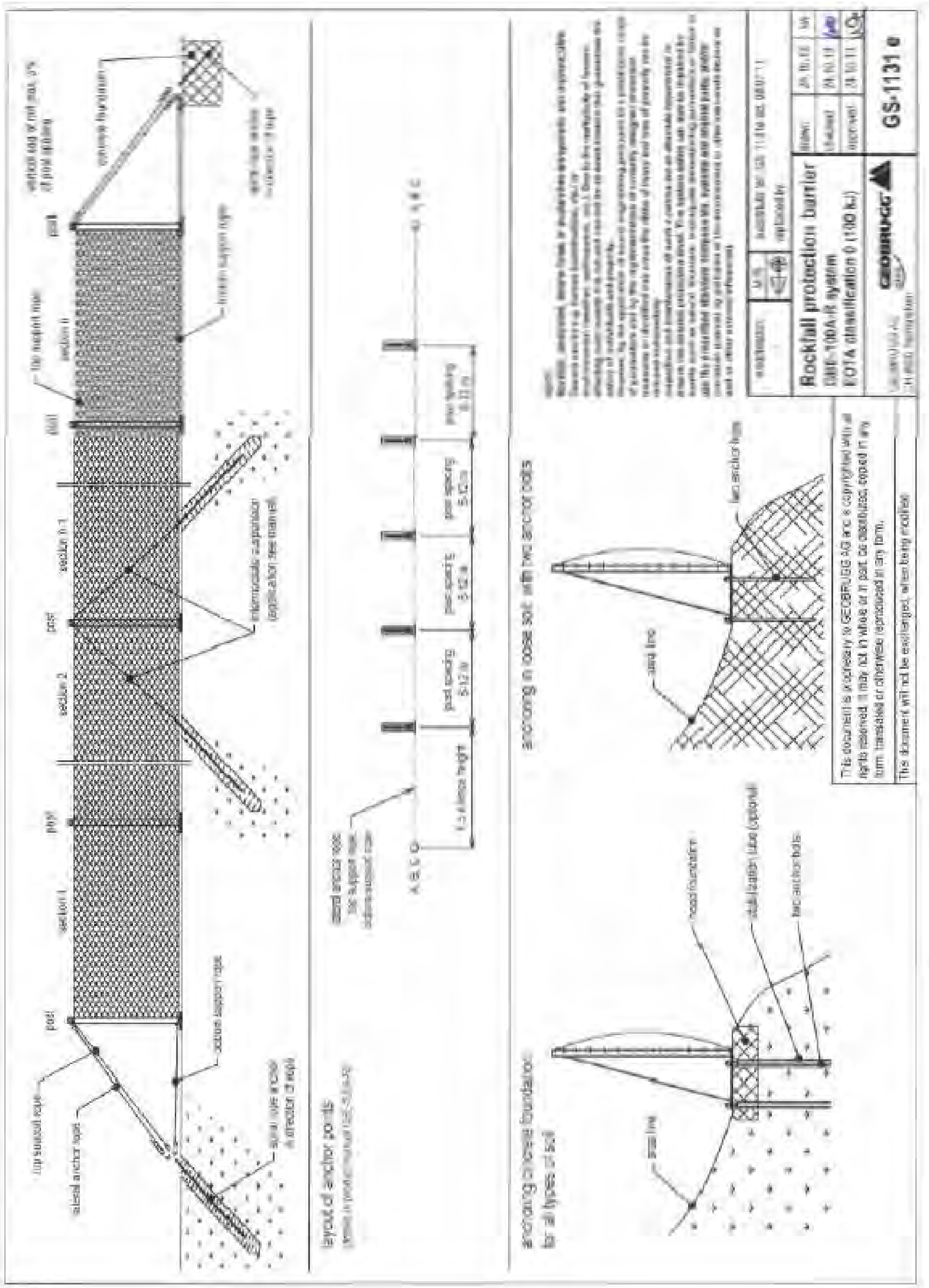

NOTE(S)

1. FINAL CONFIGURATION OF ROCK FALL PROTECTION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

CLIENT	DOMINION
PROJECT	BIC/INCREMENTAL CONTROLS
CONSULTANT	Golder Associates
YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK
TITLE	**MESH FENCE - ROCK FALL PROTECTION**
PROJECT No.	1535050
PHASE	500
Rev.	F
FIGURE	14B

NOTE(S)

1. FINAL PLANNING, DESIGN, AND IMPLEMENTATION OF BLASTING ACTIVITIES TO BE DETERMINED BASED ON SITE SPECIFIC CONDITIONS, AND MUST FOLLOW SPECIFICATIONS AND REQUIREMENTS AS DIRECTED BY DOMINION.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
BLASTING PLANS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	14C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. ADJUST ROUTING, ALIGNMENT, LOCATION (VERTICALLY OR HORIZONTALLY), OR POSITION WITHIN THE ROW OF THE PIPELINE TO AVOID IDENTIFIED HAZARDS. EXAMPLES MAY INCLUDE, BUT ARE NOT LIMITED TO, NEW ROW LOCATIONS THAT DEPART ENTIRELY FROM THE CURRENT ALIGNMENT BY SIGNIFICANT DISTANCES, RELATIVELY SMALLER ALIGNMENT SHIFTS THAT OFFSET FOR SHORTER DISTANCES FROM THE CURRENT ALIGNMENT, MINOR ADJUSTMENTS TO THE ALIGNMENT THAT REMAIN WITHIN THE ROW BOUNDARIES, LOWERING THE PIPELINE BELOW IDENTIFIED HAZARDS WHILE STAYING WITHIN THE ROW, ETC. CHANGING ROW ALIGNMENTS REQUIRES SITE SPECIFIC PLANNING, PERMITTING, ASSESSMENTS, LAND AND PROPERTY REVIEW AND COORDINATION, ENGINEERING DESIGN TO FIT THE NEW SITE CONDITIONS, AND OTHER TECHNICAL SUPPORT EFFORTS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
AVOIDANCE

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	15A

NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SITE INVESTIGATIONS NEEDED TO CONFIRM LATERAL AND VERTICAL EXTENT OF IDENTIFIED LANDSLIDE OR OTHER UNSTABLE SLOPE CONDITIONS.

3. INVESTIGATION MAY INCLUDE PROBES, TEST PITS, EXCAVATIONS ALONG PIPELINE TRENCH, GEOPHYSICAL METHODS (I.E. NON-INTRUSIVE GPR, SEISMIC OR ELECTRICAL METHODS), OR MAY REQUIRE DEEPER SUBSURFACE DRILLING METHODS. FINAL INVESTIGATION METHONGS(S) TO BE DETERMINED BASED ON SITE CONDITIONS AND REQUIREMENTS OF SITE WORK.

4. EXCAVATIONS TO REMOVE IDENTIFIED LANDSLIDE OR OTHER UNSTABLE SLOPE CONDITIONS SHOULD BE COMPLETED FOR THE FULL EXTENT OF CHARACTERIZED HAZARD AREA, AT A MINIMUM MATCHING OR EXCEEDING THE UNDERLYING AND/OR LATERAL BOUNDING FAILURE SURFACE AND/OR SLIP PLANE. THE GOAL AND INTENT OF THIS MITIGATION APPROACH IS TO ESSENTIALLY REMOVE THE SLOPE HAZARD FROM THE SITE BY DIGGING OUT THE LIMITS OF THE IDENTIFIED HAZARD.

5. REMOVAL OF TARGETED LANDSLIDE AND/OR UNSTABLE SLOPE MATERIALS MAY REQUIRE SPECIAL CONSIDERATIONS FOR OTHER DIRECTLY OR INDIRECTLY RELATED OR CONNECTED SITE MITIGATION MEASURES AND/OR SITE ACTIVITIES TO ADDRESS SAFETY, SLOPE STABILITY, ACCESS, CONSTRUCTION FEASIBILITY, ETC, THEREFORE, PLANNING FOR IMPLEMENTATION OF THIS OPTION SHOULD INCLUDE A COMPREHENSIVE REVIEW OF EXISTING PROPOSED WORK AT THE SITE.

6. EXCAVATED MATERIALS SHOULD BE SPOILED IN LOCATION(S) THAT DO NOT ACCELERATE OR EXACERBATE THE TARGETED LANDSLIDE OR UNSTABLE SLOPE AREA, OR IMPACT OTHER NEIGHBORING LANDSLIDES OR UNSTABLE SLOPE AREAS.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
EXCAVATION REMOVAL OF HAZARD

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	15B

NOTE(S)

1. ACCESS FOR PIPELINE ROW'S IN RUGGED AND REMOTE TERRAIN MAY BE LIMITED TO THE CONSTRUCTED ROW. IN THESE SCENARIOS, CONSTRUCTING INDEPENDENT ACCESS POINTS AND ROADS IS TYPICALLY MINIMIZED TO THEREBY ALSO MINIMIZE DISTURBANCE. AS SUCH, THE PRIMARY ACCESS IS COMMONLY ALONG THE TEMPORARY CONSTRUCTED ROW FOLLOWING THE PIPELINE ALIGNMENT, AND IS THEN NO LONGER AVAILABLE AFTER THE ROW IS RESTORED. THIS BIC MITIGATION MEASURE IS INTENDED TO IDENTIFY AREAS WHERE ACCESS MAY BE NEEDED TO SUPPORT MONITORING, OPERATION, AND MAINTENANCE OF THE ROW; AND TO COMPLETE THE PLANNING, PERMITTING, DESIGN, AND CONSTRUCTION FOR ACCESS TO THESE LOCATIONS. ADDITIONAL PLANNING, PERMITTING, LAND COORDINATION, ENVIRONMENTAL, AND TECHNICAL EFFORTS ARE REQUIRED TO SUPPORT THIS MITIGATION MEASURE, NOT SPECIFICALLY OUTLINED AND ADDRESSED HEREIN, BUT ANTICIPATED TO BE NEEDED TO IMPLEMENT THIS MITIGATION MEASURE.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
ACCESS TO REMOTE ROW LOCATIONS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	15C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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NOTE(S)

1. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL TYPICAL DETAILS TO MITIGATE TARGETED CONDITIONS.

2. SITE SPECIFIC STUDIES FOR POTENTIAL KARST HAZARDS WILL BE COMPLETED TO IDENTIFY, CHARACTERIZE, AND DEVELOP MITIGATION RECOMMENDATIONS, AS NEEDED.

CLIENT
DOMINION

PROJECT
BIC/INCREMENTAL CONTROLS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-28
PREPARED	REDMOND
DESIGN	DBC
REVIEW	-
APPROVED	AQK

TITLE
KARST HAZARDS

PROJECT No.	PHASE	Rev.	FIGURE
1535050	500	F	16A

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plans

ATTACHMENT C-3

Best-in-Class Site Specific Drawings on National Forest System Lands

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Supplemental Filing
March 24, 2017

APPENDIX C

Site-Specific Designs of Representative Steep Slope Crossings on U.S. Forest Service Lands

GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
FOR
ACP AP-1 MP 73.20 TO MP 73.50
CONSTRUCTION ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

GENERAL NOTES:

1. MAPPING AND TOPOGRAPHY BASED ON UTM COORDINATE SYSTEM WITH NAD83 DATUM, ZONE 17, US SURVEY FOOT, CENTRAL MERIDIAN 81 W.
2. STATIONING SHOWN IS SLOPE STATIONING FOR ROUTE REV 11B (3D) PROVIDED BY GAI CONSULTANTS, INC.
3. CONTOURS AND TOPOGRAPHIC FEATURES DERIVED FROM LIDAR DATA AND GPS SUB-METER GROUND SURVEY PERFORMED BY GAI CONSULTANTS, INC.
4. STREAM AND WETLAND DATA PROVIDED BY ERM.
5. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL BIC INCREMENTAL CONTROLS TO MITIGATE SPECIFIC CONDITIONS.
6. VOLUMES, GRADES, ELEVATIONS, AND QUANTITIES WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

BIC INCREMENTAL CONTROLS NOTES:

1. INSTALL ENHANCED DRAINS (GERMAN DRAINS) (BIC INCREMENTAL CONTROL NO. 1B) WHERE SEEPAGE IS ENCOUNTERED IN THE TRENCH.
2. INSTALL TARGETED SEEP DRAINS (BIC INCREMENTAL CONTROL NO. 1C) TO INTERCEPT SEEPS WHERE EXCAVATION ENCOUNTERS SEEPAGE.
3. GRADE TEMPORARY ROW SURFACE (BIC INCREMENTAL CONTROL NO. 2A) FOR SLOPING AND TEXTURING TO MITIGATE EROSION DURING AND AFTER CONSTRUCTION.
4. GRADE TEMPORARY ROW WITH OUTBOARD WEDGE (BIC INCREMENTAL CONTROL NO. 2B) TO ENCOURAGE MOVEMENT OF SURFACE FLOW AWAY FROM THE TRENCH.
5. BACKFILL USING ONLY DRY AND MOIST SOILS (BIC INCREMENTAL CONTROL NO. 2D). DO NOT REUSE SATURATED SOILS AS BACKFILL.
6. REMOVE EXISTING SOILS WITH ENGINEERING PROPERTIES UNSUITABLE FOR REUSE AS BACKFILL (BIC INCREMENTAL CONTROL NO. 2E). THIS MAY INCLUDE SATURATED SOILS AND ORGANIC SOILS, AMONG OTHER UNSUITABLE MATERIALS.
7. GRADE FINAL GROUND SURFACE TO MATCH EXISTING GROUND SURFACE CONTOURS (BIC INCREMENTAL CONTROL NO. 2G).
8. DEVELOP SPOILS MANAGEMENT PLAN (BIC INCREMENTAL CONTROL NO. 2J) WITH PROCEDURES FOR MANAGING SPOILS FOR BOTH TEMPORARY AND PERMANENT CONDITIONS.
9. TRACK DISTURBED SLOPES (BIC INCREMENTAL CONTROL NO. 3A) TO PROMOTE GROWTH OF VEGETATION AND TO MITIGATE EROSION.
10. INSTALL TRENCH BREAKERS (BIC INCREMENTAL CONTROL NO. 4A) AT TARGETED LOCATIONS.
11. INSTALL TRENCH BREAKERS WITH DRAINAGE (BIC INCREMENTAL CONTROL NO. 4F) AND BLEEDER DRAINS (BIC INCREMENTAL CONTROL NO. 1D) TO COLLECT SEEPAGE FROM THE TRENCH AND CONVEY OFF THE RIGHT-OF-WAY AT TARGETED AREAS.
12. INSTALL SLOPE BREAKERS (TEMPORARY AND PERMANENT) (BIC INCREMENTAL CONTROL NO. 5A) TO SLOW AND REDIRECT SURFACE WATER OFF THE RIGHT-OF-WAY.
13. INSTALL ARMORED OUTLET FOR SLOPE BREAKER (BIC INCREMENTAL CONTROL NO. 5B) TO DISSIPATE ENERGY FROM DISCHARGING SURFACE FLOW WHERE HYDRAULIC FORCES ARE ANTICIPATED TO BE HIGH.
14. CONTROL SURFACE WATER RUN-ON FROM EXISTING ACCESS ROADS (BIC INCREMENTAL CONTROL NO. 5D).
15. INSTALL BELTED REINFORCED SILT FENCE (BIC INCREMENTAL CONTROL NO. 7A) AT TARGETED LOCATIONS TO INTERCEPT SURFACE RUNOFF AND PREVENT SOIL MATERIAL FROM LEAVING THE WORK AREA.
16. INSTALL SUPER SILT FENCE (BIC INCREMENTAL CONTROL NO. 7B) AT TARGETED LOCATIONS TO RETAIN SOIL MATERIAL ALONG THE EDGE OF THE WORKSPACE.
17. RE-CONSTRUCT BENCHES THROUGH NATURAL SLOPES (BIC INCREMENTAL CONTROL NO. 10A) TO AVOID DEVELOPING TROUGH ALONG THE TRENCH LINE.
18. CONDUCT AS-BUILT SURVEY OF TRENCH BREAKERS (BIC INCREMENTAL CONTROL NO. 11F) SO THAT TRENCH BREAKERS AND SLOPE BREAKERS CAN BE CO-LOCATED FOR IMPROVED OVERALL FUNCTION.
19. DEVELOP BLASTING PLAN (BIC INCREMENTAL CONTROL NO. 14C) WHERE BEDROCK REQUIRES BLASTING.

LIST OF DRAWINGS

LEGEND

- 2650 — EXISTING GROUND ELEVATION CONTOUR (FT, MSL)
- EXISTING STREAM LINE
- BSRF — BELTED SILT RETENTION FENCE (BSRF)
- LOD — LIMIT OF DISTURBANCE
- PERMANENT ROW
- PERMANENT SLOPE BREAKER
- TEMPORARY SLOPE BREAKER
- 4417+00 — PIPELINE CENTERLINE AND STATIONING
- MP25.4 — MILE POST
- SOIL NAIL
- ROCK GUARD
- SLEEVE INTERFACE
- DRAINAGE TIGHTLINE PIPE
- PERFORATED DRAINAGE COLLECTION PIPE
- TEMPORARY ROW
- EXTRA WORKSPACE
- SACK-CRETE
- RIPRAP ARMOR LAYER (R-4 GRADATION)
- CRUSHED STONE (R-2 GRADATION)
- TECCO MESH AND COIR CLOTH SYSTEM
- FOAM TRENCH BREAKER
- COIR LOG

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
COVER SHEET WITH GENERAL NOTES AND LEGEND

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50
CONSTRUCTION ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG0007D00
REVIEWED BY:	LCB/TR	DRAWING NO.:	1 OF 29
APPROVED BY:	LCB		

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: EXISTING GROUND (1 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01A
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	2 OF 29	

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: EXISTING GROUND (2 OF 5)

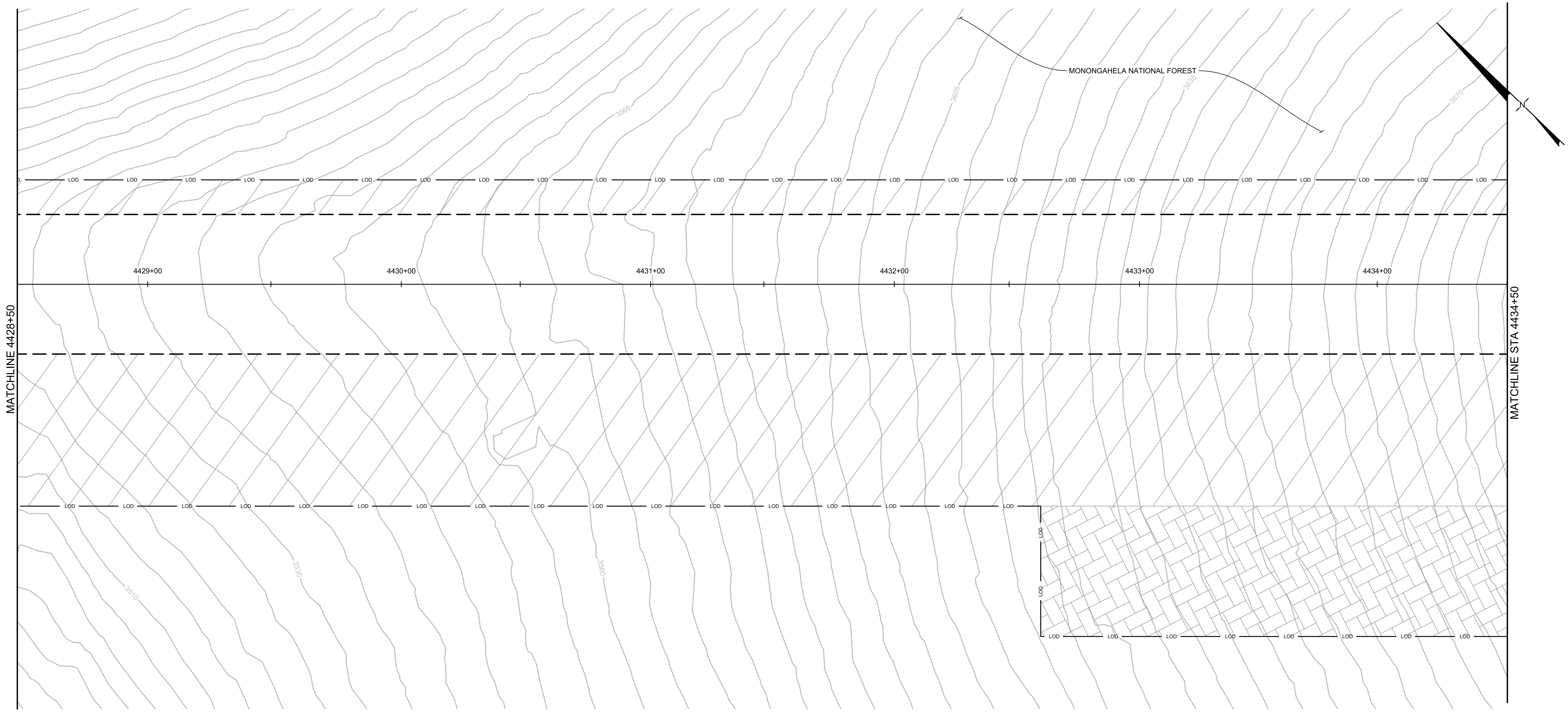
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01A
REVIEWED BY:	LCB/TR	DRAWING NO.:	3 OF 29
APPROVED BY:	LCB		



NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: EXISTING GROUND (3 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
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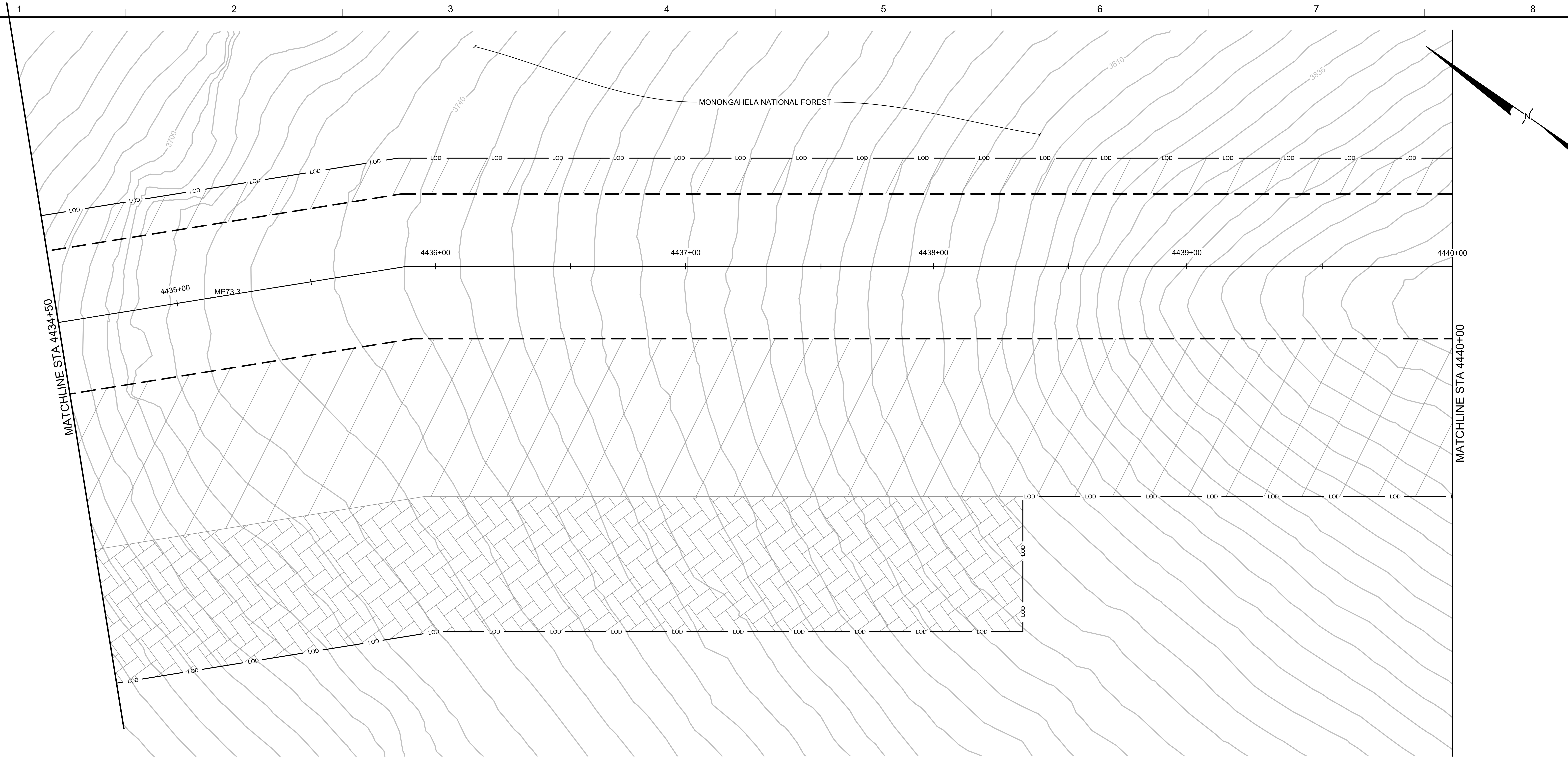
DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01A
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	4 OF 29	



NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: EXISTING GROUND (4 OF 5)

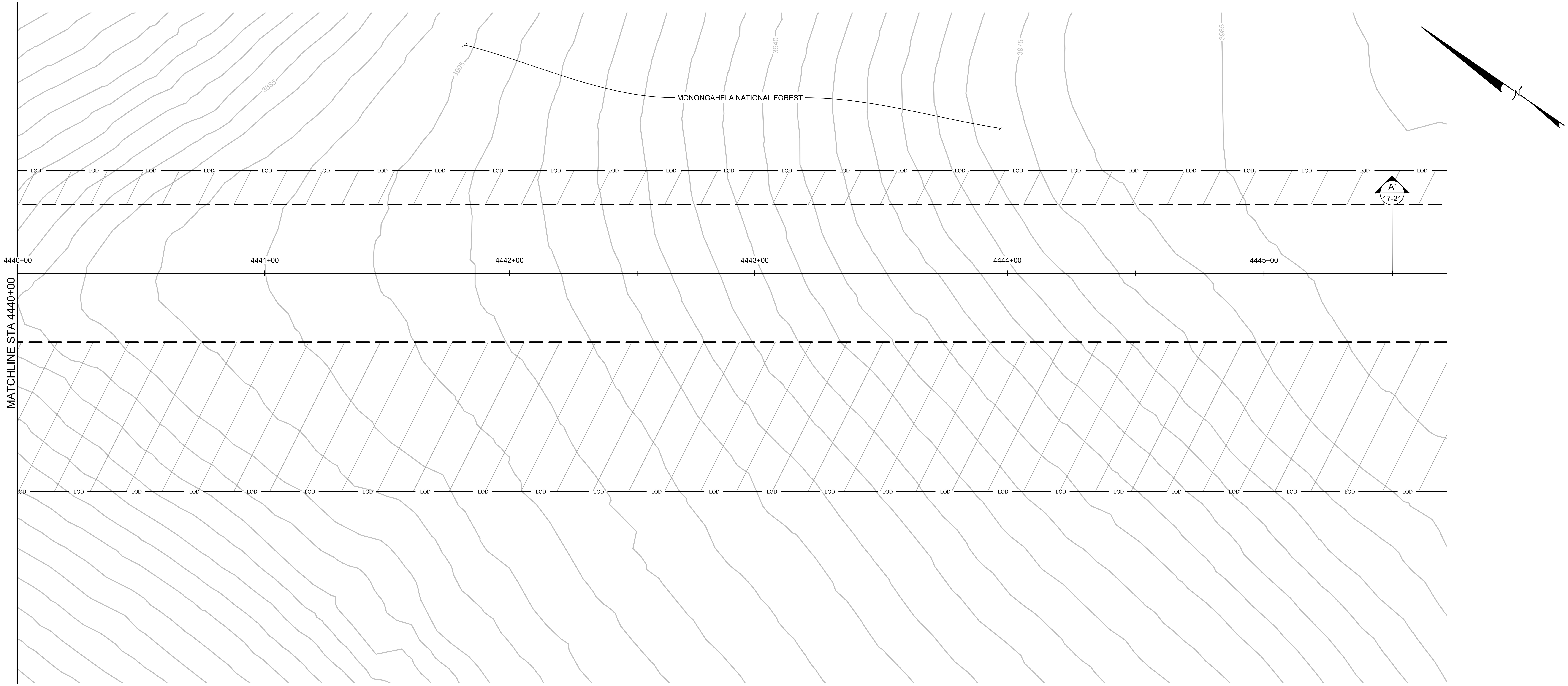
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01A
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	5 OF 29	



NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: EXISTING GROUND (5 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01A
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	6 OF 29	

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE:
GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: TEMPORARY GROUND (1 OF 5)

PROJECT:
ATLANTIC COAST PIPELINE, REV 11B

SITE:
ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01B
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	7 OF 29	

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0 20 40
SCALE IN FEET

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

P:\CADD\PROJECTS\A\ATLANTIC COAST PIPELINE\GEOHAZARD ANALYSIS\MITIGATION DESIGN\F SERVICE SITE DESIGN(TXG00071210)\DRAWINGS\TXG000713D01B

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: TEMPORARY GROUND (2 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
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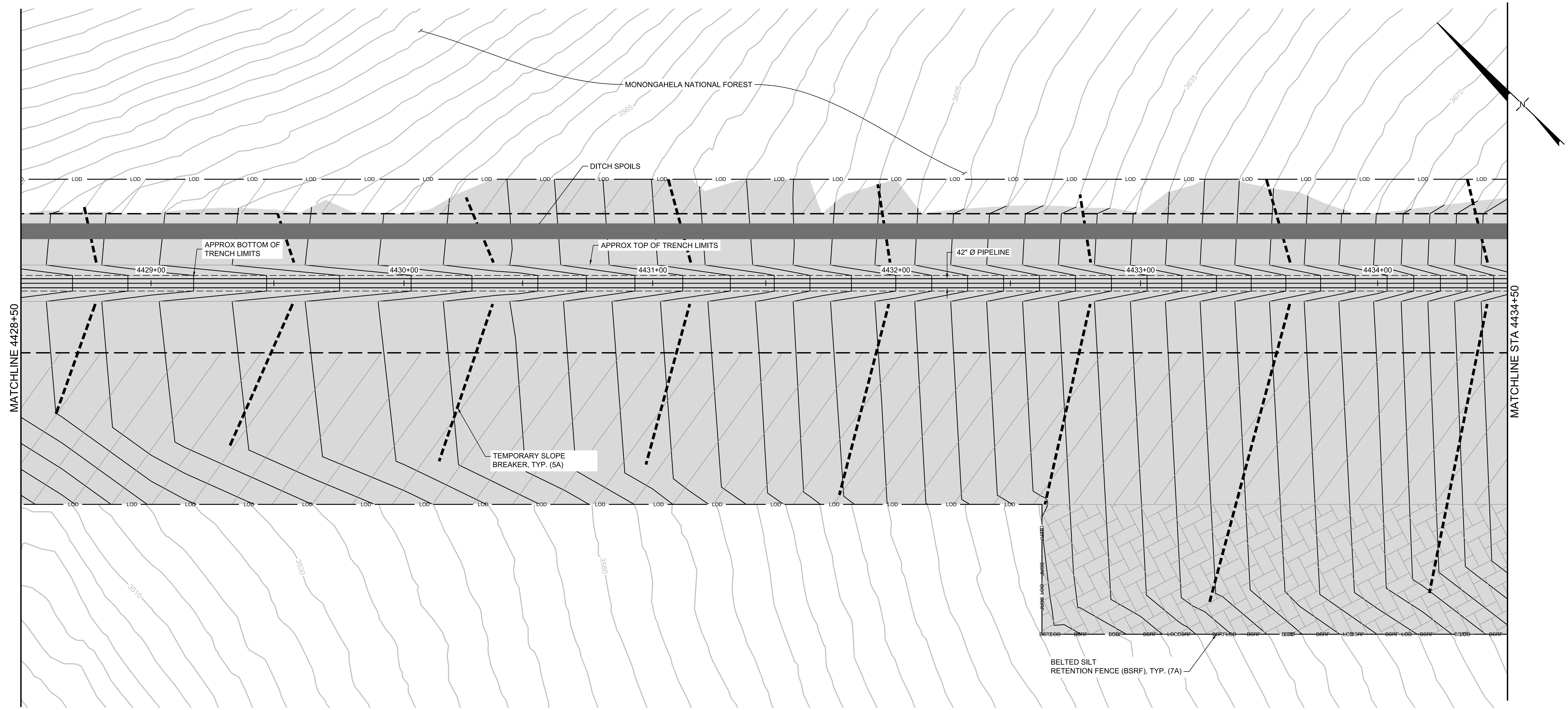
DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01B
REVIEWED BY:	LCB/TR	DRAWING NO.:	8 OF 29
APPROVED BY:	LCB		



NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: TEMPORARY GROUND (3 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01B
REVIEWED BY:	LCB/TR	DRAWING NO.:	9 OF 29
APPROVED BY:	LCB		

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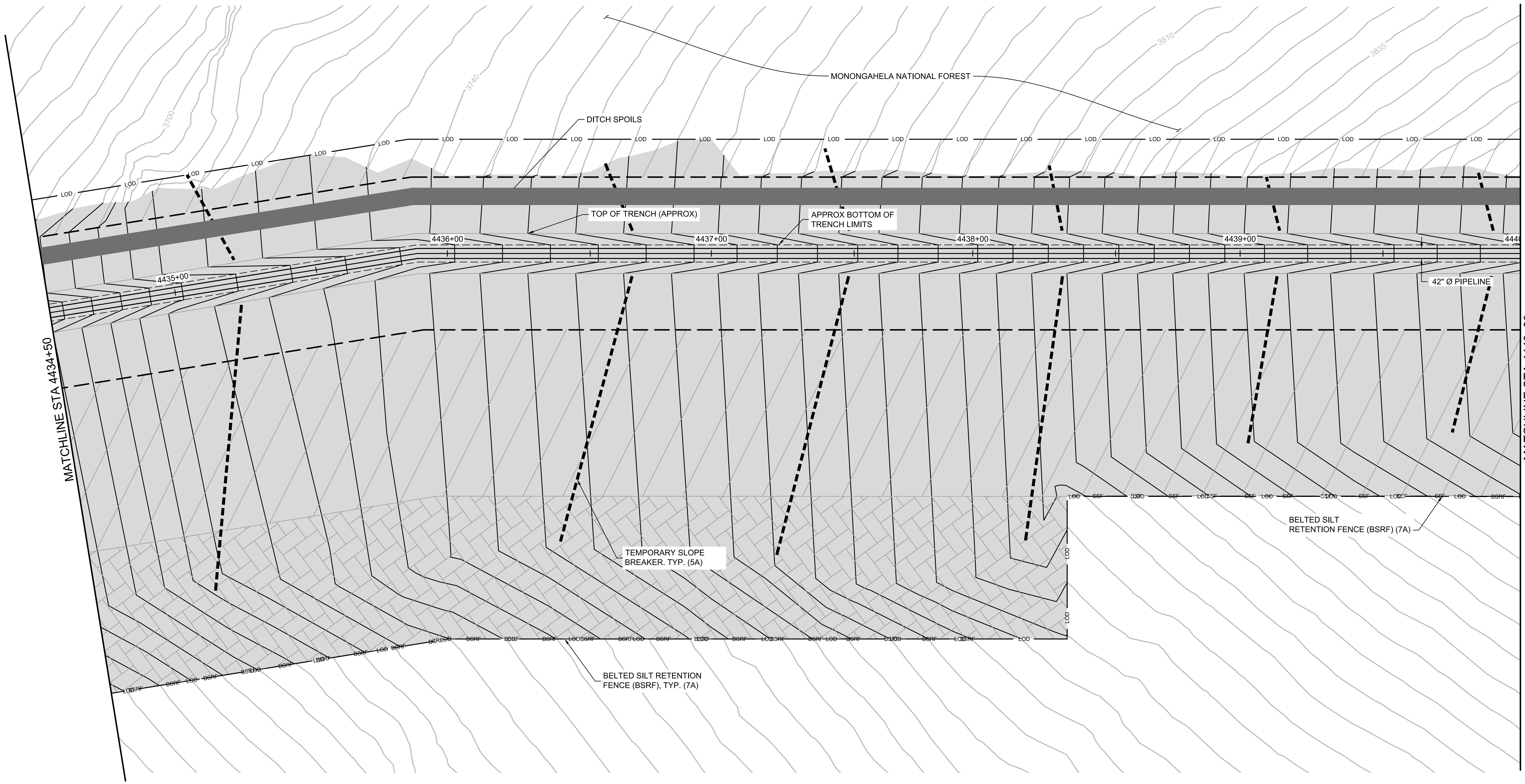

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: TEMPORARY GROUND (4 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
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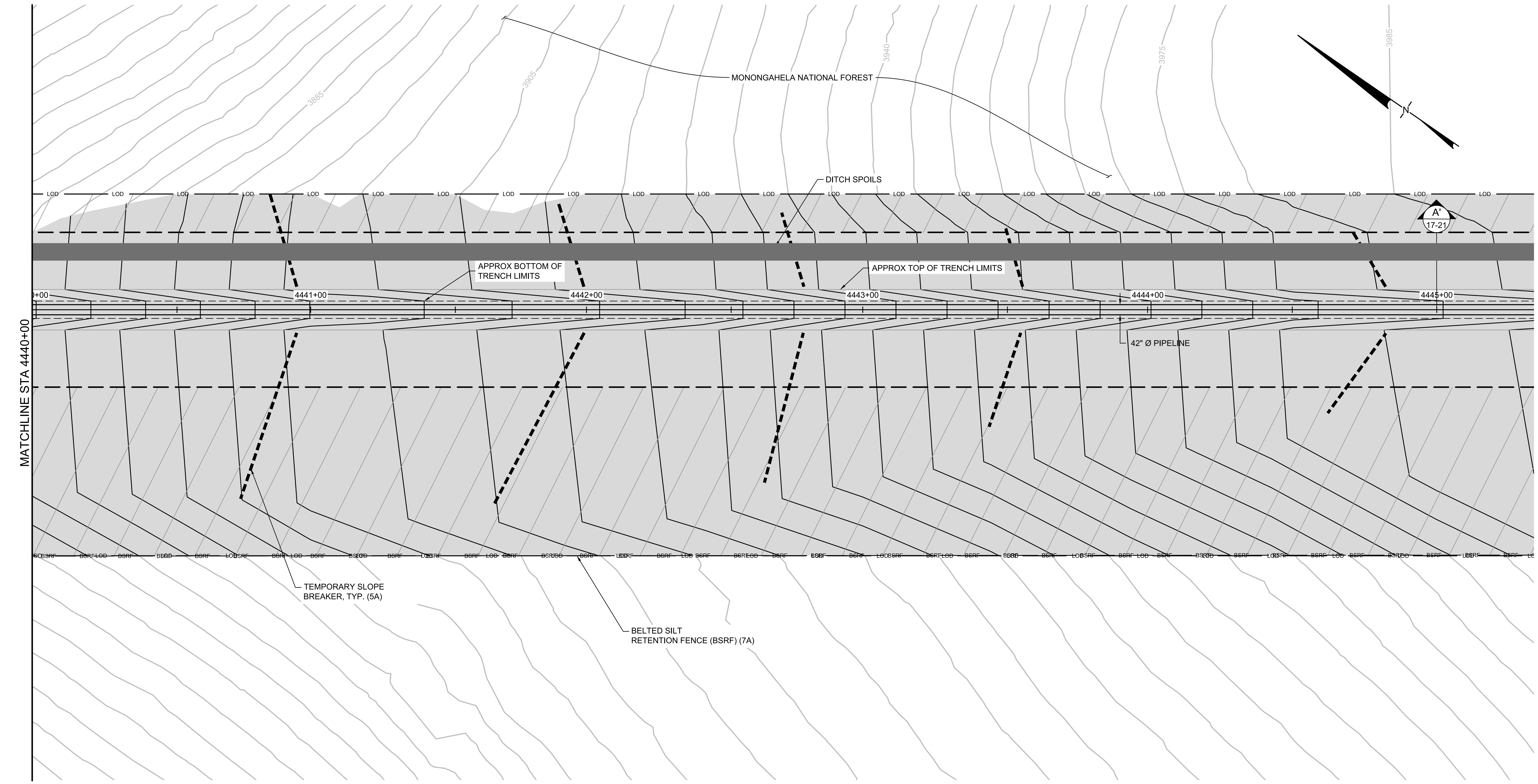
DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01B
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	10 OF 29	



NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE:
GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: TEMPORARY GROUND (5 OF 5)

PROJECT:
ATLANTIC COAST PIPELINE, REV 11B

SITE:
ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

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DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01B
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	11 OF 29	

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: FINAL GROUND (1 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

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DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01C
REVIEWED BY:	LCB/TR	DRAWING NO.:	12 OF 29
APPROVED BY:	LCB		

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NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: FINAL GROUND (2 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01C
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	13 OF 29	

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: FINAL GROUND (3 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
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DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01C
REVIEWED BY:	LCB/TR	DRAWING NO.:	14 OF 29
APPROVED BY:	LCB		

PRELIMINARY
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DRAFT-PROGRESS SET

0 20 40
SCALE IN FEET

NOTES:

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A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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TITLE:
GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: FINAL GROUND (4 OF 5)

PROJECT:
ATLANTIC COAST PIPELINE, REV 11B

SITE:
ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01C
REVIEWED BY:	LCB/TR	DRAWING NO.:	15 OF 29
APPROVED BY:	LCB		

DRAFT-PROGRESS SET

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: FINAL GROUND (5 OF 5)

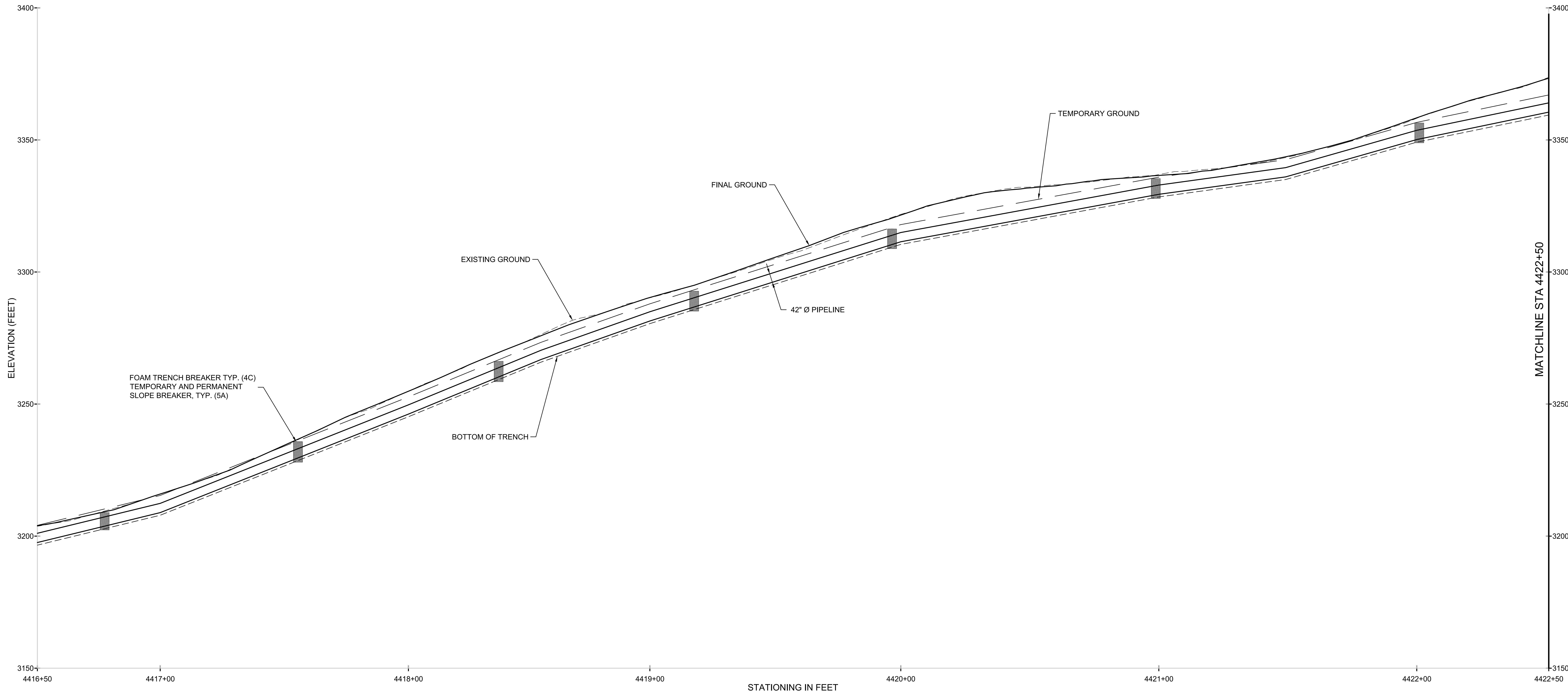
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01C
REVIEWED BY:	LCB/TR	DRAWING NO.:	16 OF 29
APPROVED BY:	LCB		



SECTION A-A'

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN PROFILE A-A' (1 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

DESIGN BY: LCB/TR	DATE: MARCH 2017
DRAWN BY: JJV/KH	PROJECT NO.: TXG0007.13
CHECKED BY: MBE	FILE: TXG000713D01D
REVIEWED BY: LCB/TR	DRAWING NO.:
APPROVED BY: LCB	17 OF 29

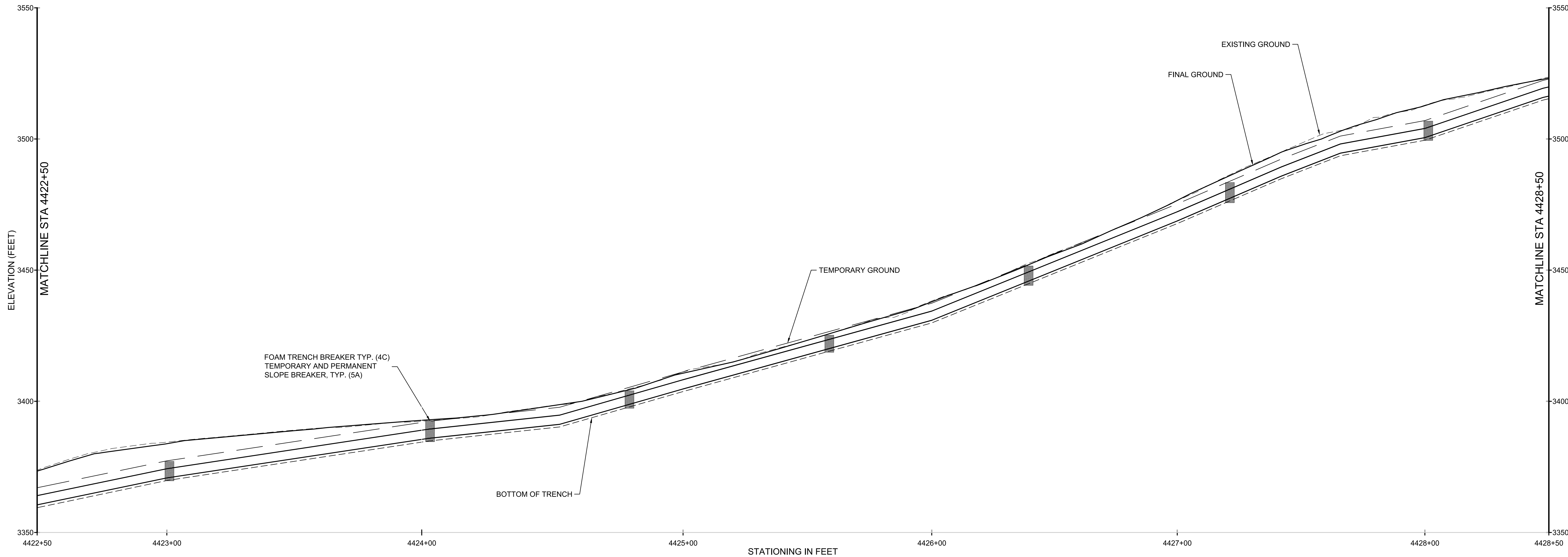
PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

0 20 40
SCALE IN FEET

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.



SECTION A-A'

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN PROFILE A-A' (2 OF 5)

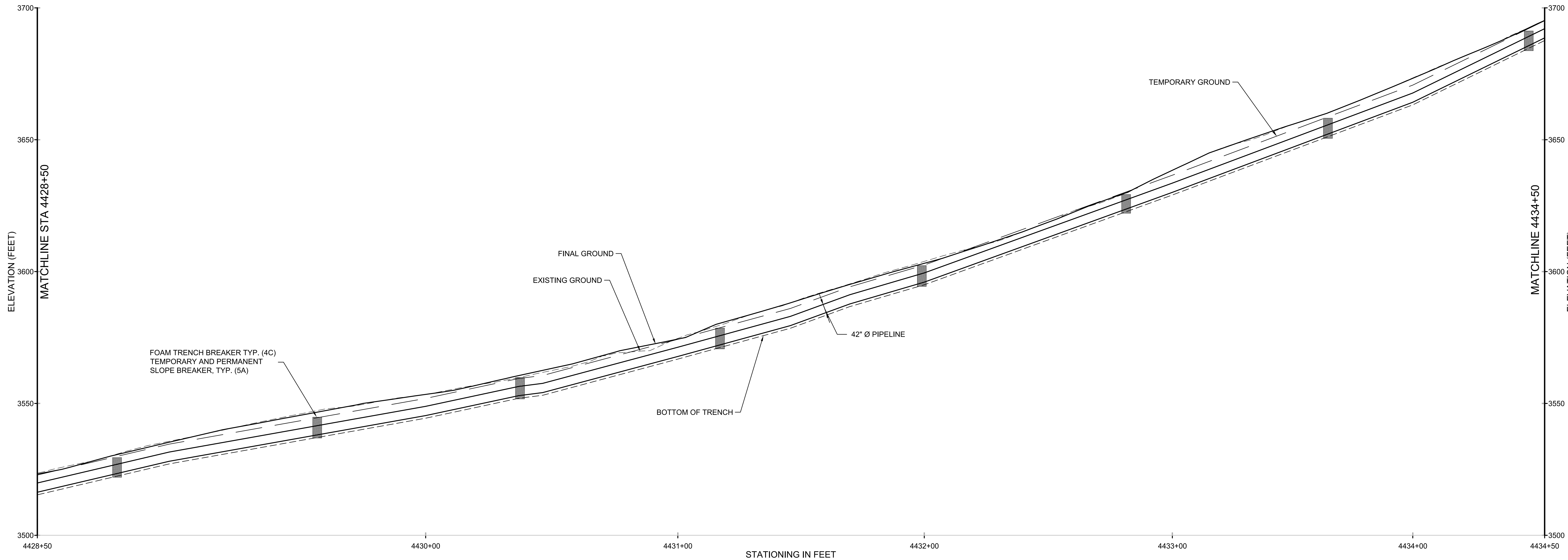
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01D
REVIEWED BY:	LCB/TR	DRAWING NO.:	18 OF 29
APPROVED BY:	LCB		



SECTION A-A'

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN PROFILE A-A' (3 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01D
REVIEWED BY:	LCB/TR	DRAWING NO.:	19 OF 29
APPROVED BY:	LCB		

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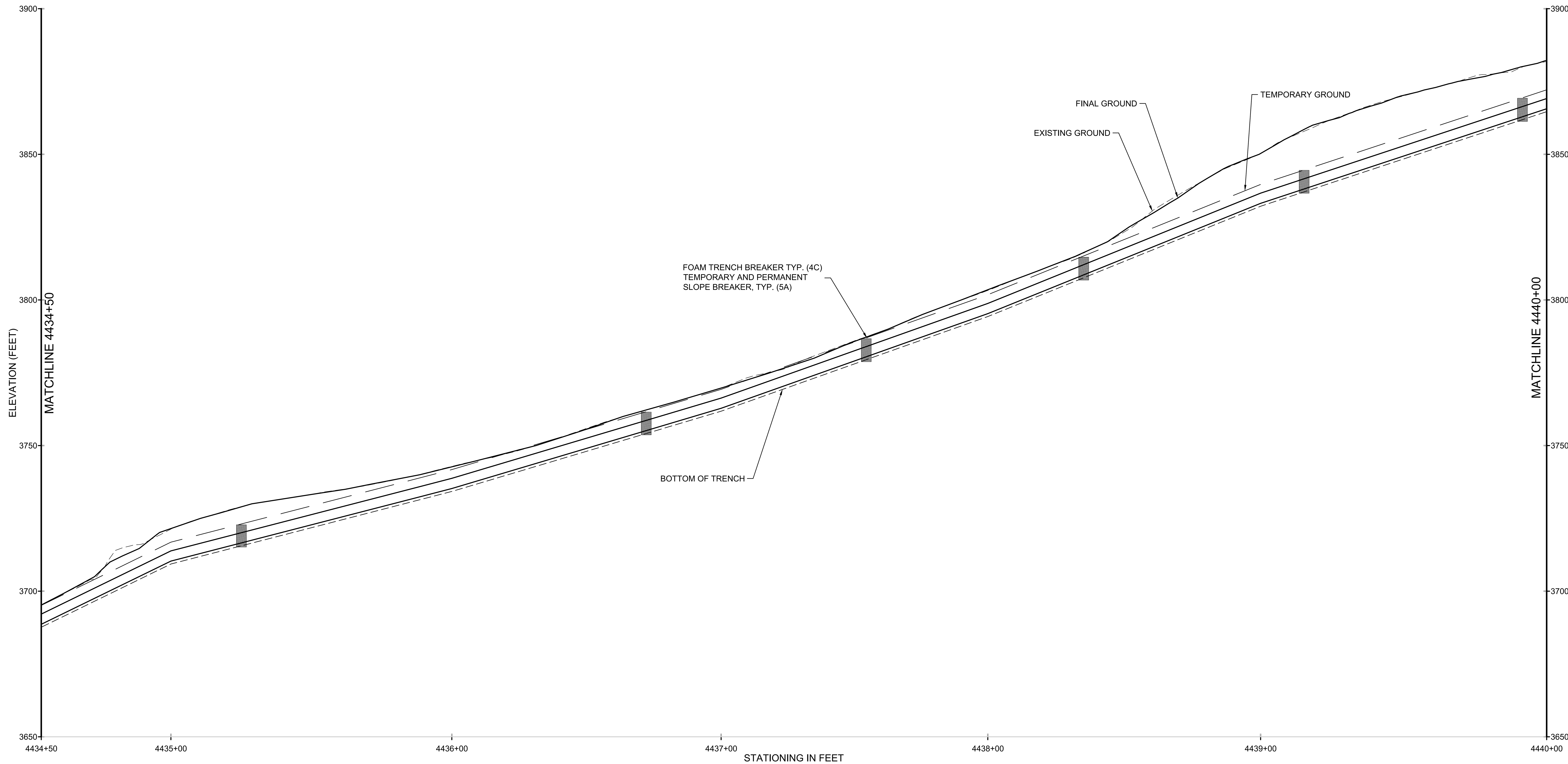

SECTION A-A'

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

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GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN PROFILE A-A' (4 OF 5)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

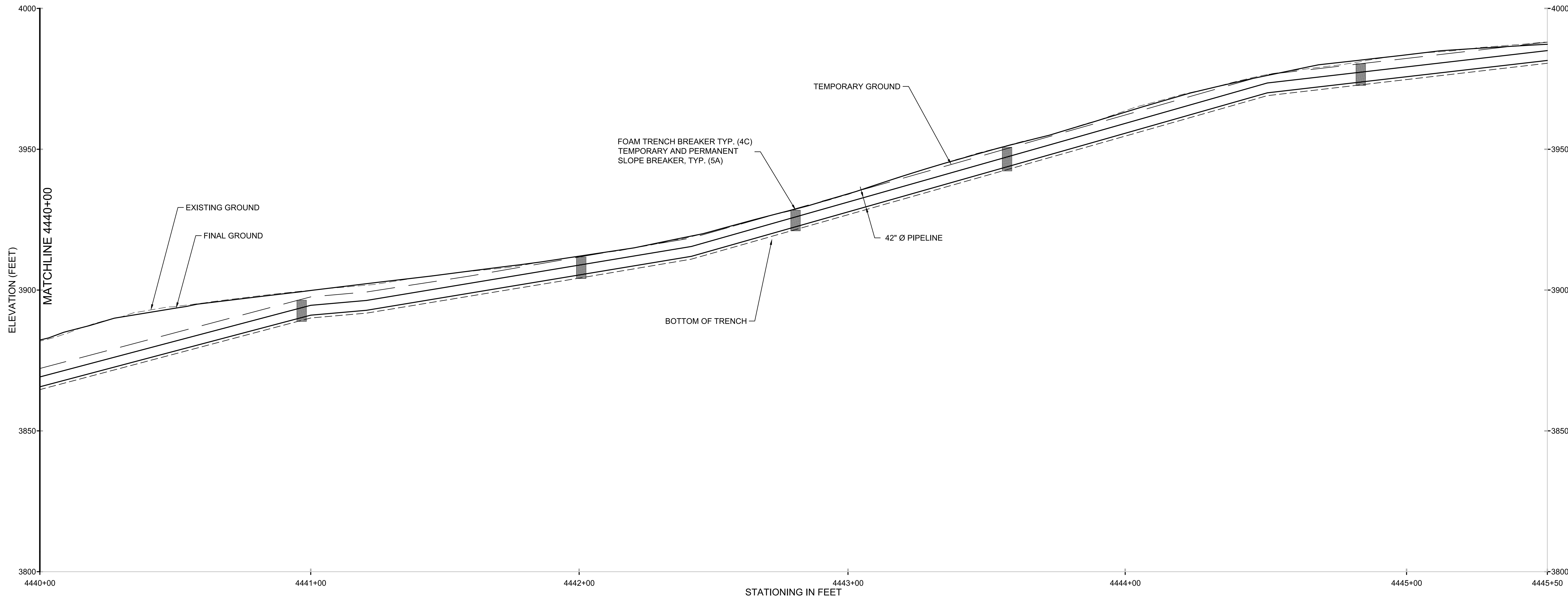
SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY NOT FOR CONSTRUCTION	DESIGN BY: LCB/TR	DATE: MARCH 2017
	DRAWN BY: JJV/KH	PROJECT NO.: TXG0007.13
	CHECKED BY: MBE	FILE: TXG000713D01D
	REVIEWED BY: LCB/TR	DRAWING NO.:
DRAFT-PROGRESS SET	APPROVED BY: LCB	20 OF 29

0 20 40
SCALE IN FEET

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.



SECTION A-A'

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

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GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE:
GEOHAZARD MITIGATION SITE SPECIFIC DESIGN PROFILE A-A' (5 OF 5)

PROJECT:
ATLANTIC COAST PIPELINE, REV 11B

SITE:
ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D01D
REVIEWED BY:	LCB/TR	DRAWING NO.:	21 OF 29
APPROVED BY:	LCB		

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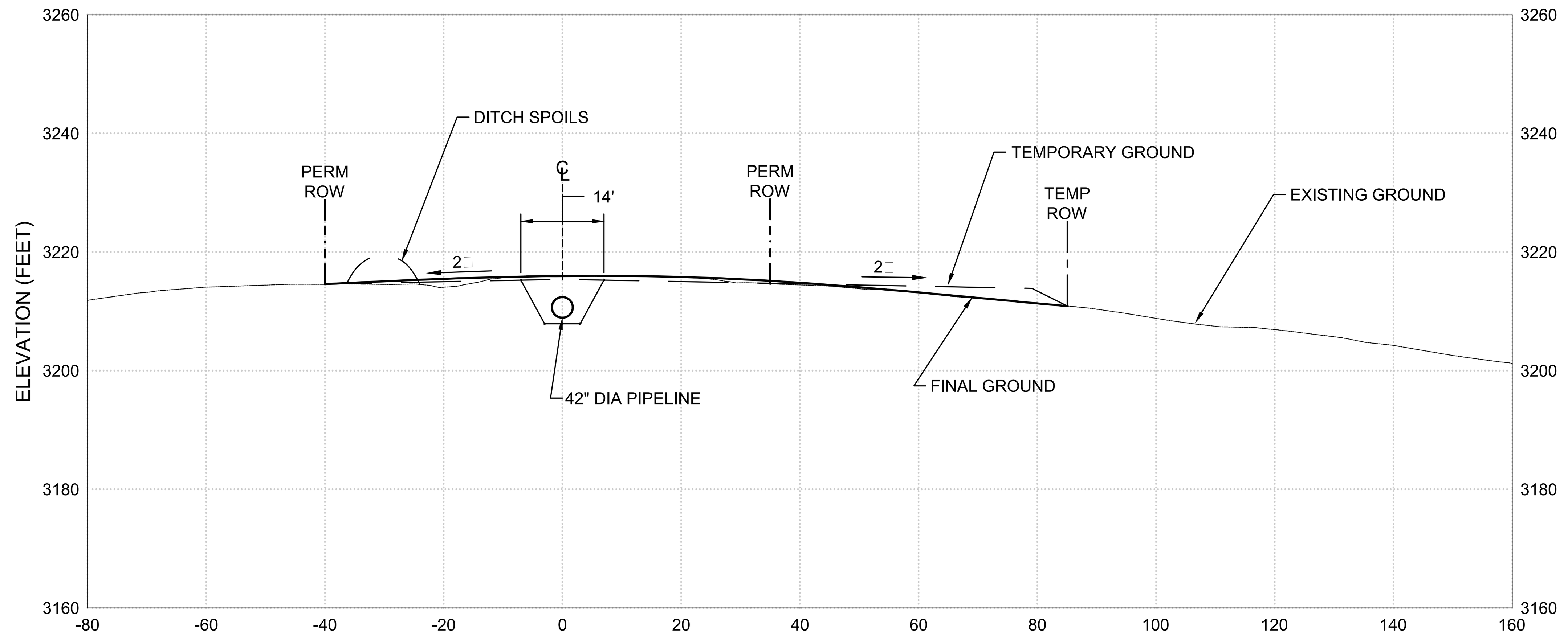

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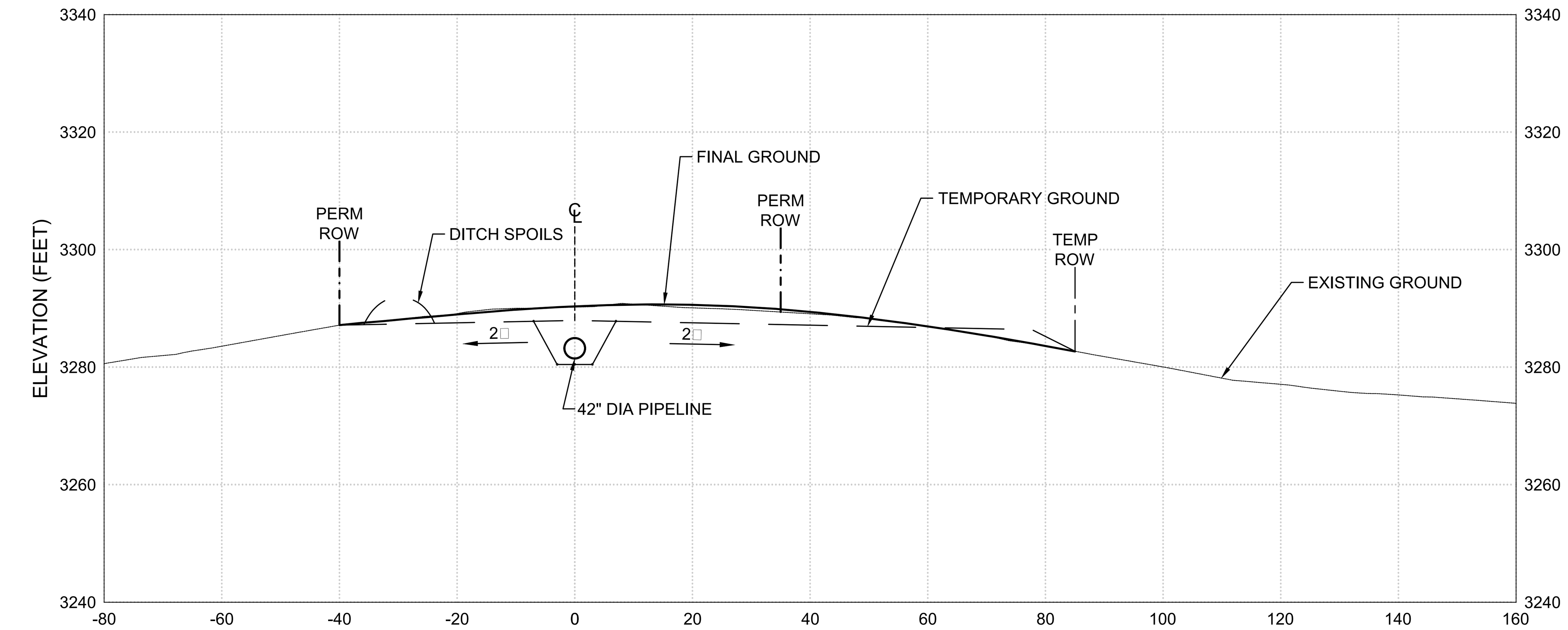
DISTANCE (FT)



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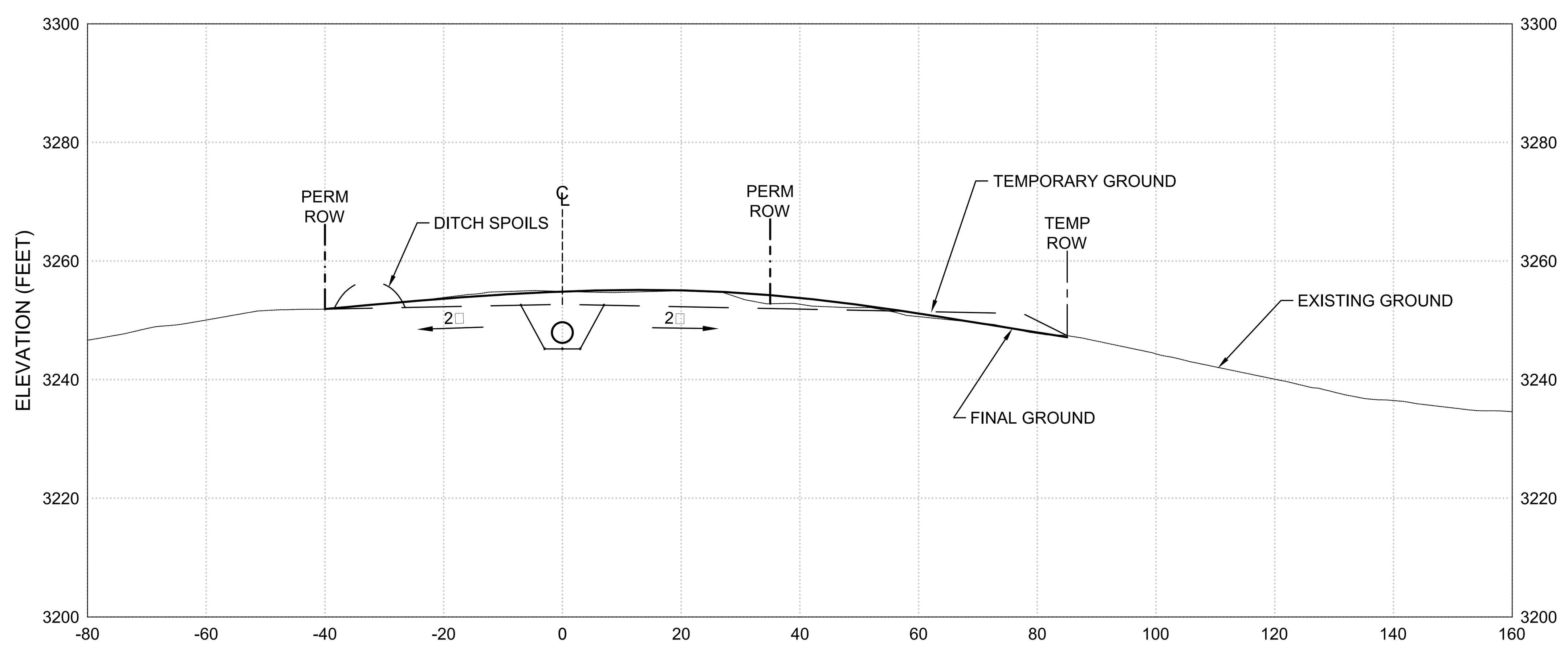

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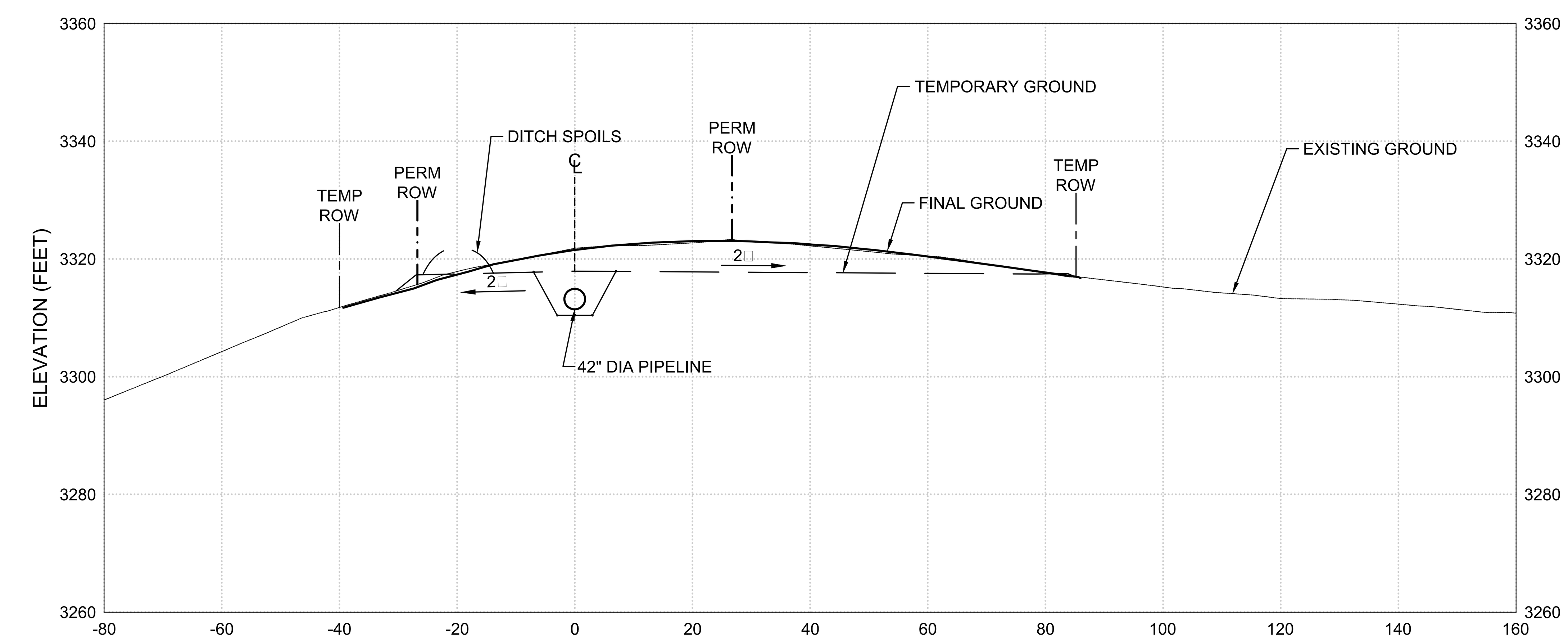


STA 4420+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (1 OF 8)

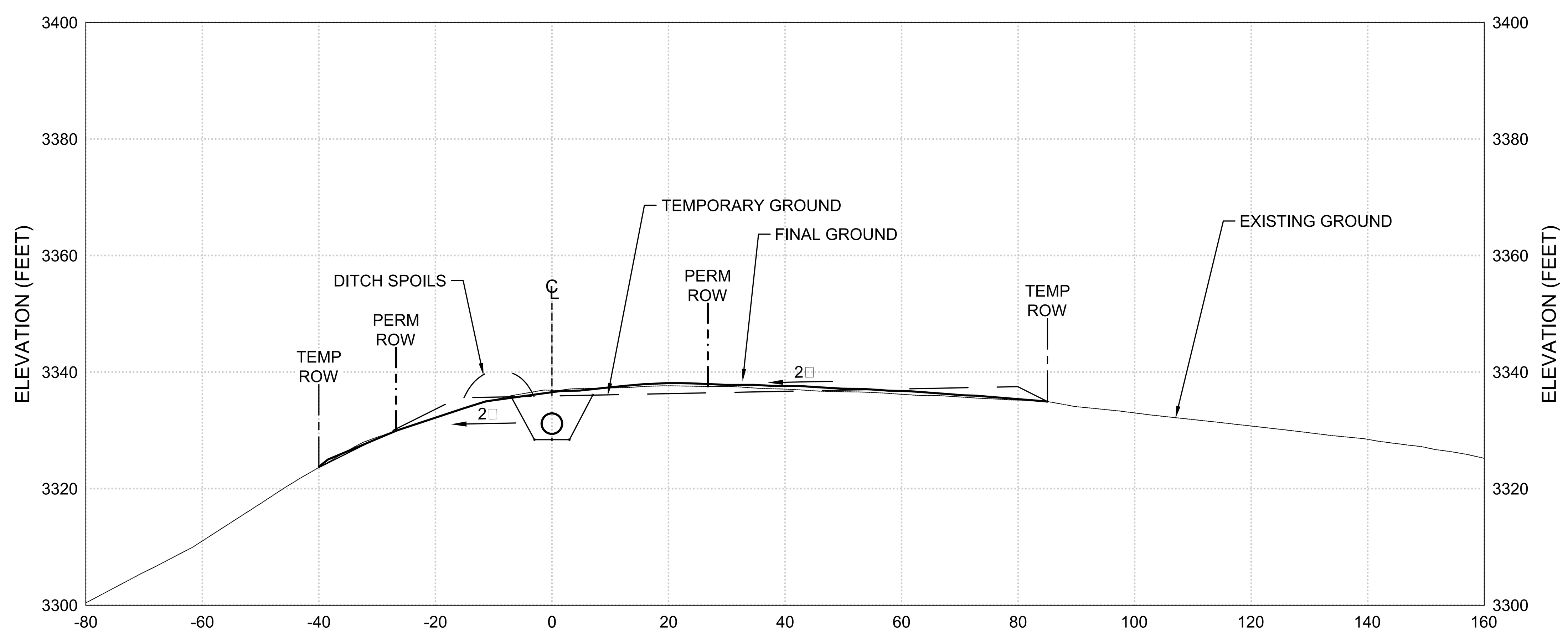
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	22 OF 29
APPROVED BY:	LCB		



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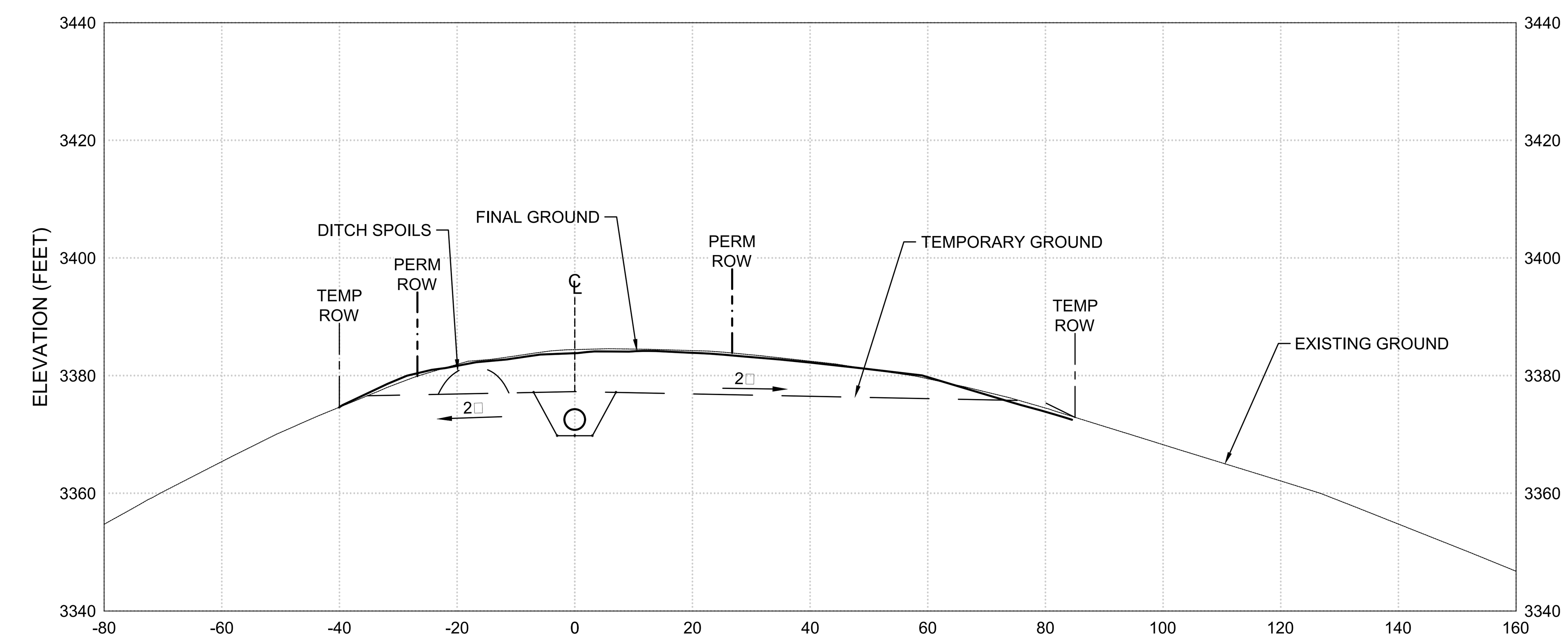

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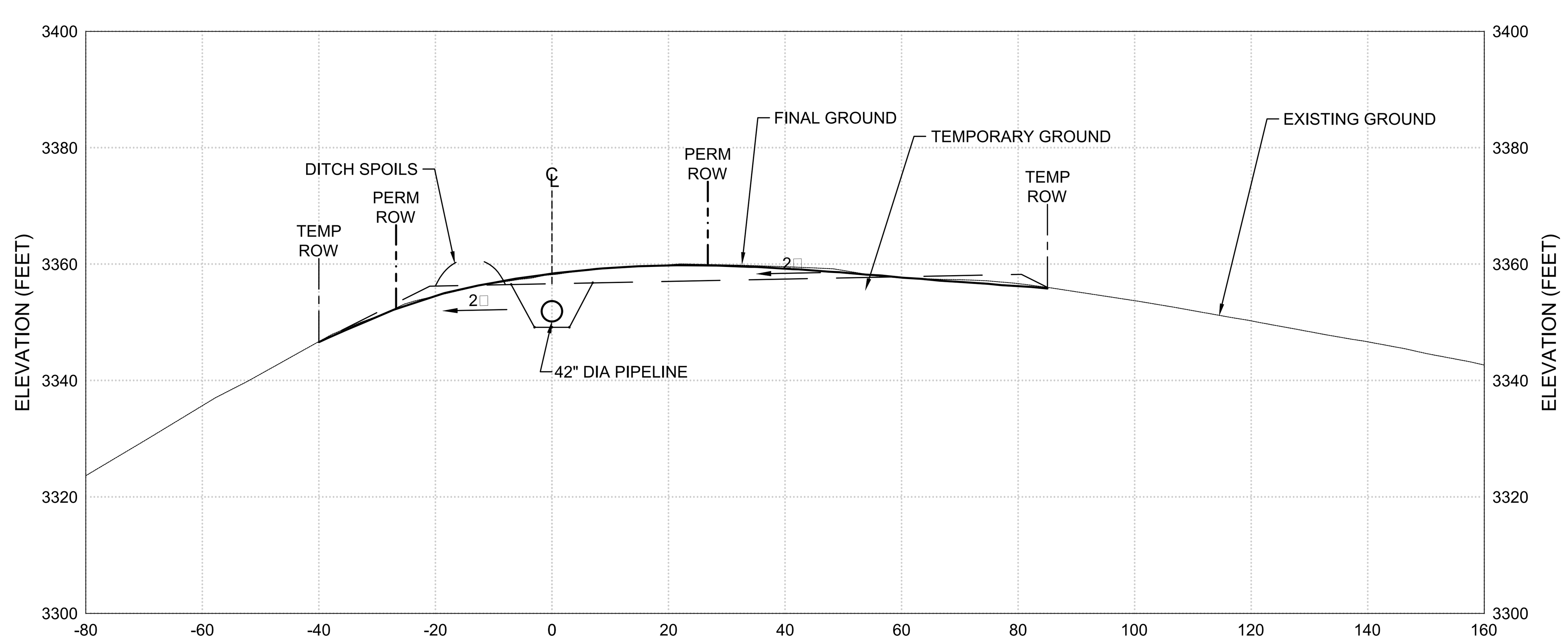
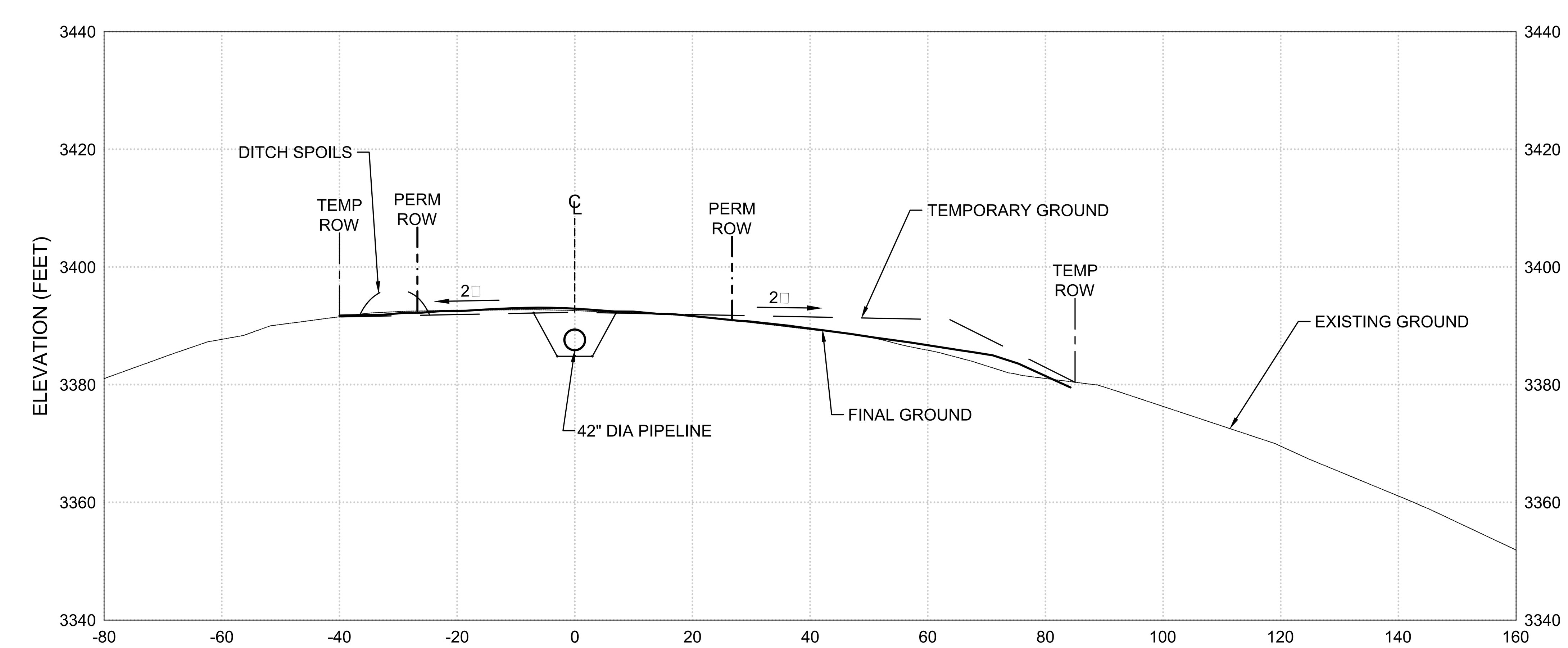


STA 4422+00
DISTANCE (FT)



STA 4424+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (2 OF 8)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

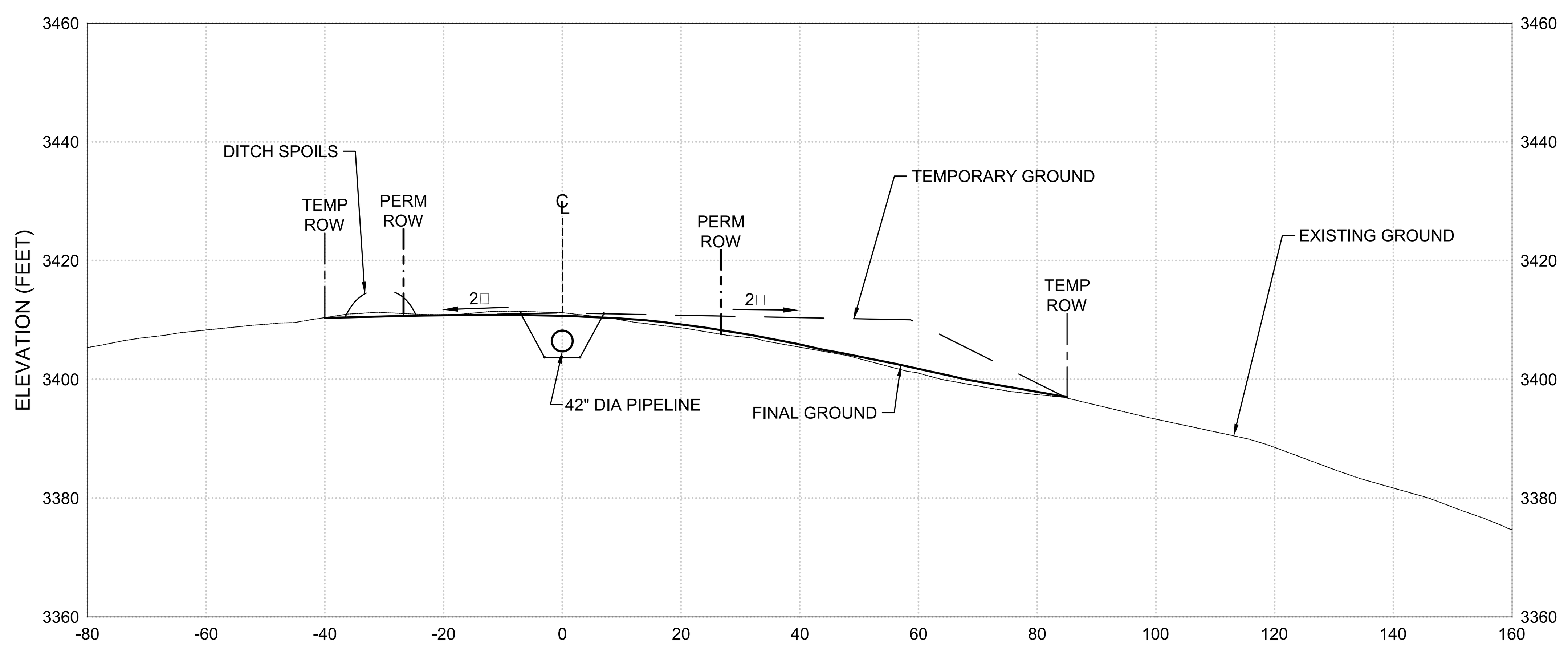
SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	23 OF 29
APPROVED BY:	LCB		

P:\CADD\PROJECTS\A\ATLANTIC COAST PIPELINE\GEOHAZARD ANALYSIS\MITIGATION DESIGN\F SERVICE SITE DESIGN(TXG00071210)\DRAWINGS\TXG000713D06



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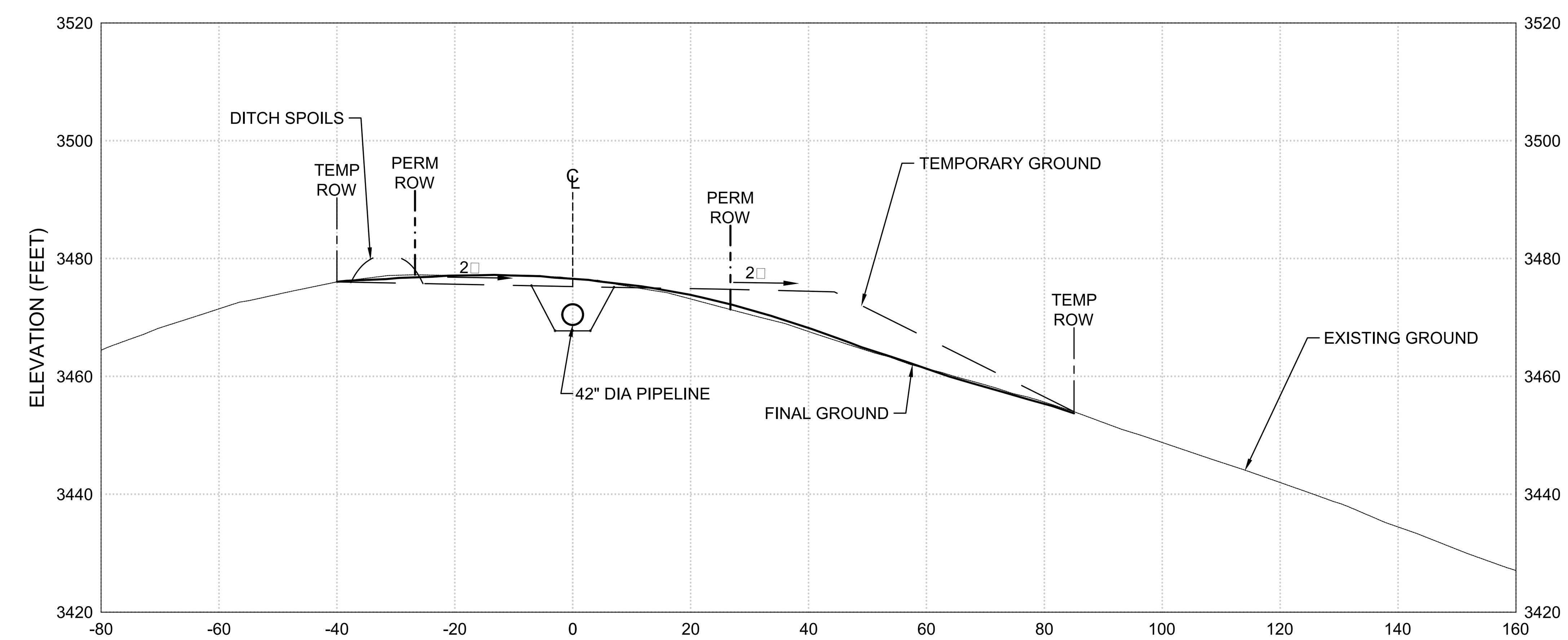

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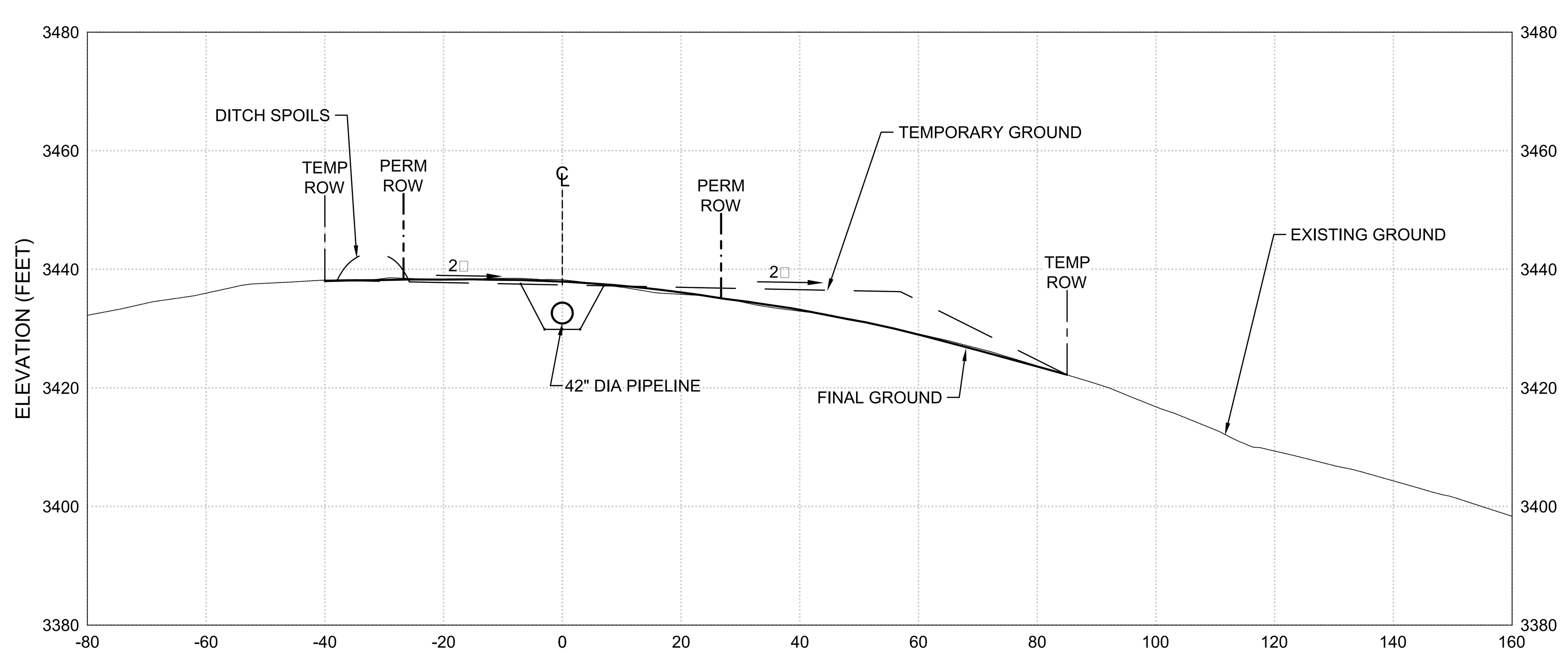

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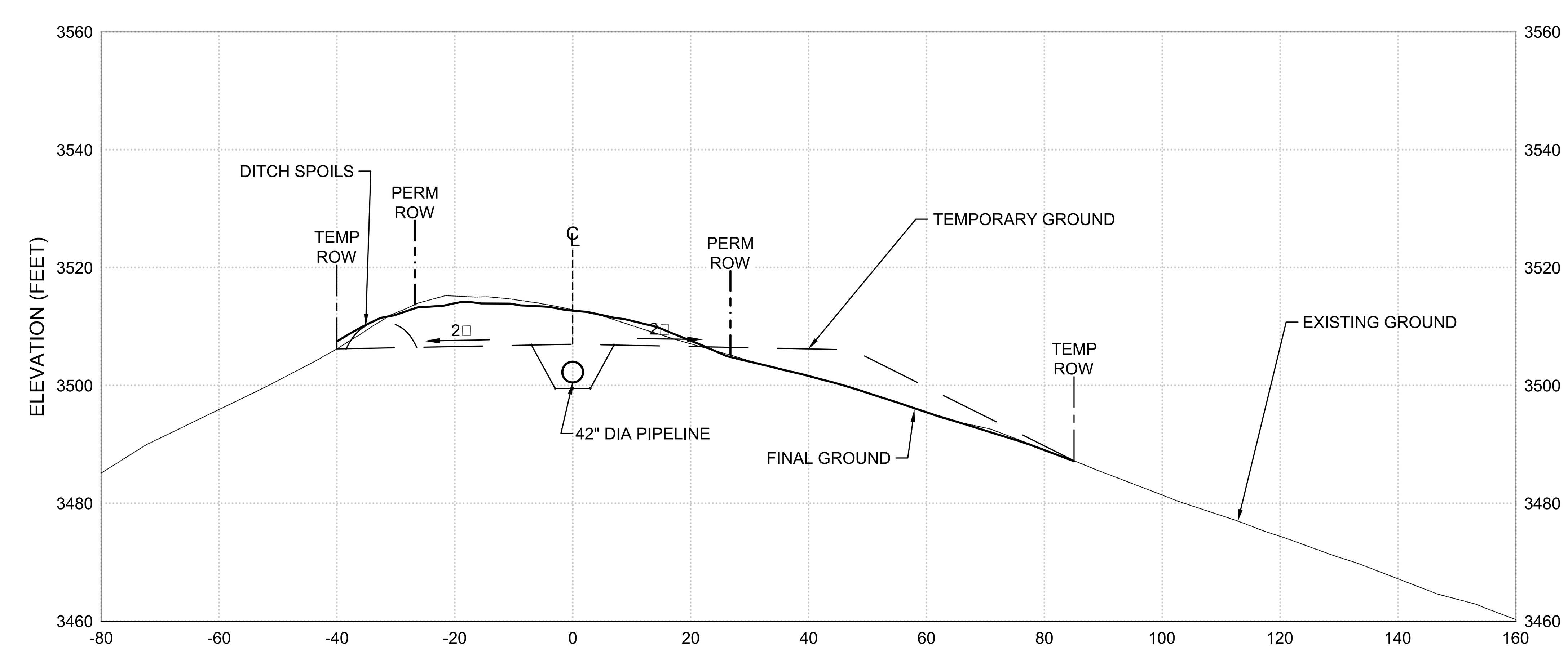
DISTANCE (FT)



STA 4428+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (3 OF 8)

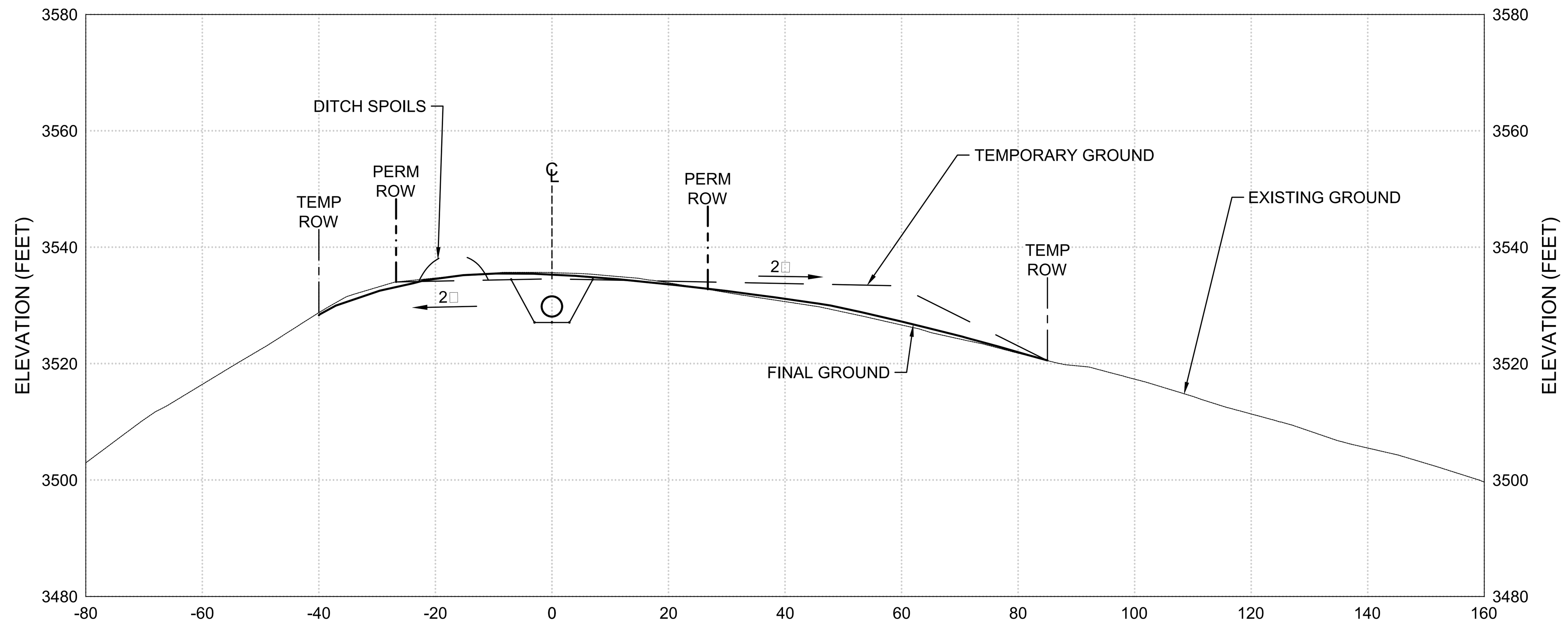
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	24 OF 29	



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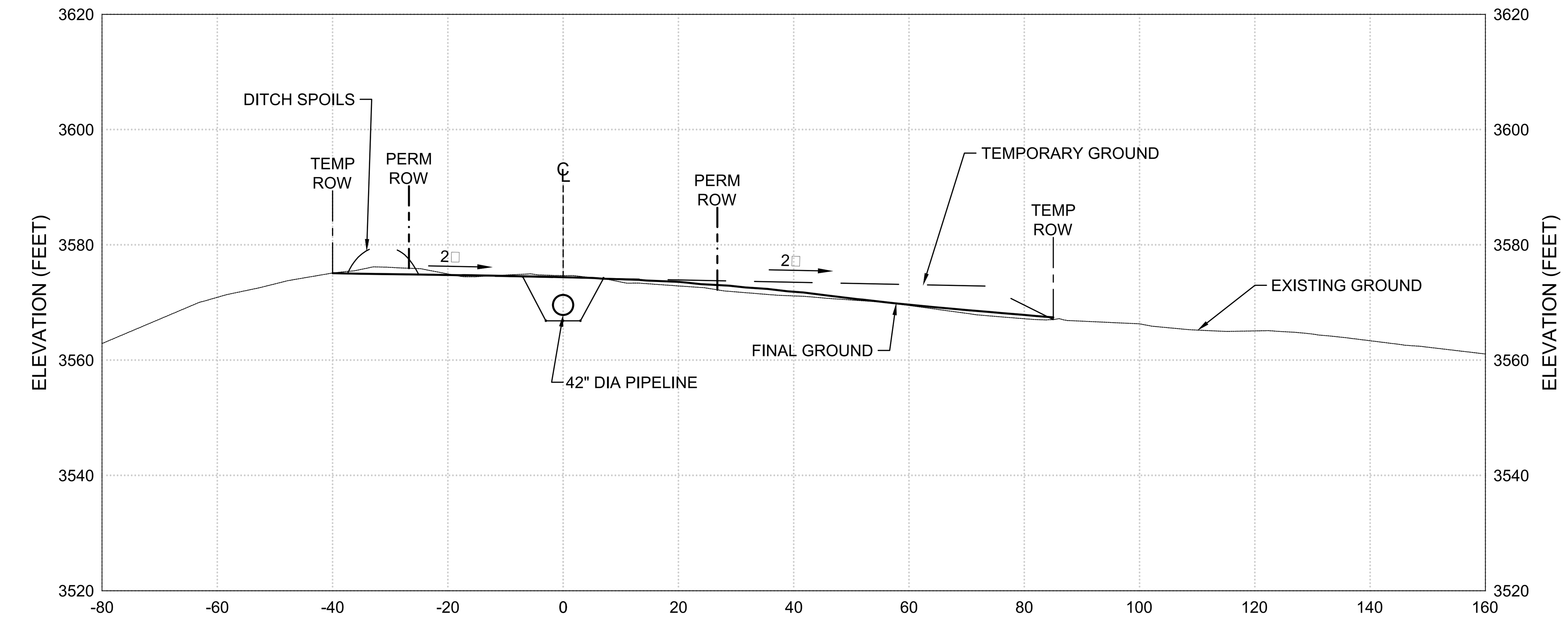

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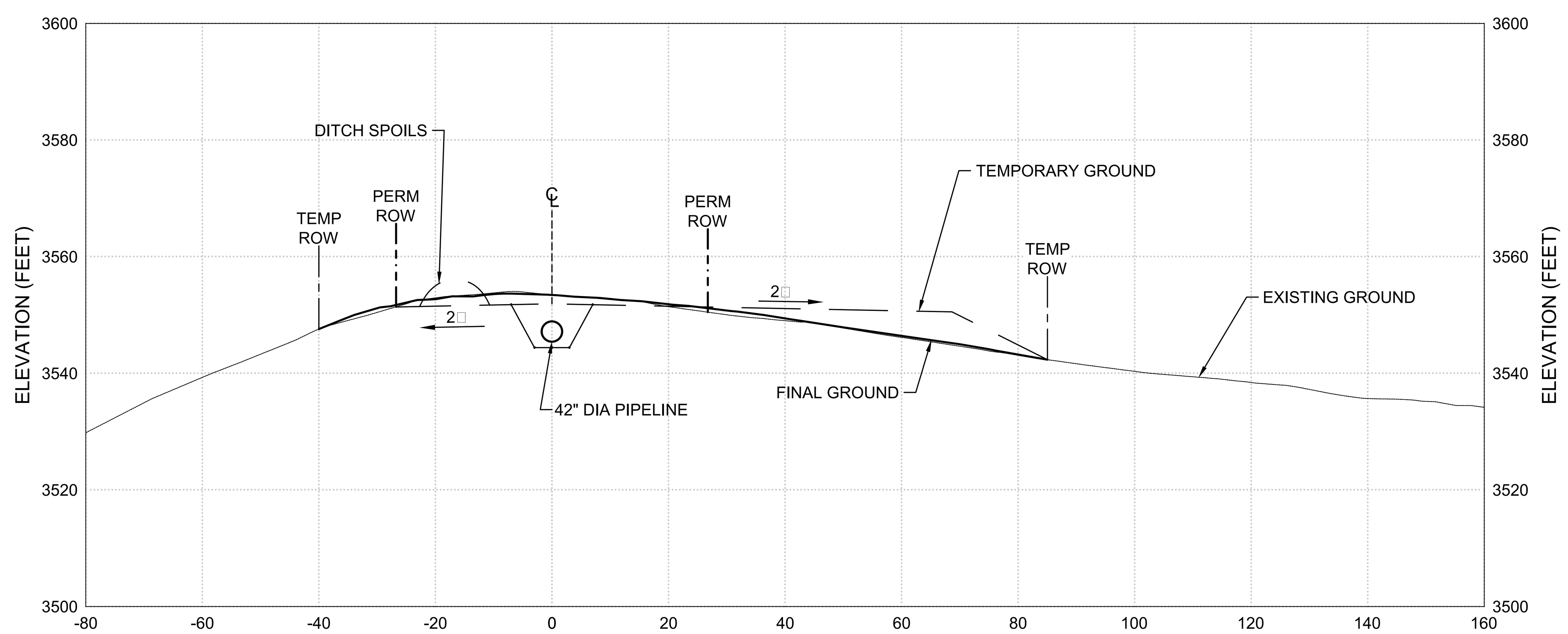

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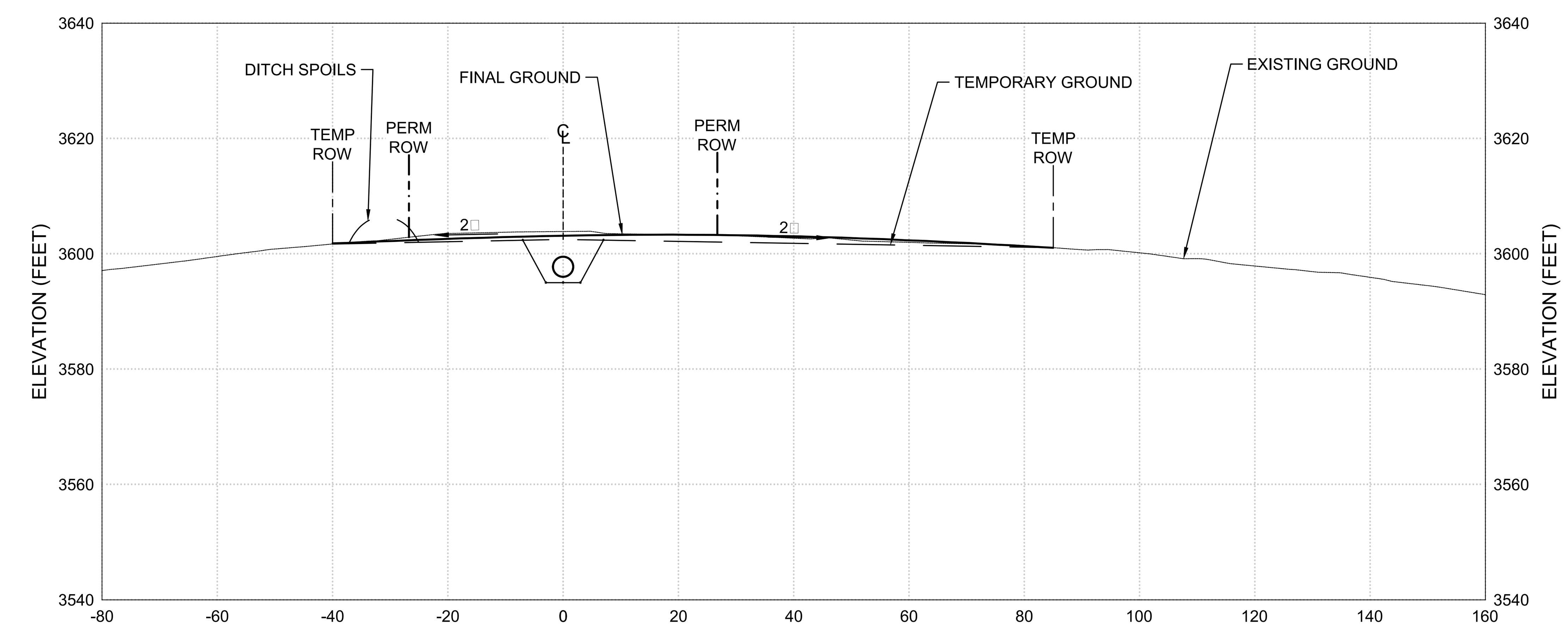

STA 4432+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (4 OF 8)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	25 OF 29
APPROVED BY:	LCB		

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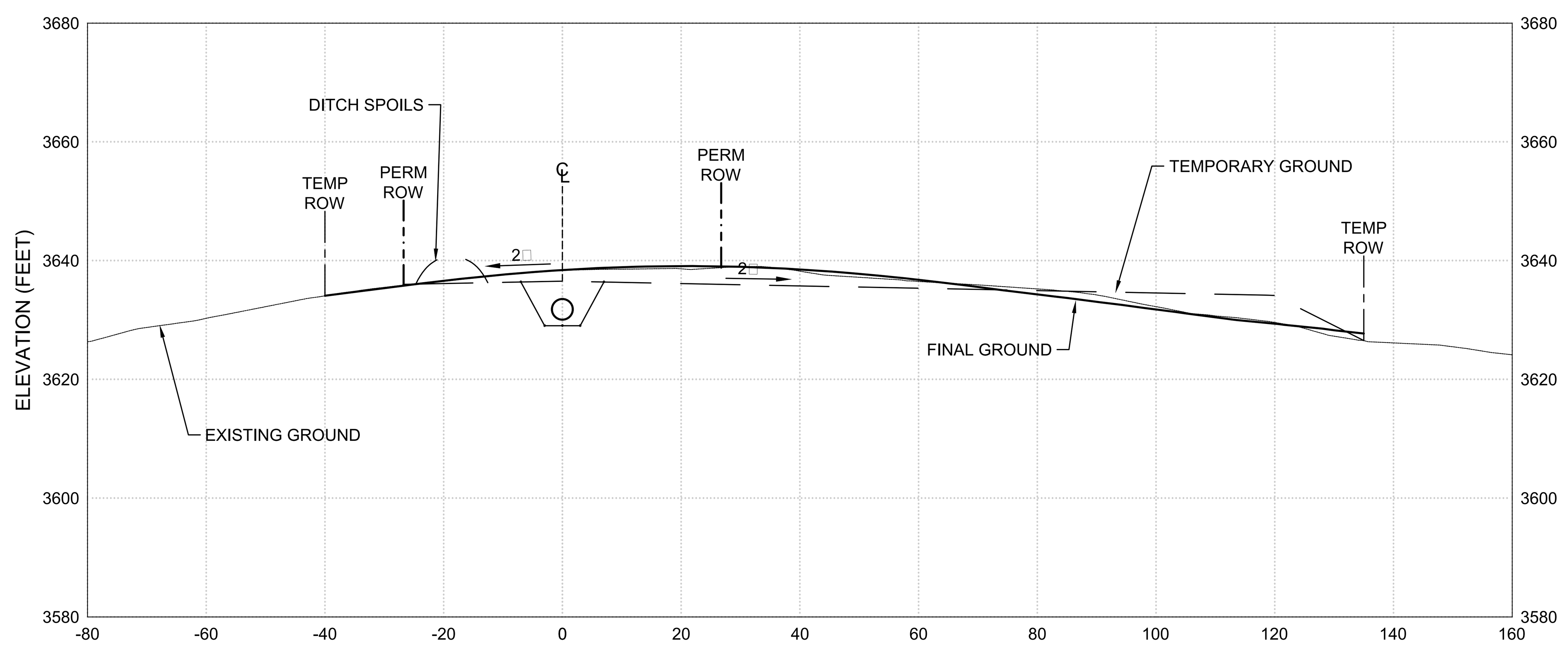

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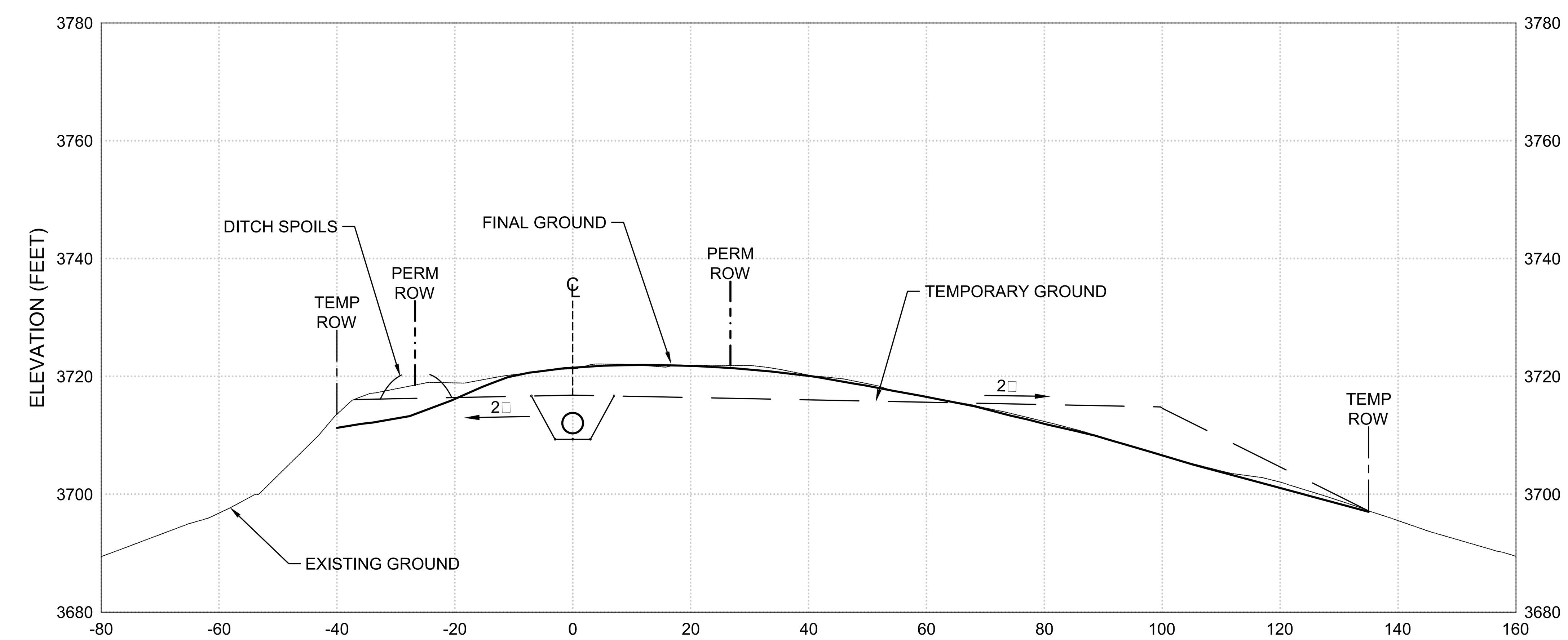

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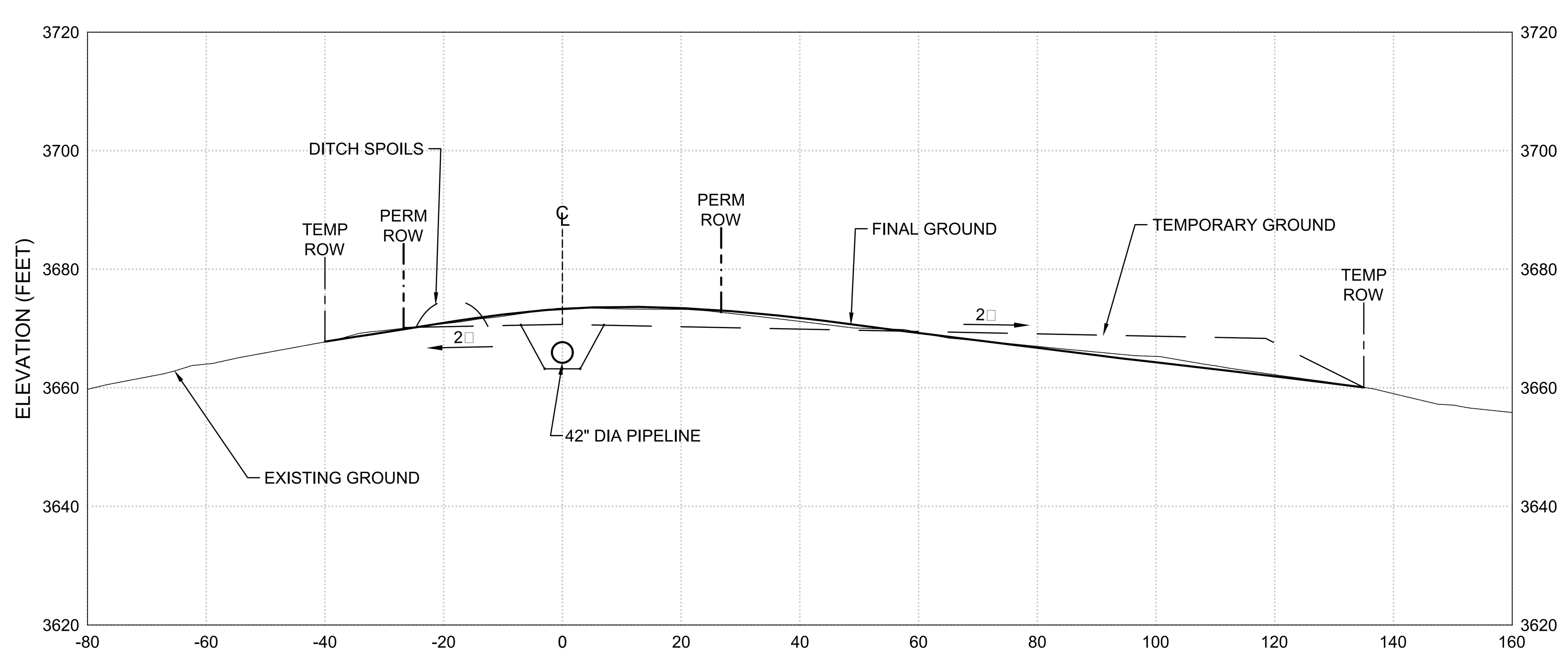

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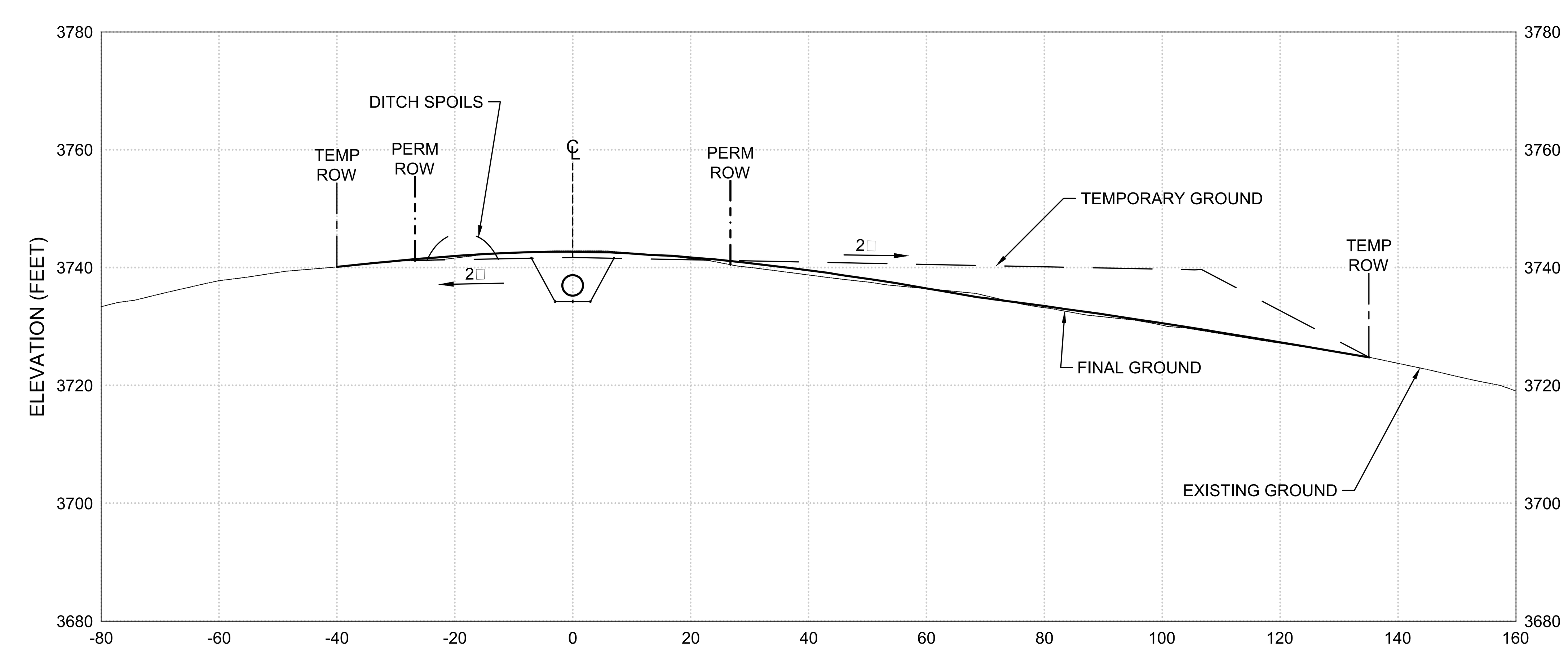
DISTANCE (FT)



STA 4436+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (5 OF 8)

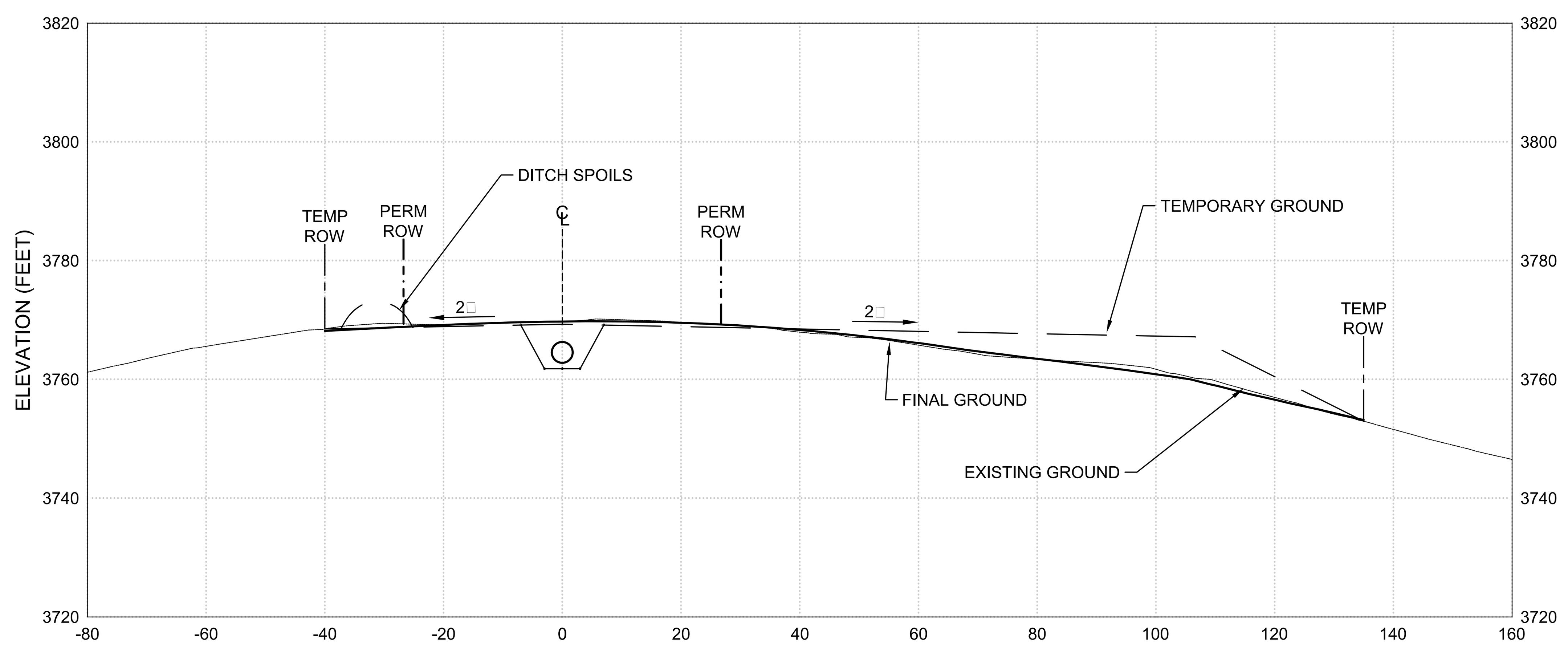
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION
ALIGNMENT SHEET NO. 96
STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	26 OF 29	



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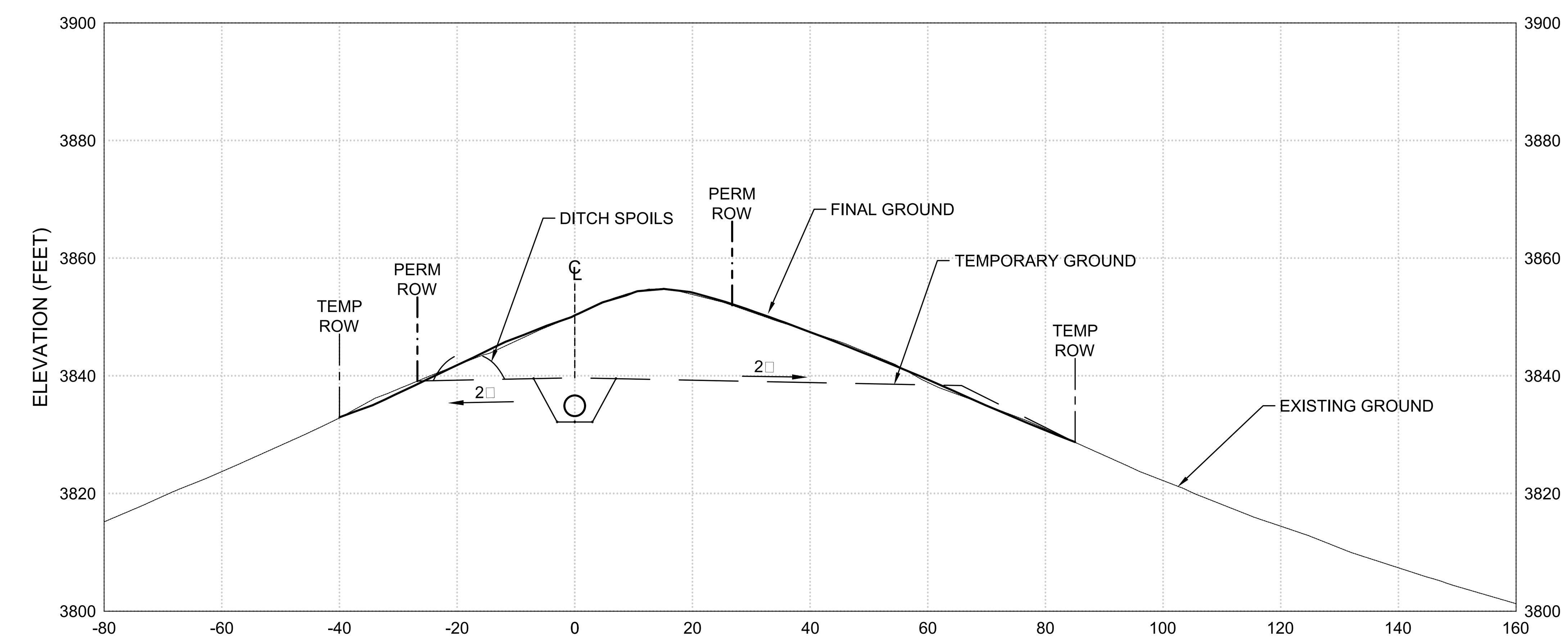

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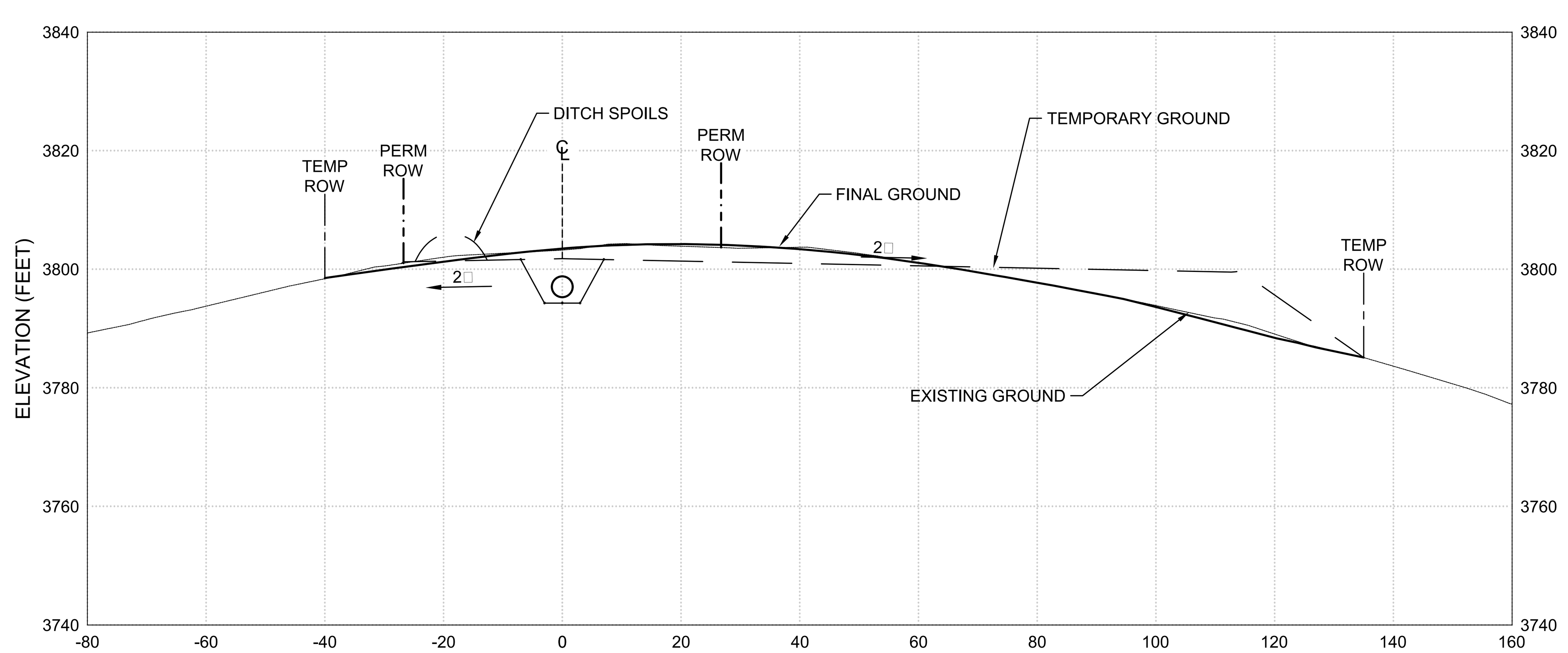
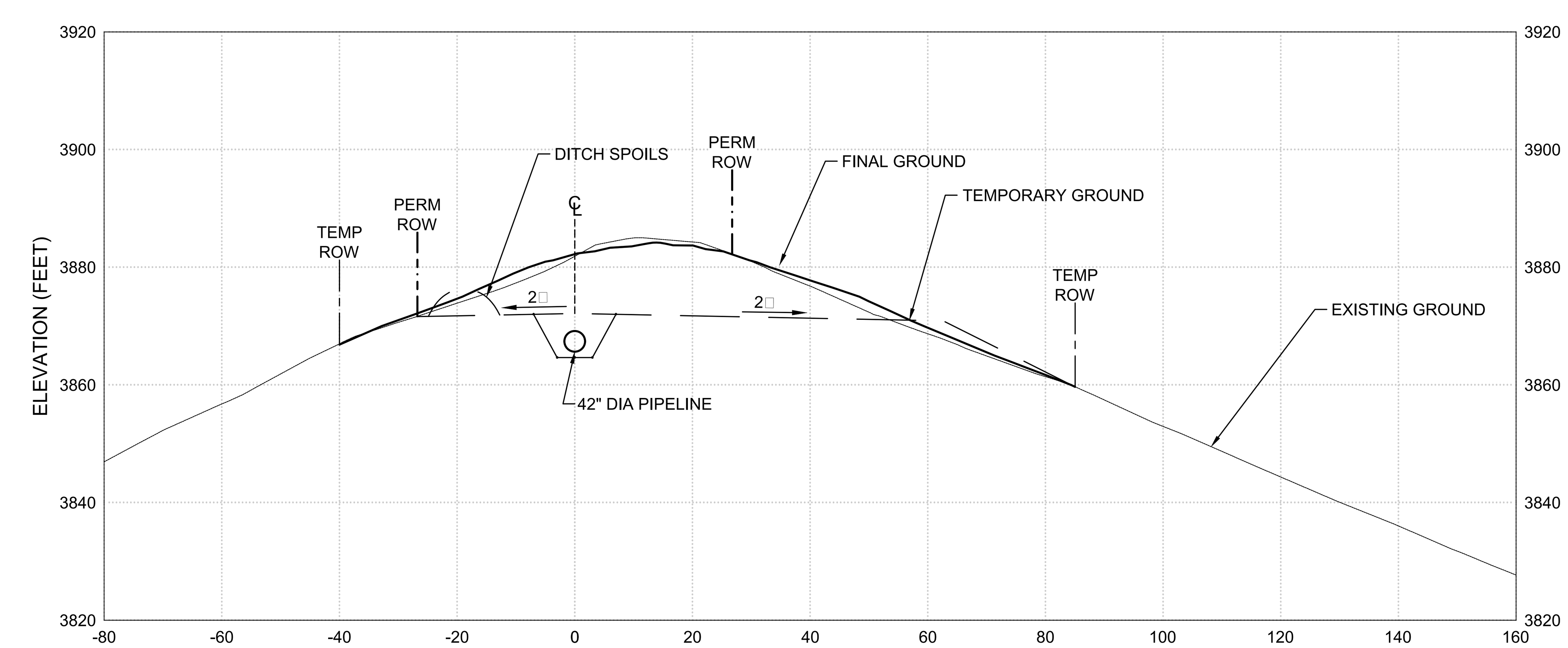


STA 4438+00
DISTANCE (FT)



STA 4440+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (6 OF 8)

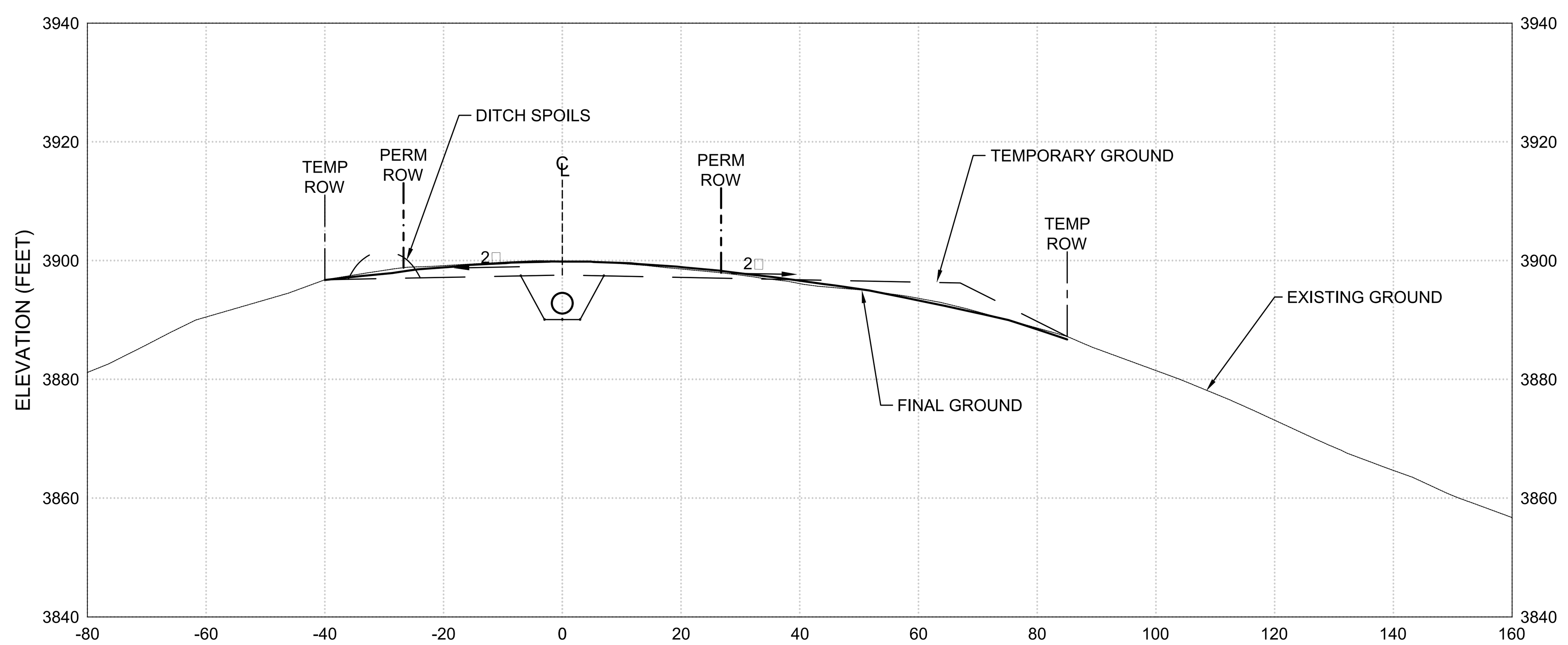
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	27 OF 29
APPROVED BY:	LCB		



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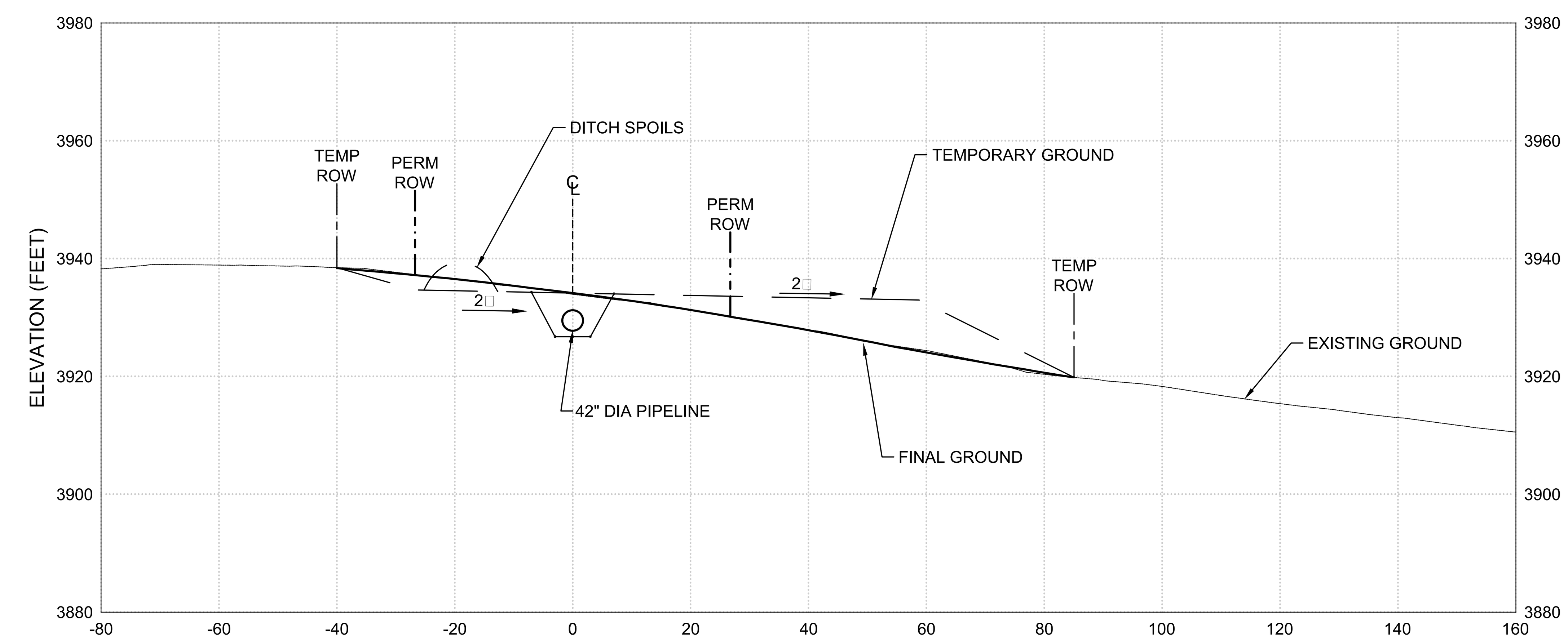

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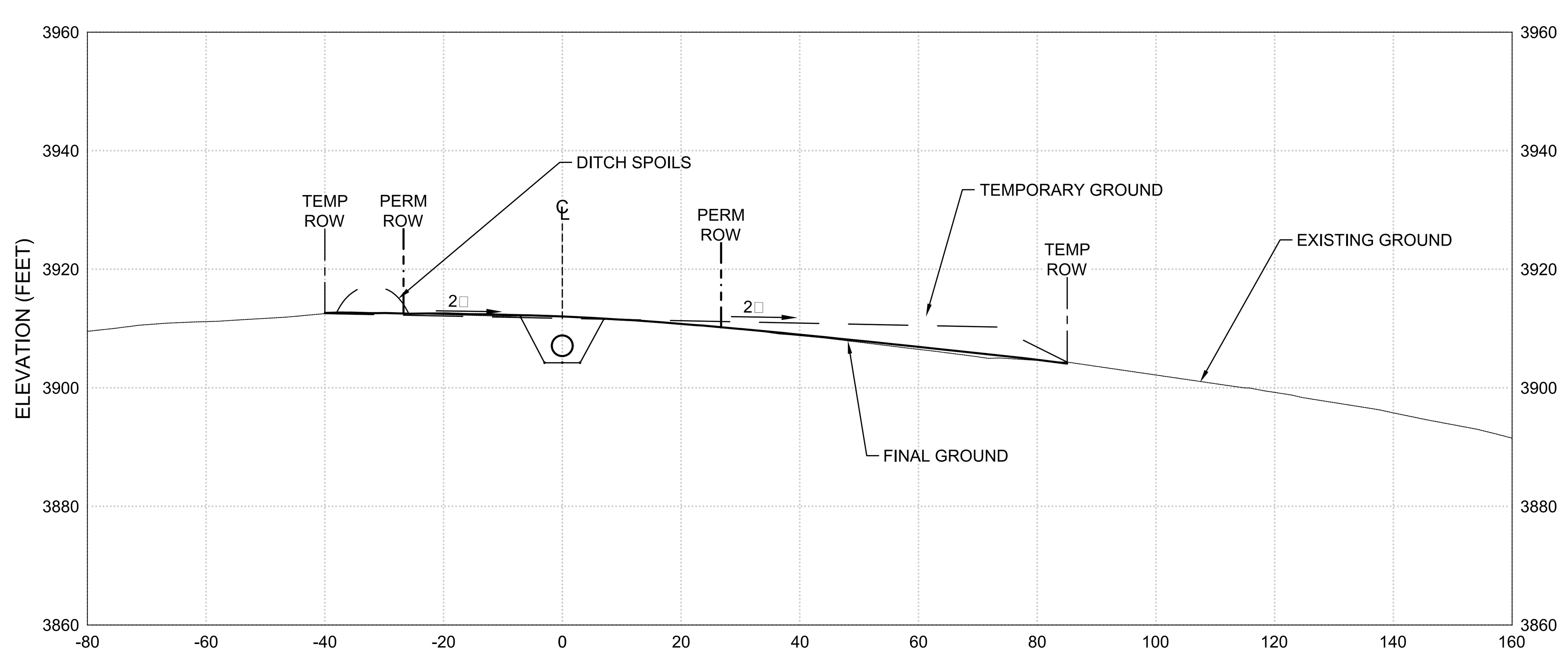

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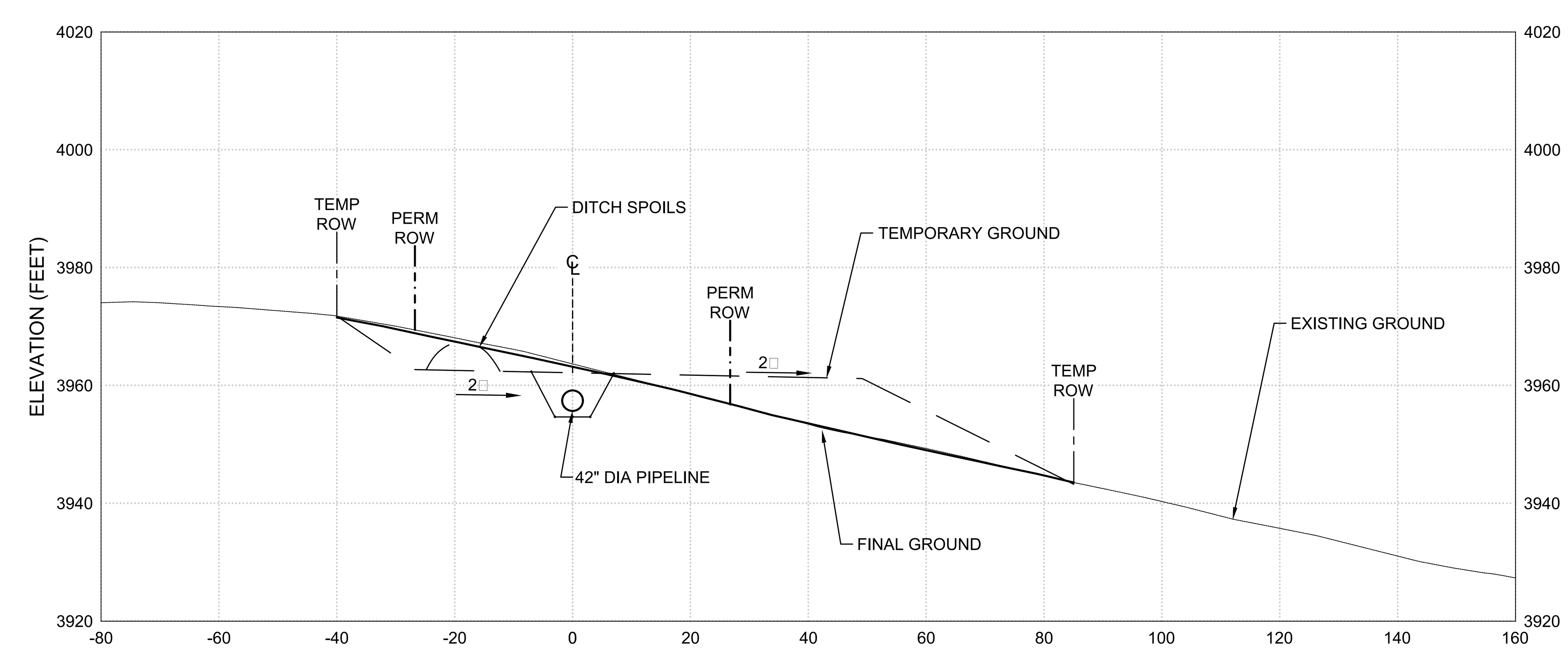

STA 4444+00
DISTANCE (FT)

NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

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GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (7 OF 8)

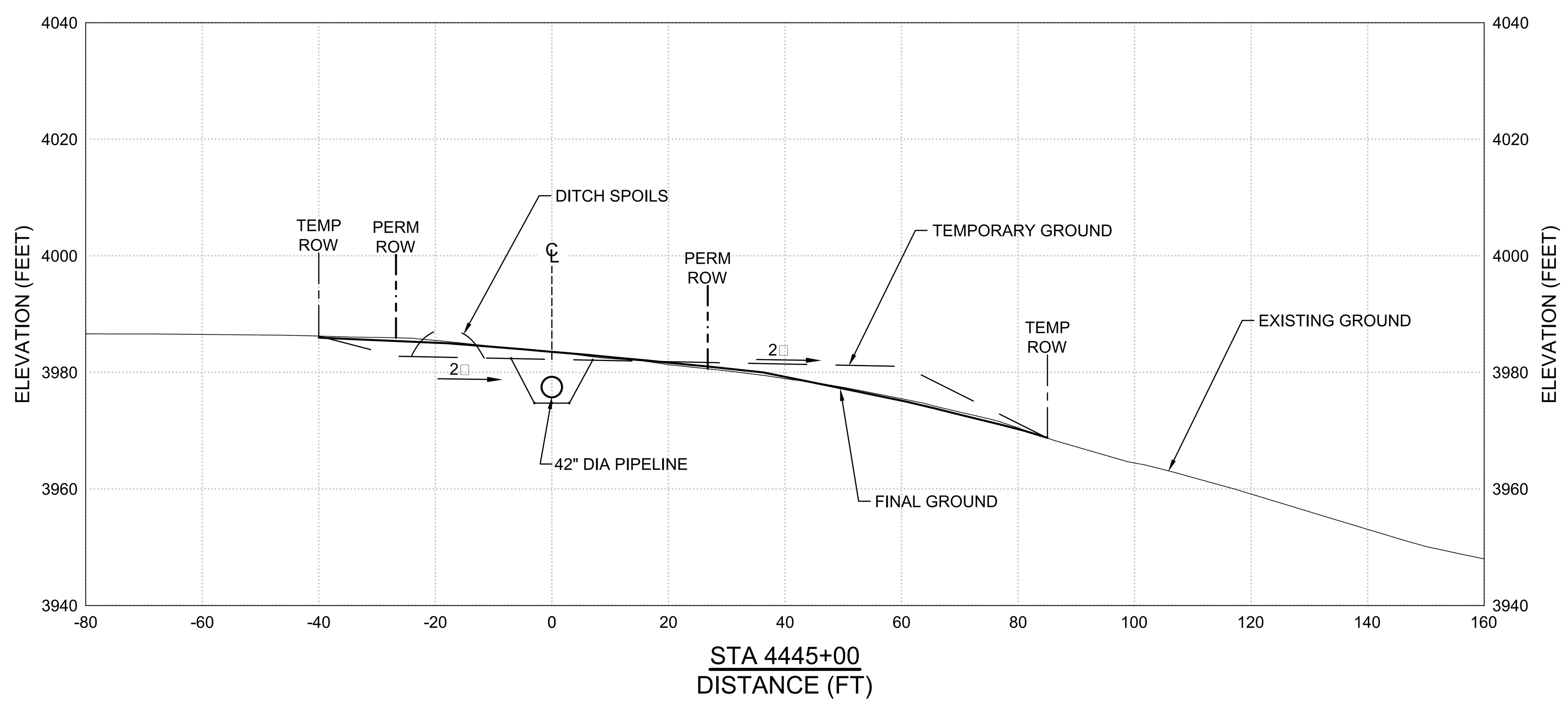
PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	28 OF 29
APPROVED BY:	LCB		



NOTES:

1. SEE DRAWING NO. 1 OF 29 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROLS NOTES.

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS (8 OF 8)

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 73.20 TO MP 73.50 CONSTRUCTION ALIGNMENT SHEET NO. 96 STA 4416+50 TO STA 4445+50

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D06
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	29 OF 29	

GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
FOR
ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

GENERAL NOTES:

1. MAPPING AND TOPOGRAPHY BASED ON UTM COORDINATE SYSTEM WITH NAD83 DATUM, ZONE 17, US SURVEY FOOT, CENTRAL MERIDIAN 81 W.
2. STATIONING SHOWN IS SLOPE STATIONING FOR ROUTE REV 11B (3D) PROVIDED BY GAI CONSULTANTS, INC.
3. CONTOURS AND TOPOGRAPHIC FEATURES DERIVED FROM LIDAR DATA AND GPS SUB-METER GROUND SURVEY PERFORMED BY GAI CONSULTANTS, INC.
4. STREAM AND WETLAND DATA PROVIDED BY ERM.
5. FINAL CONFIGURATION OF ROW RESTORATION MEASURES TO BE DETERMINED BASED ON CONDITIONS ENCOUNTERED AT TIME OF CONSTRUCTION, AND MAY CHANGE OR VARY AND/OR INCORPORATE ADDITIONAL BIC INCREMENTAL CONTROLS TO MITIGATE SPECIFIC CONDITIONS.
6. VOLUMES, GRADES, ELEVATIONS, AND QUANTITIES WILL VARY DEPENDING ON SITE CONDITIONS ENCOUNTERED.

BIC INCREMENTAL CONTROLS NOTES:

1. INSTALL ENHANCED DRAINS (GERMAN DRAINS) (BIC INCREMENTAL CONTROL NO. 1B) WHERE SEEPAGE IS ENCOUNTERED IN THE TRENCH.
2. INSTALL TARGETED SEEP DRAINS (BIC INCREMENTAL CONTROL NO. 1C) TO INTERSEPT SEEPS WHERE EXCAVATION ENCOUNTERS SEEPAGE.
3. GRADE TEMPORARY ROW SURFACE (BIC INCREMENTAL CONTROL NO. 2A) FOR SLOPING AND TEXTURING TO MITIGATE EROSION DURING CONSTRUCTION.
4. GRADE TEMPORARY ROW WITH OUTBOARD WEDGE (BIC INCREMENTAL CONTROL NO. 2B) TO ENCOURAGE MOVEMENT OF SURFACE FLOW AWAY FROM THE TRENCH.
5. BACKFILL USING ONLY DRY AND MOIST SOILS (BIC INCREMENTAL CONTROL NO. 2D). DO NOT REUSE SATURATED SOILS AS BACKFILL.
6. REMOVE EXISTING SOILS WITH ENGINEERING PROPERTIES UNSUITABLE FOR REUSE AS BACKFILL (BIC INCREMENTAL CONTROL NO. 2E). THIS MAY INCLUDE SATURATED SOILS AND ORGANIC SOILS, AMONG OTHER UNSUITABLE MATERIALS.
7. UTILIZE ROCK BACKFILL (WITH DRAIN) (BIC INCREMENTAL CONTROL NO. 2F) WITH SPECIFIED RIPRAP GRADATIONS (BIC INCREMENTAL CONTROL NO. 6F) TO PROVIDE IMPROVED STABILITY IN TARGETED AREAS.
8. GRADE FINAL GROUND SURFACE TO MATCH EXISTING GROUND SURFACE CONTOURS (BIC INCREMENTAL CONTROL NO. 2G).
9. DEVELOP SPOILS MANAGEMENT PLAN (BIC INCREMENTAL CONTROL NO. 2J) WITH PROCEDURES FOR MANAGING SPOILS FOR BOTH TEMPORARY AND PERMANENT CONDITIONS.
10. UTILIZE SOIL NAIL WITH TECCO MESH GEO-STRUCTURAL STABILIZATION SYSTEM (BIC INCREMENTAL CONTROL NO. 2L) ON TARGETED SLOPE AREAS. SEE DRAWING NO. 7 OF 7 FOR SPECIFICATIONS FOR THE SOIL NAIL AND MESH SYSTEM.
11. TRACK DISTURBED SLOPES (BIC INCREMENTAL CONTROL NO. 3A) TO PROMOTE GROWTH OF VEGETATION AND TO MITIGATE EROSION.
12. INSTALL COIR CLOTH ON DISTURBED SLOPES (BIC INCREMENTAL CONTROL NO. 3C) TO CONTROL EROSION AND TO PROMOTE GROWTH OF VEGETATION AT TARGETED AREAS.
13. ROCK ARMORING (BIC INCREMENTAL CONTROL NO. 3D) IN TARGETED AREAS FOR SLOPE STABILIZATION.
14. INSTALL COIR LOGS (BIC INCREMENTAL CONTROL NO. 3E) AT TARGETED LOCATIONS ON DISTURBED SLOPES TO FACILITATE SURFACE WATER DIVERSION WHERE SLOPES ARE TOO STEEP FOR CONVENTIONAL SLOPE BREAKERS.
15. INSTALL TRENCH BREAKERS (BIC INCREMENTAL CONTROL NO. 4A) AT TARGETTED LOCATIONS.
16. INSTALL SACK-CRETE TRENCH BREAKERS (STRUCTURAL BREAKER) (BIC INCREMENTAL CONTROL NO. 4C) FOR IMPROVED STABILIZATION OF TRENCH BACKFILL IN TARGETED AREAS.
17. INSTALL SLEEVE INTERFACE BETWEEN PIPELINE AND TRENCH BREAKER (BIC INCREMENTAL CONTROL NO. 4D) TO DECOUPLE THE BOND BETWEEN THE TRENCH BREAKER AND THE PIPELINE AT TARGETED AREAS.
18. INSTALL TRENCH BREAKERS WITH DRAINAGE (BIC INCREMENTAL CONTROL NO. 4F) TO COLLECT SEEPAGE FROM WITHIN THE TRENCH.
19. INSTALL TEMPORARY AND PERMANENT SLOPE BREAKERS (BIC INCREMENTAL CONTROL NO. 5A) TO SLOW AND REDIRECT SURFACE WATER OFF THE RIGHT-OF-WAY.
20. INSTALL ARMORED OUTLET FOR SLOPE BREAKER (BIC INCREMENTAL CONTROL NO. 5B) TO DISSIPATE ENERGY FROM DISCHARGING SURFACE FLOW WHERE HYDRAULIC FORCES ARE ANTICIPATED TO BE HIGH.
21. SURFACE WATER DIVERSIONS (BIC INCREMENTAL CONTROL NO. 5H) IN TARGETED AREAS, SUCH AS WATER BARRIERS FOR STREAM CROSSING WITH FLUME.
22. INSTALL BANK ARMORING (BIC INCREMENTAL CONTROL NO. 6E) IN TARGETED AREAS, SUCH AS RIP RAP REVETMENT AT TOE OF SLOPE TO PREVENT WASHOUT AT TRENCH.
23. USE STANDARD RIP RAP GRADATIONS (BIC INCREMENTAL CONTROL NO. 6F) WHEN CRUSHED ROCK AND STONE BACKFILL ARE REQUIRED.
24. INSTALL BELTED REINFORCED SILT FENCE (BIC INCREMENTAL CONTROL NO. 7A) AT TARGETED LOCATIONS TO INTERCEPT SURFACE RUNOFF AND PREVENT SOIL MATERIAL FROM LEAVING THE WORK AREA.
25. INSTALL ROCK GUARD (BIC INCREMENTAL CONTROL NO. 8A) TO PROTECT PIPELINE WHERE TRENCH IS EXCAVATED IN BEDROCK.
26. BENCH RE-CONSTRUCTION THROUGH NATURAL SLOPES (BIC INCREMENTAL CONTROL NO. 10A) TO AVOID DEVELOPING TROUGH ALONG THE TRENCH LINE.
27. CONDUCT AS-BUILT SURVEY OF TRENCH BREAKERS (BIC INCREMENTAL CONTROL NO. 11F) SO THAT TRENCH BREAKERS AND SLOPE BREAKERS CAN BE CO-LOCATED FOR IMPROVED OVERALL FUNCTION.
28. FLUME METHOD FOR PIPELINE STREAM CROSSING (BIC INCREMENTAL CONTROL NO. 13B).
29. DEVELOP BLASTING PLAN (BIC INCREMENTAL CONTROL NO. 14C) WHERE BEDROCK REQUIRES BLASTING.

LIST OF DRAWINGS

LEGEND

- 2650 — EXISTING GROUND ELEVATION CONTOUR (FT, MSL)
- EXISTING STREAM LINE
- BSRF — BELTED SILT RETENTION FENCE (BSRF)
- LOD — LIMIT OF DISTURBANCE
- PERMANENT ROW
- PERMANENT SLOPE BREAKER
- TEMPORARY SLOPE BREAKER
- 4417+00 — PIPELINE CENTERLINE AND STATIONING
- MP25.4 — MILE POST
- SOIL NAIL
- ROCK GUARD
- SLEEVE INTERFACE
- DRAINAGE TIGHTLINE PIPE
- PERFORATED DRAINAGE COLLECTION PIPE
- TEMPORARY ROW
- EXTRA WORKSPACE
- SACK-CRETE
- RIPRAP ARMOR LAYER (R-4 GRADATION)
- CRUSHED STONE (R-2 GRADATION)
- TECCO MESH AND COIR CLOTH SYSTEM
- FOAM TRENCH BREAKER
- COIR LOG

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN COVER SHEET WITH GENERAL NOTES AND LEGEND

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 84.95 TO MP 85.05 CONSTRUCTION ALIGNMENT SHEET NO. 113 STA 5346+00 TO STA 5352+00

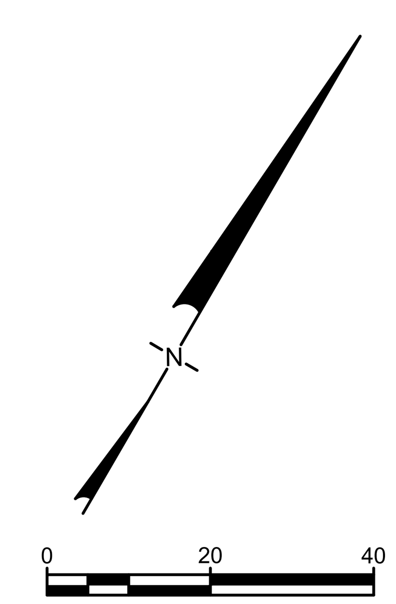
PRELIMINARY
NOT FOR CONSTRUCTION

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D02A
REVIEWED BY:	LCB/TR	DRAWING NO.:	1 OF 7
APPROVED BY:	LCB		

DRAFT-PROGRESS SET

NOTES:

1. SEE DRAWING 1 OF 7 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROL NOTES.



REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

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GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE:

GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: EXISTING GROUND

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

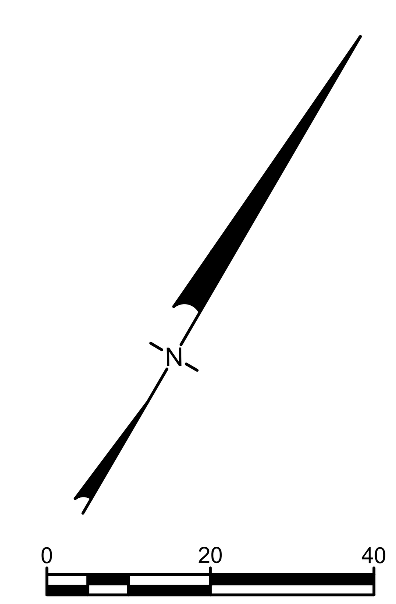
PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D03
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	2 OF 7	

NOTES:

1. SEE DRAWING 1 OF 7 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROL NOTES.



REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: TEMPORARY GROUND

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

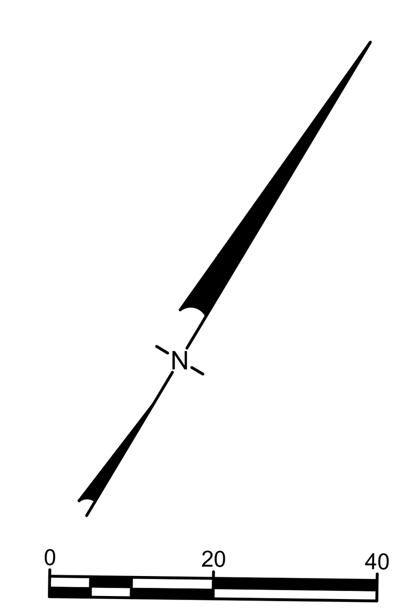
DESIGN BY: LCB/TR	DATE: MARCH 2017
DRAWN BY: JJV/KH	PROJECT NO.: TXG0007.13
CHECKED BY: MBE	FILE: TXG000713D03A
REVIEWED BY: LCB/TR	DRAWING NO.:
APPROVED BY: LCB	3 OF 7

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

NOTES:

1. SEE DRAWING 1 OF 7 FOR LEGEND, GENERAL NOTES, AND BIC INCREMENTAL CONTROL NOTES.



REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN
PLAN VIEW: FINAL GROUND

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D03B
REVIEWED BY:	LCB/TR	DRAWING NO.:	
APPROVED BY:	LCB	4 OF 7	

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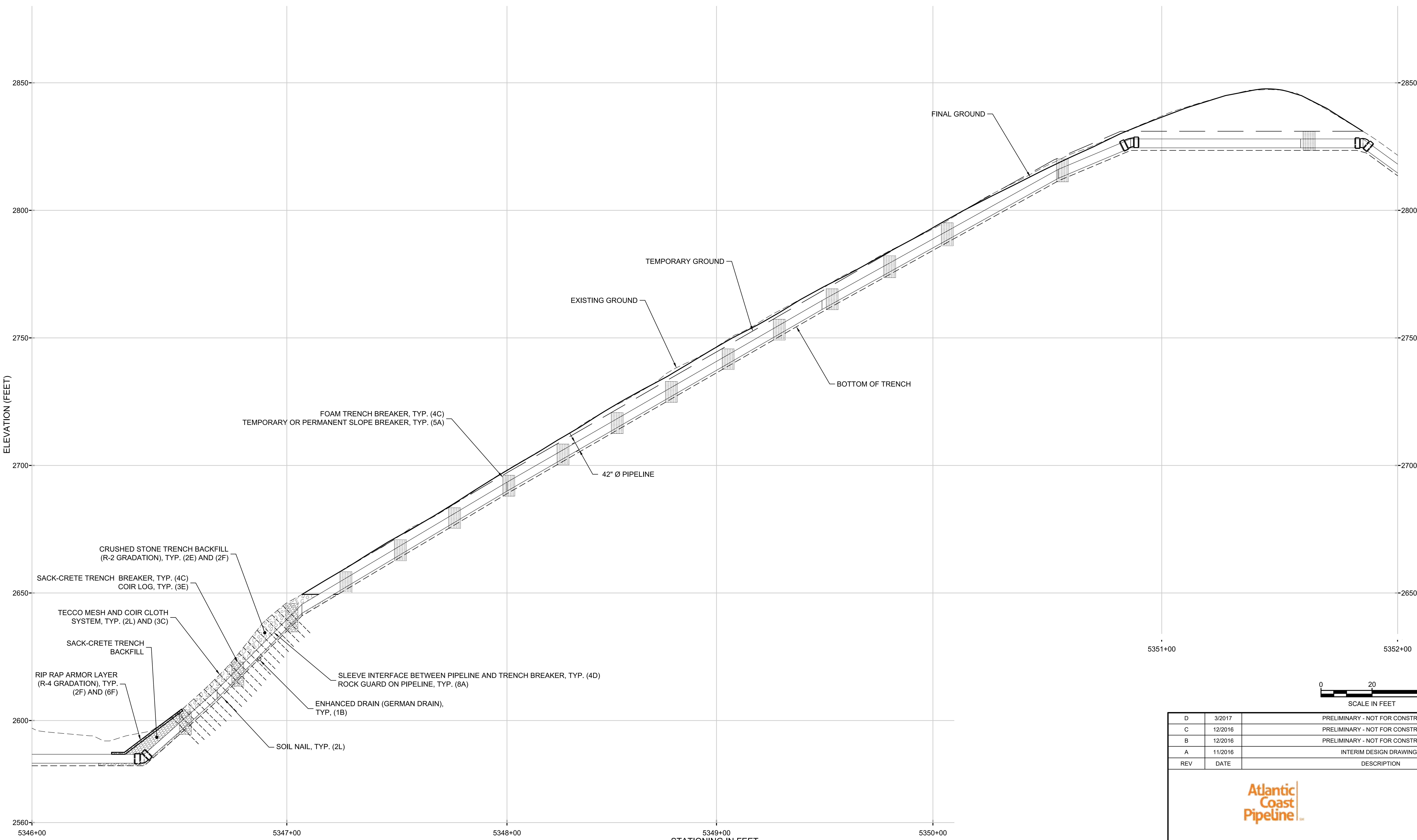

NOTES:

1. SEE DRAWING NO.1 OF 7 FOR LEGEND, GENERAL NOTES AND BIC INCREMENTAL CONTROLS NOTES.

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

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GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE:
GEOHAZARD MITIGATION SITE SPECIFIC DESIGN PROFILE A-A'

PROJECT:
ATLANTIC COAST PIPELINE, REV 11B

SITE:
ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

PRELIMINARY
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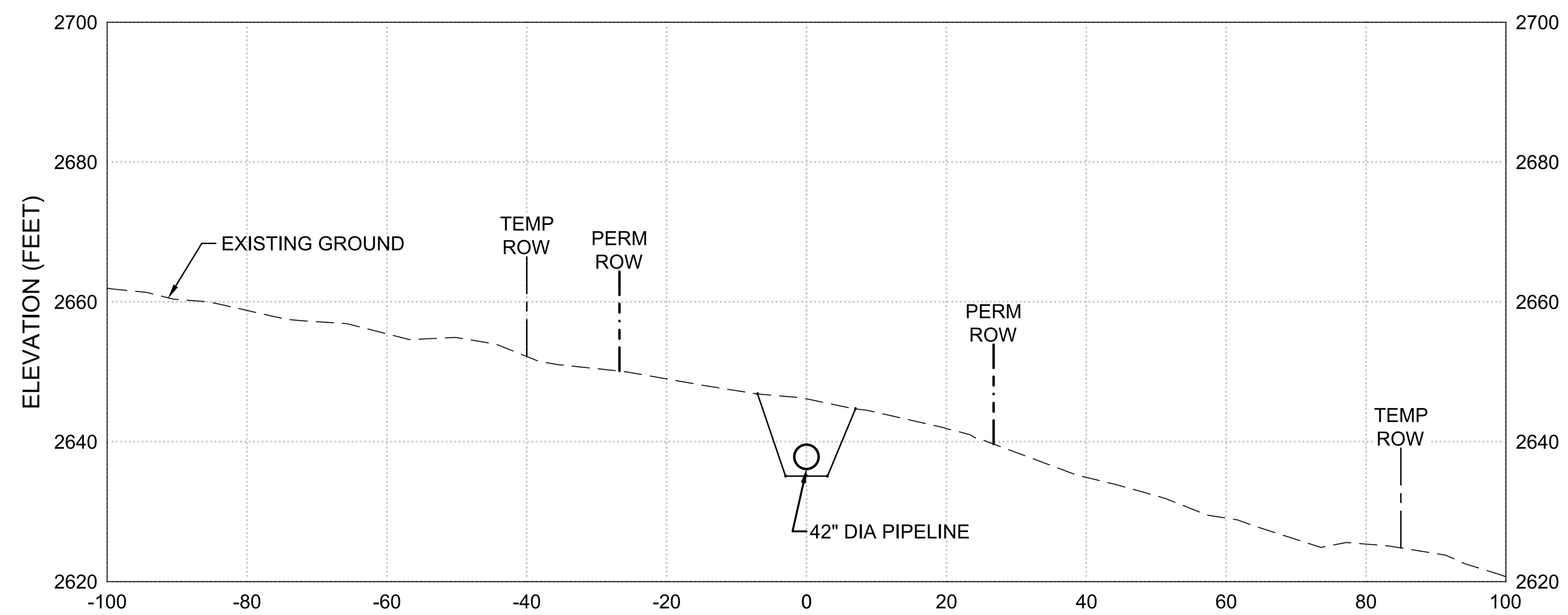
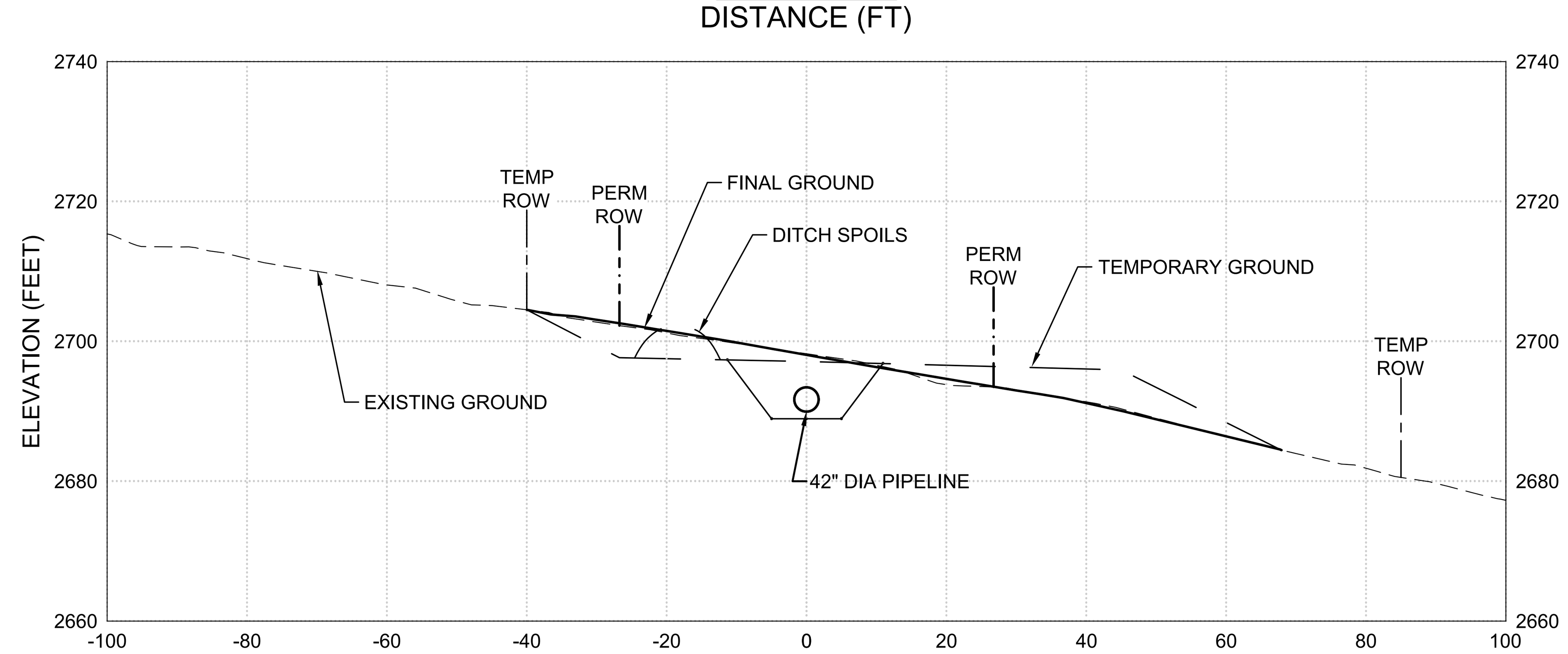
DRAFT-PROGRESS SET

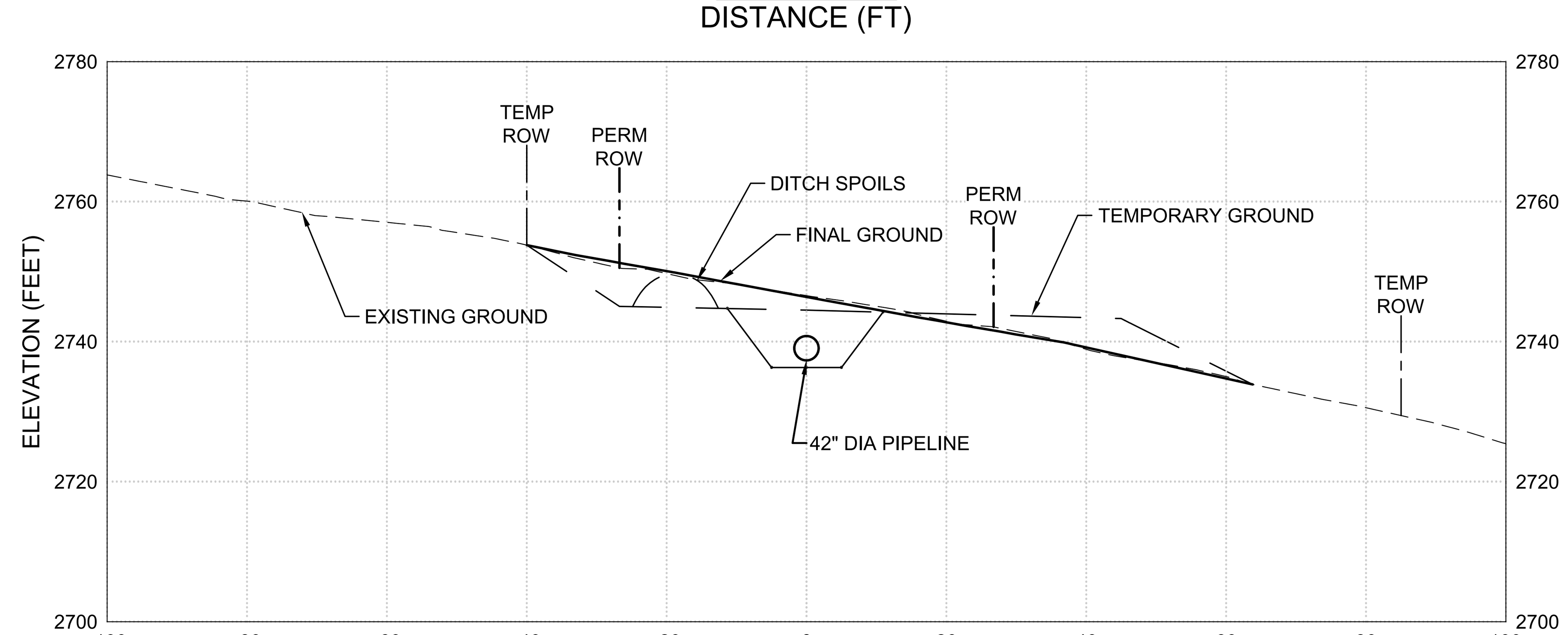
DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	LCB/BE	FILE:	TXG000713D05
REVIEWED BY:	LCB/TR	DRAWING NO.:	5 OF 7
APPROVED BY:	LCB		



STA 5347+00
DISTANCE (FT)



STA 5348+00
DISTANCE (FT)



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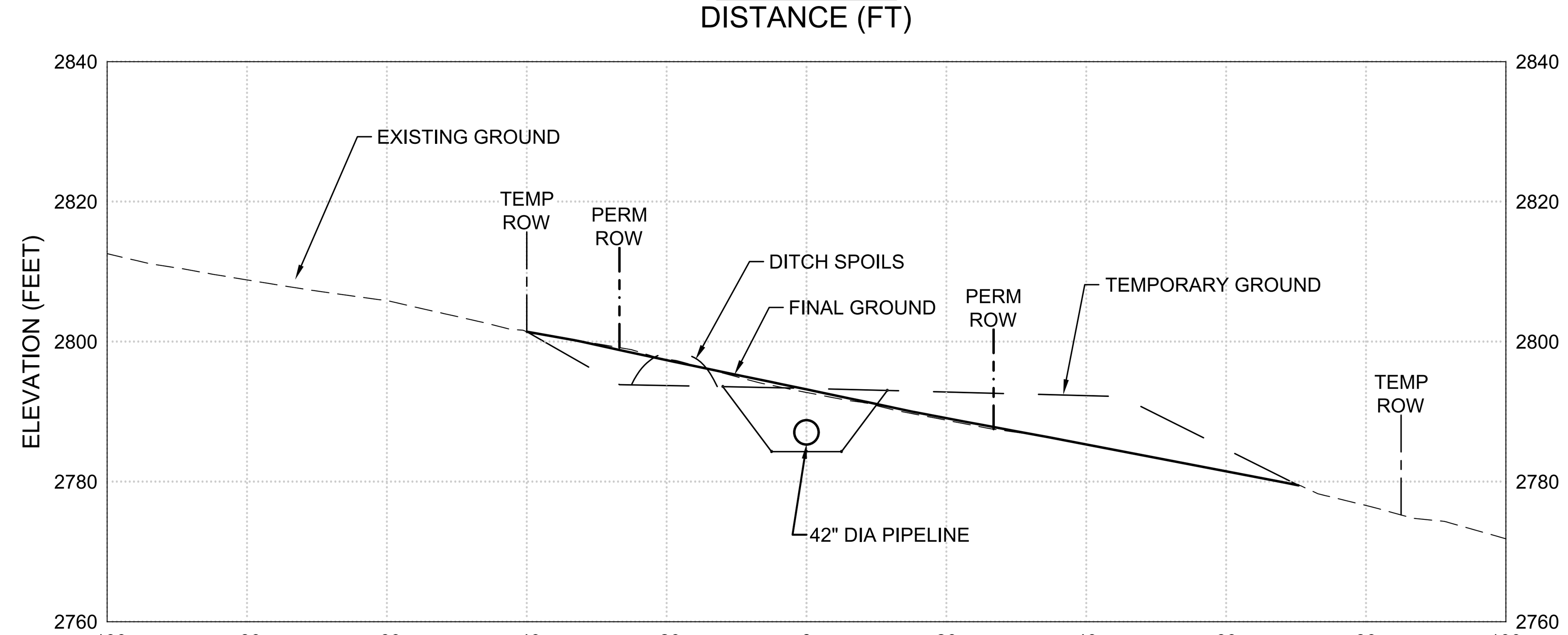

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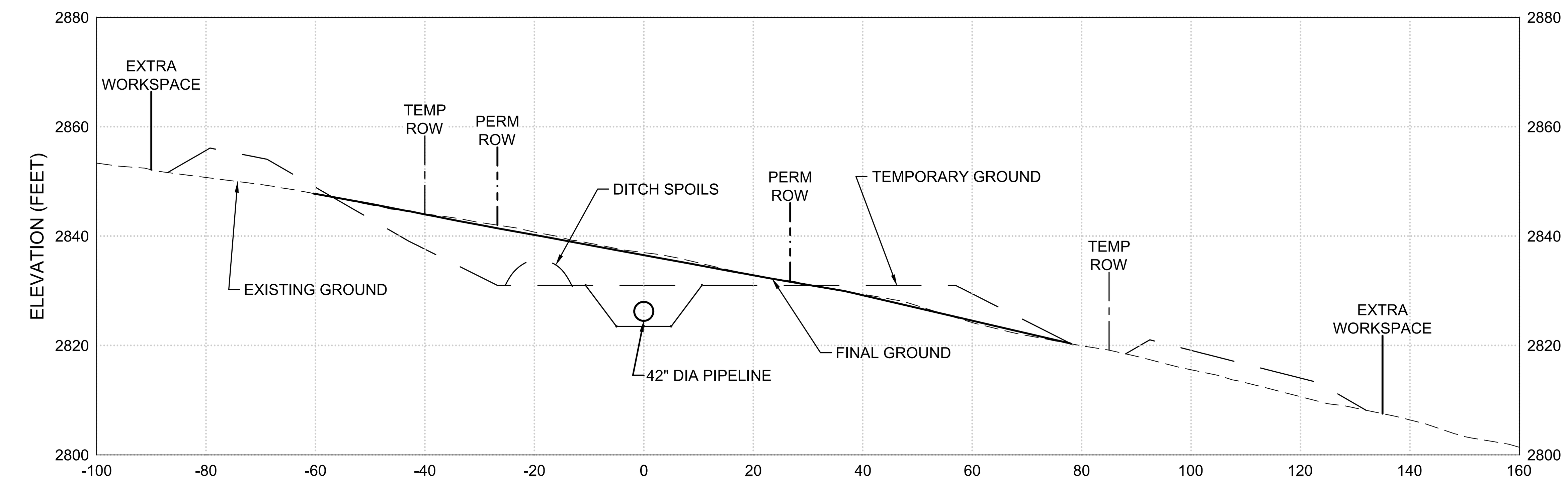

STA 5351+00
DISTANCE (FT)

0 20 40
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
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B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Atlantic Coast Pipeline

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SECTIONS

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

PRELIMINARY
NOT FOR CONSTRUCTION

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D02B
REVIEWED BY:	LCB/TR	DRAWING NO.:	6 OF 7
APPROVED BY:	LCB		

DRAFT-PROGRESS SET

GENERAL NOTES

1. STEEL WIRE MESH REINFORCEMENT SYSTEM INCLUDING STEEL TECCO WIRE MESH REINFORCEMENT (G65/4 MM), SPIKE PLATES (P66), AND OTHER FACING HARDWARE FABRICATED BY GEOBRUGG.
2. SOIL NAIL BARS ARE DYWIDAG #9, GRADE 75 THREADBAR (ASTM A615).
3. SOIL NAIL BARS ARE TO BE COATED WITH FUSION-BONDED EPOXY (ASTM A775).
4. BOND ZONE TO EXTEND 6 FT INTO BEDROCK.
5. MAXIMUM THICKNESS OF SOIL LAYER RETAINED BY SOIL NAILS IS AS FOLLOWS:
   a. 6.0 FT FOR SLOPE ANGLES BETWEEN 30 AND 37 DEGREES.
   b. 3.5 FT FOR SLOPE ANGLES BETWEEN 37 AND 45 DEGREES.
6. TOTAL LENGTH OF SOIL NAILS VARIES WITH SOIL THICKNESS.
7. SOIL NAIL ORIENTATION = 30 DEGREES FROM THE HORIZONTAL.
8. DIAMETER OF DRILLED HOLES ARE 6 INCHES.
9. COMPRESSIVE STRENGTH OF GROUT SHOULD BE 4,000 PSI (28-DAYS).
10. SPECIFIC GRAVITY OF GROUT SHOULD BETWEEN 1.8 AND 1.9.
11. GROUT CUBES PREPARED IN THE FIELD SHOULD BE TESTED IN A LABORATORY ACCORDING TO ASTM C109.
12. SOIL NAIL SPACING WITHIN PERMANENT ROW IS 8 FT (HORIZONTAL) PERPENDICULAR TO THE ALIGNMENT BY 8 FT (MEASURED ON FINAL SLOPE) PARALLEL TO THE ALIGNMENT, EXCEPT FOR SOIL NAIL ROWS ADJACENT TO THE TRENCH WHERE SPACING IS 4 FT (MEASURED ON FINAL SLOPE) PARALLEL TO THE ALIGNMENT.

SOIL NAIL VERIFICATION TESTING NOTES

1. PERFORM VERIFICATION TESTS ON SACRIFICIAL TEST NAILS WHICH WILL NOT BE INCORPORATED INTO THE PERMANENT WORK.
2. PERFORM NAIL TESTING ONLY AFTER THE GROUT HAS CURED FOR AT LEAST 72 HOURS AND ATTAINED AT LEAST 1,700 PSI (3-DAY) COMPRESSIVE STRENGTH.
3. SOIL NAILS USED FOR VERIFICATION TESTING SHOULD BE CONSTRUCTED FROM SAME MATERIALS AND TO THE SAME DIMENSIONS OF PRODUCTION NAILS.
4. PROVIDE A BONDED LENGTH OF 6 FT IN ROCK.
5. PROVIDE EXTRA BAR LENGTH OUTSIDE THE DRILL HOLE TO ALLOW PROPER CONNECTION TO THE LOAD ASSEMBLY.
6. PRIOR TO GROUTING THE DESIGNATED VERIFICATION TEST NAILS, INSTALL FREE STRESSING SLEEVE AS INDICATED TO ENSURE FULL TRANSFER OF VTL TO DESIGN BOND ZONE DURING TESTING.
7. THE ALIGNMENT LOAD (AL) NECESSARY TO MAINTAIN POSITION OF THE STRESSING AND TESTING EQUIPMENT MUST NOT EXCEED 0.025 TIMES VTL. [SET DIAL GAUGES TO "0" AFTER THE ALIGNMENT LOAD HAS BEEN APPLIED].
8. IN CASE PULLOUT IS NOT ACHIEVED UP TO VTL, TEST LOADS LARGER THAN VTL MAY BE APPLIED TO ACHIEVE PULLOUT. MONITOR THE JACK LOAD WITH A LOAD CELL. PROVIDE THE ENGINEER WITH THE LOAD CELL CALIBRATION CURVE BEFORE START OF TEST.
9. PROVIDE A DIAL GAUGE CAPABLE OF MEASURING TO 1/1000" MOVEMENT.
10. PERFORM A MINIMUM OF TWO VERIFICATION TESTS ON INSTALLATION OF PRODUCTION NAILS TO VERIFY THE CONTRACTOR'S INSTALLATION METHODS AND NAIL PULLOUT RESISTANCE.
11. APPLY INCREMENTAL LOAD UP TO VTL IN ACCORDANCE WITH THE FOLLOWING SCHEDULE. RECORD SOIL NAIL MOVEMENTS AT EACH LOAD INCREMENT.

LOAD	HOLD TIME
AL	1 MINUTE
0.13 VTL	10 MINUTES
0.25 VTL	10 MINUTES
0.38 VTL	10 MINUTES
1.50 VTL	10 MINUTES
0.75 VTL (CREEP TEST)	60 MINUTES (RECORDED AT 1, 2, 4, 5, 6, 10, 20, 30, 50, 60 MINUTES)
0.88 VTL	10 MINUTES
1.00 VTL	10 MINUTES
AL	1 MINUTES

HOLD EACH LOAD INCREMENT FOR A TIME PERIOD SPECIFIED ABOVE.

12. MONITOR THE VERIFICATION TEST NAIL FOR CREEP AT THE 0.75VTL LOAD INCREMENT. MEASURE NAIL MOVEMENTS DURING CREEP PORTION OF THE TEST AND RECORED AT 1 MINUTE, 2, 4, 5, 6, 10, 20, 30, 50 AND 60 MINUTES. MAINTAIN LOAD DURING THE CREEP TEST WITHIN 2 PERCENT OF THE INTENDED LOAD.
13. THE ENGINEER WILL REVIEW ALL VERIFICATION TEST TO DETERMINE IF THE NAIL IS ACCEPTABLE. A NAIL WILL BE ACCEPTED IF THE FOLLOWING 3 CRITERIA ARE MET:
   a. PULLOUT DOES NOT OCCUR AT LOADS LESS THAN 1.00 VTL;
   b. THE TOTAL MEASURED MOVEMENT AT THE MAXIMUM TEST LOAD EXCEEDS 80 PERCENT OF THE THEORETICAL ELASTIC ELONGATION OF THE TEST NAIL UNBONDED LENGTH.
   c. THE CREEP MOVEMENT BETWEEN THE 1-MINUTE AND 10-MINUTE READINGS AT 0.75 VTL IS LESS THAN 0.04 INCH, AND 6-AND 60-MINUTE READINGS AT 0.75 VTL IS LESS THAN 0.08 INCH. THE CREEP RATE IN LINEAR OR DECREASING THROUGHOUT THE CREEP TEST LOAD-HOLD PERIOD.

SOIL NAIL PROOF TESTING NOTES

1. UPON COMPLETION OF VERIFICATION TESTING, PERFORM PROOF TESTING AT SELECT LOCATIONS OR AS APPROVED BY THE ENGINEER. PROOF TEST A MINIMUM OF 5 PERCENT OF PRODUCTION NAILS.
2. SIMILAR TO VERIFICATION TESTING, PROVIDE A BONDED LENGTH OF 6 FT.
3. THE MAXIMUM PROOF TEST LOAD (PTL) IS 75 PERCENT OF THE PRODUCT OF THE BONDED LENGTH AND THE NOMINAL PULLOUT RESISTANCE PER UNIT LENGTH OF THE SOIL MASS.
4. APPLY INCREMENTAL LOAD UP TO PTL IN ACCORDANCE WITH THE FOLLOWING SCHEDULE. RECORD ALL SOIL NAIL MOVEMENT AT EACH LOAD INCREMENT. THE ALIGNMENT LOAD IS LESS OR EQUAL TO 0.025 TIMES PTL.

LOAD	HOLD TIME
AL	1 MINUTE
0.17 PTL	UNTIL MOVEMENT STABILIZES
0.33 PTL	UNTIL MOVEMENT STABILIZES
0.50 PTL	UNTIL MOVEMENT STABILIZES
0.67 PTL	UNTIL MOVEMENT STABILIZES
0.83 PTL	UNTIL MOVEMENT STABILIZES
1.00 PTL	UNTIL MOVEMENT STABILIZES (CREEP TEST, RECORDED AT 1, 2, 4, 5, 6, AND 10 MINUTES)
AL	1 MINUTE

5. EACH LOAD INCREMENT IS HELD FOR A MINIMUM PERIOD OF 10 MINUTES.
6. CREEP TESTS MUST BE PERFORMED AT THE MAXIMUM PROOF TEST LOAD (PTL). THE CREEP PERIOD MUST START AS SOON AS THE MAXIMUM PROOF TEST LOAD IS APPLIED AND THE NAIL MOVEMENT MUST BE MEASURED AND RECORDED AT 1, 2, 4, 5, 6 AND 10 MINUTES. WHERE THE NAIL MOVEMENT BETWEEN 1 MINUTE AND 10 MINUTES EXCEEDS 0.04", THE MAXIMUM TEST LOAD SHALL BE MAINTAINED FOR AN ADDITIONAL 50 MINUTES AND MOVEMENTS MUST BE RECORDED AT 20, 30, 50 AND 60 MINUTES.
7. THE ENGINEER WILL REVIEW ALL PROOF TESTS TO DETERMINE IF THE NAIL IS ACCEPTABLE. A NAIL WILL BE ACCEPTED IF THE FOLLOWING THREE CRITERIA ARE MET:
   a. PULLOUT DOES NOT OCCUR AT LOADS LESS THAN 1.0 PTL.
   b. THE TOTAL SOIL NAIL MOVEMENT MEASURED AT PTL IS GREATER THAN 80 PERCENT OF THE THEORETICAL ELASTIC ELONGATION OF THE UNBONDED LENGTH.
   c. THE TOTAL CREEP MOVEMENT OF LESS THAN 0.04 MEASURED BETWEEN THE 1 AND 10 MINUTE READINGS OR A TOTAL CREEP MOVEMENT OF LESS THAN 0.08" IS MEASURED BETWEEN THE 6 AND 60 MINUTE READINGS AND THE CREEP RATE IS LINEAR OR DECREASING THROUGHOUT THE CREEP TEST HOLD PERIOD.
8. SUCCESSFUL PROOF TEST NAILS MEETING THE ABOVE TEST ACCEPTANCE CRITERIA MAY BE INCORPORATED AS PRODUCTION NAILS.

REV	DATE	DESCRIPTION	DRN	APP
D	3/2017	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
C	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
B	12/2016	PRELIMINARY - NOT FOR CONSTRUCTION	JJV	LCB
A	11/2016	INTERIM DESIGN DRAWINGS	JJV / KH	TR

Geosyntec consultants
GEOSYNTEC CONSULTANTS, INC.
11490 WESTHEIMER ROAD, SUITE 150
HOUSTON, TEXAS 77077

TITLE: GEOHAZARD MITIGATION SITE SPECIFIC DESIGN SOIL NAIL AND MESH SYSTEM SPECIFICATIONS

PROJECT: ATLANTIC COAST PIPELINE, REV 11B

SITE: ACP AP-1 MP 84.95 TO MP 85.05
CONSTRUCTION ALIGNMENT SHEET NO. 113
STA 5346+00 TO STA 5352+00

PRELIMINARY
NOT FOR CONSTRUCTION

DRAFT-PROGRESS SET

DESIGN BY:	LCB/TR	DATE:	MARCH 2017
DRAWN BY:	JJV/KH	PROJECT NO.:	TXG0007.13
CHECKED BY:	MBE	FILE:	TXG000713D07A
REVIEWED BY:	LCB/TR	DRAWING NO.:	7 OF 7
APPROVED BY:	LCB		

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plans

ATTACHMENT D

Winter Construction Plan

Previously filed with the FERC on July 18, 2016 (Accession No. 20160718-5164)

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000
CP15-554-001

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT
Docket No. CP15-555-000

Winter Construction Plan

Updated, Rev. 1

Prepared by

ERM

July 18, 2016

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
Atlantic	Atlantic Coast Pipeline, LLC
ATWS	additional temporary workspace
DTI	Dominion Transmission, Inc.
EI	Environmental Inspector
FERC	Federal Energy Regulatory Commission
NOAA	National Oceanic and Atmospheric Administration
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
Projects	Atlantic Coast Pipeline and Supply Header Projects
SHP	Supply Header Project

1.0 INTRODUCTION

Atlantic Coast Pipeline, LLC (Atlantic) – a company formed by four major energy companies – Dominion Resources, Inc.; Duke Energy Corporation; Piedmont Natural Gas Co., Inc.; and AGL Resources, Inc. – proposes to construct and operate approximately 600 miles of natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and North Carolina. This Project, referred to as the Atlantic Coast Pipeline (ACP), will deliver up to 1.5 million dekatherms per day of natural gas from supply areas in the Appalachian region to demand areas in Virginia and North Carolina. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion Resources, Inc., to construct and operate the ACP on behalf of Atlantic.

In conjunction with the ACP, DTI proposes to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This Project, referred to as the Supply Header Project (SHP), will enable DTI to provide firm transportation service to various customers, including Atlantic.

2.0 PURPOSE

Construction of the ACP and SHP (collectively, the Projects) is scheduled to begin in the Spring of 2017, subject to the receipt of necessary permits and authorizations, and will continue through the fourth quarter of 2018. All facilities are anticipated to be placed in service in the fourth quarter of 2018. With this schedule, construction activities in the Winter season will be required.

Within the ACP Project area and SHP Project area, the timing and extent of Winter conditions, such as snowfall and frozen soils, vary a great deal. The northern portions of the Projects, including Pennsylvania and the mountainous regions of West Virginia and Virginia, can have temperatures below freezing from early October through late April, with frozen soil conditions potentially occurring within these months (National Oceanic and Atmospheric Administration [NOAA], 2012a and 2012b). Southern portions of the ACP, including the coastal areas in Virginia and North Carolina, can have temperatures below freezing between late October and early April, but sustained temperatures below freezing and frozen soil conditions are less likely than in northern or mountainous regions (NOAA, 2012c).

The purpose of this *Winter Construction Plan* is to identify best management practices for construction activities during the Winter. Under frozen soil conditions, the measures in this plan will supersede relevant or corresponding measures in the Federal Energy Regulatory Commission's (FERC) *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) as well as Atlantic's and DTI's *Restoration and Rehabilitation Plan*. In the transitional period between non-frozen and frozen soil conditions, Atlantic and DTI will implement appropriate measures as described in the Plan, Procedures, *Restoration and Rehabilitation Plan*, or this *Winter Construction Plan* based on site-specific conditions (e.g., soil stability) as determined by

Atlantic's and DTI's Environmental Inspectors (EIs), [1] activity inspectors, and construction manager.

3.0 TRAINING

Prior to the start of construction, Atlantic and DTI will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the Plan and Procedures; other construction, restoration, and mitigation plans, including this *Winter Construction Plan*; and applicable permit conditions. In addition, Atlantic and DTI will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

4.0 SNOW REMOVAL

Snow will be removed from construction work areas to expose soils for grading and excavation. Snow removal will be limited to active construction areas and areas needed to maintain access to the construction rights-of-way. Snow will be bladed or pushed to the edges of the right-of-way with a motor-grader, snowplow, or bulldozer, and stockpiled within the right-of-way or in approved additional temporary workspace (ATWS) areas. Snow will not be bladed off the right-of-way. The bladed equipment on the motor-grader, snowplow, or bulldozer will be fitted with a "shoe" to minimize impacts on the underlying soil and vegetation. Alternatively, in the event of extreme snow events or significant snow drifts, and with landowner permission, snow may be blown off the right-of-way using industrial blowers mounted to construction vehicles. Snow that is blown off the construction right-of-way will be directed away from existing roads and driveways, parking areas, residences, or other landowner structures. Regardless of the method used, snow removal equipment will access the construction areas from approved access roads, and will operate from within the construction right-of-way or approved ATWS areas.

Snow also will be removed, as necessary, from approved access roads by plowing to the edges of the road or blowing off the road (away from driveways, parking areas, residences, or other landowner structures) to allow safe access to the construction right-of-way. Access roads will be maintained in accordance with applicable permit requirements and landowner agreements. Snow removal from private access roads will continue as necessary through the end of active construction. Atlantic and DTI will not be responsible for snow plowing or removal on publicly maintained roads.

Snow will be removed from both the working and spoil sides of the construction right-of-way prior to topsoil segregation and grading to prevent mixing of snow with excavated spoil. Snow will be removed and stockpiled along the edges of the construction right-of-way or in approved ATWS areas, or blown off the right-of-way as described above. Gaps will be left in stockpiled snow piles based on an assessment of drainage patterns to allow water to drain off of the right-of-way during the Spring thaw or other warm periods. Gaps also will be left in the stockpiled snow at drainage crossings.

[1] The role and responsibilities of an EI are defined in the FERC's Plan.

If practicable, and in times of extremely cold weather, snow may be stored over the trenchline prior to trench excavation to prevent frost penetration along the trenchline. This snow will be bladed or pushed to the edge of the spoil side of the construction right-of-way immediately prior to topsoil removal and trenching activities.

Additional snow which accumulates on the right-of-way during construction will be removed and stockpiled along the edges of the construction right-of-way or in approved ATWS areas, or blown off the right-of-way as described above. Large accumulations of snow on excavated spoil piles will be removed as practicable prior to backfilling. Snow will not be mixed with spoil during backfilling to the extent practicable.

Generally, snow will be allowed to melt in place during the Spring thaw or other warm periods. The EIs for the Projects will work with the Contractors to identify sites where large accumulations of melting snow may flow away from the right-of-way causing erosion. Erosion control devices and diversion berms will be installed as appropriate in these areas in accordance with the Plan and Procedures or as described in Section 7.0 below. If site-specific conditions require the placement of erosion control devices or diversion berms outside the limits of the construction corridor or approved ATWS areas, Atlantic and/or DTI will request approval from the FERC and the affected landowner prior to installing these items.

5.0 GENERAL CONSTRUCTION AND RESTORATION MEASURES

In non-frozen conditions, all construction activities (topsoil removal and segregation, grading, trenching, pipe installation, backfilling, restoration, and clean-up) will be conducted in accordance with the Plan and Procedures, as appropriate. The following alternative methods will be implemented in frozen soil conditions, should these conditions be encountered during construction.

In agricultural lands, topsoil will be removed and segregated from the trenchline and the spoil side of the construction right-of-way with the exception of areas directly beneath snow stockpiles. In open uplands, including pasture and hay fields, topsoil will be removed and segregated from the trenchline only with the exception of limited areas where grading is necessary to create a level work surface within the construction right-of-way. Topsoil typically will be removed using a step blade attached to a bulldozer. Alternatively, Atlantic and DTI may remove topsoil in frozen conditions by ripping with a grader or heavy disc or by utilizing a pavement excavator to pulverize the topsoil and allow for conventional removal.

The method of topsoil removal will be determined by Atlantic's or DTI's EIs and construction manager based on site-specific conditions, including depth and extent of frost penetration into the soil. The method selected will be the best available for retaining soil and root structure within the excavated topsoil to the extent practicable given the soil conditions. Segregated topsoil will be placed on the construction right-of-way adjacent to stockpiled snow. Subsoil excavated from the trenchline will be stockpiled separately from topsoil in the area immediately adjacent to the trench.

Soils excavated while frozen may slump if they thaw. To prevent the mixing of topsoil and subsoil if slumping occurs, Atlantic and DTI will cover the stockpiled topsoil in mulch, which will create a barrier between topsoil and subsoil.

Trenching, lowering-in, and backfilling operations will be scheduled to minimize the exposure time of excavated spoil material to freezing conditions and to reduce the potential for snow accumulation in the trench. Appreciable accumulations of snow in the trench (generally greater than 12 inches in depth) will be removed prior to installation of the pipeline. Backfilling operations will commence as soon as practicable after the pipeline is installed in the trench.

In upland areas, the trench will be backfilled with subsoil as described below. Depending on the extent of frost penetration in topsoil piles, however, the topsoil may be stockpiled over the Winter for replacement during the following Spring when it can be worked and contoured.

Stockpiled subsoil will develop a layer of frost penetration, the thickness of which will be dependent on water content, temperature, wind, and snow cover conditions. Prior to backfilling, frozen material will be skimmed off the top of the subsoil pile to provide access to underlying, unfrozen subsoil for backfilling. The unfrozen subsoil material will be backfilled over the pipeline first, followed by the frozen subsoil material. If frozen subsoil exhibits lumps or sharp edges that could damage the coating on the pipeline, Atlantic's or DTI's construction manager will determine appropriate backfill measures to be implemented. Such measures may include the use of mechanical shakers or grinders to break up frozen subsoils prior to backfilling, or in extreme cases, the use of sand padding around the pipe. If sand padding is used, it will be obtained from an upland commercial source and used in upland areas only.

In certain limited areas, such as graded slopes and road and railroad crossings, subsoil (in addition to topsoil) may be stockpiled over the Winter for replacement during the following Spring. In these areas, Atlantic and DTI will ensure that there are adequate gaps between the topsoil and subsoil piles to allow water to drain between the piles during the Spring thaw and to prevent mixing of the soils. Signs will be installed as necessary to differentiate between the subsoil and topsoil piles.

Where topsoil is stockpiled over Winter, Atlantic and DTI will cover the pile in mulch and crimp the mulch or install mechanically-fastened erosion control fabric (e.g., Curlex) over the stockpile to prevent loss of topsoil during the Winter and throughout the Spring melt or other warming event. Gaps will be installed within soil piles based on an assessment of drainage patterns to allow water to drain off of the right-of-way during the Spring thaw, and berms or water bars will be installed as necessary to prevent water flow down the right-of-way.

Where final grading and restoration cannot be completed due to frozen conditions, the right-of-way will be left in a roughened condition to reduce the potential for erosion during the Spring melt. In upland areas, a slight subsoil crown may be left over the pipeline to account for settling as backfilled soils thaw. If a crown is left over the pipeline, breaks will be installed to allow water to drain across the right-of-way during the Spring melt. Atlantic and DTI will install erosion and sedimentation control devices in accordance with the Plan and Procedures or as described in Section 7.0 below, but will not reseed during frozen conditions.

In areas where topsoil replacement is delayed to the following Spring due to frozen soil conditions, or in areas where seeding is delayed due to seeding period restrictions, Atlantic and DTI will mulch disturbed areas within the right-of-way in non-cultivated uplands in accordance with the Plan.

Final cleanup activities will be performed once the ground is fully thawed in the Spring and the topsoil (and subsoil, if applicable) stockpiled over Winter has dried sufficiently to allow it to be worked without causing excessive compaction and/or rutting. The schedule for final clean-up will be determined based on ground conditions, but Atlantic and DTI anticipate that activities will resume in the Spring or as soon as extended periods above freezing occur. Final clean-up and restoration activities (including final grading, topsoil replacement, and reseeding) will be conducted in accordance with the Plan and Procedures and *Restoration and Rehabilitation Plan*.

The potential for soil compaction is minimal under frozen soil conditions; however, Atlantic and DTI will implement measures identified in the Plan and Procedures to decompact soils, where necessary, during final clean-up and restoration activities.

6.0 WETLANDS

Construction in Winter months may minimize impacts in wetlands because construction will occur outside of the wet (Spring, Summer, and Fall) seasons in areas where sustained frozen conditions occur along the pipeline routes. In Winter conditions, frozen soils may provide stability for construction equipment working on the right-of-way and help prevent sloughing of the pipe trench which could occur in the Spring, Summer, and Fall seasons due to saturated conditions.

Construction across wetlands will be conducted in accordance with the Procedures, except that snow berms (rather than silt fences) may be installed as temporary erosion control devices to prevent sediment migration off the right-of-way. If snow is not available, or if melted runoff may undercut snow berms, other temporary erosion control devices, such as silt fence, coir logs, or filter socks, will be installed to prevent sediment migration off the right-of-way. Regardless of the initial method used, silt fence will be installed across the right-of-way on the approaches to wetlands prior to the Spring run-off or warm Winter periods.

In non-frozen soil conditions in wetlands, Atlantic and DTI will remove and segregate topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are saturated. In frozen soil conditions in wetlands, Atlantic and DTI will remove and segregate topsoil from the area disturbed by trenching, but a thin layer of topsoil may be left over the trenchline during the process of removing the topsoil to prevent the introduction of subsoil into the segregated topsoil. In both non-frozen and frozen conditions, the trench in wetlands will be backfilled with subsoil as described above for uplands and the topsoil (where segregated) will be replaced at the time of construction. Atlantic and DTI will not stockpile topsoil from wetlands over the Winter for replacement the following Spring; this will minimize the need to conduct restoration activities in wetlands during the wet (Spring, Summer, and Fall) season.

Contours in wetlands will be restored as near as practicable to pre-construction condition. If necessary, Atlantic and DTI will use mechanical shakers or grinders, or other suitable methods to break up frozen topsoil prior to replacement over the trench. In frozen soil conditions, a topsoil crown (average of 4 inches in height, but no greater than 8 inches in height) will be left over the trenchline to account for settling as backfilled soils thaw. Breaks will be installed in the crown to allow water to flow across the trenchline and to prevent water from ponding on either side of the crown.

7.0 WATERBODIES

Construction in the Winter may minimize impacts on waterbodies because construction will occur outside of the wet seasons in the areas crossed. This may avoid or minimize the potential for increased turbidity within waterbodies as well as impacts on fisheries.

Construction activities will be conducted in accordance with the Procedures. Contours of the bed and banks will be restored as near as practicable to pre-construction condition. Additional measures, such as the installation of erosion control blankets, will be implemented as necessary to stabilize the bed and banks of the waterbody in advance of the return of water flow or the Spring melt.

Atlantic and DTI will use stream gauge data from the U.S. Geological Survey to determine the highest anticipated flows during the time of each waterbody crossing. In the absence of stream gauge data, Atlantic's and DTI's engineers and EIs will estimate the highest anticipated flows based on the width of the waterbody at the ordinary high water mark, the depth of the waterbody, existing flows at the time of the crossing, and the weather forecast at the time of the crossing. As a contingency, Atlantic and DTI will stage additional materials (e.g., flume pipes and erosion control devices) at the crossing in the event that the volume of flow increases due to an unexpected precipitation event or snow melt. The duration of most in-stream construction activities, i.e., 24 hours for minor waterbodies and 48 hours for intermediate waterbodies (excluding blasting), will minimize the exposure time for increased flows due to a unexpected precipitation event or snowmelt.

If thick ice is encountered on waterbodies at the time of construction, the ice will be removed where required for safe construction and placed outside of the waterbody on the spoil side of the right-of-way.

8.0 EROSION CONTROLS, MULCHING, AND SEEDING

Temporary and permanent erosion and sedimentation control measures will be implemented in accordance with the Plan and Procedures or as described below depending on ground conditions. The EIs for the Projects will verify that the erosion and sedimentation control measures are appropriate for the weather conditions. The following measures will be implemented in order for erosion control devices to be effective throughout the Winter and able to withstand the runoff that accompanies Spring thaw and snow melt conditions:

- Temporary erosion control devices (silt fences in non-frozen conditions or straw bales, straw logs, or snow berms in frozen conditions) will be installed where appropriate during topsoil stripping and grading activities to prevent the movement of disturbed soils off the right-of-way.

- In non-frozen conditions, temporary slope breakers consisting of mounded and compacted soil will be installed during clearing and grading activities in areas required by the Plan and Procedures. In frozen conditions, temporary slope breakers will not be installed during initial clearing and grading activities because soils will be frozen and not subject to erosion. However, temporary slope breakers will be installed prior to the Spring thaw, where required by the Plan and Procedures, as follows:
    - In cultivated lands, temporary slope breakers consisting of mounded and compacted subsoil will be placed across the right-of-way. Breaks will be installed in snow and topsoil piles where intersected by the temporary slope breakers to promote water flow off of the right-of-way during melting periods. When restoration activities resume the following Spring or Summer, the temporary slope breakers will be removed; the topsoil stockpiled over Winter will be replaced across the right-of-way; and silt fences will be installed in areas required by the Plan or Procedures.
    - In open uplands, including cleared forests, grasslands, hay fields, and pasture, temporary slope breakers consisting of mounded and compacted subsoil will be placed across the right-of-way. Breaks will be installed in snow and topsoil piles where intersected by the temporary slope breakers to promote water flow off of the right-of-way during the Spring thaw. When restoration activities resume the following Spring, the temporary slope breakers will be left in place; the topsoil stockpiled over Winter will be replaced over the right-of-way, including over the temporary slope breakers; and silt fences will be installed in areas required by the Plan or Procedures. In this way, the temporary slope breakers will form the basis of permanent slope breakers across the right-of-way. [2]
- Energy dissipating devices, such as stone riprap, will be installed at the outlet end of slope breakers as required by site conditions.
- Erosion control devices will be inspected by the EIs and repaired as necessary to be functional for Spring runoff.
- If an erosion control device is located in an area which is not accessible due to weather conditions or saturated soils during Spring thaw, Atlantic or DTI will request a variance from the FERC. Requested variances will depend on specific circumstances and site conditions, but would likely be related to the timeframe associated with installation, repair, or maintenance of erosion control devices.
- Mulch will be applied to topsoil stockpiled over Winter as described in Section 4.0 above.

[2] In pasture and hayfields, temporary slope breakers will be removed if requested by the landowner.

- Mulch will be applied to disturbed areas within the construction right-of-way in non-cultivated uplands in areas where topsoil replacement is delayed to the following Spring or Summer due to frozen soil conditions or in areas where seeding is delayed due to seeding period restrictions.
- Where required on the construction right-of-way, mulch typically will be applied at a rate of 2 tons/acre. When mulching before seeding, however, mulch will be applied at a rate of 3 tons/acre on slopes within 100 feet of waterbodies and wetlands. If conditions preclude crimping, Atlantic or DTI may elect to spray water to freeze the mulch in place, or apply a biodegradable tackifier.
- Following final grading and cleanup, and in the appropriate season, Atlantic and DTI will condition the construction right-of-way for planting including the preparation of a seedbed and application and incorporation of soil amendments, as appropriate. Reseeding will be conducted in accordance with the Plan and Procedures and *Restoration and Rehabilitation Plan*, as appropriate.

9.0 TEMPORARY EQUIPMENT BRIDGES

Temporary bridges will be installed at waterbody crossings as required by the Procedures. Snow will be removed from the temporary bridges by plowing the snow off the bridge onto the right-of-way or approved ATWS. Snow will not be plowed off the bridge into the waterbody.

10.0 TRENCH DEWATERING

Trench dewatering in both non-frozen and frozen conditions will be conducted in accordance with the Plan and Procedures, as appropriate. Under frozen conditions, dewatering structures may need to be larger and located further away from the construction area to avoid trench water moving back into the construction right-of-way due to low infiltration rates.

11.0 HYDROSTATIC TESTING

Hydrostatic testing is not anticipated in the Winter or in frozen conditions.

12.0 WINTER AND SPRING INSPECTIONS

Following pipeline construction activities and prior to the resumption of restoration activities the following Spring, Atlantic's and DTI's EIs will inspect the condition of erosion control devices within 48 hours of a significant rain or snow melt event, if accessible and weather permitting, to ensure that the devices remain in place and are effective in controlling snow melt and Spring runoff. The EIs will use public roads and approved access roads for access to the construction right-of-way. Particular attention will be paid to steep slopes and wetland and waterbody crossings. The EIs will determine the most effective means of correcting problems, taking into account the suitability of the right-of-way for equipment access, damage that could occur as a result of equipment crossing the right-of-way (e.g., in saturated soil conditions), and the urgency/significance of the problem.

To ensure that sufficient materials are available to repair or replace erosion control devices as necessary at the time they are inspected, Atlantic and DTI will stockpile materials within its staging areas over the Winter and Spring so they are available to the EIs and Contractor personnel. Atlantic's and DTI's EIs and the construction contractors will attempt to complete repairs at the time non-functioning or damaged erosion control devices are discovered. If repairs to erosion control devices cannot be completed within 7 days, Atlantic or DTI will seek a variance from FERC.

13.0 SPRING THAW CONDITIONS

When possible, construction during Spring thaw conditions will be avoided or minimized to reduce or avoid impacts within the construction right-of-way. However, in the event that the construction activities are required in Spring thaw conditions, the following measures will be implemented to prevent soil mixing, rutting, and compaction:

- The Contractors will work only in well drained, dry sites and/or frozen areas until conditions improve.
- The Contractors will use equipment best suited to existing ground conditions, e.g., low ground pressure equipment.
- The Contractors will install mats along the travel lane where soils are excessively wet and rutting is occurring to prevent mixing of topsoil and subsoil.
- The Contractors may use frost driving measures, such as snow packing, to increase the load bearing capacity of the ground where necessary to remove equipment off the right-of-way (but not as a condition to allow construction to continue). The frost driving measures will be implemented in the early morning or evening to take advantage of colder temperatures.
- If native materials become unsuitable for frost driving, e.g., mud resulting from snow melt, timber equipment mats will be used to create a suitable driving surface.
- When ground conditions are frozen, construction activities in problem areas will be postponed until evening or early morning.
- If the EI and construction manager determine that muddy conditions are severe and rutting occurs, work will be suspended until conditions improve.
- The EI will monitor, report, and initiate repairs in problem areas associated with Spring thaw.
- If the measures above do not allow for suitable soil conditions, Atlantic's or DTI's Contractors will suspend construction activities in problem areas until soil conditions are suitable.

14.0 SPRING RIGHT-OF-WAY ASSESSMENT

Atlantic and DTI will conduct pedestrian, windshield, and aerial reconnaissance surveys along the construction right-of-way in the late Winter or early Spring of 2018 and 2019, depending on construction spread, after the snow cover has disappeared and thaw is progressed. The surveys will identify erosion control structures in need of repair, areas of slope instability along the construction right-of-way, areas where settling of soils or subsidence has occurred along the trench line, and areas where erosion is occurring. Data from the surveys will be used to plan final clean-up and restoration activities in the Spring of 2018 or 2019, depending on construction spread.

15.0 FINAL CLEAN-UP AND RESTORATION

In frozen conditions, final clean-up and restoration (including weed treatments where required, topsoil replacement, final grading, and seeding) will be deferred to the Spring of 2018 and 2019, depending on construction spread. EIs will be deployed to verify that clean-up and restoration work is conducted in compliance with the environmental requirements of the Projects.

Special measures will be implemented during final clean-up and restoration in the event that subsidence is identified along the trenchline. In areas where topsoil is stockpiled over the Winter, the right-of-way may be re-graded prior to topsoil replacement. Additional subsoil will be placed over the trenchline during grading to restore pre-construction contours to the extent practicable. If subsidence has occurred in areas where topsoil is replaced prior to the end of active construction (e.g., in wetlands or in areas where construction occurred during non-frozen conditions), the topsoil will be removed and the right-of-way re-graded as described above to restore pre-construction contours to the extent practicable. In both cases, topsoil will be replaced after re-grading is complete. If insufficient topsoil is available to restore the area to pre-construction condition, additional topsoil will be obtained from local sources to restore the area.

16.0 MONITORING AND REPORTING

Atlantic and DTI will conduct monitoring and reporting in accordance with the Plan and Procedures, Certificate and permit conditions, and the *Restoration and Rehabilitation Plan*.

17.0 REFERENCES

National Oceanic and Atmospheric Administration. 2012a. Charleston, West Virginia Field Office, Spring Freeze Maps. Available online at: http://www.erh.noaa.gov/rlx/climate/springfreeze.html. Accessed June 2015.

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ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plans

ATTACHMENT G

Soil Survey

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Prepared for:

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ORDER 1 SOIL SURVEY
ATLANTIC COAST PIPELINE
MONONGAHELA NATIONAL FOREST, WV AND GEORGE WASHINGTON NATIONAL FOREST, VA

AUGUST 1, 2016

Prepared by:

RETTEW
Geosyntec consultants
engineers | scientists | innovators

Reviewed by:

The Nicholas Putnam Group
Landform Soils, LLC

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EXECUTIVE SUMMARY

An Order 1 Soil Survey (Survey) was performed by RETTEW Associates, Inc. between May 9 and June 22, 2016 along the available sections of the approximately 21.4-mile portion of the Rev-10 and Rev-11 reroute between MP 47 and MP 115 on the proposed Atlantic Coast Pipeline (ACP) route (Project). The Survey included approximately 5.2 miles of the Marlinton Ranger District in the Monongahela National Forest (MNF), and 15 miles in the Warm Springs and North River Districts in the George Washington National Forest (GWNF). Due to access restrictions associated with cultural resource clearance, a full Survey was not completed in an approximately 1.2 mile section of the alignment located near MP 155 and MP 156 in the GWNF Pedlar Ranger District.

The soil survey activities were conducted to be compliant with the requirements outlined in special use permit #GBR205003, dated April 22, 2015 for surveys in the MNF, and special use permit #GWP433201T, dated March 31, 2015 for surveys in the GWNF, both of which were issued by the U.S. Forest Service. These two permits were renewed as #MAR205001 dated April 11, 2016 and #GWP433202T dated April 11, 2016, as well as amendment #1 to SUP GWP433202T dated May 20, 2016. The Survey was conducted in accordance with the Project's Order 1 Soil Survey Protocols dated April 2016 and updated May 23, 2016 **(Supplemental Document A)**. The Survey was conducted by soil scientists whose qualifications and credentials were approved by the U.S. Forest Service.

The Survey was conducted in four phases including: 1) Desktop Study; 2) Preliminary Field Reconnaissance; 3) Soil Scientist Team Training; and 4) Field Investigation. Background information was obtained during the desktop study to help identify the prevalent soil-landscape relationships across the proposed pipeline route within the Project area. The background information was also used by the soil scientist team to identify preliminary test pit locations and develop strategies for conducting the Survey. Preliminary GIS-generated maps were prepared for planning and field use.

The Survey was initiated with a five day preliminary field reconnaissance investigation (reconnaissance investigation) conducted between May 9 and May 13, 2016. The reconnaissance investigation included oversight by Dr. John Galbraith of Landform Soils, LLC and the Nicholas Putnam Group (NPG) represented by Mr. Stephen Carpenter and Mr. Charles Delp. Following completion of the Preliminary Field Reconnaissance, the protocols were revised to include additional documentation as suggested by Dr. Galbraith and NPG, and to identify Mr. Daniel Fenstermacher, CPSS as the Soil Scientist Team Lead. The revised soil survey protocols were provided to the Forest Service on May 23, 2016. On June 1, 2016, the soil scientist field teams were provided classroom and field training led by the Soil Scientist Team Lead and supported by the Technical Advisor (Dr. John Galbraith) and NPG. The primary field effort of the Survey occurred over 15 days between June 2 and June 22, 2016. Dr. John Galbraith and NPG accompanied the soil survey team during portions of the Soil Survey conducted in both the MNF and the GWNF.

Mr. Thomas Bailey, with the U.S. Forest Service (GWNF) met with the soil scientist team and Dr. John Galbraith on June 8, 2016, and Mr. Kent Karricker, Dr. James Thompson and other representatives from the U.S. Forest Service (MNF) met with the soil scientist team, NPG, and Dr. John Galbraith on June 15, 2016 to observe the Survey procedures.

During the field investigation, boundaries were sketched on field maps and recorded by GPS with sub-meter accuracy to delineate soil units; boundaries were based on observations in soil test pits and transect points (shallow observations). Delineated soil units were assigned a seven component code (**Attachment 6**) that defined the delineated soil unit based on parent material, slope class, drainage class, diagnostic subsurface horizon, restrictive layer type, depth to restrictive layer, and family particle size class. The delineated soil maps have been provided in **Attachment 1.**

The total number of test pits completed during the reconnaissance investigation and the field investigation was 360, including 85 test pits in the MNF and 275 test pits in the GWNF. A total of 511 soil samples were collected in duplicate by horizon in 111 test pits. Forty-one (41) of those test pits, including 190 horizons, were selected for particle size analysis, nutrient analysis, and total and organic carbon contents. Results from these analyses are and are presented in **Attachments 7**, **8**, **9** and **10**.

A detailed summary of the field observations and laboratory data is presented in **Section 6.0** of the Report. A few of the key observations from the investigation are as follows:

- The Project route is primarily situated on ridgelines and is primarily comprised of residual soil material with the observation of bedrock.
- Restrictive layers were observed in 255 of the 360 test pits observed, with 248 lithic contacts and 7 soils containing fragipans or fragic properties.
- Colluvium is abundant, primarily occurring as relatively shallow deposits with a residual base.
- Evidence of slope failures or movements were observed in two potential slide areas, surface sloughing at a third location, and several bent or leaning trees at other locations.
- The nutrient analysis revealed that the soils are mildly acidic and nutrient levels are generally below optimum levels.
- The soils have a high potential for erodibility due to a high silt fraction, observed in field textures, and the abundance of steep slopes.

1.0 INTRODUCTION

An Order 1 Soil Survey (Survey) was performed by RETTEW Associates, Inc. between May 9 and June 22, 2016 along the available sections of the approximately 21.4-mile portion of the Rev-10 and Rev-11 reroute between MP 47 and MP 115 on the proposed Atlantic Coast Pipeline (ACP) route (Project). The Survey included approximately 5.2 miles of the route within the Marlinton Ranger District in the Monongahela National Forest (MNF), and 15 miles in the Warm Springs and North River Districts in the George Washington National Forest (GWNF). Due to access restrictions associated with cultural resource clearance, a full Survey was not completed in an approximately 1.2 mile section of the Rev-10 route located near MP 155 and MP 156 in the GWNF Pedlar Ranger District.

The purpose of the Order 1 Soil Survey was to provide more site-specific soil data for the proposed pipeline corridor to support construction of a 42-inch diameter pipeline. This Report presents a summary of the Survey data collection process and procedures, laboratory results, and soil mapping. The Soil Survey Protocols developed for the Project are provided as Supplemental Data (**Attachment A**).

2.0 ORDER 1 SOIL SURVEY PROTOCOL SUMMARY

The Survey activities were conducted in a manner compliant with the requirements outlined in special use permit #GBR205003, dated April 22, 2015 for surveys in the MNF, and special use permit #GWP433201T, dated March 31, 2015 for surveys in the GWNF, both of which were issued by the U.S. Forest Service. These two permits were renewed as #MAR205001 dated April 11, 2016 and #GWP433202T dated April 11, 2016, as well as amendment #1 to SUP GWP433202T dated May 20, 2016.

The Survey was conducted in accordance with the Project's Order 1 Soil Survey Protocols (Protocols) dated April 2016 (Revised: May 23, 2016 and June 30, 2016; **Supplemental Document A**). All fieldwork was conducted by professional soil scientists whose qualifications and credentials were approved by the U.S. Forest Service. Geosyntec Consultants (Geosyntec) personnel provided program management and field logistics support for the soil survey team.

3.0 SOIL SURVEY

The Survey was conducted in four phases: (1) Desktop Study, (2) Preliminary Field Reconnaissance, (3) Team Training, and (4) Field Investigation. This section outlines the objectives and accomplishments of each phase.

3.1 Desktop Study

The initial phase of the Survey consisted of a desktop study to help identify the prevalent soil-landscape relationships across the proposed pipeline route within the Project area, aid in the identification of test pit locations, and develop strategies for conducting the Survey. Available topographic maps, geologic maps, soil map unit boundaries contained in the Soil Survey Geographic Database (SSURGO), aerial photography, and other pertinent remotely- sensed data were reviewed as part of the desktop study.

Preliminary GIS-generated maps were developed that included topographic contours, SSURGO map units, the pipeline centerline, the limits of the 300-foot survey corridor, and available Forest Service boundaries. Preliminary proposed test pit locations were plotted at a 350-foot interval spacing along the pipeline center line for planning purposes and to assist in field locating test pits. Actual soil test pit locations were determined by the soil scientists in the field.

3.2 Preliminary Field Reconnaissance

Field activities for the Survey were initiated with a preliminary field reconnaissance (Recon) investigation conducted between May 9 and May 13, 2016. The Recon investigation included oversight by Dr. John Galbraith of Landform Soils, LLC, and Nicholas Putnam Group (NPG) represented by Mr. Stephen Carpenter and Mr. Charles Delp. The objectives of the Recon investigation included:

- Assess and refine Project logistics.
- Conduct test pits to observe and discuss soil-landscape relationships in various locations in the MNF and GWNF.
- Receive input from Dr. Galbraith and NPG personnel on the Project's Survey Protocols, test pit selection, soil and parent material resources and relationships, landscape analysis, indicator vegetation types, identification of potential habitat for sensitive species (e.g. red spruce), identification of important soil properties to document and sample, and identification of unique soil formations (e.g. pit and mound formations, sinkholes, landslides, and outcrops).
- Assess and refine the Project's Survey Protocols and documentation.
- Develop a draft soil mapping key to be used during the field investigation.
- Prepare training materials for the soil survey team.

Following the completion of the Recon investigation, the Project's Survey Protocols were revised to include additional documentation as suggested by Dr. Galbraith and NPG personnel, and to identify Mr. Daniel Fenstermacher, CPSS as the Soil Scientist Team Lead. The revised Protocols were provided to the Forest Service on May 23, 2016.

During the Recon investigation, a total of 29 test pits (Recon pits) were observed in the MNF (11 Recon pits) and GWNF (18 Recon pits). Recon pits are noted with an "R" prefix in the test pit ID and are identified on the maps in **Attachment 1.** An inventory of soil test pits and locations are provided in **Attachment 2** and copies of the Recon log sheets are included in **Attachment 3**.

3.3 Team Training

Prior to starting the field investigation, the soil scientists and field support teams were provided classroom and field training on June 1, 2016. The training was led by the Soil Scientist Team Lead and supported by the Technical Advisor (Dr. John Galbraith) and the NPG. The purpose of the training was to discuss soil-landscape observations from the Recon investigation, unique soil properties that may be encountered and their distribution across the landscape, provide guidance on soil profile description best practices to maintain consistency between soil scientists. The training included a review of the draft ACP Order 1 Soil Mapping Key and naming system, and discussed other pertinent information gathered during the Recon investigation including criteria for identifying the soil delineation boundaries and composition. During the field training, the field teams traveled to a portion of the Project in the GWNF to review and conduct soil test pit selection, excavation, soil classification, and mapping protocols. During the field training, five soil test pits and two transect points were conducted with delineation of soil units.

3.4 Field Investigation

The Survey field investigation occurred over the course of 15 days between June 2 and June 22, 2016. The Technical Advisor and NPG accompanied each of the soil scientists at various points during field investigation to help maintain consistency in preparation of the soil profile descriptions and delineation of soil boundaries in the MNF and the GWNF. Mr. Thomas Bailey, with the GWNF, met with the soil scientist team on June 8, 2016, and Mr. Kent Karricker, Dr. James Thompson, and other representatives from MNF met with the soil scientist team on June 15, 2016 to observe the Survey process.

The proposed 350-foot spaced soil test pit locations developed during the desktop study were for planning and guidance purposes only. The actual soil test pit locations were selected by the soil scientists based on field observations to adequately describe the soils across the landscapes. At least one soil test pit was conducted in proximity to a proposed test pit location. Additional test pits (identified with a letter in the test pit ID number, e.g. P-###A-Date-Time-Initials) were added where the increased soil observation density was warranted to adequately describe all of the soil types and landforms.

Initially, the Protocols identified the need for a total of 290 proposed test pit locations based on an approximate 350-foot spacing, with 80 soil test pits located in the MNF and 210 soil test pits located in the GWNF. A total of 360 soil test pits were completed to date during the Recon investigation and field investigation, with 85 located in the MNF and 275 located in the GWNF (**Table 1**). The change in the number of test pits from the Protocols occurred due to the following:

- As additional geospatial property data was made available and as portions of the Rev-10 route were confirmed, nine proposed test pit locations were added to the MNF for a total of 89 (P-001 to P-089) and 54 proposed test pit locations were added in the GWNF, with 21 of those being added for the Rev-11 reroute, for a total of 264 (P-090 to P-353) proposed test pit locations in the GWNF.
- Access to 18 of the proposed test pit locations (P-315 to P-332) in the GWNF is currently restricted pending cultural clearance.
- Based on differences of U.S. Forest Service property boundaries observed in the field from the boundaries obtained during the desktop study, seven (7) proposed soil test pit locations (P-013 to P-016 in the MNF and P-168, P-169, and P-198 in the GWNF) were eliminated and three (3) proposed test pits (P-216A, P-216B, P-353A in the GWNF) were added.
- Six (6) proposed test pit locations (P-017 to P-021 in the MNF, and P-194 in the GWNF) were eliminated due to the presence of roadways separating the U.S. Forest Service property from the pipeline center line on private property. In these locations the pipeline centerline is located on private property and no land disturbance would occur on U.S. Forest Service property associated with the proposed Project.
- A total of 35 additional test pits were added at the discretion of the soil scientists in the field to describe another soil type or landform not represented by the proposed test pits. Sixteen (16) of those additional soil test pits were conducted during the field investigation and are identified with a letter in the test pit ID number (e.g. P-###A) and 19 of the additional soil test pits were Recon pits.

Table 1 summarizes the test pit allocation between the MNF and GWNF and the total number of soil test pit observations. When a Recon pit was located in proximity to a proposed test pit location and the landform was adequately described by the Recon pit, then the Recon pit was used to map the landform. However, if the Recon pit did not adequately describe the landform, then an additional test pit was added in that area. **Attachment 2** identifies the Recon pit locations in proximity to proposed soil test pit locations. Transect soil observations (shallow observations with an abbreviated description) were conducted in various locations to assist in the refinement of soil boundaries or to verify that soils on different slopes or aspects were consistent with soil test pit observations. A total of 65 transect point observations were conducted with 17 in the MNF and 48 in the GWNF. Test pit and transect point locations are identified on the project maps in **Attachment 1**. Test pit logs are provided in **Attachment 4**, and Transect logs are provided in **Attachment 5**.

Table 1. Allocation of each soil test pit conducted in the MNF and GWNF.

Test Pit Type	MNF	GWNF	Total
Proposed Test Pits (≈350-foot spacing)	73	242	315
Additional Test Pits	1	15	16
Recon Pits - Used as Proposed Test Pits (≈350-foot spacing)	7	3	10
Recon Pits - Used as Additional Test Pits	4	15	19
Total	**85**	**275**	**360**

4.0 SOIL MAPPING

4.1 Mapping Key

Soil units were delineated during the Survey based on changes observed in the soil profiles with regard to the seven components identified on the ACP Soil Mapping Key developed for the Project including: 1) Parent Material; 2) Slope Class; 3) Drainage Class; 4) Diagnostic Subsurface Horizons; 5) Restrictive Layer Type; 6) Depth to Restrictive Layer; and 7) Family Particle Size Class. A detailed description of each of the ACP Soil Mapping Key components are discussed below and a concise version of the ACP Soil Mapping Key and the component symbology is included in **Attachment 6**. The Mapping Key uses numbers or letters to represent each component in a set order. **Figure 1** provides an example of a delineated soil unit ID with call-outs to identify each component.

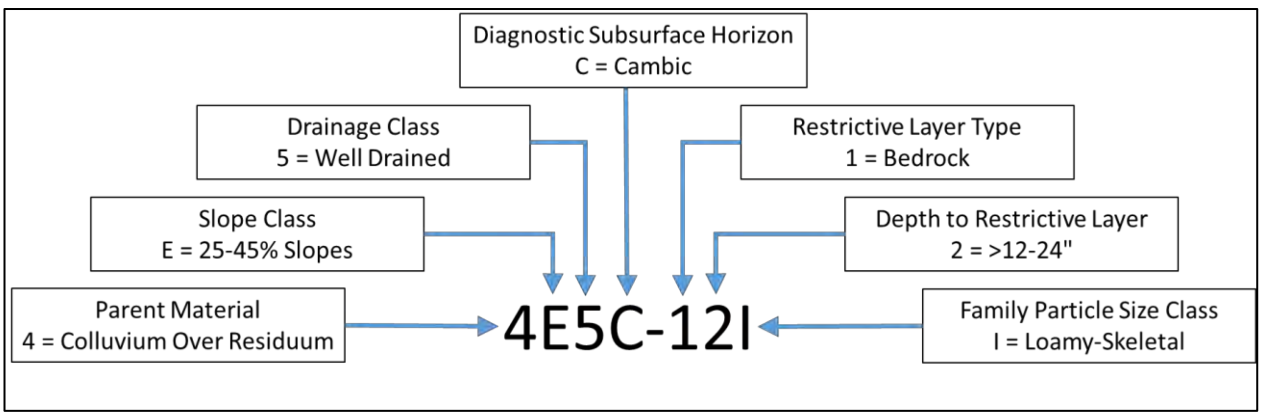


Figure 1. Example delineated soil unit ID with call out boxes describing the symbology used in the set order of components.

4.1.1 Parent Material

Parent material was observed by the soil scientist, and then one of the 10 numeric codes below were assigned to the map unit.

1. **Residuum**- soil material that has formed in place. Generally evidenced by coarse fragments with similar orientation to bedrock, and presence of a lithic or paralithic contact.
2. **Alluvium** – soil material that has been transported and deposited by water. Generally, evidenced by highly rounded coarse fragments and sorting of grain sizes.
3. **Colluvium** – soil material that has been moved by gravity. Generally, evidenced by random coarse fragment orientation, or mixtures of coarse fragment types in a horizon.

4. **Colluvium over Residuum** – a deposit(s) of colluvial material overlying residual soil material. Colluvium must extend deeper than the A-horizons to be considered a significant component.
5. **Colluvium over Alluvium** – a deposit(s) of colluvial material overlying alluvial material.
6. **Human Transported Materials (HTM)** – material that has been disturbed through excavation or relocation due to anthropogenic activity.
7. **Organic Soil Materials** – Accumulation of organic matter to have organic soil horizons (greater than 12-18% carbon depending on clay content) that are 16 inches or more thick. (None observed during soil survey)
8. **Alluvium over Colluvium** – a deposit(s) of alluvial material overlying colluvial material.
9. **HTM over Colluvium** – a deposit(s) of HTM on top of colluvial material.
10. **Alluvium over Residuum** – a deposit of alluvial material overlying residual soil material.

4.1.2 Slope Class

Slopes were measured with inclinometers or Abney levels to assign slope classes for mapping units. On landforms where the slope rapidly changed over too short of a distance to delineate separate units, then slope classes were lumped by using all of the letters that symbolize the range in slope classes within that delineated soil unit (e.g. BC - >3-15% slopes). Slope classes and symbology are provided in **Table 2**.

Table 2. Slope classes and their symbology used in the delineated soil map unit ID.

Symbol	Slope Range
A	0-3%
B	>3-8%
C	>8-15%
D	>15-25%
E	>25-45%
F	>45-70%
G	>70%

4.1.3 Drainage Classes

Drainage classes were assigned based on identification of zones of saturation indicated by the presence of redoximorphic features (redox), and/or interpretation of rate of water movement through the soil based on texture, coarse fragment content, depth to bedrock, and slope (**Table 3**).

Table 3. Drainage classes, delineated soil map unit ID symbology, and criteria used to assign them to a soil test profile.

Symbol	Drainage Class	Criteria
1	**Very Poorly**	Thick dark surface with depleted matrix underneath
2	**Poorly**	Redox shallower than 8 inches
3	**Somewhat Poorly**	Redox from 8 to less than 20 inches
4	**Moderately Well**	Redox from 20 to less than 40 inches
5	**Well**	Redox greater than or equal to 40 inches, and bedrock occurs deeper than 20 inches
6	**Somewhat Excessively**	Soils that are coarse textured, skeletal, or 10 to 20 inches to bedrock, and/or on steep slopes
7	**Excessively**	Soils that are coarse textured, skeletal, or less than 10 inches to bedrock, and/or on steep slopes

4.1.4 Diagnostic Subsurface Horizons

Diagnostic subsurface horizons form below the surface and are typically associated with B-horizons. Diagnostic subsurface horizons were identified by morphological characteristics. When multiple subsurface horizons were present in a profile without a lithologic discontinuity, both were included in the delineated soil unit ID (e.g. a soil with argillic horizons and a fragipan = AB). Diagnostic subsurface horizons separated by a lithologic discontinuity were presented with a "/" between the upper and lower components of the discontinuity. Diagnostic subsurface horizons identified during the survey, and their morphological criteria, included:

A. **Argillic** – a subsurface horizon with an accumulation of clay translocated from the overlying materials as evidenced by argillans (aka: clay films, coatings, or skins) or bridging in sandy soils (Alfisols or Ultisols).
B. **Fragipan** – a subsurface horizon that is dense and restricts rooting depth and perches water. Characterized by its firmness, brittleness, and very coarse structure (Alfisols, Ultisols, or Inceptisols).
C. **Cambic** – a subsurface horizon that has shown soil development of two or more processes (Inceptisols).
D. **Spodic** – a subsurface horizon that has formed under acidic conditions that result in an illuvial accumulation of aluminum-organic complexes with or without iron (Spodosols).
E. **None** – no subsurface horizon meets the criteria for any diagnostic subsurface horizon (Entisols), including any horizon that does not meet thickness requirements (e.g. a Bw horizon <6-inches thick).

4.1.5 Restrictive Layer Type

A restrictive layer is a horizon that inhibits root growth and downward movement of water. Paralithic layers are normally considered root limiting (Keys to Soil Taxonomy, 12th edition, *2014*). However, most paralithic layers observed during the Survey were composed of soft highly weathered shales or siltstones, or contained highly fractured rock and tended to contain few roots. For the purpose of this Survey, paralithic layers were not identified as restrictive layers, but have been identified on the soil logs when present. The restrictive layer symbology is presented in **Table 4**.

Table 4. Root limiting layer types and the delineated soil map unit ID symbology.

Symbol	Restrictive Layer Type
0	None
1	Bedrock
2	Fragipan

4.1.6 Depth to Restrictive Layer

The depth to a restrictive feature (**Table 5**) is defined by depth classes where the depth to the top of any root restrictive layer occurs. When excavations were limited by a water table or by coarse fragments, and observations were stopped prior to observing a restrictive layer or 50 inches, then the depth class was assigned based on the depth of observation in the soil test pit with a restrictive layer type of "None" (e.g. soil observation stopped at a depth of 22 inches due to a water table, therefore the Restrictive Layer Type is "0" and the Depth Class is "2").

Table 5. Depth to restrictive layer from the soil surface and the representative delineated soil map unit ID symbology.

Symbol	Depth Classes
1	≤12"
2	>12-24"
3	>24-36"
4	>36-48"
5	>48"

4.1.7 Family Particle Size Class

Family particle size class was assigned based on the control section and as defined by Keys to Soil Taxonomy, 12th edition (2014). A list of the family particle size classes and their delineated soil map unit symbology is provided in **Table 6**. Profiles that contained contrasting family particle size classes due to lithologic discontinuities are represented with a "/" between the upper and lower portions of the control sections.

Table 6. Family particle size class as defined by Keys to Soil Taxonomy 12th edition and their delineated soil map unit ID symbology.

Symbol	Family Particle Size Class
A	Coarse Silty
B	Fine Silty
C	Coarse Loamy
D	Fine Loamy
E	Sandy
F	Fine
G	Very Fine
H	Sandy-Skeletal
I	Loamy-Skeletal
J	Clayey-Skeletal
K	Clayey

4.2 Map Generation

During the Survey, boundaries were sketched on field maps to delineate soil map units based on changes in the seven components of the ACP Soil Mapping Key (**Attachment 6**) described in **Section 4.1.** GPS points (with sub-meter accuracy) were recorded to assist in the digitization of the delineated soil map units. Maps of adjacent areas were compared and joined the same day as they were drafted by the soil scientists. The hand-sketched field maps with the delineated soil map unit boundaries were scanned and georeferenced into ArcGIS to trace the hand drawn maps and reference with GPS data to generate delineated soil map in **Attachment 1**. The field-sketched maps and soil maps were prepared at a 1:2,400 scale. Delineated soil map units were labeled using the ACP Soil Mapping Key.

4.3 Mapping Assumptions

Soil mapping was conducted by U.S. Forest Service approved professional soil scientists. The mapping was conducted at an Order 1 scale (1:2,400) to map each individual soil unit on the landscape within the proposed pipeline corridor. However, soils are spatially dynamic and excavations within a delineated soil unit may result in the observation of slightly different soil properties due to the inherent variability in soil. One specific soil property that is likely to vary within delineated soil units is the family particle size class. A significant number of the soil test pits had soils with clay percentages which placed them near the break-point between the family particle size classes of 'fine loamy' and 'coarse loamy' or had coarse fragment contents which placed them close to being classified as 'skeletal.' The delineation between soils that differed only in family particle size class or another subtle property were conducted based on the professional judgment of the soil scientists.

The delineation of soil map units did not necessarily involve a soil test pit or transect point in each delineated map unit. Soil delineation IDs were assigned based on the observed relationships between soils and landscapes, which included identifying underlying parent materials, noting vegetative communities, and relating soil information from similar landscapes and nearby soil observations as a guide.

5.0 SOIL SAMPLE LABORATORY DATA

During the Survey a total of 511 soil samples were collected by soil horizon in duplicates from 111 test pits. The sampled test pits were examined, and a total of 41 test pits were selected to represent a variety of soil delineations and soil types. The 41 soil test pits contained a total of 190 sampled horizons. One set of the duplicate soil samples were sent the Pennsylvania State University Agricultural Analytical Services Laboratory (AASLAB) to be analyzed for soil particle size, pH and standard fertility testing (including determination of P, K, Mg, Ca, Zn, Cu, S, Acidity, CEC, and limestone and Mg application recommendations). The second set of duplicate soil samples were sent to ALS Environmental for determination of total carbon and organic carbon content. A summary data table is available in **Attachment 7**. The data reports from the AASLAB for the soil fertility testing are provided in **Attachment 8** and particle size analysis in **Attachment 9** and the data reports from the ALS Environmental laboratory for total organic carbon (TOC) and total carbon (Loss on ignition [LOI]) are provided in **Attachment 10**.

6.0 OBSERVATIONS

6.1 Soil and Parent Material Observations

A table presenting a summary of observations of the seven components of the ACP Soil Mapping Key is presented in **Attachment 11**, including the number of observations for each component class in the MNF and GWNF. The Project area is dominated by steep ridge and valley topography. The Project's centerline within the Survey area is predominately located on ridgelines with steep side slopes. When the Project route continued off the ridgelines it would travel straight down the steep slopes into and out of the intervening narrow valleys. With the route favoring the ridgelines, 82 percent of the soil test pits had a residual soil component (formed in place) and 61 percent of the soil test pits had a colluvial soil component due to the presence of steep slopes. The majority of the colluvium observed consisted of relatively thin deposits over residuum. This colluvium likely moved only short distances (e.g. from the shoulder to backslope) resultant of minor erosion/deposition events or slow creep over the centuries which has resulted in the material to be dislocated sufficiently by gravity to create random coarse fragment orientations. A few thicker colluvial deposits were observed primarily on footslope or headslope (concave backslope) positions, although some headslope positions were erosive landforms that were shallow to bedrock. In addition, evidence of colluvium was also observed in some of the A-horizons formed on the summits of secondary ridgelines (secondary ridges are those situated at lower elevations compared to major ridges which have the highest elevations in the region). Colluvium observed on the secondary ridgelines was likely transported from the higher elevation primary ridges during periods of landscape instability. Fragipans or fragic properties were observed in seven soil test pits situated in broader valleys on terraces, typically formed in colluvial material. In the high elevations of the MNF (P-068) and the westernmost end of the GWNF (P-090), evidence of frost churning (such as flagstones sticking vertically out of the ground) was observed in the upper portion of the soil profiles.

Topsoil (O and A-horizons) thickness ranged between 0.5 inches and 10 inches thick with an average of 3.1 inches between all of the test pits and transect observations. O-horizons (excluding duff) ranged from being absent to 6 inches thick with an average of 1.5 inches across all profiles. A-Horizons ranged from being absent to 7 inches thick, with an average thickness of 1.7 inches. When examining these horizons in relation to their landform position (**Table 7**), the lower landscape positions, such as footslopes and headslopes, that tend to be moister environments have thinner O horizons, but thicker A horizons relative to the higher and more xeric landscape positions. This may be a result of increased microbial activity decomposing the O horizons at a higher rate due to presence of more moisture.

Table 7. Thickness of topsoil (combined O and A-Horizons), O-horizons, and A-horizons for different landform positions or groups of landforms.

Landform Position	Topsoil (O- and A-Horizons) Thickness (in)	O-Horizon Thickness (in)	A-horizons Thickness (in)
Summit	2.9	1.5	1.4
Nose	2.6	1.6	1.1
Shoulder	3.2	1.6	1.6
Backslope	3.3	1.6	1.7
Footslope/Toeslope/Floodplain/Terrace	3.5	1.1	2.4
Headslope	3.0	0.8	2.2

With the Project route favoring the ridgelines, 87 percent of the test pits were well drained to excessively drained. Only one profile described was identified as poorly drained and less than 5 percent were classified as somewhat poorly drained.

Within the 360 soil test pits, restrictive layers were observed in 255 (71%) of the test pits. Of those with restrictive layers, 248 (97% of restrictive layers, 69% overall) had a lithic contact and seven (3% of restrictive layers, 2% overall) had a fragipan or fragic properties. Of the remaining 105 (29%) test pits that did not exhibit a restrictive layer, 25 (24% of no limiting layer, 7% overall) had a paralithic contact and eight (8% of no limiting layer, 2% overall) had refusal due to the presence of a water table.

Bedrock was primarily composed of siltstone or sandstone with approximately 41 percent containing siltstone and 38 percent containing sandstone. Shale coarse fragments were observed in the majority of the soil test pits, but shale was only identified as bedrock in 18 percent of the test pits where bedrock was observed. Limestone derived soils were observed in four test pits located in the GWNF (P-172, P-173, P-175, and P-176). In addition, soils that potentially have some limestone influence were observed in two Recon pits (R-028 and R-029) located in the MNF. One instance of breccia as bedrock was observed in test pit P-027 in the MNF.

Dip of bedrock varied greatly throughout the Project route. In the MNF the dip ranged from nearly level (1°) to as much as 42°, with every observation of a 22° dip or greater being located east of Route 92. In the GWNF, the dip was highly variable, from 1° to 90°, with all instances of dip steeper than 45° occurring from test pit P-189 eastward (near MP 99.6). Due to the limited bedrock exposure in the test pits, the measured dips should be considered qualitative, as bedding actual planes were difficult to discern.

6.2 Slopes and Evidence of Slope Failure Observations

Slopes observed along the Project route were fairly steep with 32 percent of the soil test pits (113) located on slopes ranging from 45 to 70 percent. As a result of the abundance of steep slopes, colluvium (soil material moved by gravity) was observed in 61 percent of the soil test pits, most of which was shallow local colluvium (over residuum) that over time has slowly crept down backslopes. This type of mass movement is not associated with slope failures.

Features indicating evidence of former landslides or slope movement, such as bent or leaning tree trunks, surface cracking or scarps, or shallow slip planes were observed during the Survey. Several instances of leaning trees or trees with bent bases were observed in the vicinity of test pits P-103, P-104, P-146, P-163, P-164, P-165, P-180, P-183, P-184, P-262, P-275, and P-333 in the GWNF; however, no indications of soil movement were observed in these areas other than the fact that all but two (P-184, P-275) contained a colluvial soil component. Surface sloughing was observed in the vicinity of test pit P-347 (REV 11 approximate MP 98.7) in the GWNF on a steep slope where the depth to bedrock was very shallow. One instance of an interpreted former slope failure was observed in the vicinity of T-312A, R-012, and R-013 in the GWNF. The slide scarp was in the vicinity of R-013 with the hummocky debris field in the vicinity of R-012 and T-312A (REV 11 approximate MP 123.0 to 123.1). Mature trees have been established in this historical slide area. A second possible historical slide was observed in the vicinity of R-007 (REV 11 approximate MP 155.0) in the GWNF; however, more data will be collected in this area when access is obtained to complete the Survey.

Throughout the Project, the predominant soil textures observed in the field were silt loams. The ridgelines and steep backslopes were mostly comprised of soil material with this silt-rich texture. The silt particle size (2-50 µm) is the most susceptible to erosion due to its light weight and minimal cohesiveness. Erosion and sediment control measures will be critical during and post construction with soil material that is highly susceptible to erosion, especially on steep slopes. Particle size analysis results are presented in **Attachments 7** and **9**. Initial review of these results shows some variations from textures conducted in the field. Additional analyses will be conducted to verify the lab results received by RETTEW and will be provided when available.

6.3 Soil Chemistry Observations

A summary of laboratory results is provided in **Attachment 7**. Copies of the original data from AASLAB for the nutrient analysis is provided in **Attachment 8**. Copies of the TOC and total volatile solids data from ALS Environmental is provided in **Attachment 10**. TOC is the mass of organic carbon per mass of soil and can be represented as a percentage. The total volatile solids represents the organic and non-organic carbon (carbonates) contents of the soil.

In general, nutrient contents and pH were below optimum levels, primarily a result of the acidic and nutrient poor geology. These below optimum levels pose a challenge for restoration, as the native species growing in this environment are adapted to the low pH and nutrient levels; some species prefer to grow in mildly acidic soils. For an accelerated reestablishment of vegetation, soils should be fertilized and limed. However, care should be taken in the determination of the quantities of fertilizer and lime to be applied, as over fertilization or liming could result in a shift in vegetative communities within the restoration corridor and could affect other ecosystems, such as acidic bogs, if downstream of the corridor.

Three test pits were observed to have contained spodic horizons in the MNF (P-012 and P-022) and in the GWNF (P-170) and had higher levels of carbon deeper in the profile (17, 14, and 5.6 inches in P-012, P-022, and P-170, respectively) in the Bhs and Bs horizons compared to non-spodic soils where percent organic carbon generally drops below 1 % carbon for subsurface horizons. The O and A horizons were high in organic carbon, with averages of 32.4 percent and 6.1 percent respectively. The sub soil, excluding spodic horizons, had an average organic content of 0.9 percent. The high quantity of carbon was anticipated in the surface horizons; however the thickness of these horizons was relatively thin (**Section 6.1**).

Based on an estimated bulk density (not measured during survey) of 0.2 g cm^{-3} for the O-horizons, 1.2 g cm^{-3} for the A-horizons, and 1.4 g cm^{-3} for subsoil horizons it would be estimated that the O-horizons, A-horizons and Subsoil horizons would contain about 64.8 mg C cm^{-3}, 73.2 mg C cm^{-3}, and 12.6 mg C cm^{-3} respectively. Due to their interaction with the environment, surface horizons provide numerous ecosystem services as a result of the higher organic carbon contents and biotic interactions including facilitating higher infiltration rates, carbon sequestration, nutrient cycling, providing a seed bank, etc. Carbon contents are dynamic because they are a balance between vegetative inputs and decomposition rates. Complete loss of these layers during construction would require decades of high inputs to recover. Conservation of these layers during construction and replacement following construction will ensure a faster recovery and provide ecosystem services that would assist in the restoration of these habitats.

Soils tended to be acidic with a pH ranging from 3.1 to 6.7 with an average (accounting for log scale) of 5.2. The lowest and highest pH values were observed in O horizons. Certain vegetative species can have an influence on soil pH, particularly pines. The Project route was primarily dominated by chestnut oak. Pines were mostly observed to grow sporadically with only a few instances where white pine grew in greater populations in proximity to test pits. Examination of the extreme values observed in the O-horizons reveals that the higher values tend to be in vegetative communities dominated by species of maple, while the more acidic O-horizons tend to be vegetated with chestnut oak, white pine, mountain laurel, and blueberry. The pH of the subsoil tends to be more driven by the geology rather than vegetation. The majority of the route contained siltstone, shale, and sandstone soils which tend to be slightly acidic. The pH of the subsoil (excluding O and A-horizons) ranged from 3.1 to 6.7 and had an average pH of 5.2, excluding limestone derived soils. The sub soil horizons that were derived from limestone had a pH that ranged from 5.2 to 6.8 with an average of 5.8.

7.0 SUMMARY

An Order 1 Soil Survey was completed for the ACP on behalf of Dominion Transmission, Inc. in the MNF and GWNF. The Survey resulted in the production of an Order 1 Soil survey with delineated soil map units (Attachment 1) determined through the use of the ACP Soil Mapping Key (**Attachment 6**). Soil test pit logs, transect logs, and laboratory test results for soil samples collected in the field are provided as **Attachments 3**, **4**, **5**, **7**, **8**, **9**, and **10**. The data gathered for the Survey may be utilized for environmental impact studies, geohazard studies, for assessing Best Management Practices (BMPs) for post construction restoration within the pipeline study corridor.

Overall the Project route is primarily situated on ridgelines and is primarily comprised of residual soil material with the observation of bedrock, although due to the steep slopes colluvium is abundant. Most of the colluvium is relatively shallow with a residual base. Evidence of slope failures or movements were observed in two potential slides, and several bent or leaning trees. With the Project favoring the ridge tops, most soils are well drained to excessively drained. The nutrient analysis revealed that the soils are mildly acidic and nutrient levels are generally below optimum levels. Also, based on field observations, the soils have a high potential for erodibility due have a high silt fraction and the abundance of steep slopes, therefore it is critical to implement and maintain erosion and sediment control measures during and post construction.

A supplement to this report and mapping will be provided following the completion of the route Survey in the vicinity of MP 155 and MP 156 and when the additional particle size analyses are completed. ACP anticipates the Order 1 Soil Survey and report for this segment of the alignment will be completed June 2017.

8.0 GLOSSARY

Alluvium/Alluvial – A soil material that has been transported and deposited by water. Generally, evidenced by highly rounded coarse fragments and sorting of grain sizes.

Argillic – A subsurface horizon with an accumulation of clay translocated from the overlying materials as evidenced by argillans (aka: clay films, coatings, or skins) or bridging in sandy soils (Alfisols or Ultisols).

Alfisols – An Order of soils in soil taxonomy that have formed an argillic subsurface diagnostic horizon and a base saturation of greater than 35% in the control section.

Colluvium/Colluvial – soil material that has been moved by gravity. Generally, evidenced by random coarse fragment orientation, or mixtures of coarse fragment types in a horizon. Could be the result of slope creep or major slope failures.

Cambic – A subsurface horizon that has shown soil development of two or more processes (Inceptisols).

Depleted Matrix – A soil horizon that exhibits a gray matrix color (value 4 or more and chroma 2 or less) that has resulted from reduction and translocation of iron due to saturation and anaerobic conditions with or without Redoximorphic features.

Human Transported Materials (HTM) – Soil material that has been disturbed through excavation or relocation due to anthropogenic activity.

Entisols – An Order of soils in soil taxonomy that no diagnositic subsurface horizon is present. Usually soils of recent depositions, or highly erosive environments.

Fragipan – A subsurface horizon that is dense and restricts rooting depth and perches water. Characterized by its firmness, brittleness, and very coarse structure (Alfisols, Ultisols, or Inceptisols).

Fragic Properties – A subsoil horizon that possesses similar properties of a fragipan but fails to meet all of the requirements of a Fragipan. Similar properties include firmness and some brittleness. The layer containing fragic properties also acts as a root restricting layer and impedes downward movement of water, although not as effectively as a fragipan.

Inceptisols – An Order of soils in soil taxonomy that have had development in a few soil properties and exhibit a weakly developed B-horizon in the form of a cambic horizon.

Lithologic Discontinuity – A change in soil material that has formed from different parent materials. Two examples of a lithologic discontinuity would be colluvium deposited over residuum or residuum formed from sandstone overlying residuum formed from siltstone.

Organic Soil Materials – Accumulation of organic matter to have organic soil horizons (greater than 12-18% carbon depending on clay content) that are 16 inches or more thick. (None observed during the soil survey.

Paralithic – A layer of residual material that is comprised of rock that has weathered sufficiently to be excavated by hand either through softening of the rock, or fracturing the rock to allow fines in between bedding planes.

Particle size analysis – Analysis conducted to determine the proportion of the sand, silt, and clay fractions in a soil sample to determine a textural class.

Redoximorphic Features (Redox) – A morphological feature produced from the reduction and oxidation of iron in the soil due to saturated and anaerobic conditions.

Residuum/Residual – Soil material that has formed in place. Generally evidenced by coarse fragments with similar orientation to bedrock, and presence of a lithic or paralithic contact.

Spodic – A subsurface horizon that has formed under acidic conditions that result in an illuvial accumulation of aluminum-organic complexes with or without iron (Spodosols).

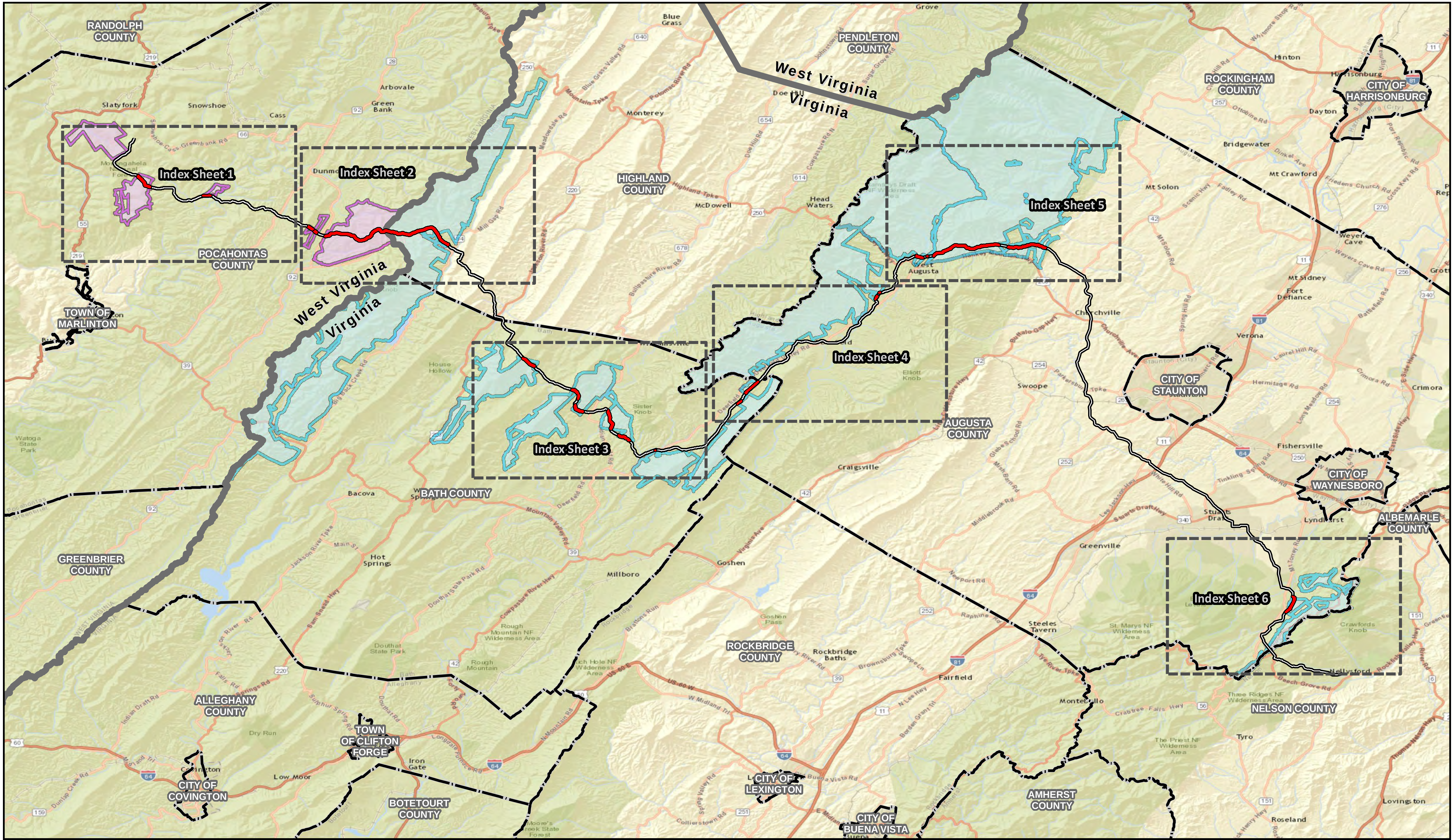
Spodosols – An Order of soils in soil taxonomy that are characterized by the presence of spodic horizons.

Ultisols – An Order of soils in soil taxonomy that have formed an argillic subsurface diagnostic horizon and a base saturation of less than 35% in the control section.

ATTACHMENTS

1. Project Mapping
2. Soil Observations Inventory
3. Reconnaissance Soil Test Pit Logs
4. Soil Survey Test Pit Logs
5. Soil Transect Logs
6. ACP Soil Mapping Key
7. Laboratory Results Summary
8. AASLAB Nutrient Analysis Results
9. AASLAB Particle Size Analysis
10. ALS Environmental TOC and LOI Results
11. ACP Soil Mapping Key – Soil Test Pit Observation Summary

Attachment 1
Project Mapping



Centerline Alignment (Rev-10 & Rev-11)	George Washington National Forest	County Boundary	Index Sheet
Area of Investigation	Monongahela National Forest	State Boundary	

0 30,000 Feet

1 inch = 30,000 feet

Imagery Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Rev. 7/29/2016

Drawn By: john.deloretta

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Atlantic Coast Pipeline

Order 1 Soil Survey

Cover Sheet

Project No. 089962000

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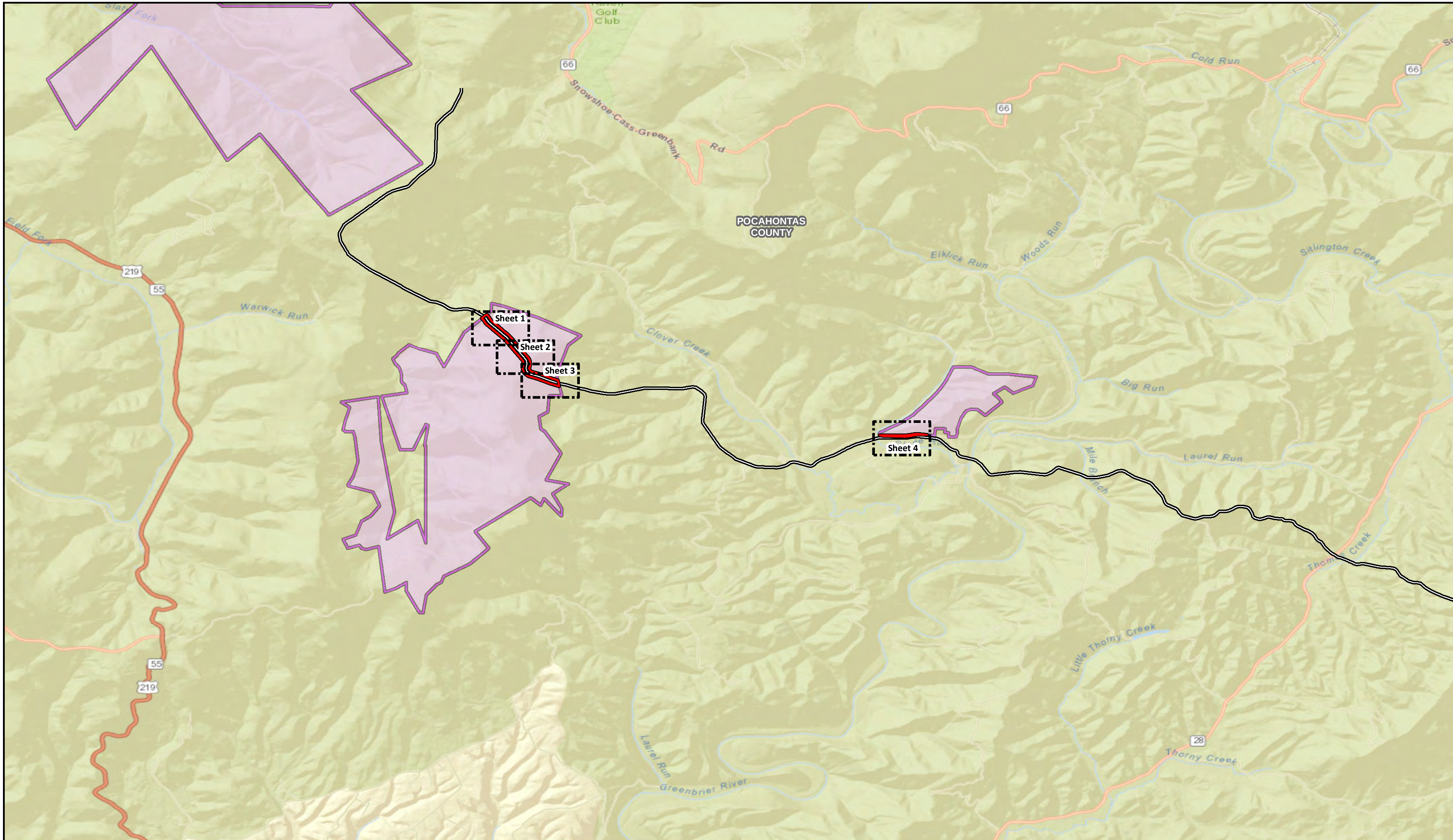

Centerline Alignment (Rev-10 & Rev-11)	George Washington National Forest	County Boundary	Grid Sheet
Area of Investigation	Monongahela National Forest	State Boundary	

0 — 5,000 Feet
1 inch = 5,000 feet

Imagery Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Rev. 7/29/2016

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Geosyntec Consultants
Atlantic Coast Pipeline
Order 1 Soil Survey
Index Sheet 1
Project No. 089962000

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