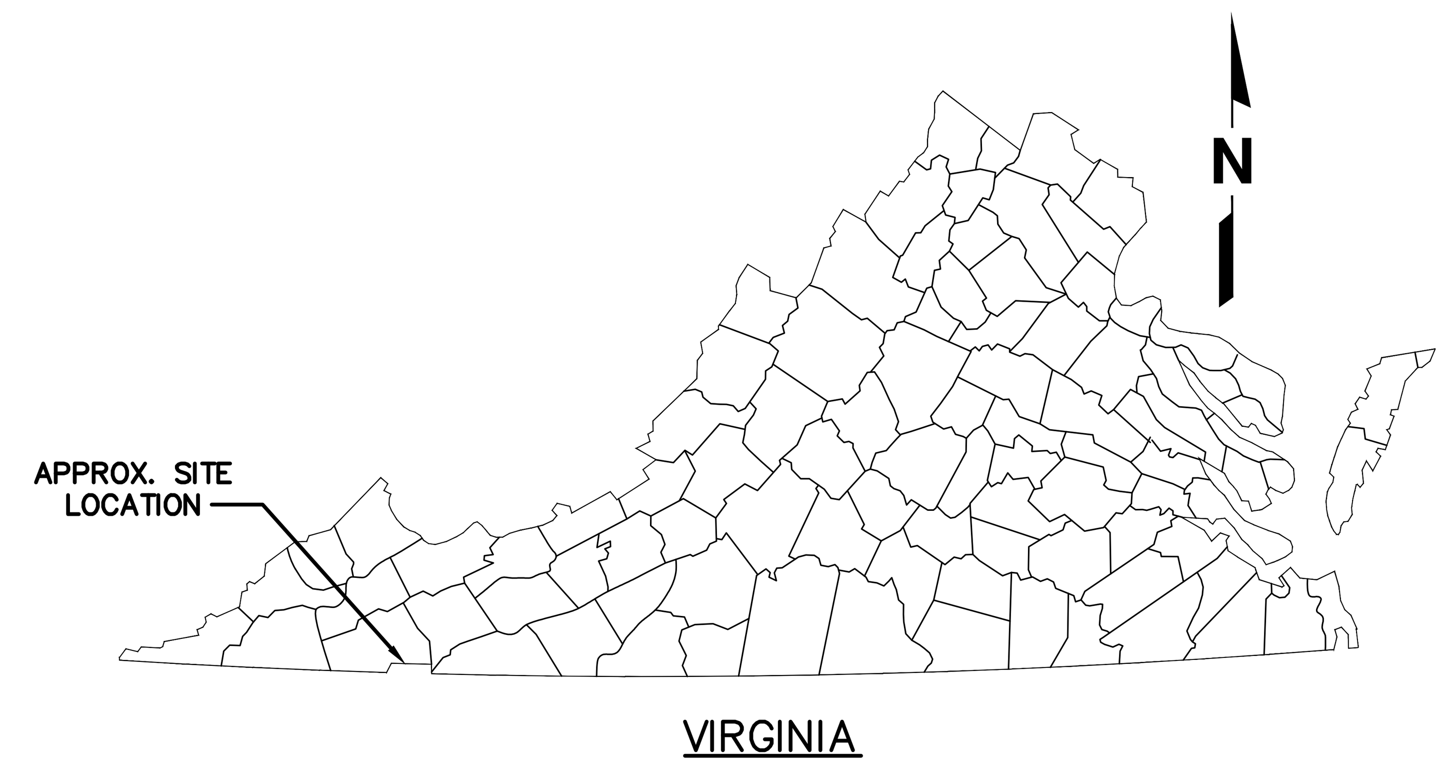
BRISTOL, VIRGINIA INTEGRATED SOLID WASTE MANAGEMENT FACILITY
SOLID WASTE PERMIT #498

CLOSURE DESIGN PLANS

BRISTOL, VIRGINIA



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PREPARED FOR:

CITY OF BRISTOL, VIRGINIA
300 LEE STREET
BRISTOL, VIRGINIA 24201

INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TURNPIKE, SUITE 305
MIDLOTHIAN, VIRGINIA 23113-7313
PH. (804) 378-7440 FAX. (703) 471-6676
WWW.SCSENGINEERS.COM

SCS PROJECT NO. 02218208.17

JANUARY 31, 2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: COVER SHEET

PROJECT TITLE: SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK., MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO. 02218208.05 | DWN. BY: TRW/SHA | Q/A RVW BY:
DSN. BY: TRW | CHK. BY: CJW | APP. BY: CJW

CADD FILE: 02218208.05
DATE: 1/31/23
SCALE: AS SHOWN
DRAWING NO. 1 of 16

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LEGEND:

- 1850 — EXISTING CONTOUR, MAJOR (10')
- EXISTING CONTOUR, MINOR (2')
- 1850 — PROPOSED CONTOUR, MAJOR (10')
- PROPOSED CONTOUR, MINOR (2')
- EXISTING 2" AIR LINE
- EXISTING 4" FORCE MAIN
- LFG — EXISTING LFG HEADER
- 4G — EXISTING 4" LFG HEADER
- 6G — EXISTING 6" LFG HEADER
- 8G — EXISTING 8" LFG HEADER
- 12G — EXISTING 12" LFG HEADER
- BUILDING
- L — EXISTING LEACHATE PIPE
- L — PROPOSED LEACHATE PIPE
- L — LEACHATE CLEANOUT
- STORMWATER PIPE
- EXISTING GRAVEL ROAD
- RIP RAP/ ROCKS
- FLEXAMAT DOWNCHUTE
- > — DIVERSION BERM
- SF — SILT FENCE
- CELL BOUNDARY
- EDGE OF LINER
- LANDFILL GAS VENT
- LFG — LANDFILL GAS PIPE
- P-2 PIEZOMETER
- MW-11 MONITORING WELL
- LOD — LIMITS OF DISTURBANCE
- S — SOIL TYPE BOUNDARY
- DRAINAGE AREA
- STREAM OR WATERLINE
- CENTERLINE
- (TS) TEMPORARY SEEDING
- (PS) PERMANENT SEEDING
- (CIP) CULVERT INLET PROTECTION
- (OP) OUTLET PROTECTION
- (SF) SILT FENCE
- (CE) CONSTRUCTION ENTRANCE
- (MU) MULCHING
- (B/M) BLANKETS AND MATTING
- RUNOFF FLOW DIRECTION
- LFG HEADER 6"ø

LEGEND:

- TP-3 EXISTING TEMPERATURE PROBE
- EXISTING WELLHEAD
- EXISTING AIR RELEASE VALVE
- EXISTING ISOLATION VALVE
- EXISTING LEACHATE CLEANOUT
- EXISTING U-TRAP
- EXISTING CONDENSATE PUMP STATION
- EXISTING HORIZONTAL COLLECTOR SUMP
- EXISTING LFG LIGUIDS CONTAINMENT TANK
- GP-5 EXISTING GAS PROBE
- MW-110 EXISTING GROUNDWATER MONITORING WELL
- EXISTING MANHOLE
- GW-## PROPOSED LFG COLLECTION WELLHEAD
- PROPERTY LINE
- FACILITY BOUNDARY
- WASTE MANAGEMENT UNIT BOUNDARY
- APPROXIMATE LOCATION FOR OF SIDEWALL
- EXISTING ROAD OUTLINE
- EXISTING LFG HORIZONTAL COLLECTOR
- PROPOSED LFG HORIZONTAL COLLECTOR
- LFG — EXISTING LFG COLLECTION PIPING
- LFG — PROPOSED LFG COLLECTION PIPING
- 8G — 8G — 8G — PROPOSED 8" LFG COLLECTION PIPING
- 12G — 12G — 12G — PROPOSED 12" LFG COLLECTION PIPING
- 16G — 16G — 16G — PROPOSED 16" LFG COLLECTION PIPING
- 18G — 18G — 18G — PROPOSED 18" LFG COLLECTION PIPING
- 24G — 24G — 24G — PROPOSED 24" LFG COLLECTION PIPING
- 28G — 28G — 28G — PROPOSED 28" LFG COLLECTION PIPING
- 36G — 36G — 36G — PROPOSED 36" LFG COLLECTION PIPING
- PROPOSED 2" AIR LINE
- PROPOSED 4" FORCE MAIN

GENERAL NOTES:

1. OWNER/DEVELOPER: CITY OF BRISTOL, VIRGINIA
2. CONSULTING ENGINEER: SCS ENGINEERS, 15521 MIDLOTHIAN TURNPIKE #305, MIDLOTHIAN, VA 23113
3. LOCATION OF EXISTING SEWER, WATER, OR GAS LINES, CONDUITS, OR OTHER STRUCTURES ACROSS, UNDERNEATH, OR OTHERWISE ALONG THE LINE OF PROPOSED WORK ARE NOT NECESSARILY SHOWN ON THE PLANS, AND IF SHOWN ARE ONLY APPROXIMATELY CORRECT. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF UNDERGROUND UTILITIES SHOWN ON THE PLANS IN AREAS OF CONSTRUCTION PRIOR TO STARTING WORK. CONTACT ENGINEER IMMEDIATELY IF LOCATION OF ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLANS, IF THERE APPEARS TO BE A CONFLICT, OR UPON DISCOVERY OF A UTILITY NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL OBTAIN FIELD UTILITY LOCATIONS BY CALLING "MISS UTILITY" FORTY EIGHT (48) HOURS PRIOR TO WORKING IN THE VICINITY OF EXISTING UTILITIES.
4. BOUNDARY INFORMATION TAKEN FROM OTHERS.
5. THESE DRAWINGS ARE NOT SUITABLE FOR CONSTRUCTION.
6. HORIZONTAL DATA IS BASED ON US STATE PLANE NAD 1983 VIRGINIA SOUTH ZONE. VERTICAL DATA BASED ON NAVD 88.
7. GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
8. EXISTING LFG HEADER WAS OBTAINED FROM SCS CONSTRUCTION DRAWINGS, LAST UPDATED JULY 6, 2022.
9. THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
10. THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.
11. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
GENERAL NOTES AND LEGEND

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK., MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

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DSN. BY: TRW | CHK. BY: CJW | APP. BY: CJW

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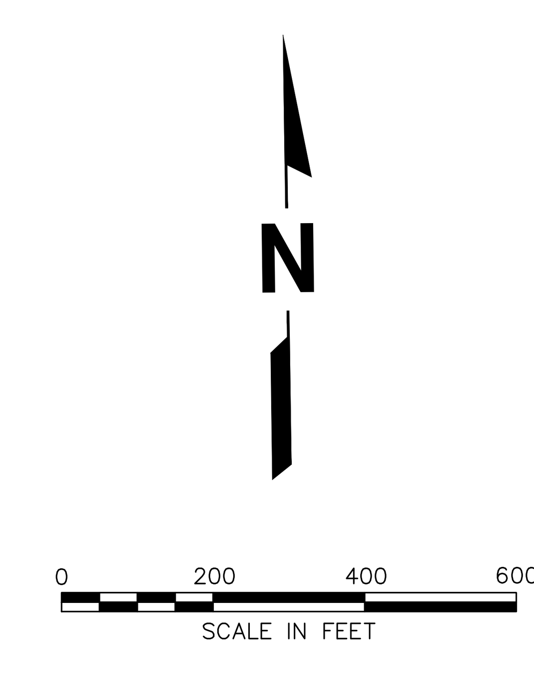
BRISTOL VIRGINIA SOLID WASTE FACILITY CONTROL MONUMENTS 9-10-2020				
BENCHMARK	NORTHING	EASTING	ELEVATION	DESCRIPTION
BM-1	3398930.8510	10412541.7390	1945.9200	BOLT IN CONCRETE MONUMENT
BM-2	3398427.2980	10411954.6380	1880.3510	BOLT IN CONCRETE MONUMENT
BM-3	3399535.2420	10412031.2950	1864.1110	TOP OF ANCHOR BOLT FOR ROCK PROTECTION FENCING
BM-4	3399345.9430	10413587.4720	1852.0750	1/2" REBAR IN CONCRETE AT FENCE CORNER
BENCHMARK INFORMATION PROVIDED BY THE CITY OF BRISTOL, VIRGINIA				



COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
OVERALL SITE MAP

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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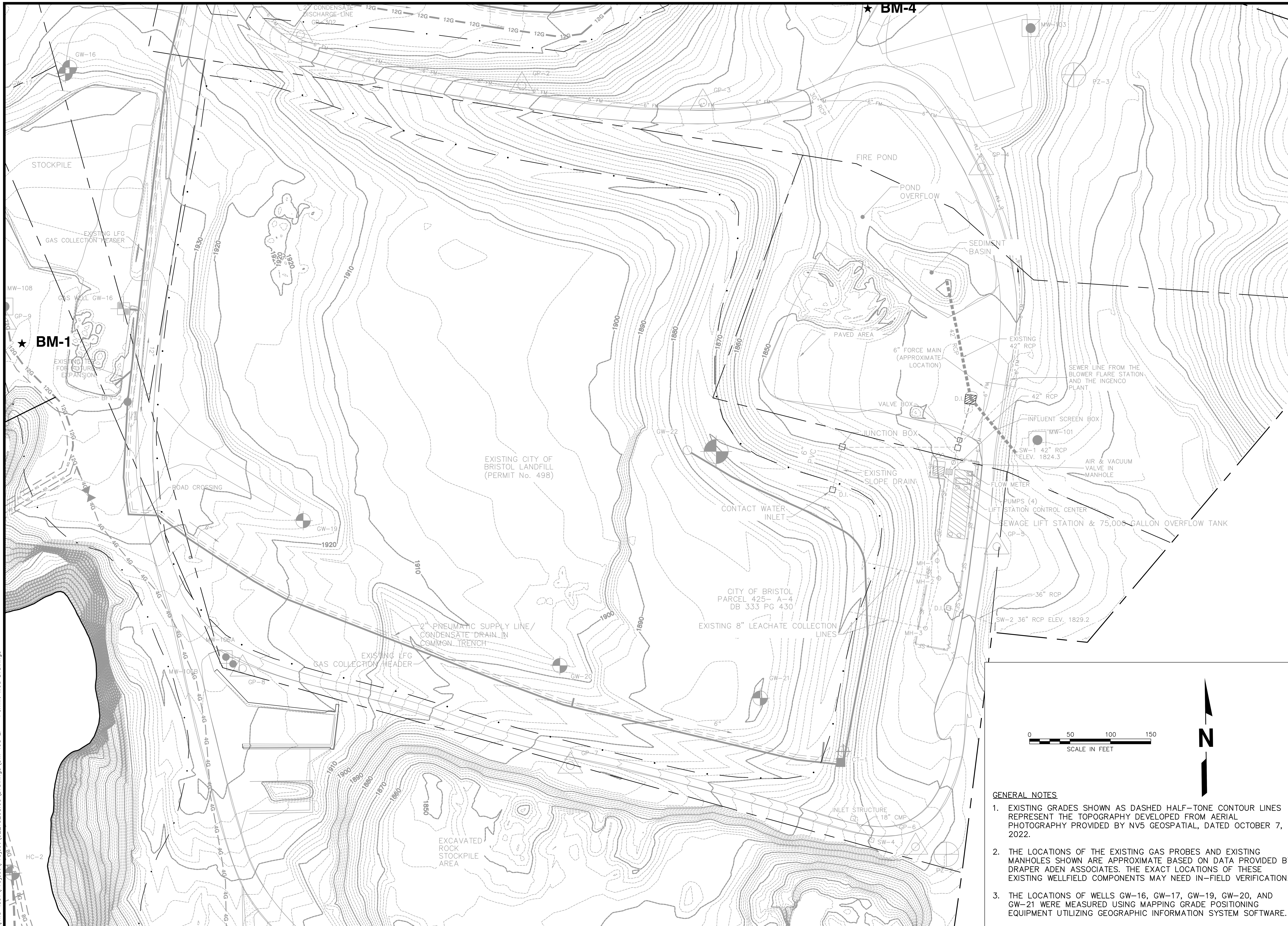

GENERAL NOTES

1. EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
2. THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
3. THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
EXISTING CONDITIONS

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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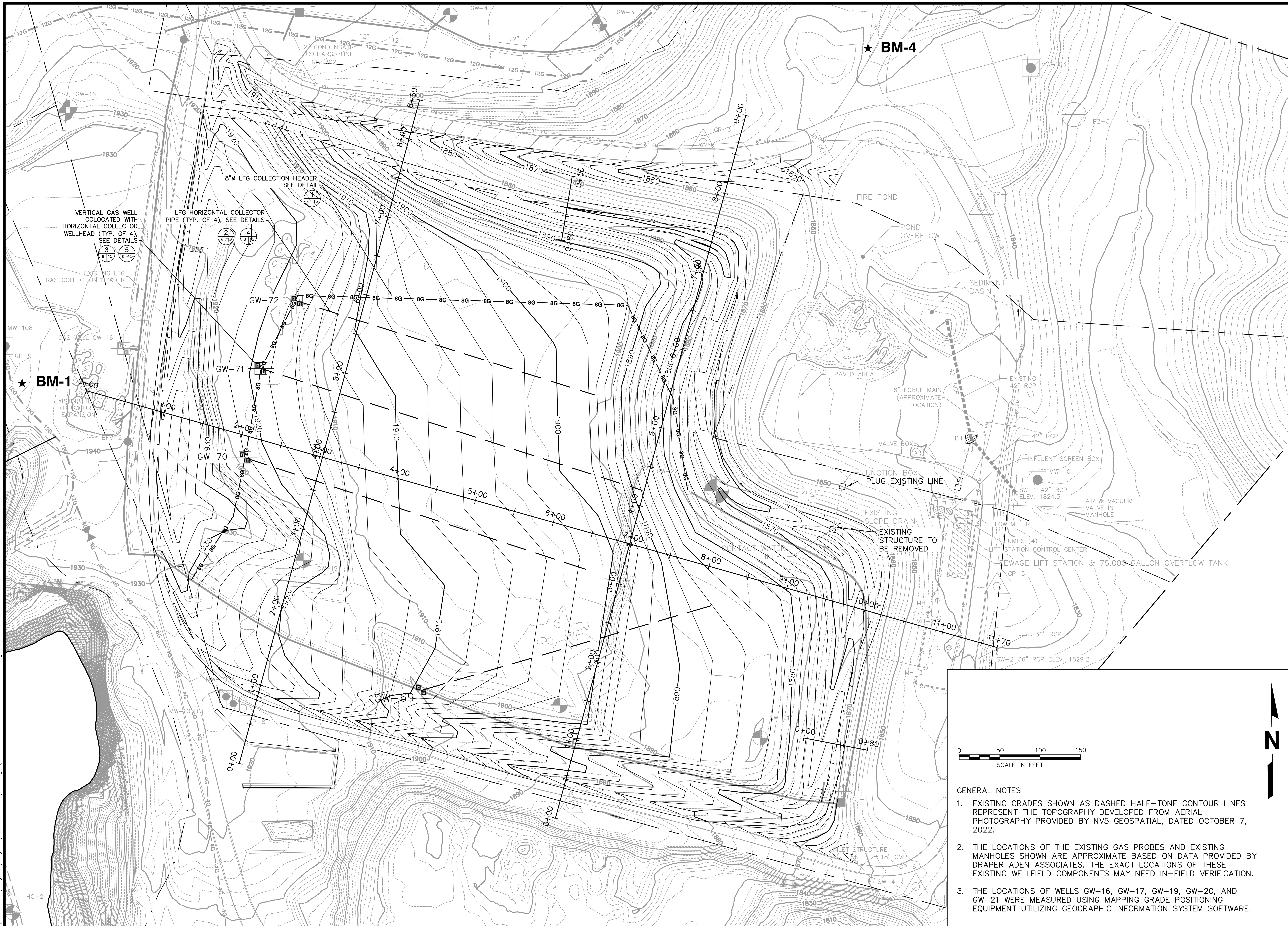

GENERAL NOTES

1. EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
2. THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
3. THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
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1/31/23
PROFESSIONAL ENGINEER

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SHEET TITLE
INTERMEDIATE COVER GRADE

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM
PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
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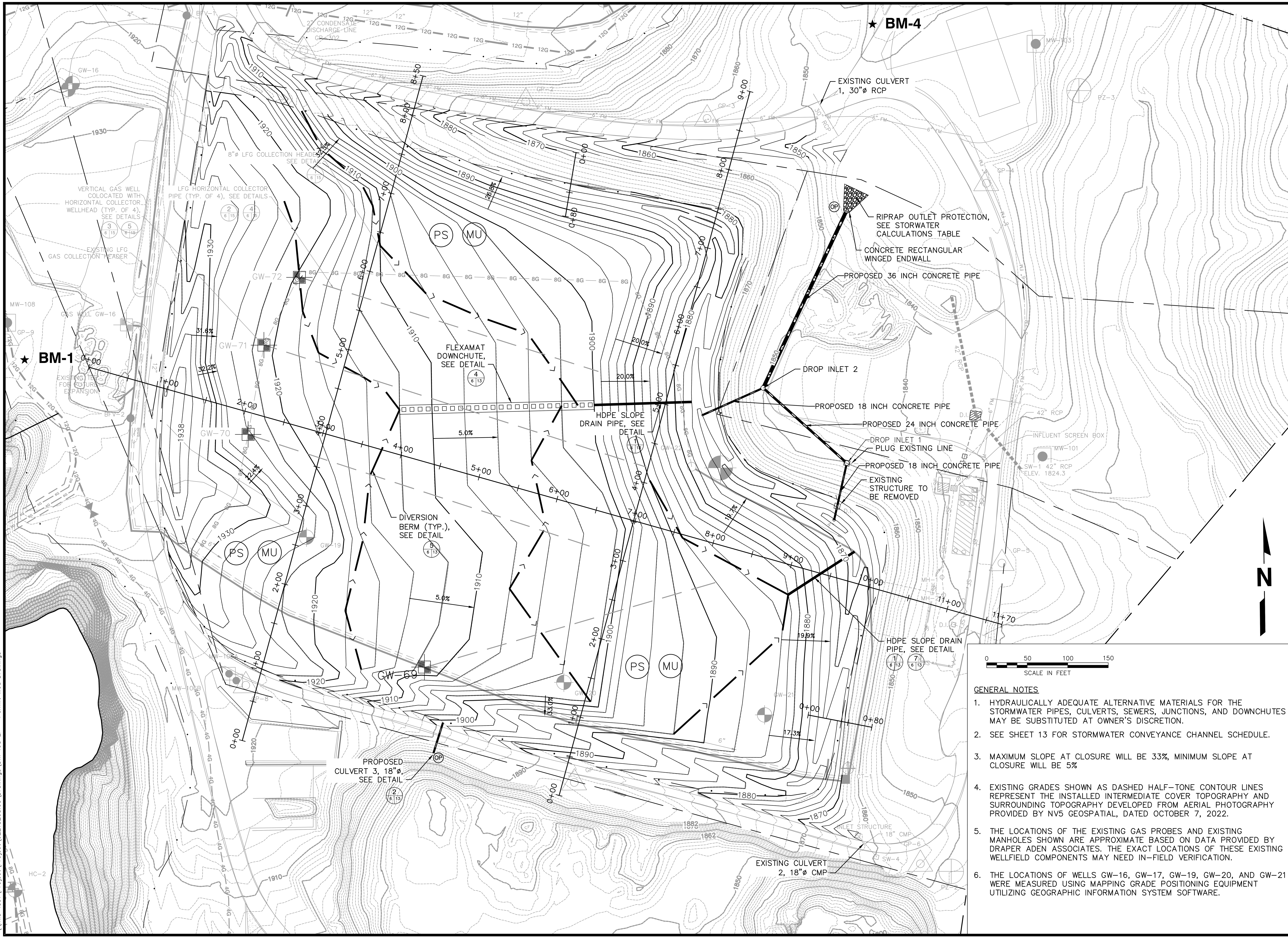

GENERAL NOTES

1. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.
2. SEE SHEET 13 FOR STORMWATER CONVEYANCE CHANNEL SCHEDULE.
3. MAXIMUM SLOPE AT CLOSURE WILL BE 33%, MINIMUM SLOPE AT CLOSURE WILL BE 5%
4. EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE INSTALLED INTERMEDIATE COVER TOPOGRAPHY AND SURROUNDING TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
5. THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
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COMMONWEALTH OF VIRGINIA
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1/31/23
PROFESSIONAL ENGINEER

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SHEET TITLE
FINAL CLOSURE GRADE

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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6 of **16**

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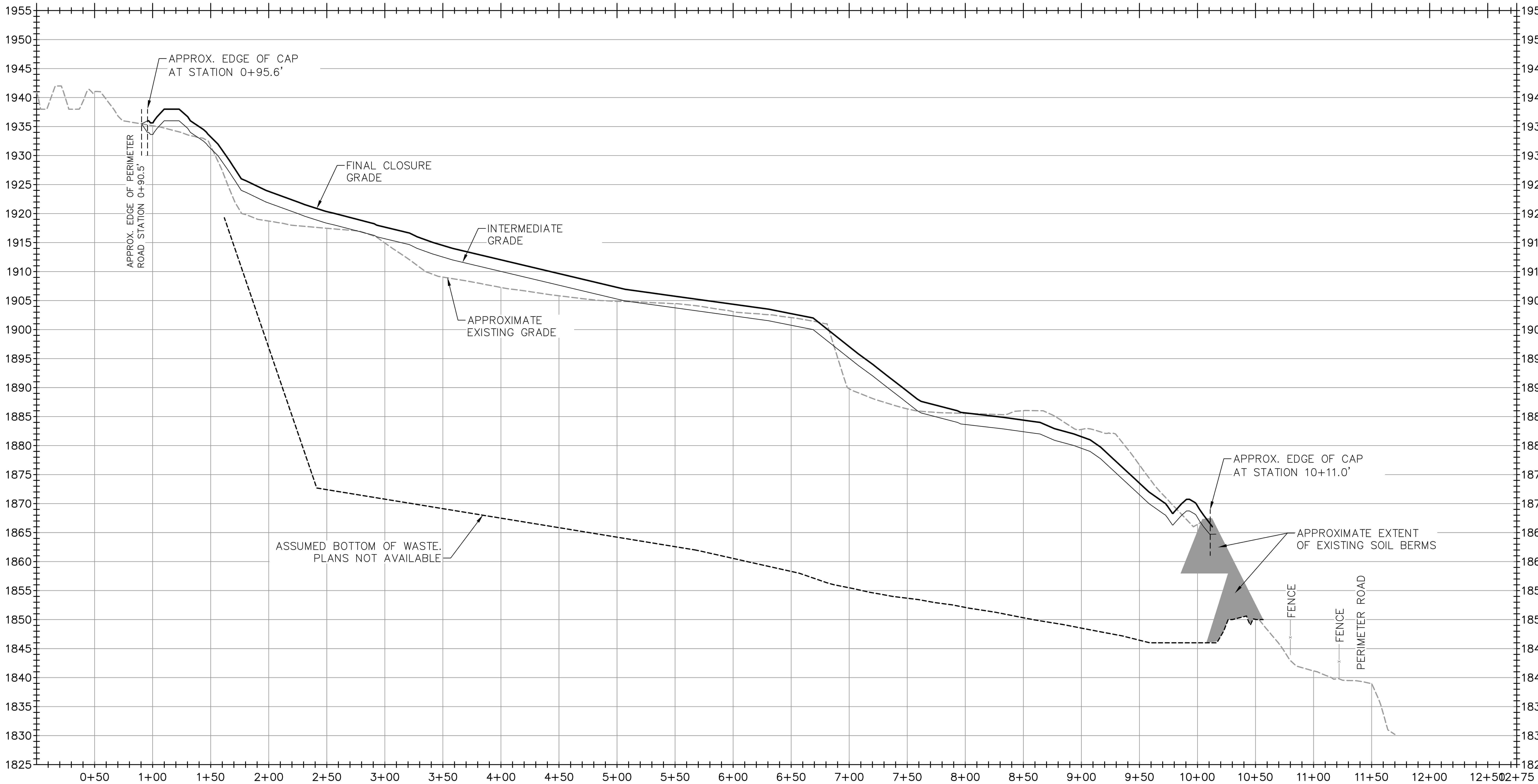

SECTION 1
H: 1" = 50'
V: 1" = 10'

GENERAL NOTES

1. EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
2. THE ASSUMED BOTTOM OF WASTE PROFILE IS BASED UPON DRAWINGS PREPARED BY DRAPER ADEN ASSOCIATES. THE ORIGINAL PLANS ARE NOT AVAILABLE.
3. THE WRITTEN SCALES INDICATED UNDERNEATH THE PROFILE VIEW TITLES WILL VARY DEPENDING UPON PLOT SIZE. DRAWINGS ARE INTENDED TO BE PLOTTED ON 24" X 36" SHEETS.

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COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
CROSS SECTIONS 1

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM
PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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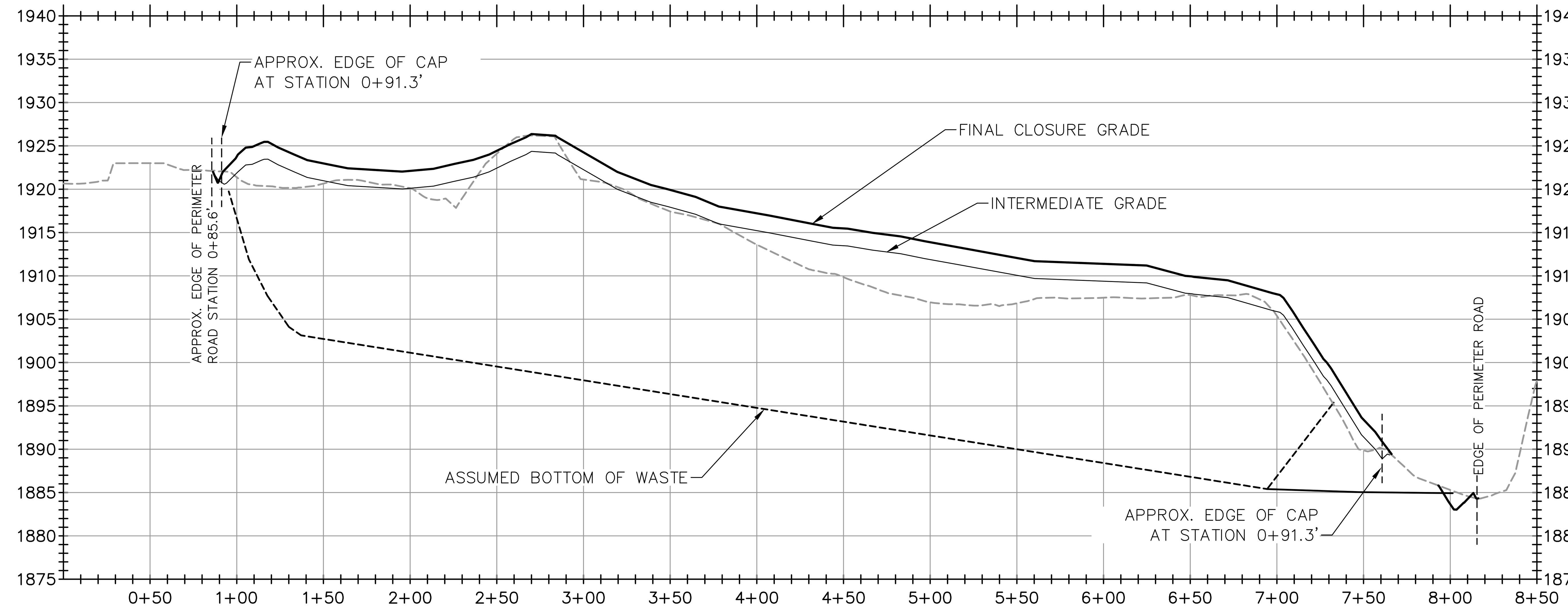
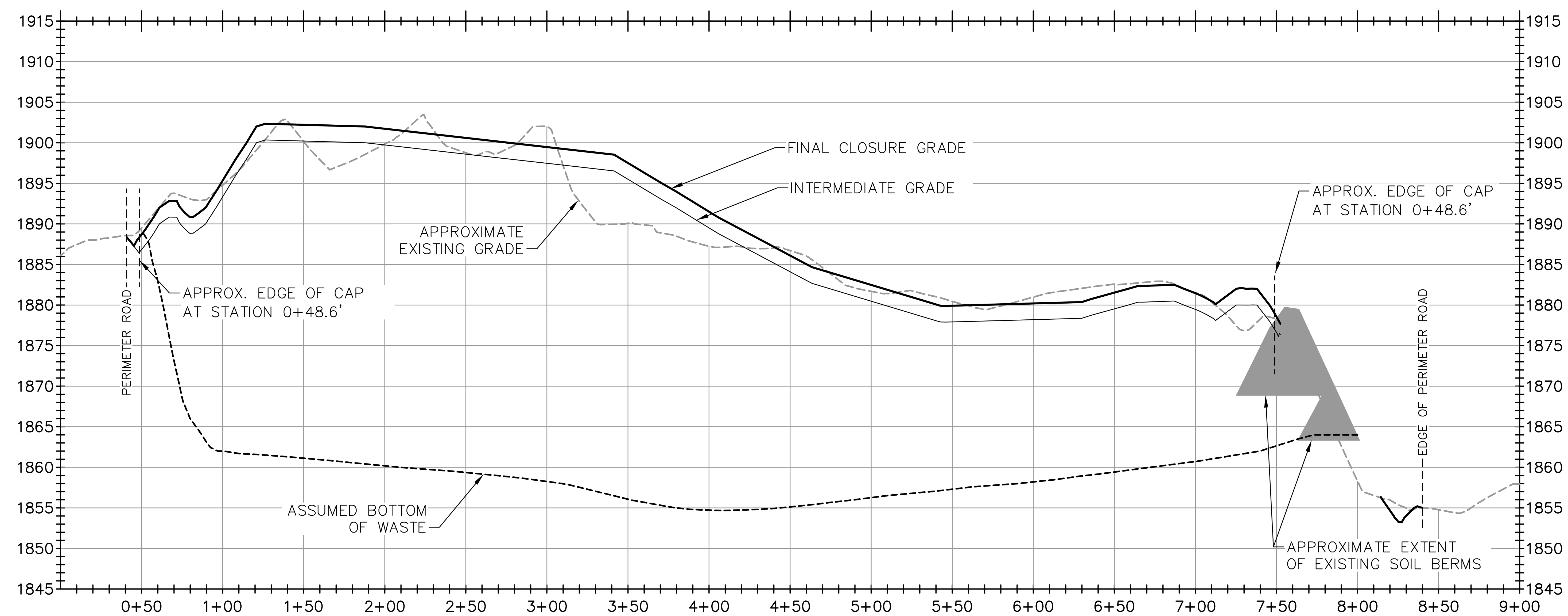


SECTION 2
H: 1" = 50'
V: 1" = 10'



SECTION 3
H: 1" = 50'
V: 1" = 10'

GENERAL NOTES

1. EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
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3. THE WRITTEN SCALES INDICATED UNDERNEATH THE PROFILE VIEW TITLES WILL VARY DEPENDING UPON PLOT SIZE. DRAWINGS ARE INTENDED TO BE PLOTTED ON 24" X 36" SHEETS.

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COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
CROSS SECTIONS 2

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM
PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
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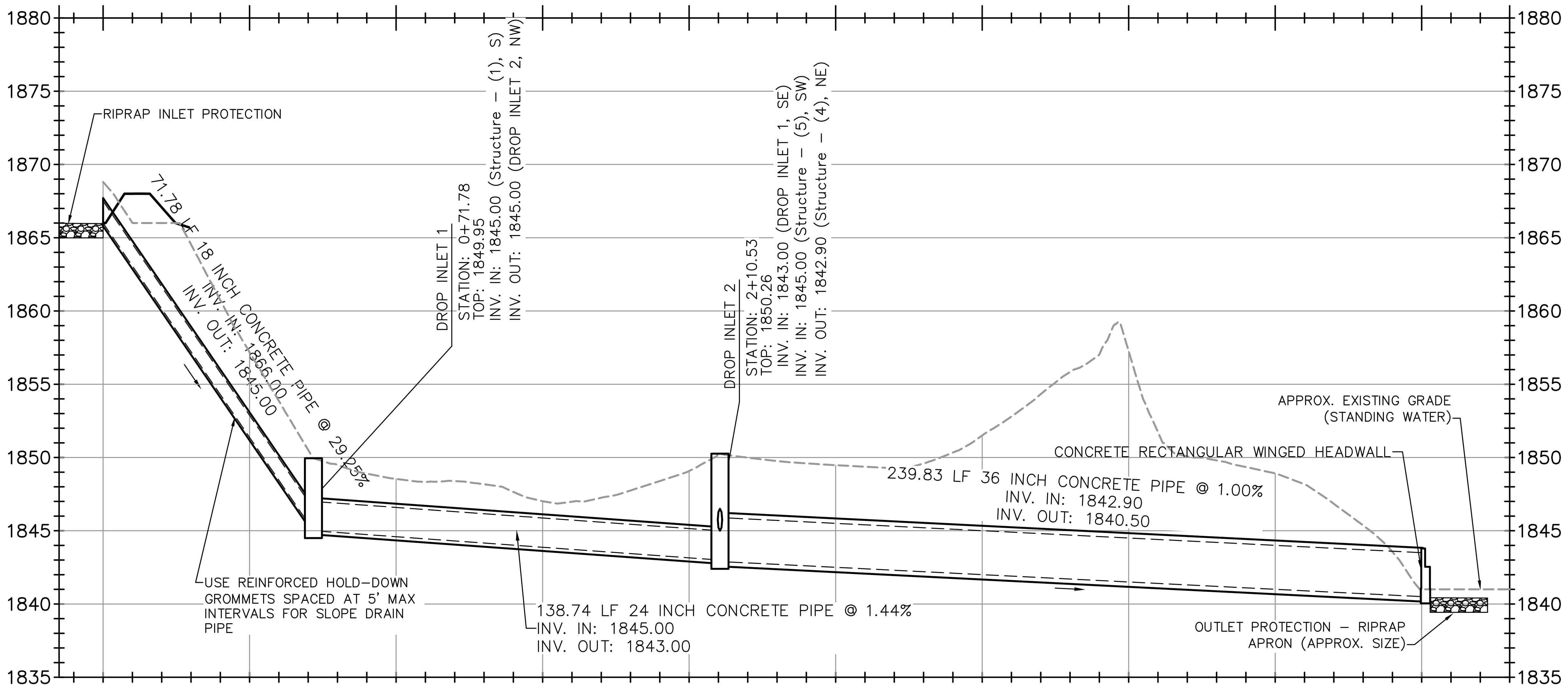
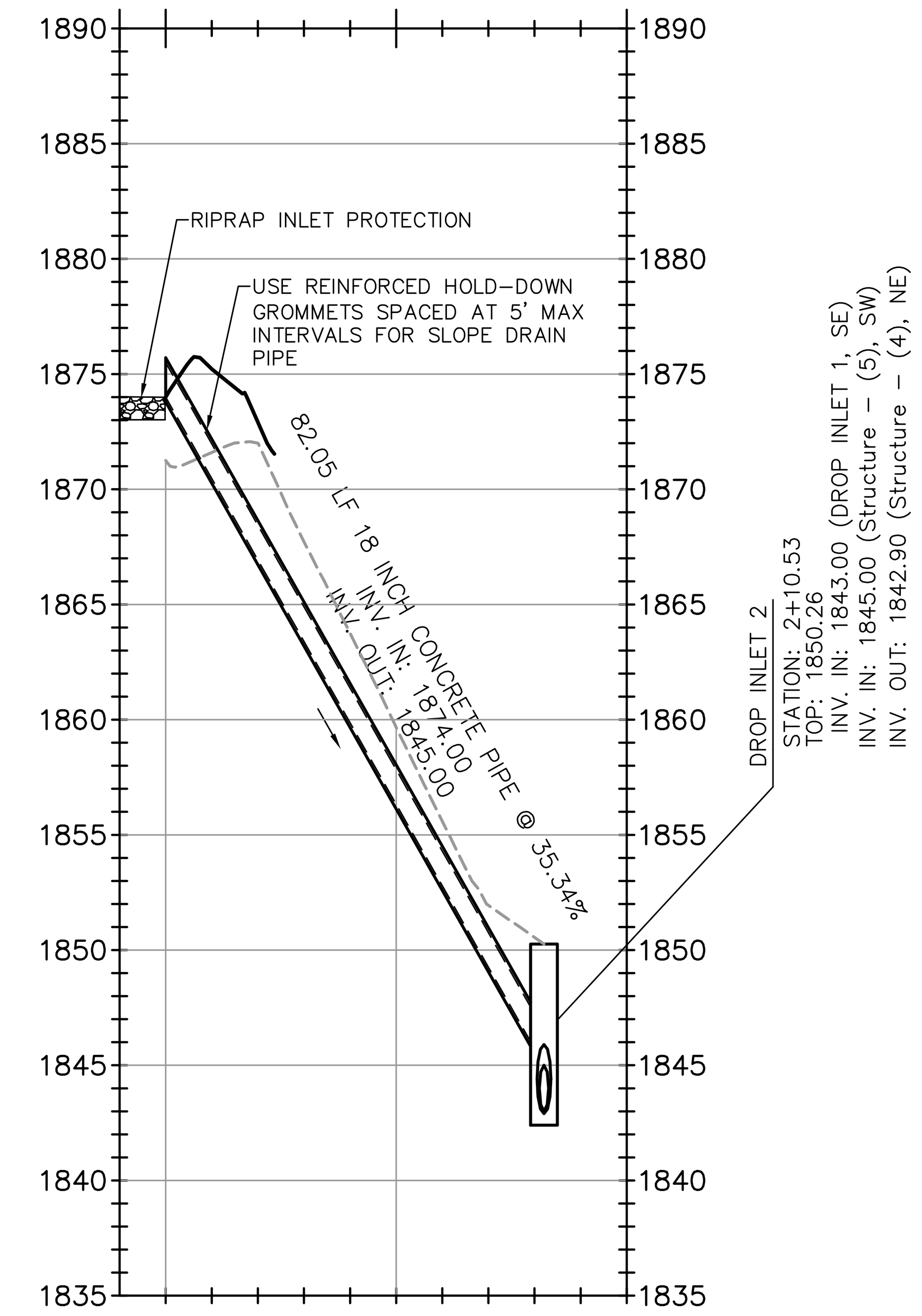
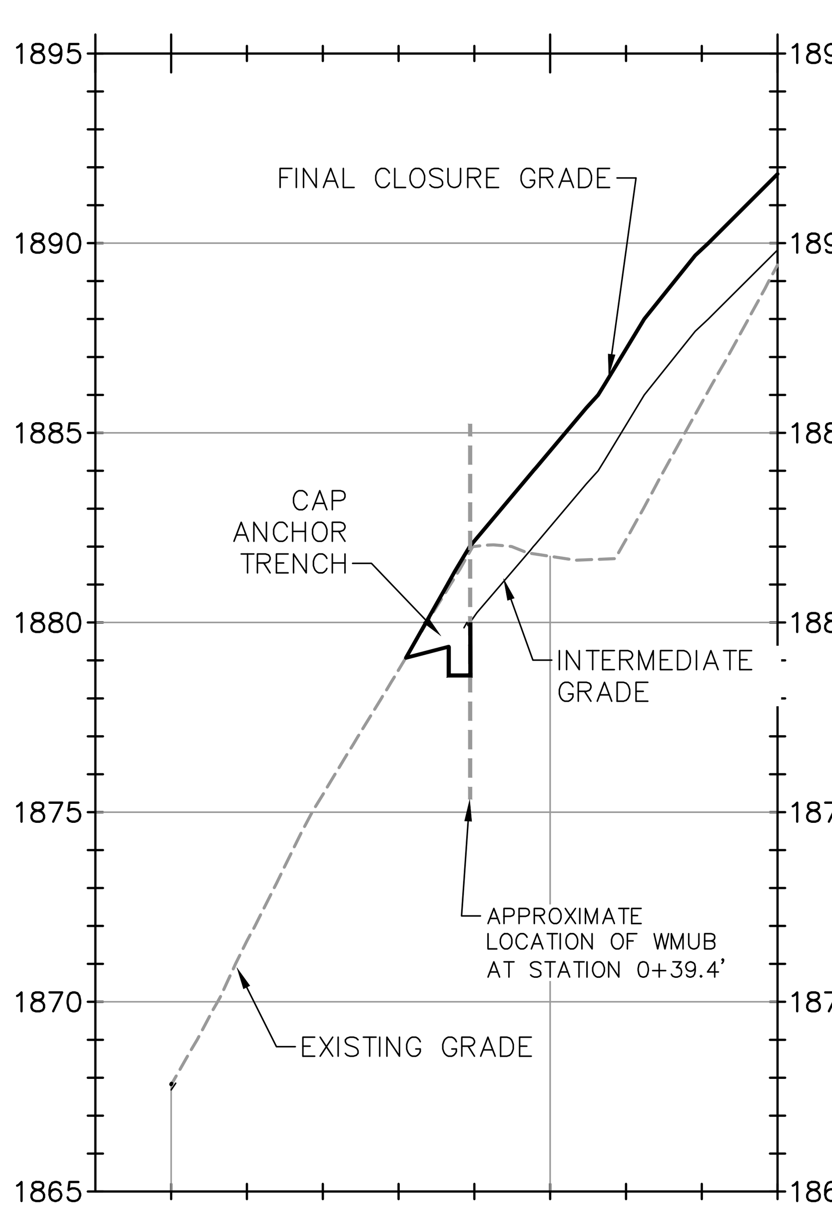


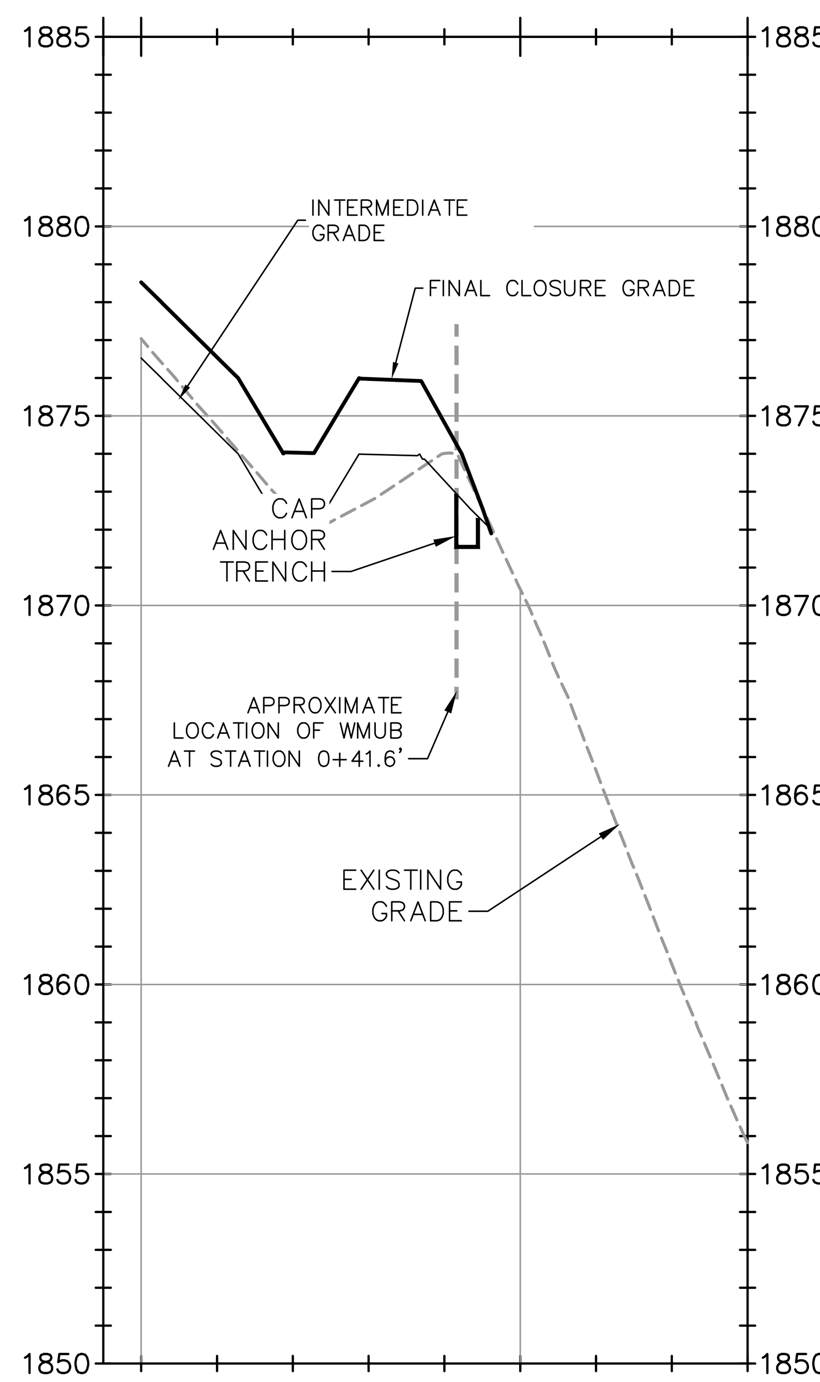
STORM SEWER 1
H: 1" = 50'
V: 1" = 10'



STORM SEWER 2
H: 1" = 50'
V: 1" = 10'



NORTH EDGE OF CAP DETAIL
H: 1" = 50'
V: 1" = 10'



EAST EDGE OF CAP DETAIL
H: 1" = 50'
V: 1" = 10'

GENERAL NOTES

1. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.
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3. THE ASSUMED BOTTOM OF WASTE PROFILE IS BASED UPON DRAWINGS PREPARED BY DRAPER ADEN ASSOCIATES. THE ORIGINAL PLANS ARE NOT AVAILABLE.
4. THE WRITTEN SCALE INDICATED UNDERNEATH THE PROFILE VIEW TITLES WILL VARY DEPENDING UPON PLOT SIZE. DRAWINGS ARE INTENDED TO BE PLOTTED ON 24" X 36" SHEETS

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: CROSS SECTIONS 3

PROJECT TITLE: SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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DRAWING NO. 9 of 16

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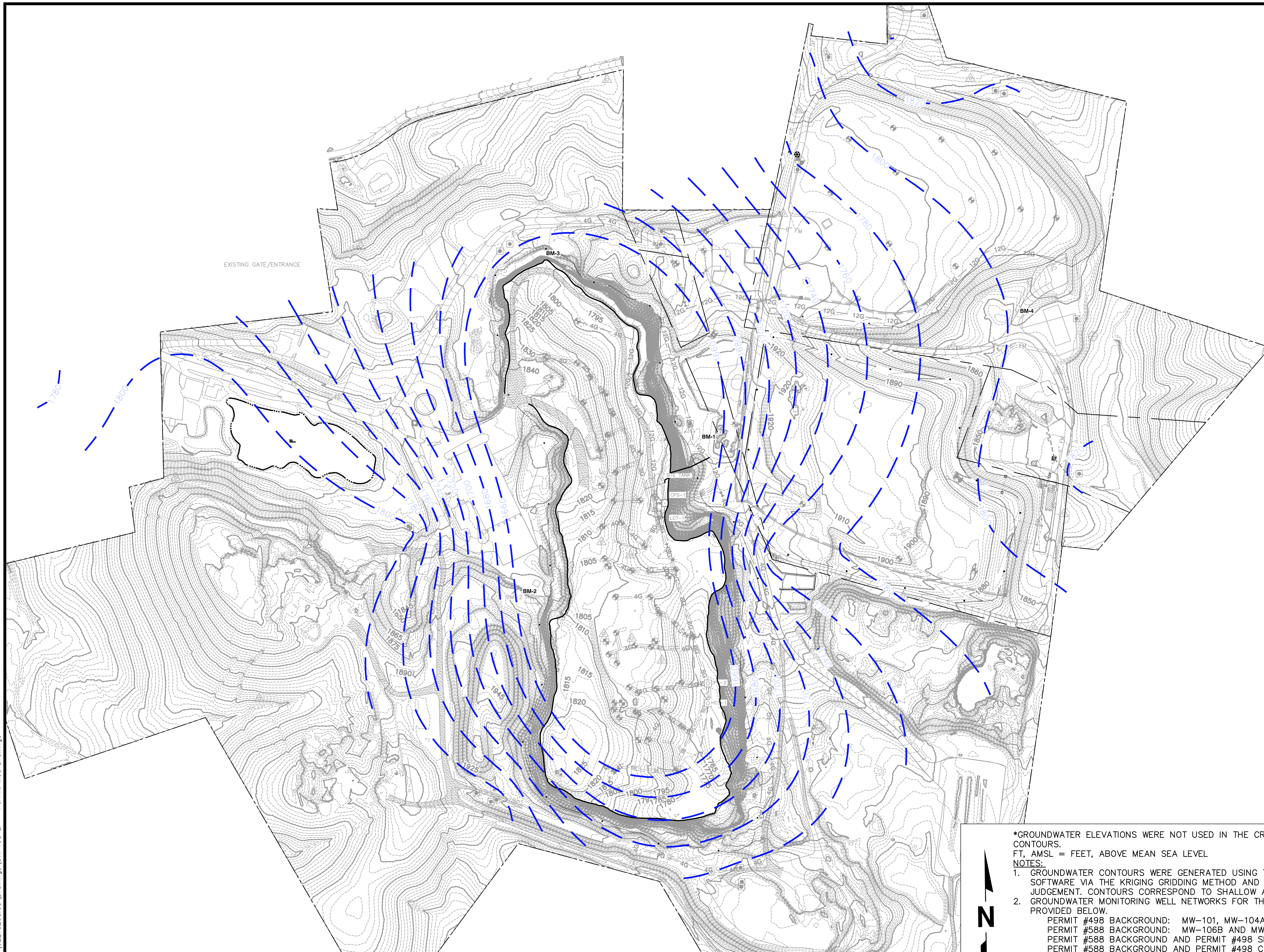

LANDFILL GAS MONITORING PROGRAM	
MONITORING NETWORK PROBES FOR SWP 498	GP-4, GP-5, GP-6, GP-9, GP-11, GP-12, GP-13, GP-14, GP-15, GP-16, GP-17, GP-18, GP-1OO, GP-200
PROBES NOT IN MONITORING NETWORK	GP-2, GP-3, GP-7, GP-8

*GROUNDWATER ELEVATIONS WERE NOT USED IN THE CREATION OF THE GROUNDWATER CONTOURS.
FT, AMSL = FEET, ABOVE MEAN SEA LEVEL

NOTES:

1. GROUNDWATER CONTOURS WERE GENERATED USING THE SURFER SURFACE MAPPING SYSTEM SOFTWARE VIA THE KRIGING GRIDDING METHOD AND ALTERED UTILIZING PROFESSIONAL JUDGEMENT. CONTOURS CORRESPOND TO SHALLOW AQUIFER – LENOIR-MOSHEIM.
2. GROUNDWATER MONITORING WELL NETWORKS FOR THE PERMIT #588 AND #498 LANDFILLS ARE PROVIDED BELOW.
   - PERMIT #498 BACKGROUND: MW-101, MW-104A, AND MW-104B
   - PERMIT #588 BACKGROUND: MW-106B AND MW-206A
   - PERMIT #588 BACKGROUND AND PERMIT #498 SENTINEL: MW-206B
   - PERMIT #588 BACKGROUND AND PERMIT #498 COMPLIANCE: MW-106A
   - PERMIT #588 BACKGROUND AND PERMIT #498 COMPLIANCE/SENTINEL: MW-205B
   - PERMIT #498 COMPLIANCE/PERFORMANCE: MW-108
   - PERMIT #588 COMPLIANCE AND PERMIT #498 SENTINEL: MW-210A, MW210B, MW211A, AND MW-211B
   - PERMIT #498 PERFORMANCE: GC OUTFALL (AKA. GRADIENT CONTROL SYSTEM)
   - PERMIT #498 SENTINEL: MW-105A, MW-105B, AND MW-109

N

0 150 300 450
SCALE IN FEET

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
SITE MONITORING PLAN

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK., MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO. 02218208.05 | DWN. BY: TRW/SHA | Q/A RVW BY:
DSN. BY: TRW | CHK. BY: CJW | APP. BY: CJW

CADD FILE: 02218208.05
DATE: 1/31/23
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DRAWING NO.

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NO.	REVISION	DATE

SHEET TITLE
EXISTING DRAINAGE PLAN

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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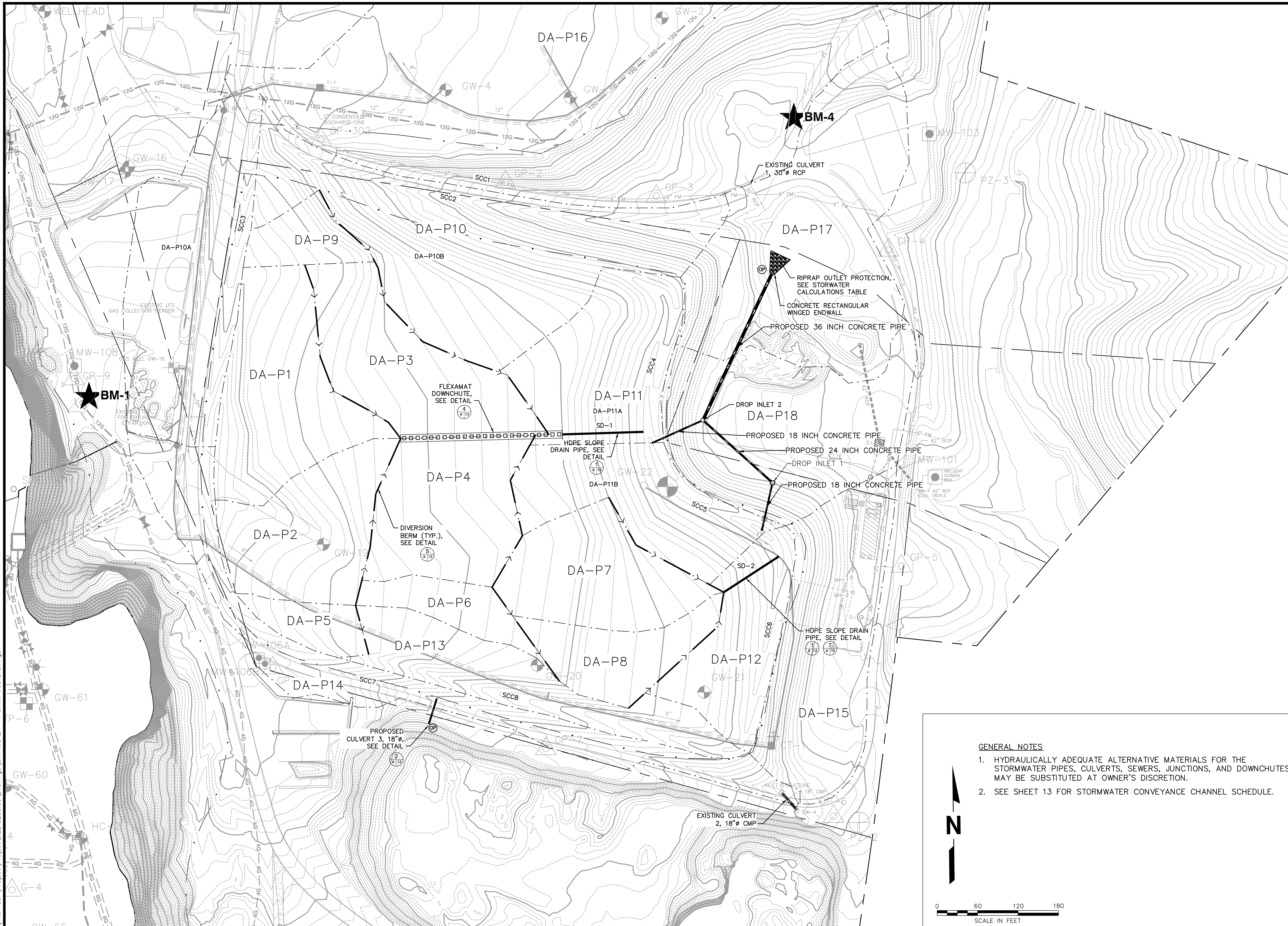

GENERAL NOTES

1. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.
2. SEE SHEET 13 FOR STORMWATER CONVEYANCE CHANNEL SCHEDULE.

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COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
STORMWATER MANAGEMENT PLAN

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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SCALE: AS SHOWN

DRAWING NO.

Drainage Area Discharge Calculation Summary

			Overland Flow			Shallow Concentrated Flow			Concentrated Flow					
Drainage Area No. (Dwg. 11)	Drainage Area, AC	Curve No.	% Slope	Drainage Length, ft	Tc, min.	% Slope	Drainage Length ft	Tc, min.	ΔH	Drainage Length, ft	Tc, min	Total Tc, min	2-Year Flow, cfs	25-Year Flow, cfs
P1	1.21	94	10	100	8.41	8	24	0.09	N/A			9	3.53	5.58
P2	0.97	94	10	100	8.41	7	160	0.62	N/A			9	2.83	4.48
P3	1.07	94	5	100	11.1	5	50	0.23	N/A			11	2.99	4.73
P4	1.00	94	5	100	11.1	5	172	0.79	N/A			12	2.59	4.10
P5	0.24	94	10	100	8.41	5	58	0.27	N/A			9	0.70	1.11
P6	0.33	94	5	100	11.1	5	110	0.51	N/A			12	0.85	1.35
P7	0.90	94	5	100	11.1	10*	206	0.71	N/A			12	2.33	3.69
P8	0.54	94	5	100	11.1	7*	184	0.78	N/A			12	1.40	2.22
P9	0.29	94	5	100	11.1	16*	80	0.28	N/A			11	0.81	1.28
P10A	1.69	79	5	100	11.1	5	125	0.58	N/A			12	2.02	4.27
P10B	2.54	87	5	100	11.1	25	150	0.31	N/A			11	5.22	9.32
P11A	1.09	94	5	100	11.1	12	120	0.36	N/A			11	3.04	4.82
P11B	0.96	94	7	100	9.7	20	114	0.26	N/A			10	2.80	4.43
P12	0.77	94	5	100	11.1	20	54	0.12	N/A			11	2.15	3.40
P13	0.93	94	5	100	11.1	10	127	0.41	N/A			12	2.41	3.81
P14	1.30	84	5	100	11.1	10	200	0.65	N/A			12	2.10	3.99
P15	1.46	79	10	100	8.41	8	200	0.73	N/A			9	2.00	4.19
P16	6.92	79	4	100	12.14	10	600	1.96	N/A			14	7.84	16.66
P17	2.31	79	11	100	8.1	8	210	0.77	N/A			9	3.17	6.62
P18	1.68	79	20*	100	8.28	8	250	0.91	N/A			9	2.30	4.82

Curve Number assumed as 94 within final cover area due to infiltration layer and 79 outside final cover (Group C soil)
Concentrated flow not considered, to be conservative
Manning's n value - 0.040 for riprap, 0.030 for tall grass
Riprap is VDOT Class 1
*Slope listed is a weighted average of slopes along the flow path. Actual Tc calculations utilized individual sections for paths with significant change in slope.

Stormwater Conveyance Channel Calculation Summary

								Overtopping	Erosion	
Ditch Number	Drainage Area No. (Dwg. 11)	25-Year Flow, cfs	Ave. Slope, ft/ft	Ditch Type	Base Width, ft	Side Slopes	Ditch Depth, ft	Flow Depth D_{25}, ft	Velocity V_{25}, ft/s	Lining
SCC-1	Partial P16	6.12	0.09	Trapezoid	2	3:1	1.5	0.48	3.71	Flexamat
SCC-2	P9 + P10	14.87	0.09	Trapezoid	2	3:1	2	0.74	4.76	Flexamat
SCC-3	P10A	4.27	0.05	Trapezoid	2	3:1	2	0.46	2.75	Flexamat
SCC-4	P1+P2+P3+P4+P11A	23.71	0.03	Trapezoid	4	3:1	2	0.97	3.54	Flexamat
SCC-5	P11B	4.43	0.03	Trapezoid	4	3:1	2	0.4	2.13	Flexamat
SCC-6	P5 + P12 + P13	8.33	0.03	Trapezoid	4	3:1	2	0.56	2.62	Flexamat
SCC-7	P14	3.99	0.08	Vee	0	3:1	1.5	0.63	3.35	Flexamat
SCC-8	P5 + P13	4.92	0.07	Trapezoid	4	3:1	2	0.33	2.99	Flexamat
SCC-9	Partial P13	2.00	0.07	VEE	0	3:1	1.5	0.4	3.5	Flexamat
FD-1*	P5 + P13	18.89	0.05	Trapezoid	2	3:1	1.5	0.95	4.1	Flexamat

*Flexamat downchute

HDPE Slope Drain Pipe Calculation Summary

Slope Drain No.	Drainage Areas	25-Year Flow, cfs	Ave. Slope, ft.ft	Pipe Dia., in	Flow Depth, in.	Flow Velocity, ft/s	Full Flow Capacity, cfs
SD-1	P1, P2, P3, P4	18.89	0.2	18	7.6	26.62	50.87
SD-2	P7, P8	5.91	0.2	18	4.2	18.78	50.87

Manning's n value - 0.025 for corrugated plastic pipe

Storm Sewer Pipe Capacities

Pipe ID	25-Year Flow, cfs	Slope, ft/ft	Pipe Dia., in	25yr Flow Depth, ft	25yr Flow Velocity, ft/s	Full Flow Capacity, cfs
36" Outlet Pipe	61.26	0.01	36	2.1	11.4	77
24" Sewer	18.66	0.014	24	1.2	9.7	31
18" Pipe to DI2	47.03	0.35	18	0.9	40.8	72

Manning's n value - 0.025 for corrugated plastic pipe

Culvert Calculations Summary

						Inlet Control , 25-yr Flow			Outlet Control								Open Channel Assumption			
Culvert Description	Pipe Diameter ft	25-Yr Pipe Flow cfs	Length, ft	Inv. In, ft	Inv. Out	HW/D	HWin	Elhi	TW,ft	Dc, ft	(Dc + D)/2	ho	ke	H	ELho	Control HW Elev	25-Yr Flow Depth, ft	Road Elev. Ft	Pipe Capacity cfs	Pipe Velocity ft/s
Culvert 1	2.5	16.66	40	1847	1846	0.81	2.02	1849.02	1	1.4	1.7	1.7	0.2	0.6	1848.3	1849.2	0.83	1850	70.25	11.65
Culvert 2	1.5	2.55	32	1860	1859	0.55	0.83	1860.83	0.5	0.6	1.1	1.1	0.2	0.4	1860.45	1860.83	0.36	1861	20.13	11.39
Culvert 3	1.5	1.56	32	1897.5	1896.5	0.42	0.62	1898.12	0.4	0.7	1.1	1.1	0.2	0.4	1898	1898.12	0.29	1899	20.13	11.39

All pipe is assumed Class IV RCP
ho is larger of TW or (Dc+D)/2

Outlet Protection Summary

Structure ID	Pipe Diameter ft	25 Year Peak Flow, cfs	L_a, ft	Initial Width, ft	End Width, ft	d_{50}, min., ft
Culvert 1	2.5	16.6	30	7.5	32.5	0.9
Culvert 2	1.5	2.55	10	4.5	5.5	0.9
Culvert 3	1.5	1.56	10	4.5	5.5	0.9

L_a and widths from VESCH Plate 3.18-4
Use VDOT Class IA riprap. Discharge channels will be lined with flexamat, so additional OP is not needed

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COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO. | REVISION | DATE

SHEET TITLE
STORMWATER CALCULATIONS

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM
PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID
WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
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15521 MIDLOTHIAN TNPK., MIDLOTHIAN, VA 23113
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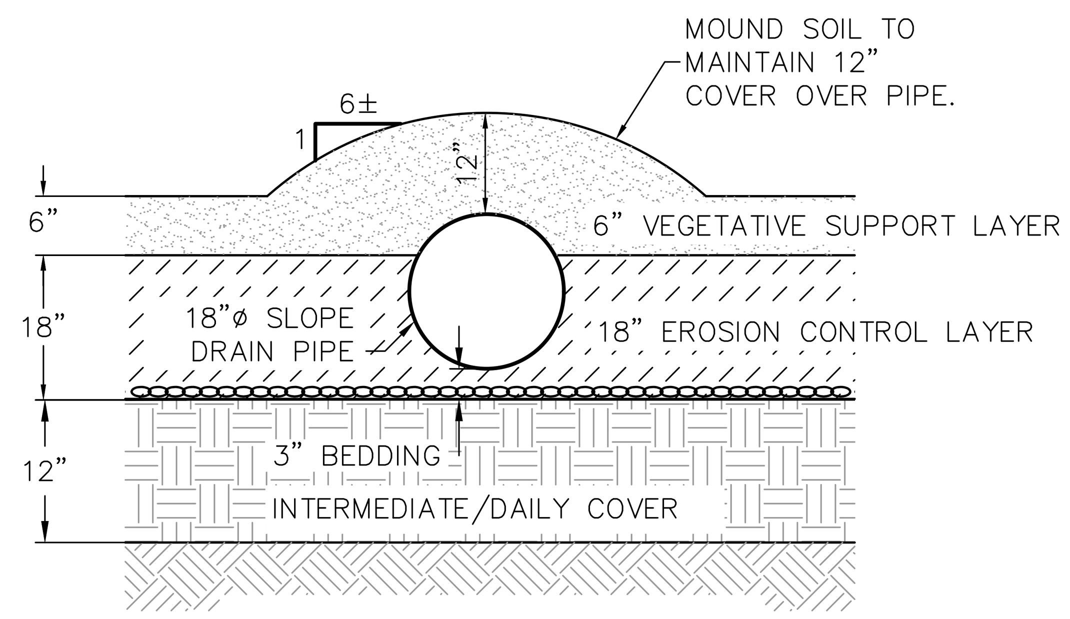

PERMANENT SLOPE DRAIN SECTION A (1, 6/13)
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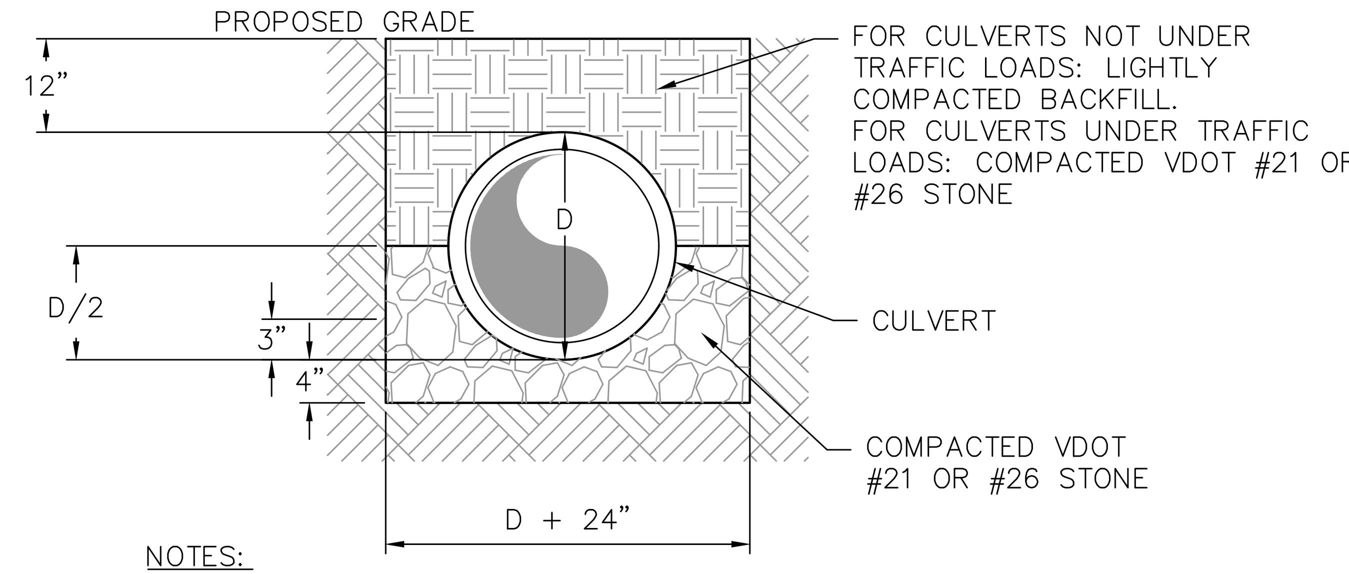
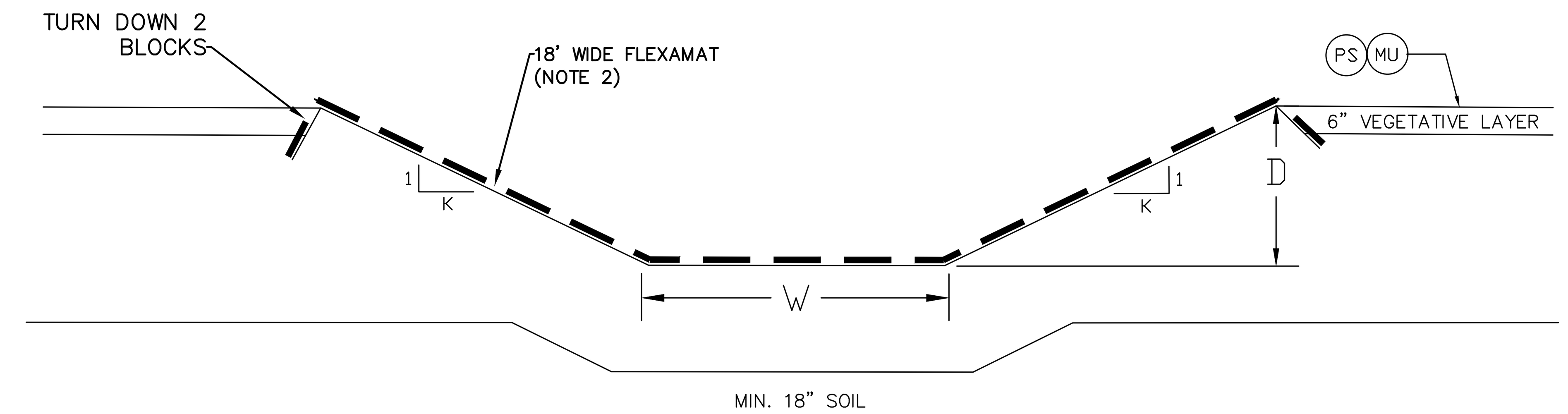


NOTES:

1. DETAIL DOES NOT APPLY TO UNDERDRAIN PIPING.
2. SHOULD GROUNDEASTE OR SATURATED SOILS BE EXPECTED, BEDDING SHALL BE VDOT #57 STONE IN LIEU OF VDOT #21 OR #26 STONE.

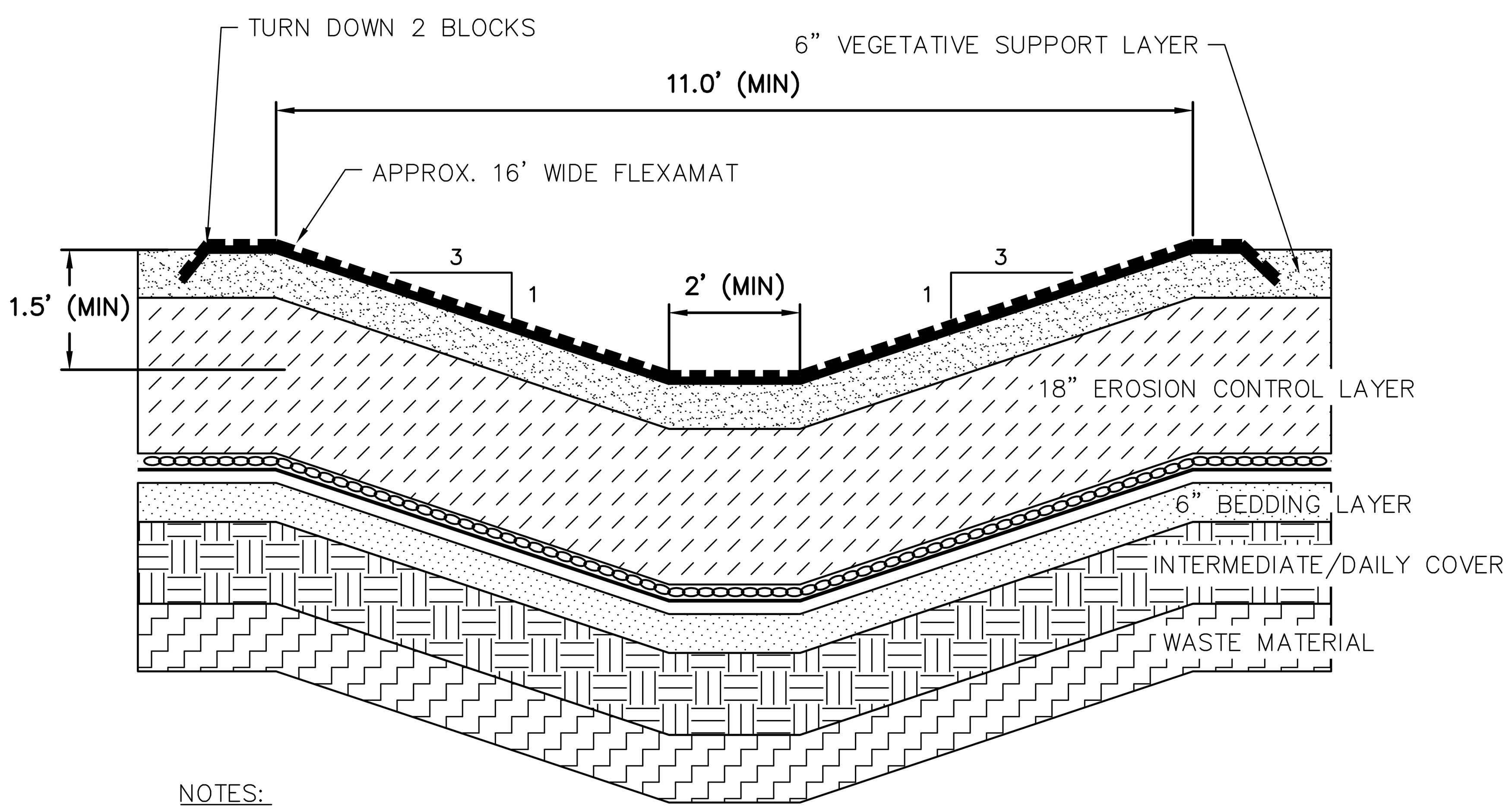
CULVERT BEDDING AND BACKFILL (2, 6/13)
N.T.S.



NOTE:

1. FOR FLEXAMAT LINED STORMWATER CONVEYANCE CHANNELS (SCC), CHANNEL DIMENSIONS SHALL BE PER THE FINAL GRADING PLAN AND SCC SCHEDULE ON THE STORMWATER CALCULATIONS SHEET.
2. FLEXAMAT STANDARD WITH 8' AND 10' REQUIRED IF 18' WIDTH NOT AVAILABLE PER MANUFACTURER.

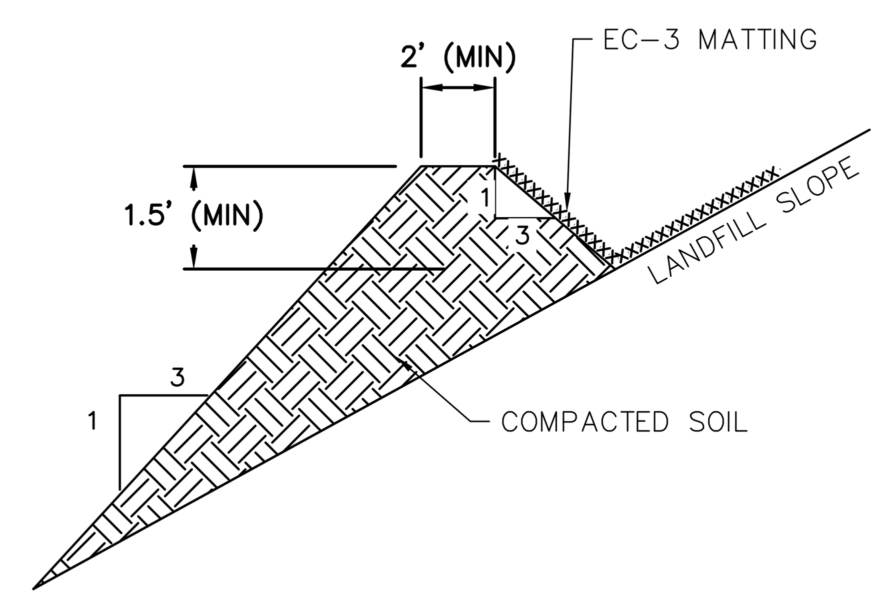
STORMWATER CONVERYANCE CHANNEL FLEXAMAT INSTALLATION DETAIL (3, 6/13)
N.T.S.



NOTES:

1. WHERE DIVERSION BERMS ENTER INTO FLEXAMAT DOWN CHUTE, EXTEND FLEXAMAT 8 FEET INTO DIVERSION BERM TO CREATE TRANSITION.
2. CHANNEL DIMENSIONS SHOWN FOR DOWN CHUTE ONLY. FOR FLEXAMAT LINED STORMWATER CONVEYANCE CHANNELS (SCC), SEE CHANNEL SCHEDULE AND FINAL GRADING PLAN.

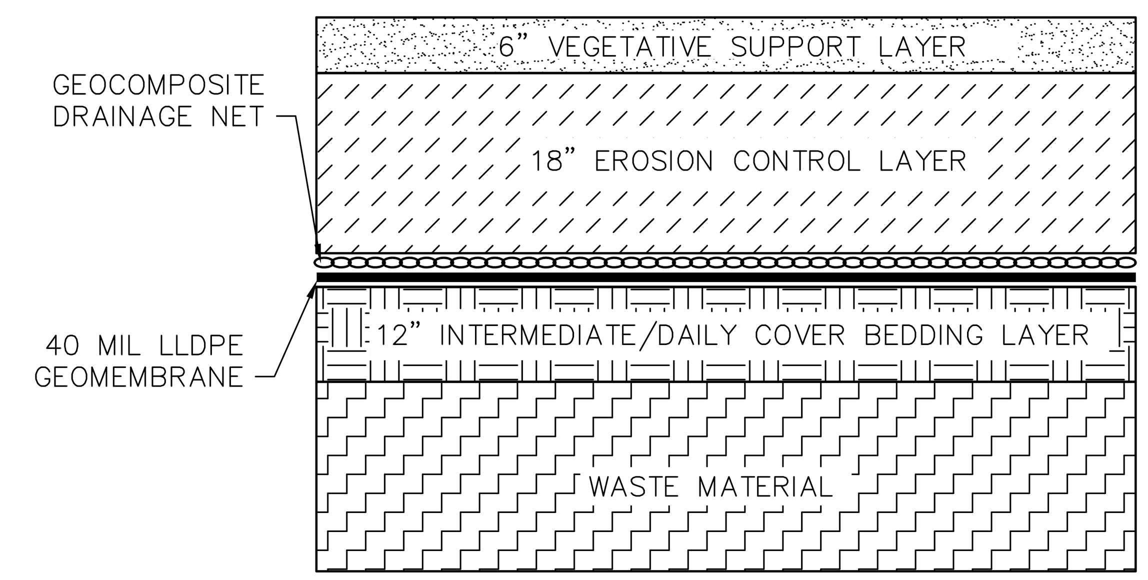
FINAL COVER FLEXAMAT DOWN CHUTE INSTALLATION DETAIL (4, 6/13)
N.T.S.



NOTES:

1. FLOW SLOPE OF THE DIVERSION TO BE MAX. 5% AND MIN. 2%
2. SEE FINAL COVER DOWNCHUTE DETAIL FOR CONNECTION OF DIVERSION BERMS.
3. VESCH – STD 3.12.

DIVERSION BERM DETAIL (5, 6/13)
N.T.S.



NOTES:

1. THE TOP 6" OF INTERMEDIATE/DAILY COVER WILL FUNCTION AS A BEDDING LAYER AND IS TO BE SMOOTH AND FREE OF STICKS, ROCKS LARGER THAN 3/8 INCH, OR OTHER IREGULARITIES WHICH COULD PUNCTURE THE SYNTHETIC CAP.
2. THE SYNTHETIC CAP SHALL BE PLACED AS PER MANUFACTURER'S RECOMMENDATIONS. SEE CLOSURE SPECIFICATIONS FOR ALLOWABLE MATERIALS, INSTALLATION AND QUALITY CONTROL MEASURES.
3. EROSION CONTROL LAYER SHALL BE PLACED IMMEDIATELY AFTER THE GEOCOMPOSITE. THE GEOCOMPOSITE MAY NOT BE EXPOSED TO SUNLIGHT FOR MORE THAN THE TIME LIMITED IN THE PROJECT SPECIFICATIONS.
4. THE VEGETATIVE COVER SHALL BE PLACED AND SEEDED IMMEDIATELY AFTER INSTALLATION OF THE EROSION CONTROL LAYER. A TEMPORARY SEEDING MIXTURE MAY BE USED TO PROTECT THE AREA FROM EROSION. ONCE THE CLOSURE IS COMPLETED, FINAL SEEDING WILL OCCUR.

TYPICAL LLDPE CAP DETAIL (6, 6/13)
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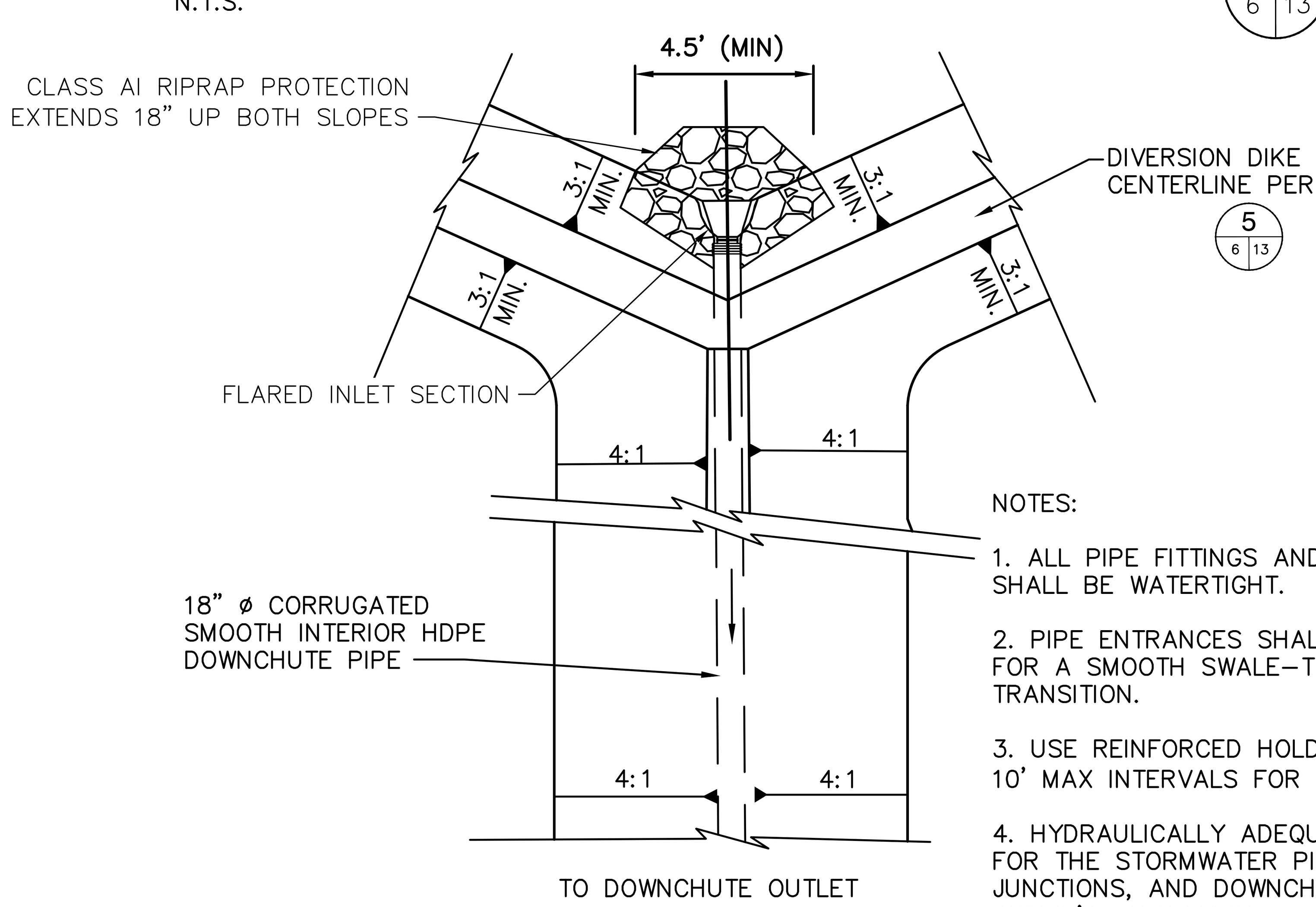

NOTES:

1. ALL PIPE FITTINGS AND CONNECTIONS SHALL BE WATERTIGHT.

2. PIPE ENTRANCES SHALL BE GRADED FOR A SMOOTH SWALE-TO-FLANGE TRANSITION.

3. USE REINFORCED HOLD-DOWN GROMMETS SPACED AT 10' MAX INTERVALS FOR SLOPE DRAIN PIPE

4. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.

HDPE DOWNCHUTE UPPER INLET, WITH DIVERSION BERMS (7, 6/13)
N.T.S.

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COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1		
2		
3		
4		
5		
6		

SHEET TITLE: DETAILS 1

PROJECT TITLE: SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
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DRAWING NO. 14 of 16

(PS) LIME AND FERTILIZER APPLICATION RATES
IF POSSIBLE, DETERMINE BY SOILS TEST. WHERE NOT POSSIBLE TO OBTAIN A SOILS TEST, THE FOLLOWING SOIL AMENDMENTS WILL APPLY:

LIME

COASTAL PLAIN: 2 TONS/ACRE PULVERIZED AGRICULTURAL GRADE LIMESTONE (90 LBS./1000 FT.^{2})

PIEDMONT AND APPALACHIAN REGION: 2 TONS/ACRE PULVERIZED AGRICULTURAL GRADE LIMESTONE (90 LBS./1000 FT.)

NOTE: AN AGRICULTURAL GRADE OF LIMESTONE SHOULD ALWAYS BE USED.

FERTILIZER

MIXED GRASSES AND LEGUMES: 1000 LBS./ACRE 10-20-10 OR EQUIVALENT NUTRIENTS (23 LBS./1000 FT.^{2}).

LEGUME STANDS ONLY: 1000 LBS./ACRE 5-20-10 (23 LBS./1000 FT.) IS PREFERRED; HOWEVER, 1000 LBS./ACRE OF 10-20-10 OR EQUIVALENT MAY BE USED.

GRASS STANDS ONLY: 1000 LBS./ACRE 10-20-10 OR EQUIVALENT NUTRIENTS, (23 LBS./1000 FT.).

OTHER FERTILIZER FORMATIONS, INCLUDING SLOW-RELEASE SOURCES OF NITROGEN (PREFERRED FROM A WATER QUALITY STANDPOINT), MAY BE USED PROVIDED THEY CAN SUPPLY THE SAME AMOUNTS AND PROPORTIONS OF PLANT NUTRIENTS.
INCORPORATION – LIME AND FERTILIZER SHALL BE INCORPORATED INTO THE TOP 4-6 INCHES OF SOIL FROM A WATER QUALITY STANDPOINT), MAY BE USED PROVIDED THEY CAN SUPPLY THE SAMEAMOUNTS AND PROPORTIONS OF PLANT NUTRIENTS.

(MU) ORGANIC MULCH MATERIALS AND APPLICATION RATES

MULCHES:	RATES: PER ACRE	RATES: PER 1000 SQ. FT.	NOTES:
STRAW OR HAY	1 1/2 – 2 TONS (MINIMUM 2 TONS OF WINTER COVER)	70 – 90 LBS.	FREE FROM WEEDS AND COARSE MATTER. MUST BE ANCHORED. SPREAD

PERMANENT SEEDING (PS)

VESCH STD & SPEC 3.32

TABLE 3.32-C
SITE SPECIFIC SEEDING MIXTURES
FOR APPALACHIAN/MOUNTAIN AREA

MINIMUM CARE LAWN	TOTAL LBS. PER ACRE
-COMMERCIAL OR RESIDENTIAL	200-250 LBS.
-KENTUCKY 31 OR TURF-TYPE TALL FESCUE	90-100%
-IMPROVED PERENNIAL RYEGRASS *	0-10%
-KENTUCKY BLUEGRASS	0-10%
HIGH-MAINTENANCE LAWN	
MINIMUM OF THREE (3) UP TO FIVE (5) VARIETIES OF BLUEGRASS FROM APPROVED LIST FOR USE IN VIRGINIA	125 LBS.
GENERAL SLOPE (3:1 OR LESS)	
- KENTUCKY 31 FESCUE	128 LBS.
- RED TOP GRASS	2 LBS.
- SEASONAL NURSE CROP **	20 LBS.
	150 LBS.
LOW-MAINTENANCE SLOPE (STEEPER THAN 3:1)	
- KENTUCKY 31 FESCUE	108 LBS.
- RED TOP GRASS	2 LBS.
- SEASONAL NURSE CROP **	20 LBS.
- CROWNVETCH ***	20 LBS.
	150 LBS.

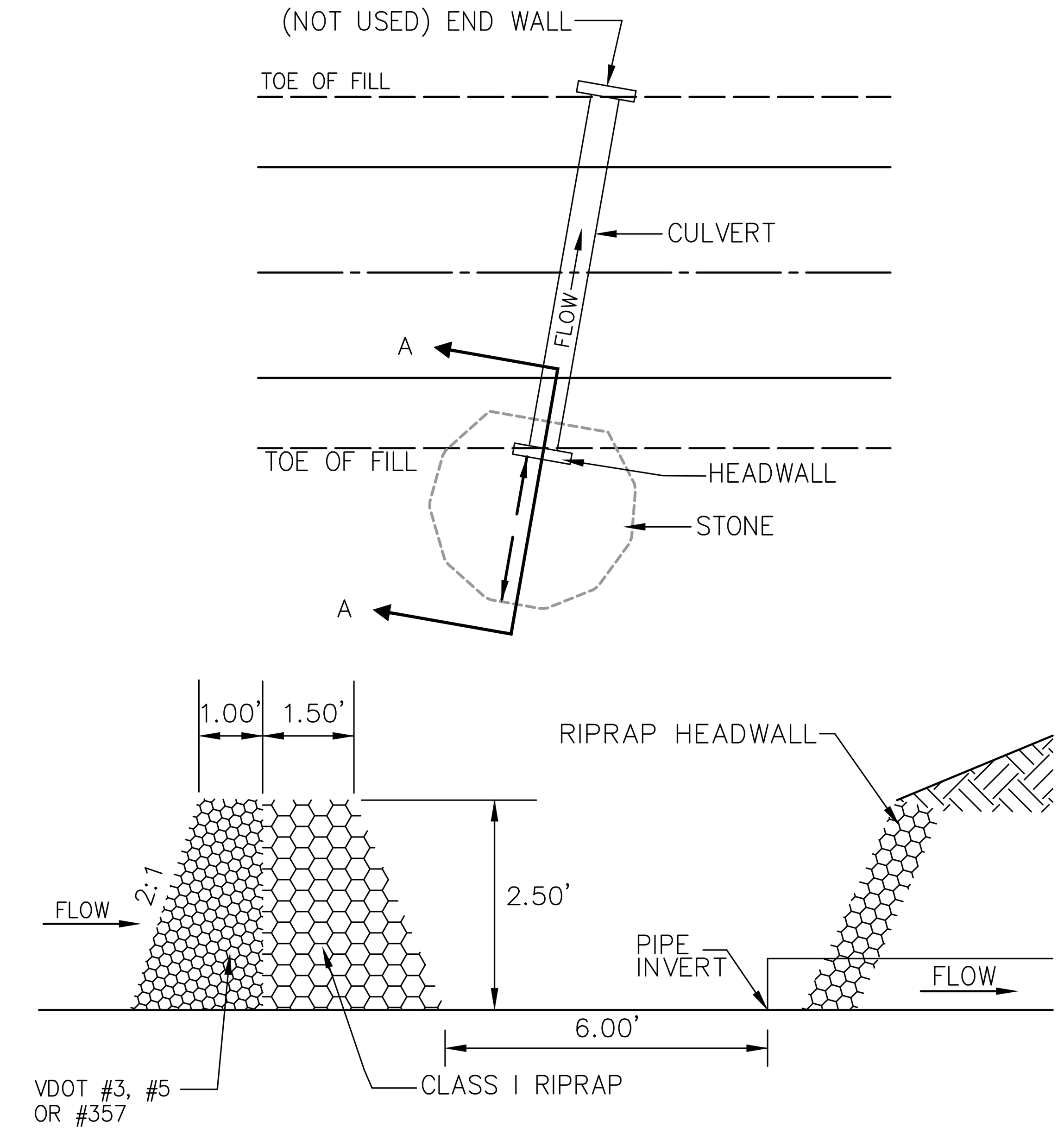
* PERENNIAL RYEGRASS WILL GERMINATE FASTER AND AT LOWER SOIL TEMPERATURES THAN FESCUE, THEREBY PROVIDING COVER AND EROSION RESISTANCE FOR SEEDBED.

** USE SEASONAL NURSE CROP IN ACCORDANCE WITH SEEDING DATES AS STATED BELOW:

MARCH, APRIL THROUGH MAY 15TH	ANNUAL RYE
MAY 16TH THROUGH AUGUST 15TH	FOXTAIL MILLET
AUGUST 16TH THROUGH SEPTEMBER, OCTOBER	ANNUAL RYE
NOVEMBER THROUGH FEBRUARY	WINTER RYE

*** IF FLATPEA IS USED, INCREASE TO 30 LBS./ACRE. ALL LEGUME SEED MUST BE PROPERLY INOCULATED. WEEPING LOVEGRASS MAY ALSO BE INCLUDED IN ANY SLOPE OR LOW-MAINTENANCE MIXTURE DURING WARMER SEEDING PERIODS; ADD 10-20 LBS./ACRE IN MIXES.

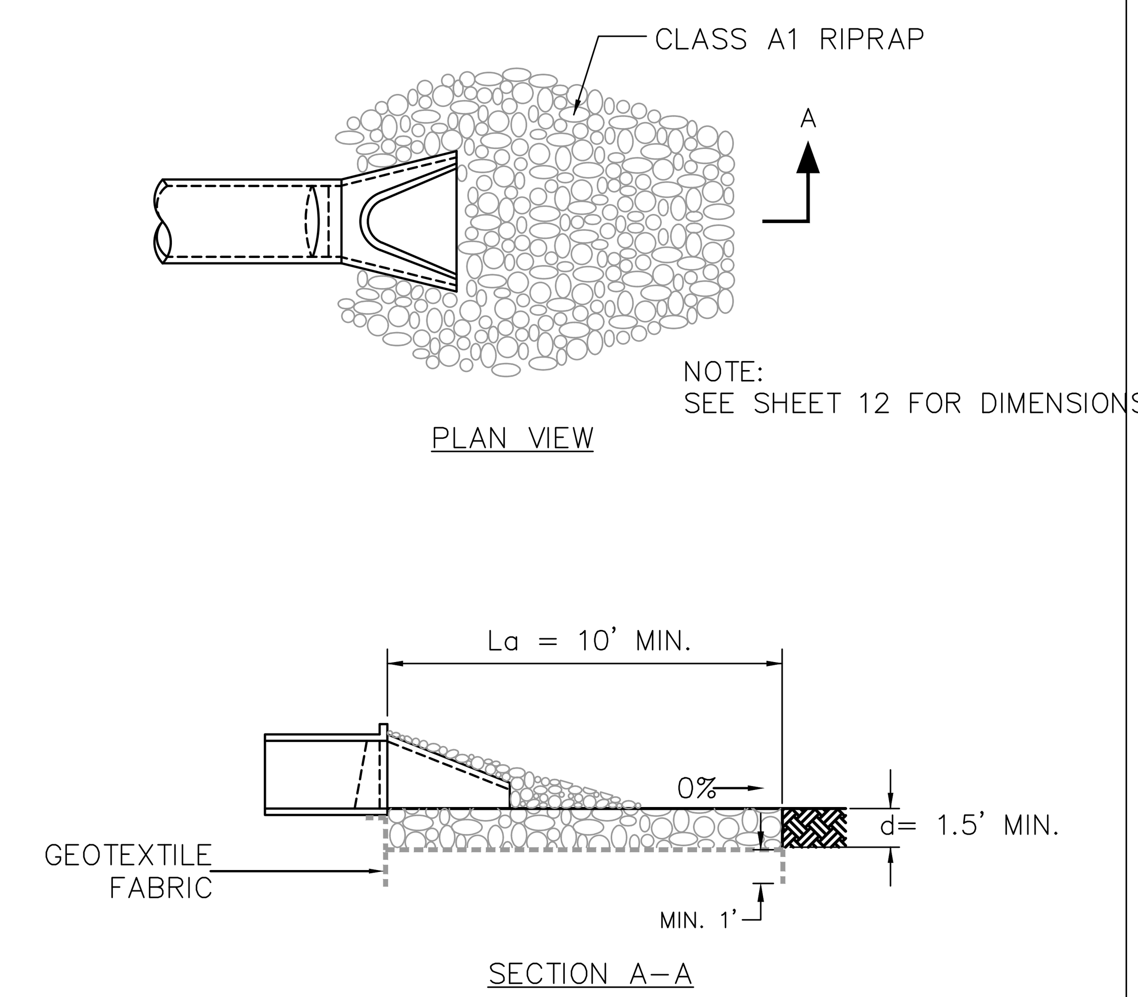
III - 302



SECTION A–A

OPTIONAL STONE COMBINATION

(CIP) CULVERT INLET PROTECTION DETAIL
NOT TO SCALE



NOT TO SCALE

(OP) OUTLET PROTECTION – PIPE OUTLET TO WELL-DEFINED CHANNEL
NOT TO SCALE

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
1/31/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
DETAILS 2

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO. 02218208.05 | DWN. BY: TRW/SHA | Q/A RVW BY:
DSN. BY: TRW | CHK. BY: CJW | APP. BY: CJW

CADD FILE: 02218208.05
DATE: 1/31/23
SCALE: AS SHOWN
DRAWING NO.
15 of 16

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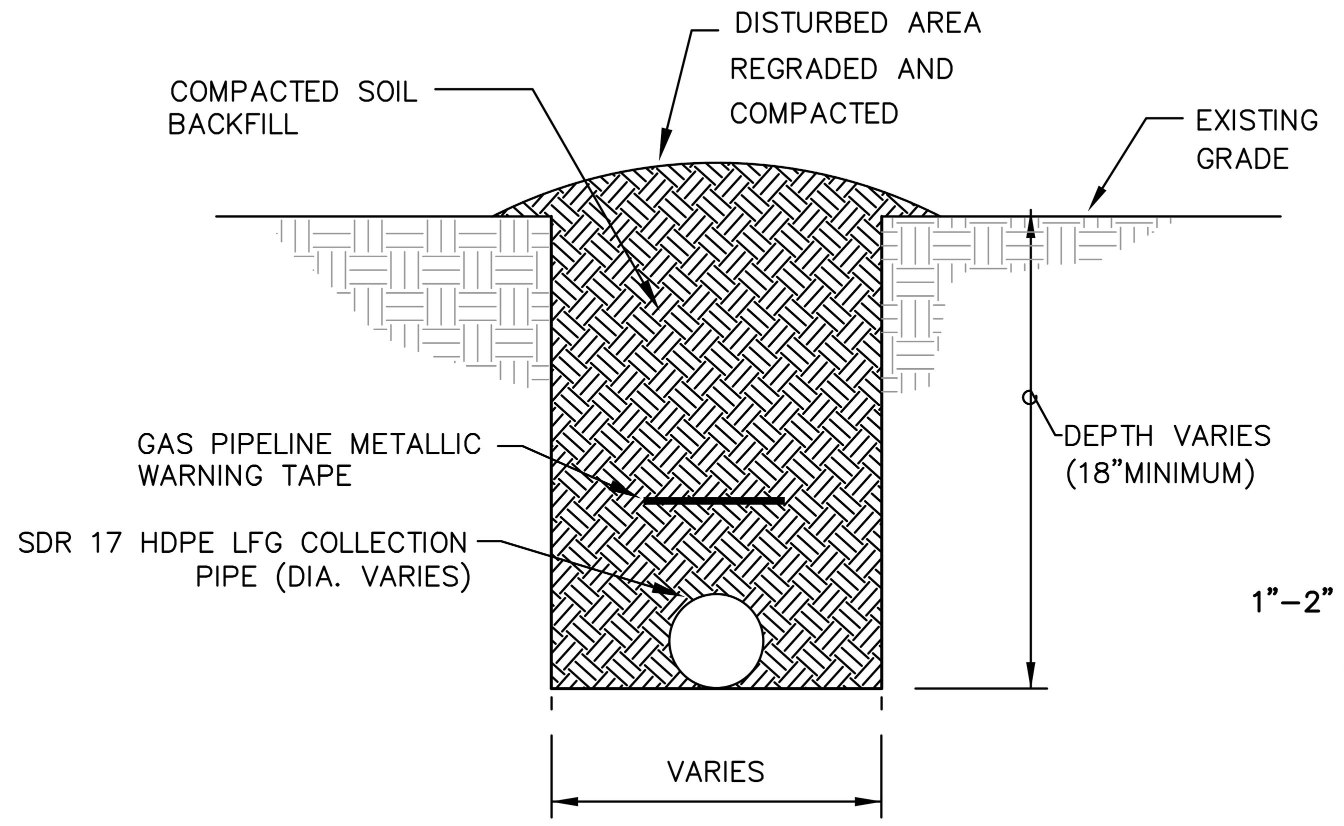
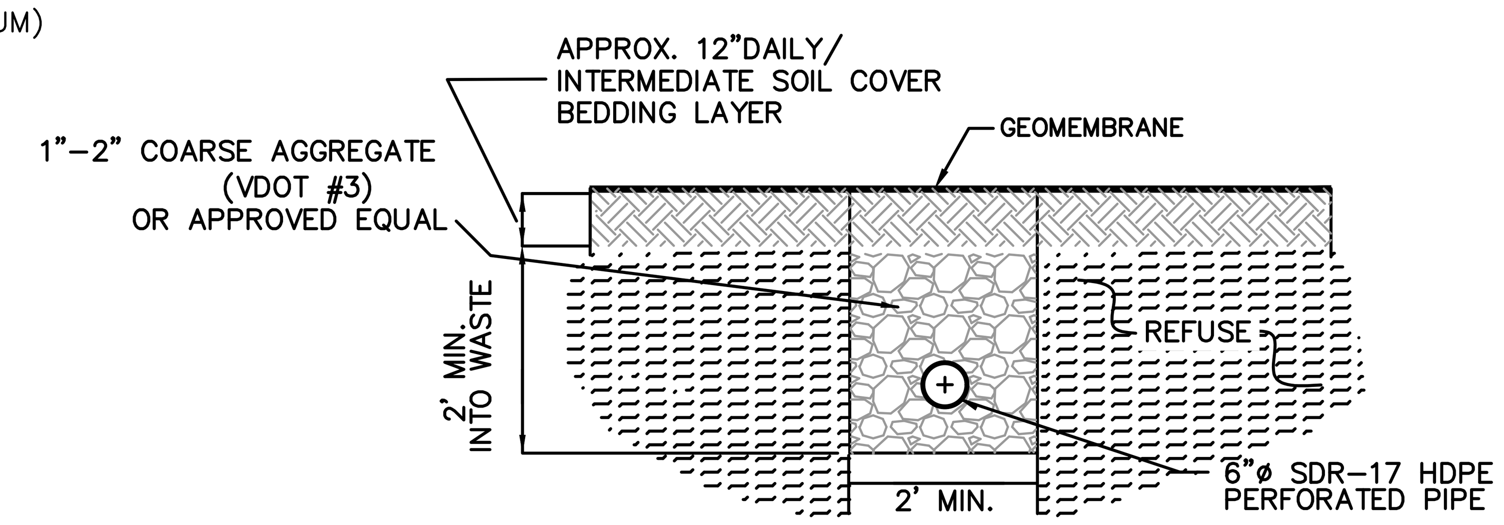


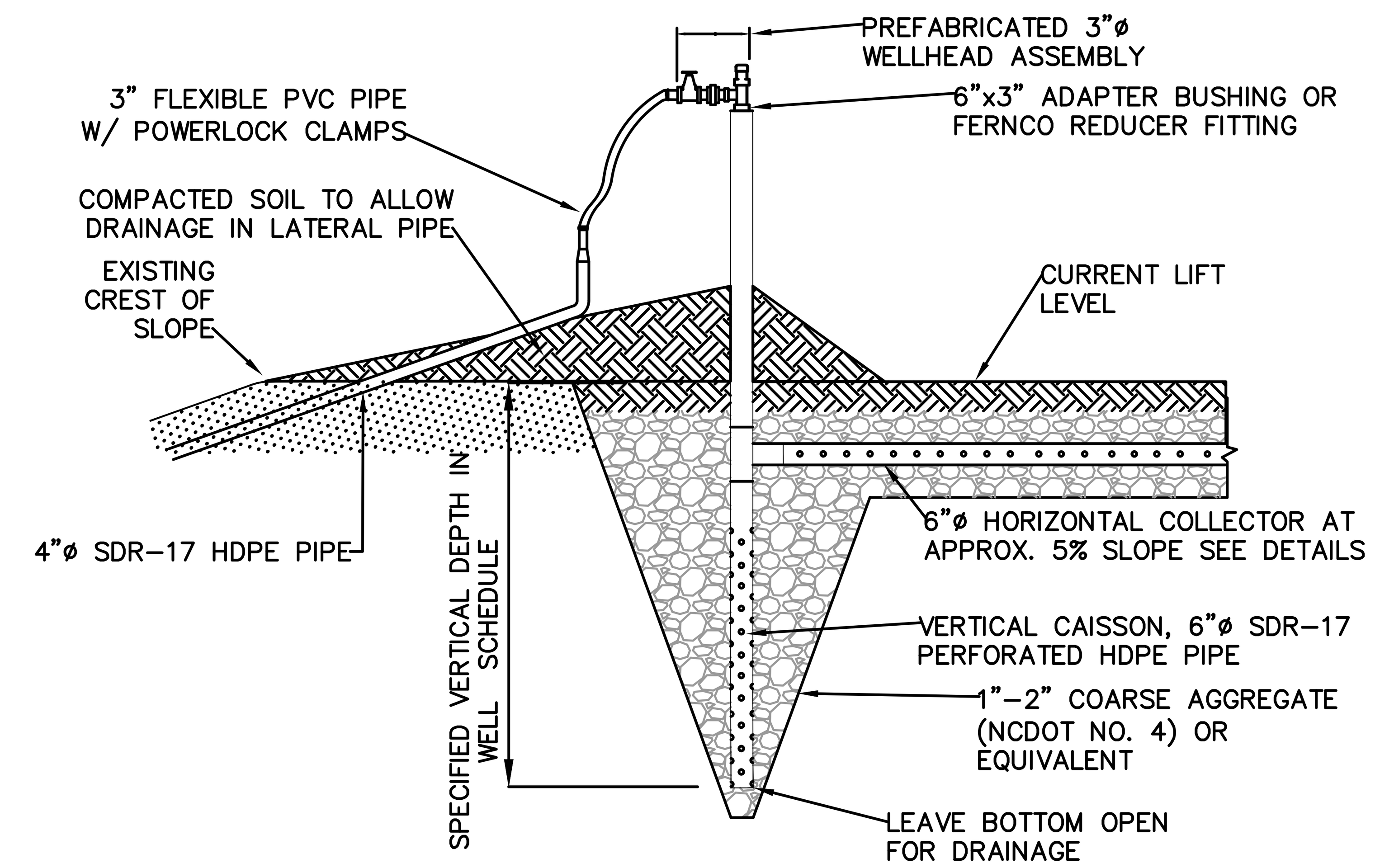
1 5,6 15 LFG COLLECTION PIPE TRENCH DETAIL
NOT TO SCALE

NOTES:

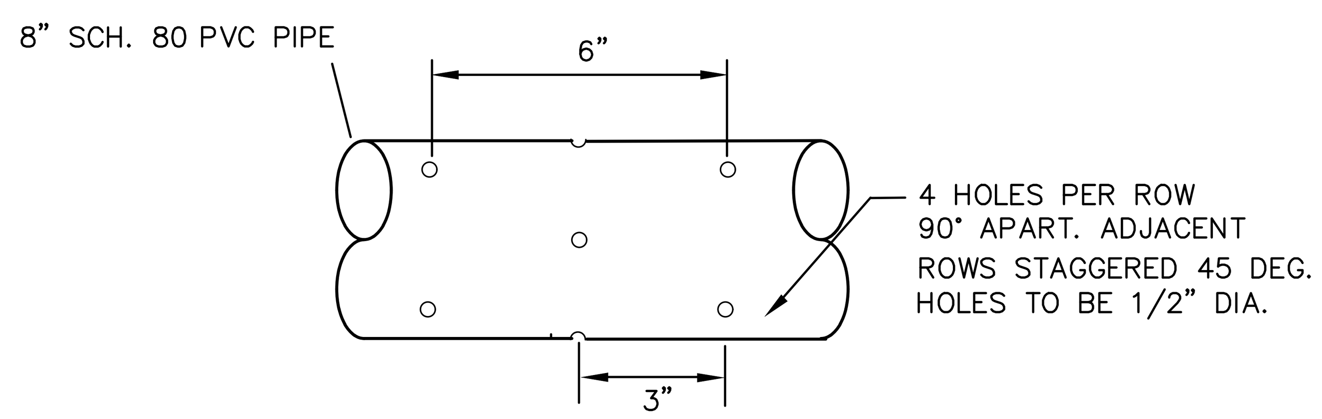
1. PNEUMATIC SUPPLY, FORCEMAIN, AND SPARE CONDUIT PIPING TO BE OMITTED FOR LFG COLLECTION PIPE WITHIN WASTE FOOTPRINT.



2 5,6 15 HORIZONTAL COLLECTOR SECTION
NOT TO SCALE



3 5,6 15 HORIZONTAL COLLECTOR WITH PIT DETAIL
NOT TO SCALE

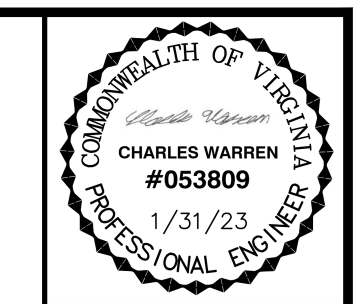


4 5,6 15 PERFORATED PIPE DETAIL
NOT TO SCALE

Well ID	Northing	Easting	Surface Elevation (MSL)	Top of Liner System Elevation (MSL)	Total Boring Depth (ft)	Solid Wall Length (ft)	Slotted Length (ft)
GW-69	3398552.73	10413034.88	1931	1911	10	0	9
GW-70	3398839.81	10412817.39	1921	1901	10	0	9
GW-71	3398950	10412836.87	1919	1899	10	0	9
GW-72	3399033.65	10412880.61	1918	1898	10	0	9

NOTES:
1. CONTRACTOR SHALL SURVEY PROPOSED WELL LOCATIONS FOR ACTUAL GROUND ELEVATIONS BEFORE CONSTRUCTION.
2. CONTRACTOR SHALL SUBMIT SURVEY INFORMATION, INCLUDING NORTHING AND EASTING AND ACTUAL SURFACE ELEVATIONS, TO OWNER AND ENGINEER FOR POTENTIAL ADJUSTMENTS TO WELL BORING DEPTHS. FOLLOWING REVIEW OF ADJUSTED WELL SCHEDULE, CONTRACTOR SHALL OBTAIN WRITTEN AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.

5 5,6 15 LANDFILL GAS EXTRACTION WELL SCHEDULE



NO. | REVISION | DATE

SHEET TITLE: DETAILS 3

PROJECT TITLE: SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
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