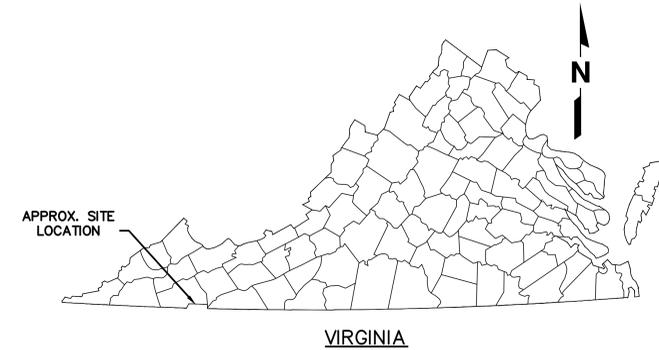


BRISTOL, VIRGINIA INTEGRATED SOLID WASTE MANAGEMENT FACILITY SOLID WASTE PERMIT #588

INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

BRISTOL, VIRGINIA



STORMWATER MANAGEMENT PLAN SHEETS

Sheet Number	Sheet Title
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4	ANTICIPATED CONDITIONS
5	PRE-EVOH COVER SYSTEM EXISTING STORMWATER CONDITIONS
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8	PROPOSED STORMWATER BASINS
9	STORMWATER PROFILES 1
10	STORMWATER PROFILES 2
11	DETAILS 1
12	DETAILS 2
13	DETAILS 3
14	DETAILS 4 PUMPING SYSTEM SCHEMATIC
15	STORMWATER CALCULATIONS 1
16	STORMWATER CALCULATIONS 2
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18	STORMWATER CALCULATIONS 4
19	STORMWATER CALCULATIONS 5
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21	STORMWATER CALCULATIONS 7

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

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SCS PROJECT NO. 02218208.16

APRIL 28, 2023

PERMIT
DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023



NO.	REVISION	DATE

SHEET TITLE: COVER SHEET
PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

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

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PROJ. NO. 02218208.16
TRW/CSW
CHK. BY: TRW/CSW
APP. BY: CSW

CADD FILE: 02218208.05

DATE: 4/28/23

SCALE: AS SHOWN

DRAWING NO.

LEGEND:

- 1800 — EXISTING CONTOUR, MAJOR (TYP. 10')
- EXISTING CONTOUR, MINOR (TYP. 2')
- 1800— 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
- — — EXISTING LEACHATE PIPE
- — — PROPOSED LEACHATE PIPE
- — — LEACHATE CLEANOUT
- >—>— STORMWATER CONVEYANCE FEATURE
- EXISTING GRAVEL ROAD
- RIP RAP/ ROCKS
- SF — SILT FENCE
- CELL BOUNDARY
- EDGE OF LINER
- > — FLOW PATH
- LANDFILL GAS PIPE
- LIMITS OF DISTURBANCE
- S — SOIL TYPE BOUNDARY
- DRAINAGE AREA
- STREAM OR WATERLINE
- CENTERLINE
- TS — TEMPORARY SEEDING
- PS — PERMANENT SEEDING
- GP — CULVERT INLET PROTECTION
- OP — OUTLET PROTECTION
- SF — SILT FENCE
- CE — CONSTRUCTION ENTRANCE
- MU — MULCHING
- B/M — BLANKETS AND MATTING
- — RUNOFF FLOW DIRECTION
- PROPOSED LFG COLLECTION STRIP
- 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 LIQUIDS CONTAINMENT TANK
- GP-5 — EXISTING GAS PROBE
- NW-110 — EXISTING GROUNDWATER MONITORING WELL
- EXISTING MANHOLE
- FACILITY BOUNDARY
- WASTE MANAGEMENT UNIT BOUNDARY
- APPROXIMATE EXTENT OF WASTE
- EXISTING ROAD OUTLINE
- x — EXISTING FENCE
- EXISTING LFG HORIZONTAL COLLECTOR
- PROPOSED LFG HORIZONTAL COLLECTOR
- LFG — EXISTING LFG COLLECTION PIPING
- LFG — PROPOSED LFG COLLECTION PIPING
- 8G — 8G — PROPOSED 8" LFG COLLECTION PIPING
- 12G — 12G — PROPOSED 12" LFG COLLECTION PIPING
- 16G — 16G — PROPOSED 16" LFG COLLECTION PIPING
- 18G — 18G — PROPOSED 18" LFG COLLECTION PIPING
- 24G — 24G — PROPOSED 24" LFG COLLECTION PIPING
- 28G — 28G — PROPOSED 28" LFG COLLECTION PIPING
- 36G — 36G — PROPOSED 36" LFG COLLECTION PIPING
- PROPOSED 2" AIR LINE
- PROPOSED 4" FORCE MAIN
- BENCHMARK

LEGEND NOTES:

1. UNLESS INDICATED OTHERWISE, EXISTING FEATURES ARE SHOWN IN HALF-TONE AND PROPOSED FEATURES ARE SHOWN IN FULL-TONE.
2. IF USED, ALTERNATIVE CONTOUR INTERVALS WILL BE NOTED ON THE RELEVANT SHEET.

EXISTING CONDITIONS:

THE EXISTING PROJECT SITE AREA INCLUDES THE SOLID WASTE PERMIT #588 (SWP #588) QUARRY LANDFILL, THE ACCESS ROAD INTO THE LANDFILL, THE TWO EXISTING STORMWATER BASINS LOCATED WEST OF THE QUARRY, AND AREAS ADJACENT TO EXISTING ROADS AND DITCHES FOR INSTALLATION OF STORMWATER DIVERSION CONTROLS. THE LARGER STORMWATER POND IS REFERRED TO AS THE "PRIMARY STORMWATER BASIN", AND THE SMALLER STORMWATER POND IS REFERRED TO AS THE "SECONDARY STORMWATER BASIN".

THE PRIMARY STORMWATER BASIN DRAINAGE AREA INCLUDES THE SURROUNDINGS TO THE BASIN'S NORTHEAST, EAST, SOUTHEAST, AND SOUTH. AN EXISTING STORM SEWER SYSTEM FROM THE OPERATIONS BUILDING WEST OF THE QUARRY CENTER DISCHARGES INTO THE BASIN.

THE PRIMARY STORMWATER BASIN DISCHARGES INTO AN EXISTING 12"x15" STEEL BOX RISER LOCATED IN THE SOUTHWEST CORNER OF THE BASIN. AN EXISTING 12" CORRUGATED METAL PIPE CULVERT DISCHARGES FROM THE STEEL BOX RISER INTO THE SECONDARY BASIN. A SPILLWAY CONSISTING OF 18" REINFORCED CONCRETE HALF PIPE IS POSITIONED DIRECTLY OVER THE 12" CULVERT.

THE SECONDARY STORMWATER BASIN IS LOCATED IMMEDIATELY WEST OF THE PRIMARY STORMWATER BASIN. THE SECONDARY BASIN DISCHARGES INTO AN EXISTING 12" STEEL CULVERT OUTFALL WITH A VALVE ON THE INLET SIDE. SHEET 5 PRESENTS THE EXISTING STORMWATER BASIN FEATURES.

THE QUARRY LANDFILL CONSISTS OF RECENTLY DISTURBED COVER SOIL WITH UNDERLYING WASTE. THE EXISTING QUARRY TOPOGRAPHY GENERALLY SLOPES DOWNWARDS FROM NORTH TO SOUTH AND FROM WEST TO EAST. SLOPES GENERALLY RANGE FROM 5% TO 33%. STORMWATER WITHIN THE QUARRY LANDFILL IS CURRENTLY ALLOWED TO INFILTRATE INTO THE WASTE MASS AND IS MANAGED AS LEACHATE.

A SOIL REPORT OBTAINED FROM THE USDA NATURAL RESOURCES CONSERVATION SERVICE GENERALLY CLASSIFIES THE SITE SOIL IN PROXIMITY TO THE QUARRY AS UDORTHENTS. PAGES FROM THE SOIL REPORT ARE INCLUDED ON SHEET 13. BASED ON THE SOIL REPORT AND FIELD OBSERVATIONS, THE SITE SOIL HAS BEEN ASSIGNED TO HYDROLOGIC SOIL GROUP C FOR THE PURPOSE OF STORMWATER ANALYSIS.

STORMWATER MANAGEMENT NOTES:

THE CITY OF BRISTOL MANAGES STORMWATER FOR THE LANDFILL PER THE VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES) INDUSTRIAL STORMWATER MANAGEMENT PROGRAM (9VAC 25-151) UNDER A GENERAL PERMIT REGISTRATION NO: VAR050053 (EFFECTIVE JULY 1, 2019, EXPIRATION ON JUNE 30, 2024).

THE CITY OF BRISTOL, AS THE VPDES PERMITTEE, SHALL OVERSEE THE EVOH COVER SYSTEM CONTRACTOR'S ACTIVITIES TO ENSURE EXECUTION IN ACCORDANCE WITH THE VPDES PERMIT REQUIREMENTS AND THE APPROVED EVOH COVER SYSTEM CONSTRUCTION DRAWINGS.

STORMWATER MANAGEMENT IS DESIGNED AS INDICATED IN THESE DRAWINGS WHICH INCLUDE PLANS, DETAILS, AND CALCULATIONS. THE INTERIM EVOH COVER SYSTEM IS DESIGNED TO CONVEY QUARRY STORMWATER TO A PROPOSED STORMWATER BASIN IN THE SOUTHEAST CORNER OF THE QUARRY. A PUMPING SYSTEM IS DESIGNED TO TRANSFER THE STORMWATER FROM THE STORAGE BASIN TO THE EXISTING PRIMARY STORMWATER BASIN LOCATED WEST OF THE QUARRY.

THE EXISTING STORMWATER BASINS WILL BE MODIFIED TO INCREASE STORAGE CAPACITY, AND NEW MULTISTAGE OUTLET STRUCTURES AND EMERGENCY SPILLWAYS WILL BE INSTALLED FOR BOTH THE PRIMARY AND SECONDARY STORMWATER BASIN.

EROSION AND SEDIMENT CONTROL WILL BE ADDRESSED IN CONSTRUCTION DRAWINGS.

STORMWATER SAMPLING PROTOCOLS

STORMWATER SHALL BE MONITORED IN ACCORDANCE WITH THE FACILITY'S VPDES GENERAL PERMIT FOR DISCHARGE OF STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITY WITH THE FOLLOWING ADDITIONAL REQUIREMENTS:

1. AN ADDITIONAL STORMWATER SAMPLE WILL BE COLLECTED AT THE DISCHARGE OF THE QUARRY STORMWATER PUMPING SYSTEM LOCATED IN THE UPPER STORMWATER BASIN.
2. A SAMPLE WILL BE COLLECTED DURING THE INITIAL DISCHARGE FROM THE QUARRY STORMWATER PUMPING SYSTEM.
3. SAMPLES WILL BE COLLECTED AND ANALYZED ON A MONTHLY BASIS IF THERE IS A DISCHARGE. A LOWER SAMPLING FREQUENCY MAY BE APPROVED IN WRITING BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY.
4. RESULTS OF WILL BE SUBMITTED ON A SEMI-ANNUAL BASIS AS OUTLINED IN THE FACILITY'S VPDES GENERAL PERMIT FOR DISCHARGE OF STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITY.

GENERAL NOTES:

1. THESE DRAWINGS PRESENT A CONCEPTUAL STORMWATER MANAGEMENT PLAN FOR THE SWP #588 LANDFILL AND ARE NOT INTENDED FOR CONSTRUCTION. CONSTRUCTION DRAWINGS WILL BE SUBMITTED TO THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY AT A LATER DATE. THE CONSTRUCTION DRAWINGS WILL DEMONSTRATE THE ADEQUACY OF PROPOSED CHANGES TO THIS CONCEPTUAL STORMWATER MANAGEMENT PLAN.
2. OWNER/DEVELOPER: CITY OF BRISTOL, VIRGINIA
3. CONSULTING ENGINEER: SCS ENGINEERS, 15521 MIDLOTHIAN TURNPIKE #305, MIDLOTHIAN, VA 23113
4. 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.
5. BOUNDARY INFORMATION TAKEN FROM OTHERS.
6. HORIZONTAL DATA IS BASED ON US STATE PLANE NAD 1983 VIRGINIA SOUTH ZONE. VERTICAL DATA BASED ON NAVD 88.
7. REFERENCE GRID LINES ARE SHOWN ON THE DRAWINGS WITH GRID SPACING AT 200 FEET.

PERMIT
DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023



NO.	REVISION	DATE

SHEET TITLE: GENERAL NOTES AND LEGEND
PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2855 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
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D/W: BTW/SJH
C/W: BTW/SJH
APP: BTW
CHK: BTW
C/W: BTW

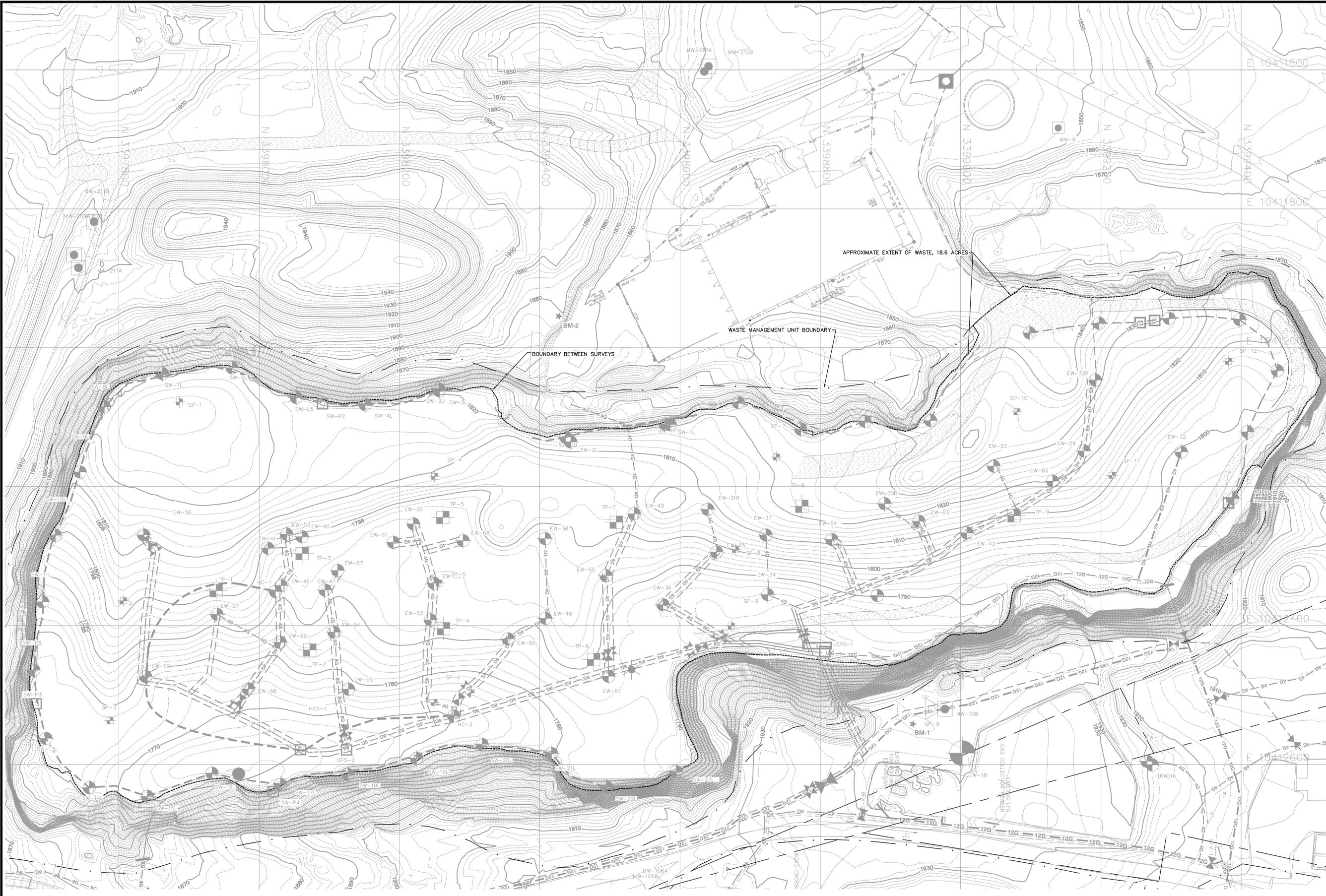
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DATE: 4/28/23

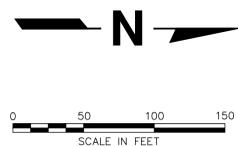
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DRAWING NO.

Project\02218208.05\Drawings\VOH_Cover_System_Design_-_SWP588\Construction_Plans\VREF



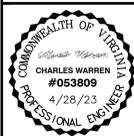
- GENERAL NOTES**
1. OUTSIDE OF THE QUARRY FOOTPRINT, GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022. WITHIN THE QUARRY, THE GRADES ARE BASED UPON AN SCS DRONE FLYOVER DATED MARCH 9, 2023.
 2. PER A USDA SOIL REPORT OBTAINED ON JANUARY 26, 2023, THE QUARRY AND ITS IMMEDIATE SURROUNDINGS ARE CLASSIFIED AS UDORTHERTS.



PERMIT DRAWINGS NOT FOR CONSTRUCTION DATE: 04/28/2023	
DATE	
REVISION	
NO.	
SHEET TITLE	EXISTING CONDITIONS
PROJECT TITLE	SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN
CLIENT	CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY 2655 VALLEY DRIVE BRISTOL, VA 24201
SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 10000 WOODMAN, VA 22113 PH: (804) 370-7400 FAX: (804) 370-7425	CADD FILE: 02218208.05 DATE: 4/28/23 SCALE: AS SHOWN DRAWING NO. 3 of 21



PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023



NO.	REVISION	DATE

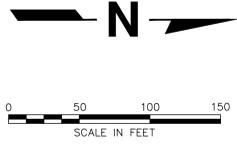
SHEET TITLE: **ANTICIPATED CONDITIONS**
PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

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

SCS ENGINEERS
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10000 WOODLAND DRIVE, SUITE 100
BRISTOL, VA 24201
PH: (804) 370-7400 FAX: (804) 370-7405

DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 4 of 21

- GENERAL NOTES**
- OUTSIDE OF THE QUARRY FOOTPRINT, GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
 - WITHIN THE QUARRY FOOTPRINT, THE GRADES SHOWN REPRESENT AN APPROXIMATION OF ANTICIPATED FUTURE CONDITIONS FOLLOWING THE INSTALLATION OF THE SIDEWALL ODOR MITIGATION SYSTEM.



Project\02218208.05\Drawings\VOH Cover System Design - SWP588 Construction Plans\WREF



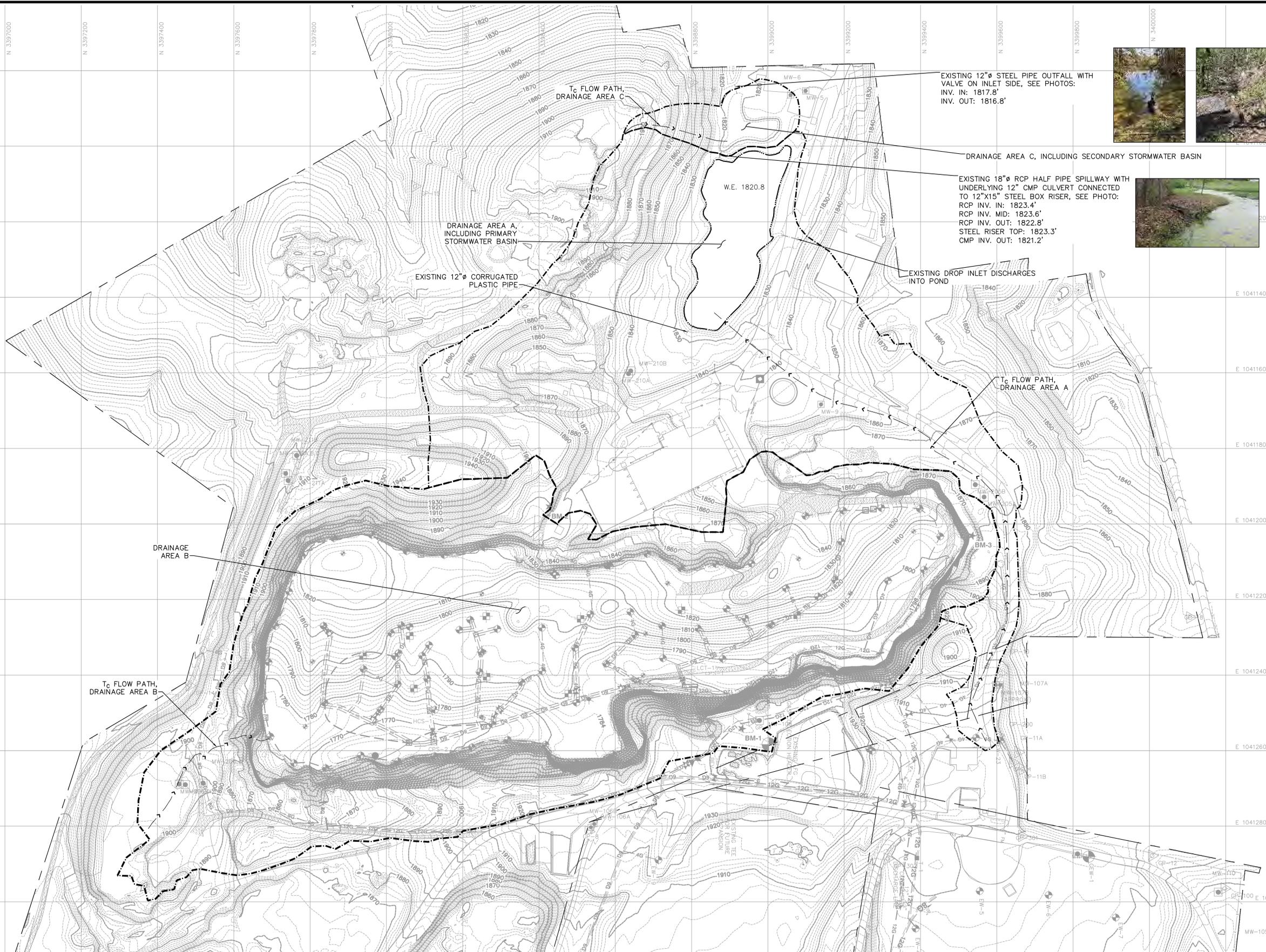
NO.	REVISION	DATE

SHEET TITLE: PRE-EVOH COVER SYSTEM
EXISTING STORMWATER CONDITIONS
PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM
STORMWATER MANAGEMENT PLAN

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

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PH: (804) 876-7440 FAX: (804) 876-7426
PRJ: SWP#588
DATE: 4/28/23
D/W: BTW / SJA
CHK: BTW / SJA
APP: BTW / SJA
C/W: BTW / SJA

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 5 of 21



EXISTING 12"Ø STEEL PIPE OUTFALL WITH VALVE ON INLET SIDE, SEE PHOTOS:
INV. IN: 1817.8'
INV. OUT: 1816.8'



DRAINAGE AREA C, INCLUDING SECONDARY STORMWATER BASIN

EXISTING 18"Ø RCP HALF PIPE SPILLWAY WITH UNDERLYING 12" CMP CULVERT CONNECTED TO 12"X15" STEEL BOX RISER, SEE PHOTO:
RCP INV. IN: 1823.4'
RCP INV. MID: 1823.6'
RCP INV. OUT: 1822.8'
STEEL RISER TOP: 1823.3'
CMP INV. OUT: 1821.2'

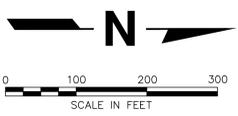


EXISTING DROP INLET DISCHARGES INTO POND

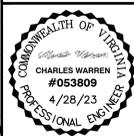
- GENERAL NOTES**
- ALONG THE QUARRY FLOOR, THE HALF-TONE CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN SCS DRONE FLIGHT CONDUCTED ON MARCH 9, 2023.
 - OUTSIDE OF THE QUARRY, THE HALF-TONE-CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN AERIAL SURVEY PERFORMED BY NV5 GEOSPATIAL DURING OCTOBER 2022.
 - UNLESS INDICATED OTHERWISE, STORMWATER FEATURE INVERT ELEVATIONS ARE BASED ON A CITY OF BRISTOL SURVEY COMPLETED ON APRIL 12, 2023.

DRAINAGE AREA	DESCRIPTION	AREA (AC)	CN	T _c (MIN)	RUNOFF (IN)	RUNOFF VOLUME (ACXFT)	OUTLET DESCRIPTION	PEAK DISCHARGE FROM OUTLET, 1-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 2-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 10-YEAR STORM (CFS)
A	RUNOFF INTO EXISTING PRIMARY STORMWATER BASIN	22.67	81	21.0	0.70	1.33	EXISTING MULTISTAGE RISER DISCHARGES INTO SECONDARY BASIN	0.16	0.20	0.26
B	RUNOFF INTO QUARRY	35.78	90	24.7	1.22	3.65	NO EXISTING STORMWATER OUTLET	0	0	0
C	RUNOFF INTO EXISTING SECONDARY STORMWATER BASIN	1.19	81	9.9	0.56	0.06	EXISTING 12"Ø STEEL PIPE OUTFALL WITH VALVE ON INLET SIDE	0.18	0.24	0.56

- STORMWATER NOTES**
- THE DEPTHS OF THE EXISTING PRIMARY STORMWATER BASIN AND SECONDARY STORMWATER BASIN HAVE BEEN ASSUMED BASED ON FIELD OBSERVATION AND MEASUREMENTS OF THE DISCHARGE PIPE LOCATIONS AND ELEVATIONS.
 - THE EXISTING PRIMARY STORMWATER BASIN IS ASSUMED TO HAVE A 3"Ø DEWATERING ORIFICE AT INVERT ELEVATION = 1821.5', AND THE 12"Ø CMP CULVERT IS ASSUMED TO HAVE A 2.0% SLOPE. THE ASSUMPTIONS ARE BASED ON FIELD OBSERVATIONS OF THE EXISTING RISER AND ITS SURROUNDINGS.
 - ADDITIONAL STORMWATER INFORMATION AND CALCULATIONS ARE SHOWN ON SUBSEQUENT SHEETS, INCLUDING WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS, RUNOFF HYDROGRAPHS, ROUTING HYDROGRAPHS, AND POND INFORMATION.



Project\02218208.05\Drawings\EVOH Cover System Design - SWP#588 Construction Plans VREF



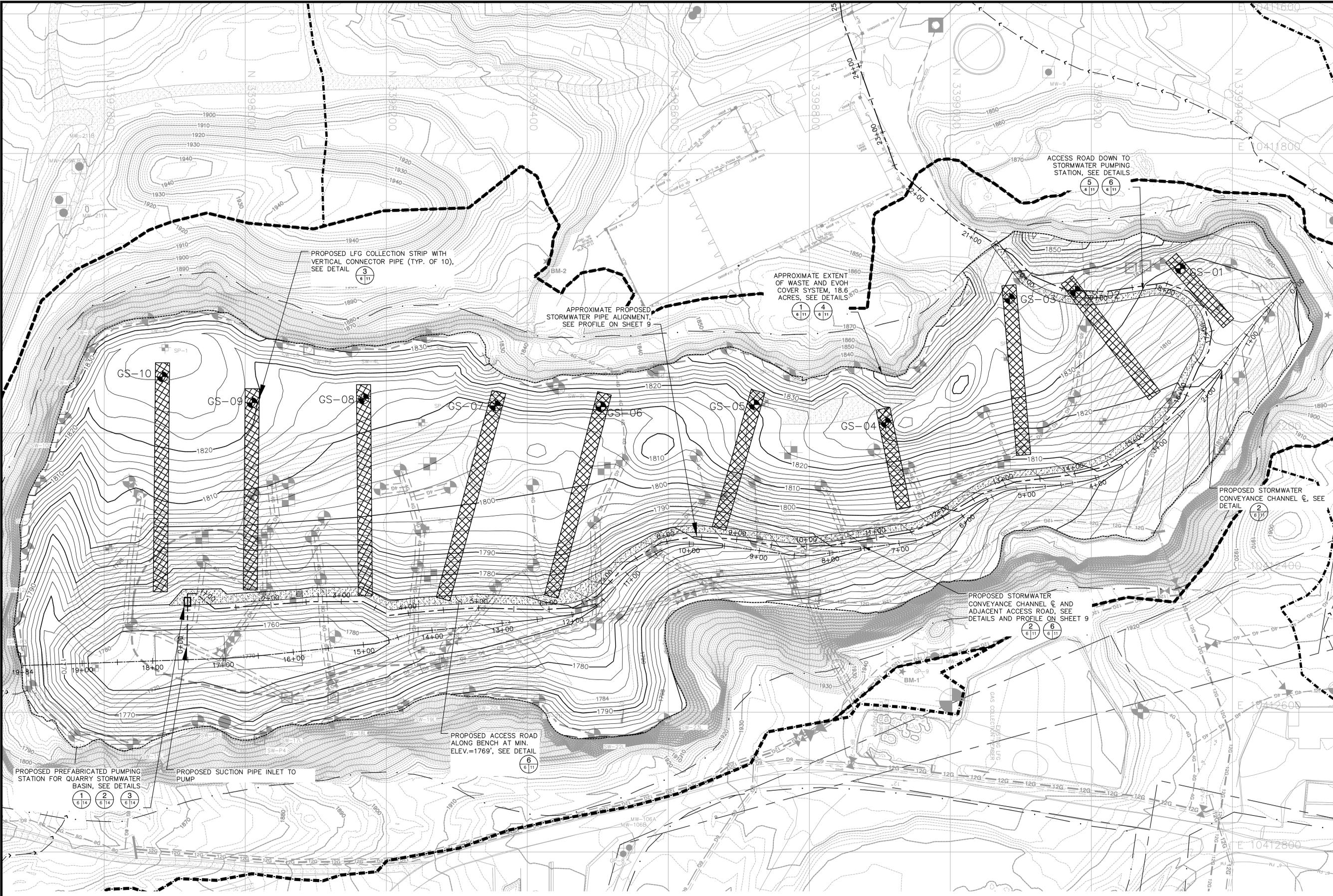
NO.	REVISION	DATE

PROPOSED MEMBRANE DEPLOYMENT PLAN
PROJECT TITLE
SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

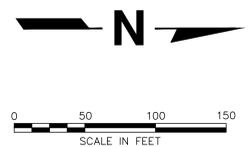
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
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CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO.



- GENERAL NOTES**
- WITHIN THE QUARRY FOOTPRINT, THE HALF-TONE CONTOURS REPRESENT AN APPROXIMATION OF ANTICIPATED FUTURE CONDITIONS FOLLOWING THE INSTALLATION OF THE SIDEWALL ODOR MITIGATION SYSTEM. THE FULL-TONE CONTOURS SHOW THE PROPOSED EVOH COVER SYSTEM INSTALLATION GRADE.
 - SCS PLANS TO EXPAND THE LANDFILL GAS SYSTEM TO INCORPORATE THE LFG COLLECTION STRIPS. SCS PLANS TO APPLY VACUUM PRESSURE TO THE VERTICAL COLLECTION PIPES NEAR THE TOP OF THE COLLECTION STRIPS.



Project\02218208.05\Drawings\EVOH Cover System Design - SWP#588 Construction Plans VREF



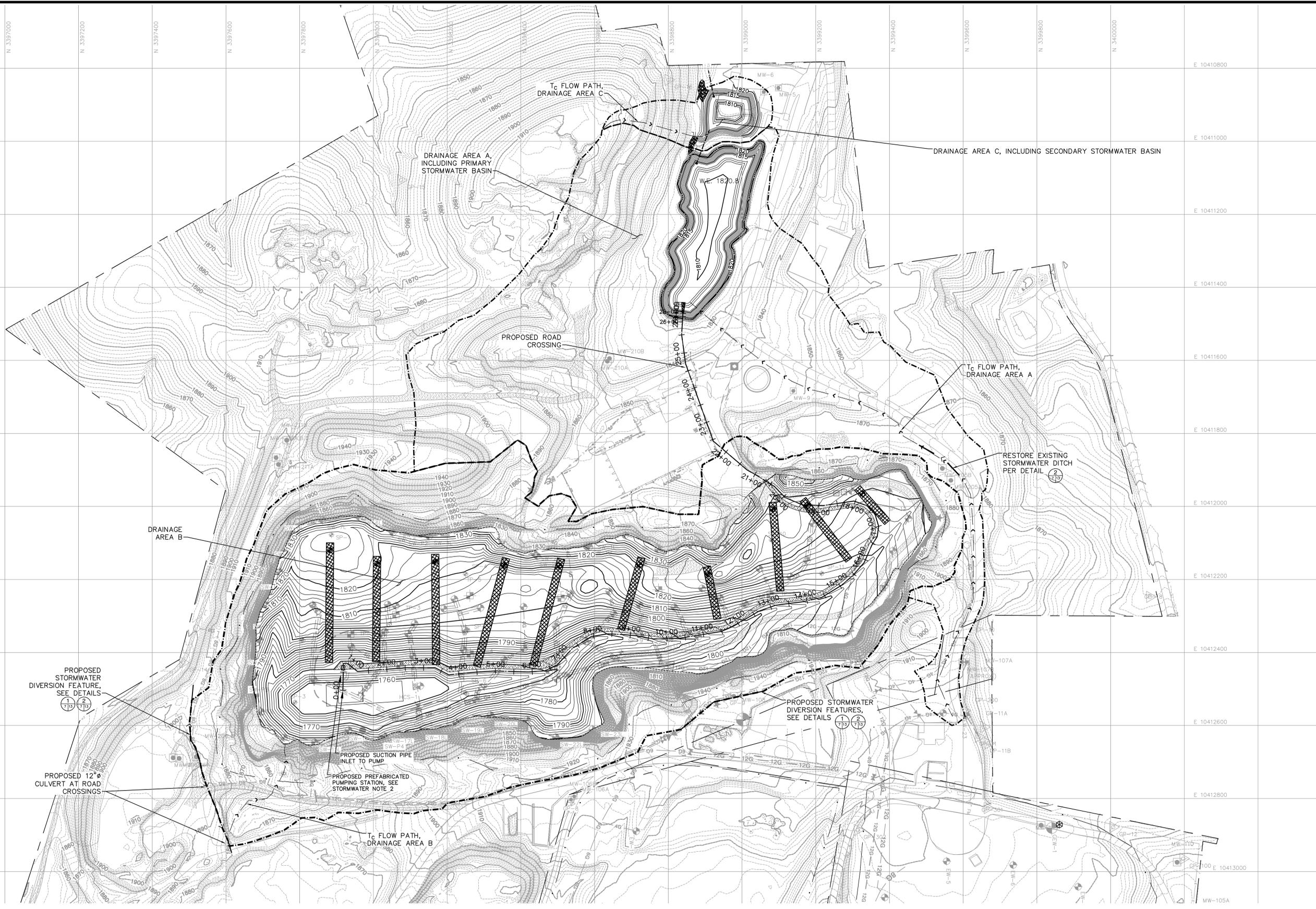
NO.	REVISION	DATE

SHEET TITLE: **POST-EVOH STORMWATER MANAGEMENT PLAN**
PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

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

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DWM: BTW/SJA
CHK: BTW
APP: BTW
CJW

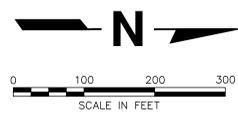
CADD FILE: **02218208.05**
DATE: **4/28/23**
SCALE: **AS SHOWN**
DRAWING NO.



- GENERAL NOTES**
- ALONG THE QUARRY FLOOR, THE FULL-TONE CONTOURS SHOW THE PROPOSED MEMBRANE DEPLOYMENT GRADE.
 - OUTSIDE OF THE QUARRY, THE HALF-TONE CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN AERIAL SURVEY PERFORMED BY NV5 GEOSPATIAL DURING OCTOBER 2022.
 - UNLESS INDICATED OTHERWISE, EXISTING STORMWATER FEATURE INVERT ELEVATIONS ARE BASED ON A CITY OF BRISTOL SURVEY COMPLETED ON APRIL 12, 2023.
 - THE PROPOSED PRIMARY AND SECONDARY BASIN CONTOURS ARE SHOWN AT A 1' INTERVAL.

POST-DEVELOPMENT DRAINAGE AREA CHARACTERISTICS (1-YEAR STORM OR AS SHOWN)										
DRAINAGE AREA	DESCRIPTION	AREA (AC)	CN	T _c (MIN)	RUNOFF (IN)	RUNOFF VOLUME (AC*FT)	OUTLET DESCRIPTION	PEAK DISCHARGE FROM OUTLET, 1-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 2-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 10-YEAR STORM (CFS)
A	RUNOFF INTO PRIMARY POND	22.67	81	21.0	0.70	1.33	PROPOSED MULTISTAGE RISER	0.42	0.47	0.56
B	RUNOFF INTO QUARRY	33.92	91.5	17.2	1.34	3.78	PUMP DISCHARGE INTO PRIMARY BASIN	2.45	2.45	2.45
C	RUNOFF INTO SECONDARY POND	1.19	81	9.9	0.69	0.07	PROPOSED MULTISTAGE RISER	0.22 SEE STORMWATER NOTE 3	0.24	0.38 SEE STORMWATER NOTE 4

- STORMWATER NOTES**
- ADDITIONAL STORMWATER INFORMATION AND CALCULATIONS ARE SHOWN ON SHEETS 15-20, INCLUDING WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS, RUNOFF HYDROGRAPHS, ROUTING HYDROGRAPHS, AND STORMWATER BASIN INFORMATION.
 - THE PROPOSED PUMPING SYSTEM WILL BE EQUIPPED WITH VARIABLE FREQUENCY DRIVE. THE PUMPING SYSTEM IS DESIGNED TO OPERATE AT 1100 GALLONS PER MINUTE. SEE PUMPING DETAILS ON SHEET 14.
 - COMPLIANCE WITH 9VAC25-870-66 FOR CHANNEL PROTECTION IS BASED ON THE FORESTED CONDITION ANALYSIS PER 9VAC25-870-66.B.3.
 - COMPLIANCE WITH 9VAC-25-870-66 FOR FLOOD PROTECTION IS ACHIEVED PER 9VAC25-870-66.C.2.b.



Project\02218208.05\Drawings\EVOH_Cover_System_Design - SWP#588 Construction Plans\WREF



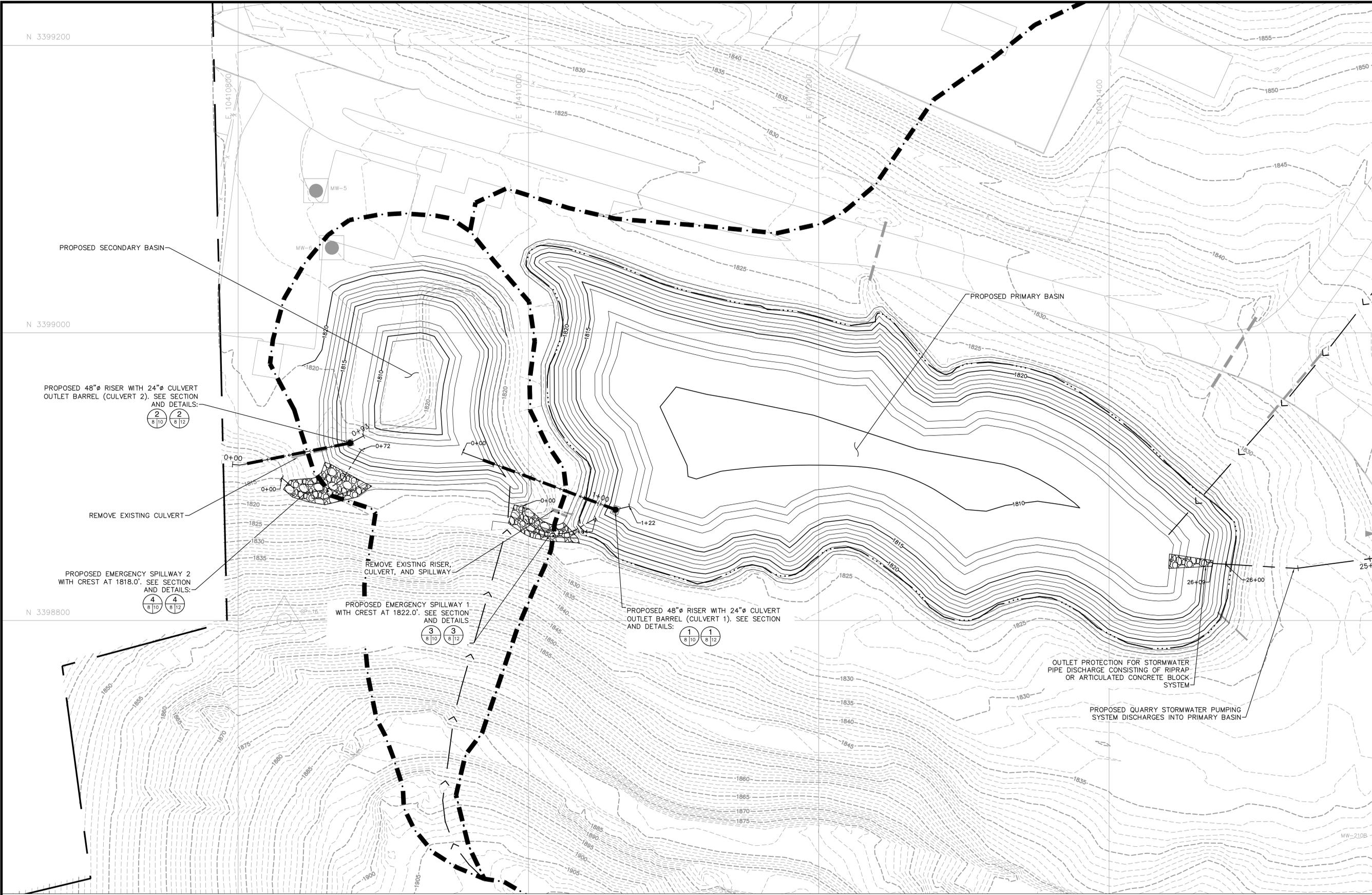
NO.	REVISION	DATE

SHEET TITLE: **PROPOSED STORMWATER BASINS**
PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

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

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
1000 W. BROADWAY, SUITE 200
BRISTOL, VA 24201
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DWN: BTW / SJA
CHK: BTW / SJA
APP: BTW / SJA
CJM

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **8** of 21



PROPOSED SECONDARY BASIN

PROPOSED PRIMARY BASIN

PROPOSED 48"Ø RISER WITH 24"Ø CULVERT
OUTLET BARREL (CULVERT 2). SEE SECTION
AND DETAILS:
2/8 2/8

REMOVE EXISTING CULVERT

PROPOSED EMERGENCY SPILLWAY 2
WITH CREST AT 1818.0'. SEE SECTION
AND DETAILS:
4/8 4/8

PROPOSED EMERGENCY SPILLWAY 1
WITH CREST AT 1822.0'. SEE SECTION
AND DETAILS:
3/8 3/8

PROPOSED 48"Ø RISER WITH 24"Ø CULVERT
OUTLET BARREL (CULVERT 1). SEE SECTION
AND DETAILS:
1/8 1/8

OUTLET PROTECTION FOR STORMWATER
PIPE DISCHARGE CONSISTING OF RIPRAP
OR ARTICULATED CONCRETE BLOCK
SYSTEM

PROPOSED QUARRY STORMWATER PUMPING
SYSTEM DISCHARGES INTO PRIMARY BASIN

GENERAL NOTES

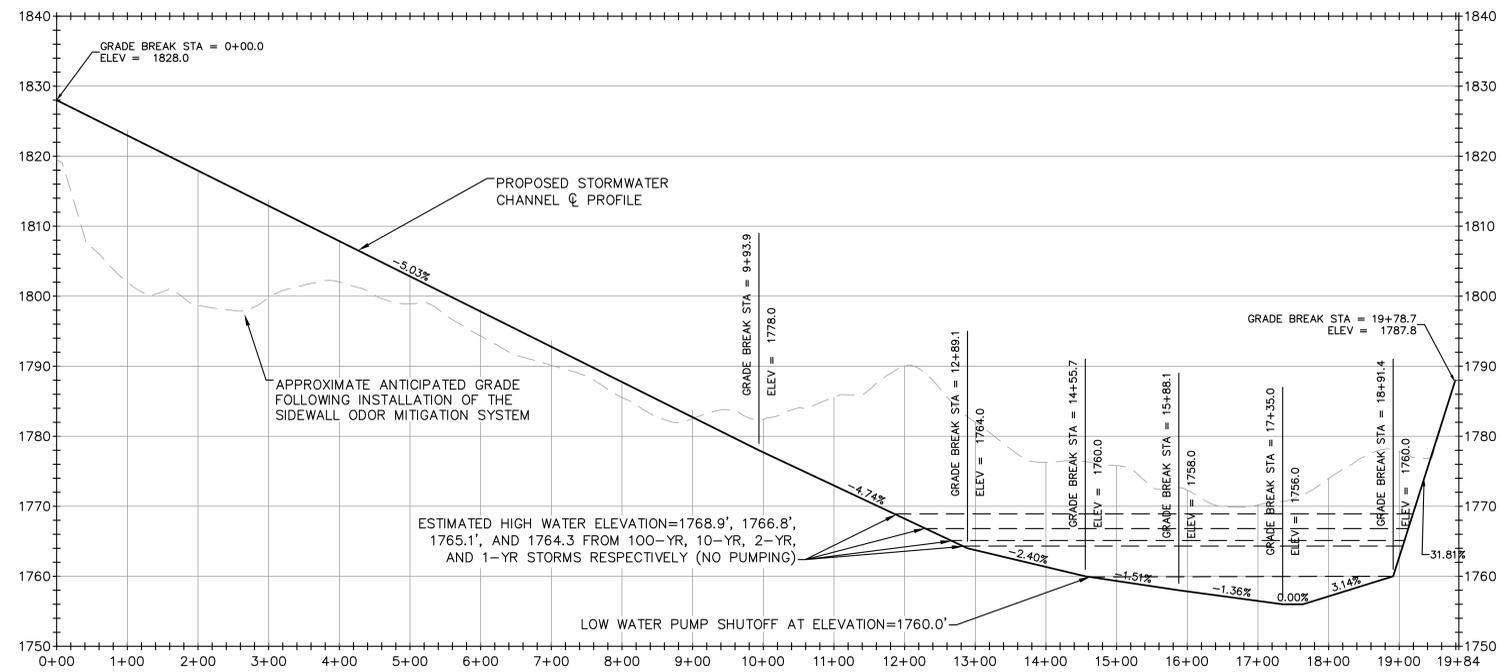
1. THE EXISTING GRADE AND PROPOSED BASIN GRADES ARE SHOWN USING 1' CONTOUR INTERVALS.
2. OUTSIDE OF THE QUARRY, THE HALF TONE-CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN AERIAL SURVEY PERFORMED BY NV5 GEOSPATIAL DURING OCTOBER 2022.
3. UNLESS INDICATED OTHERWISE, EXISTING STORMWATER FEATURE INVERT ELEVATIONS ARE BASED ON A CITY OF BRISTOL SURVEY COMPLETED ON APRIL 12, 2023.

STORMWATER NOTES

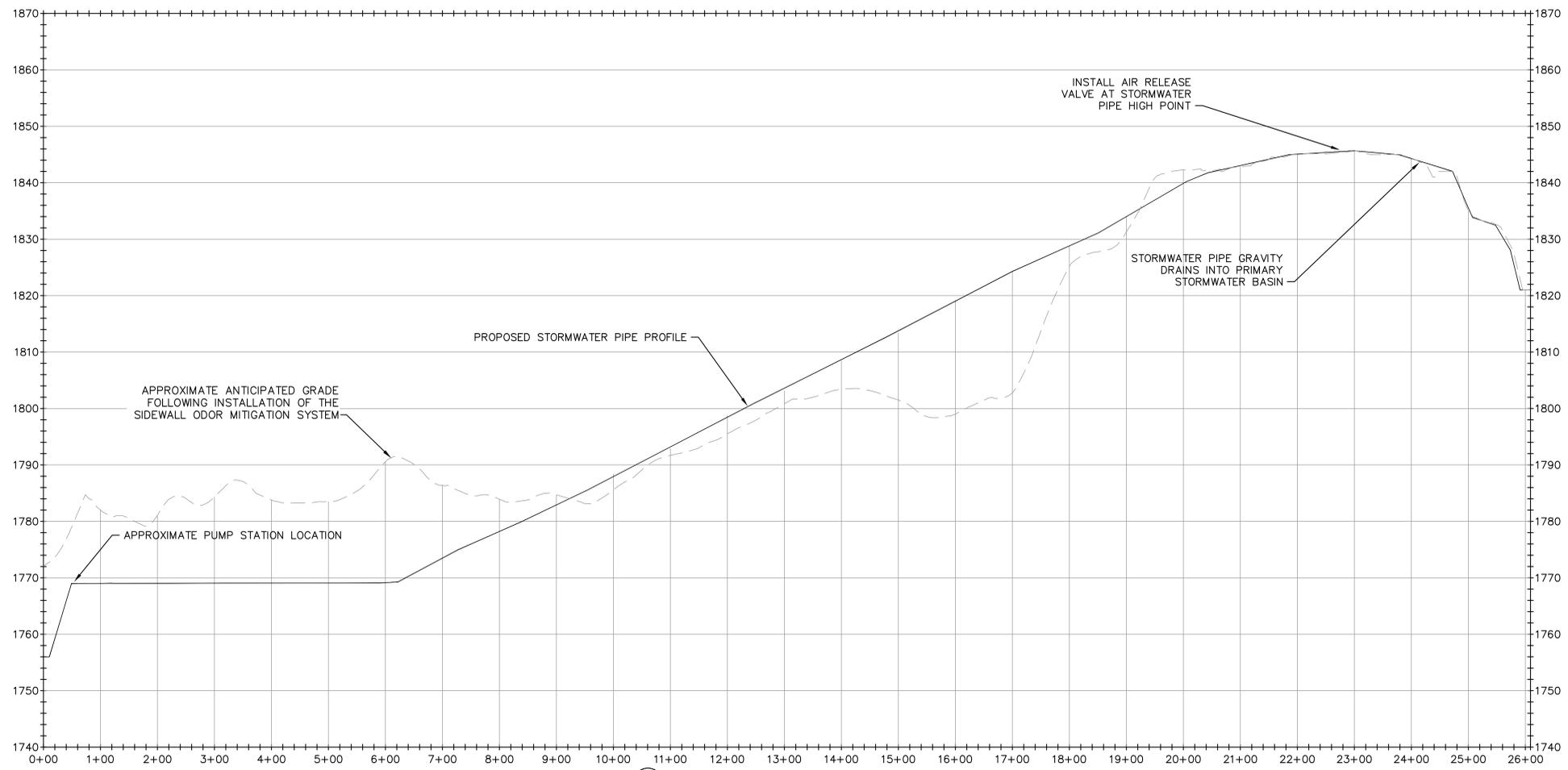
1. ADDITIONAL STORMWATER INFORMATION AND CALCULATIONS ARE SHOWN ON SHEETS 15-20, INCLUDING WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS, RUNOFF HYDROGRAPHS, ROUTING HYDROGRAPHS, AND STORMWATER BASIN INFORMATION.



Project: 02218208.05 Drawings: EVOH Cover System Design - SWP#588 Construction Plans VREF



1
6 9
STORMWATER CHANNEL CENTERLINE PROFILE
SCALE: H: 1"=100', V: 1"=10'
NOTE: INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE



2
6 9
STORMWATER PIPE PROFILE
SCALE: H: 1"=100', V: 1"=10'
NOTE: INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

NO.	REVISION	DATE

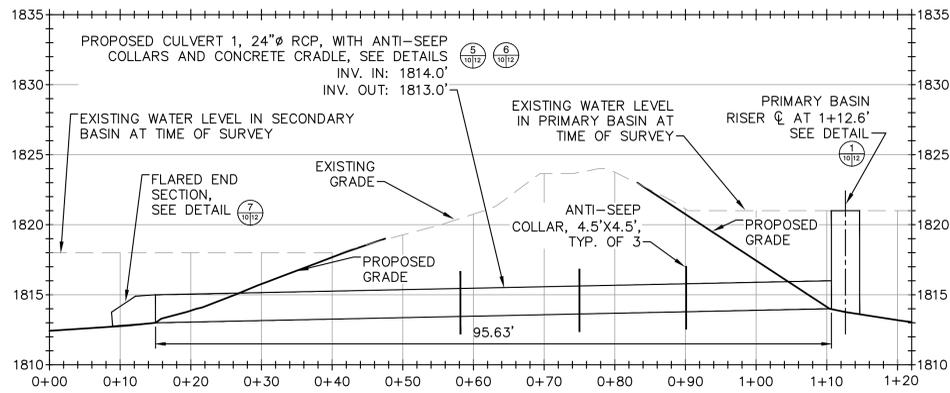
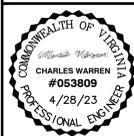
SHEET TITLE	STORMWATER PROFILES 1
PROJECT TITLE	SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

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

SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 10000 WOODBURN AVENUE FARMINGTON, VA 22113 PH: (804) 878-7740 FAX: (804) 878-7463	DWN: BTW / SJ/A CHK: BTW / C/JW INSP: BTW / C/JW DATE: 4/28/23
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CADD FILE:	02218208.05
DATE:	4/28/23
SCALE:	AS SHOWN
DRAWING NO.	9

Project\02218208.05\Drawings\VOH_Cover_System_Design - SWP#588\Construction_Plans\VOEF

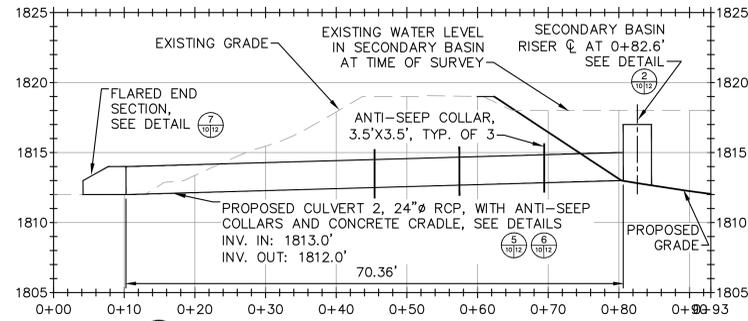


1
8/10 STORMWATER CULVERT 1 PROFILE

SCALE: H: 1"=10', V: 1"=5'

INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

NOTE: AS AN ALTERNATIVE TO ANTI-SEEP COLLARS, A CUT-OFF TRENCH, SEEPAGE DIAPHRAGM, TOE DRAIN, AND/OR DRAINAGE BLANKET MAY BE USED.

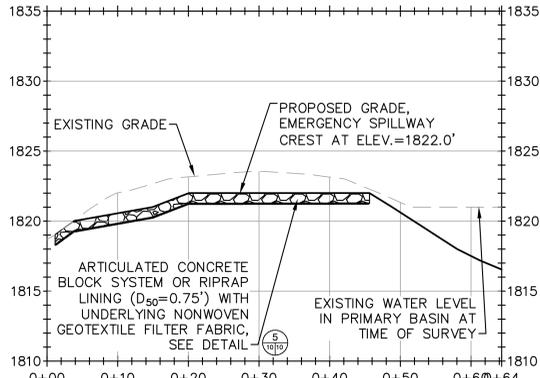


2
8/10 STORMWATER CULVERT 2 PROFILE

SCALE: H: 1"=10', V: 1"=5'

INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

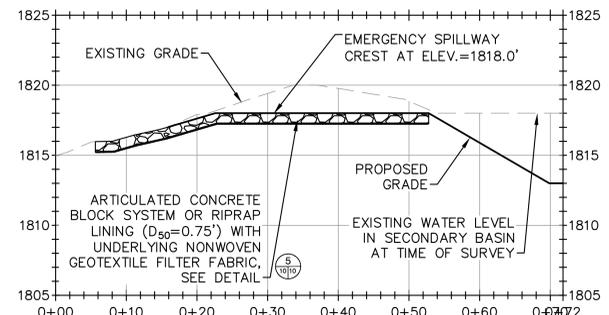
NOTE: AS AN ALTERNATIVE TO ANTI-SEEP COLLARS, A CUT-OFF TRENCH, SEEPAGE DIAPHRAGM, TOE DRAIN, AND/OR DRAINAGE BLANKET MAY BE USED.



3
8/10 EMERGENCY SPILLWAY 1 PROFILE

SCALE: H: 1"=10', V: 1"=5'

INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE



4
8/10 EMERGENCY SPILLWAY 2 PROFILE

SCALE: H: 1"=10', V: 1"=5'

INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

TABLE 3.19-D
REQUIREMENTS FOR FILTER FABRIC USED WITH RIPRAP

Physical Property	Test Method	Requirements
Equivalent Opening Size	Corps of Engineers CWO 2215-77	Equal or greater than U.S. No. 50 sieve
Tensile Strength* @ 20% (maximum)	VTM-52	30 lbs./linear in. (minimum)
Puncture Strength	ASTM D751*	80 lbs. (minimum)

* Tension testing machine with ring clamp, steel ball replaced with 5/16 diameter solid steel cylinder with hemispherical tip centered within the ring clamp.

Seams shall be equal in strength to basic material.

Additional fabric material or non-corrosive steel wire may be incorporated into the fabric to increase overall strength.

Source: VDOT Road and Bridge Specifications

5
10/10 NONWOVEN GEOTEXTILE FOR EMERGENCY SPILLWAYS

NO.	REVISION	DATE

SHEET TITLE	STORMWATER PROFILES 2
PROJECT TITLE	SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

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

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1000 W. MAIN ST., SUITE 200
BRISTOL, VA 24201
PH: (804) 878-7440 FAX: (804) 878-7443

DWG. BY: /SJA/ D/A R/W BY: /SJA/
CHK. BY: /SJA/ APP. BY: /SJA/
TRV/CSJW

CADD FILE: 02218208.05

DATE: 4/28/23

SCALE: AS SHOWN

DRAWING NO.

Project\02218208.05\Drawings\VOH_Cover_System_Design - SWP#588\Construction_Plans\WREF



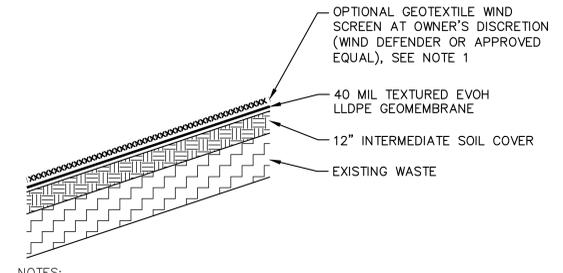
NO.	DATE	REVISION

SHEET TITLE: **DETAILS 1**
PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

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

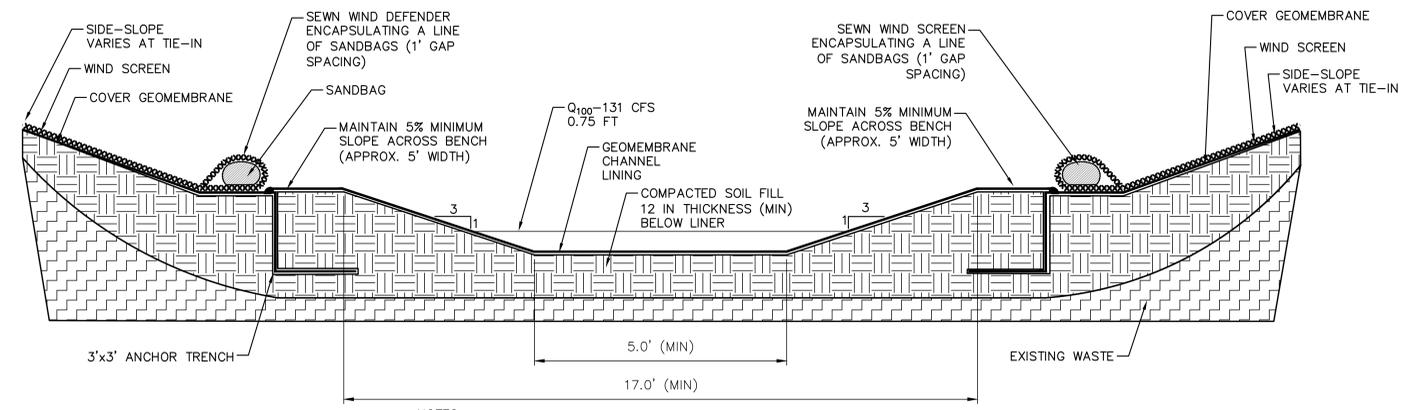
SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
10000 WOODLAND AVENUE, SUITE 200
MANASSAS, VA 20108
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DWN: BTW / SJA
CHK: BTW / SJA
APP: BTW / SJA
CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO.



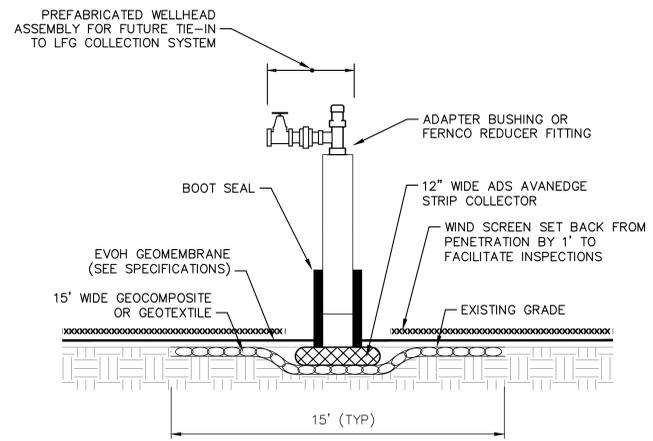
NOTES:
1. THE OWNER MAY OR MAY NOT ELECT TO INCLUDE A GEOTEXTILE WIND SCREEN. IF A WIND SCREEN IS NOT SPECIFIED, WIND CALCULATIONS WILL BE PROVIDED DEMONSTRATING THE LACK OF NEED.

1 INTERIM EVOH COVER
6/11 NOT TO SCALE

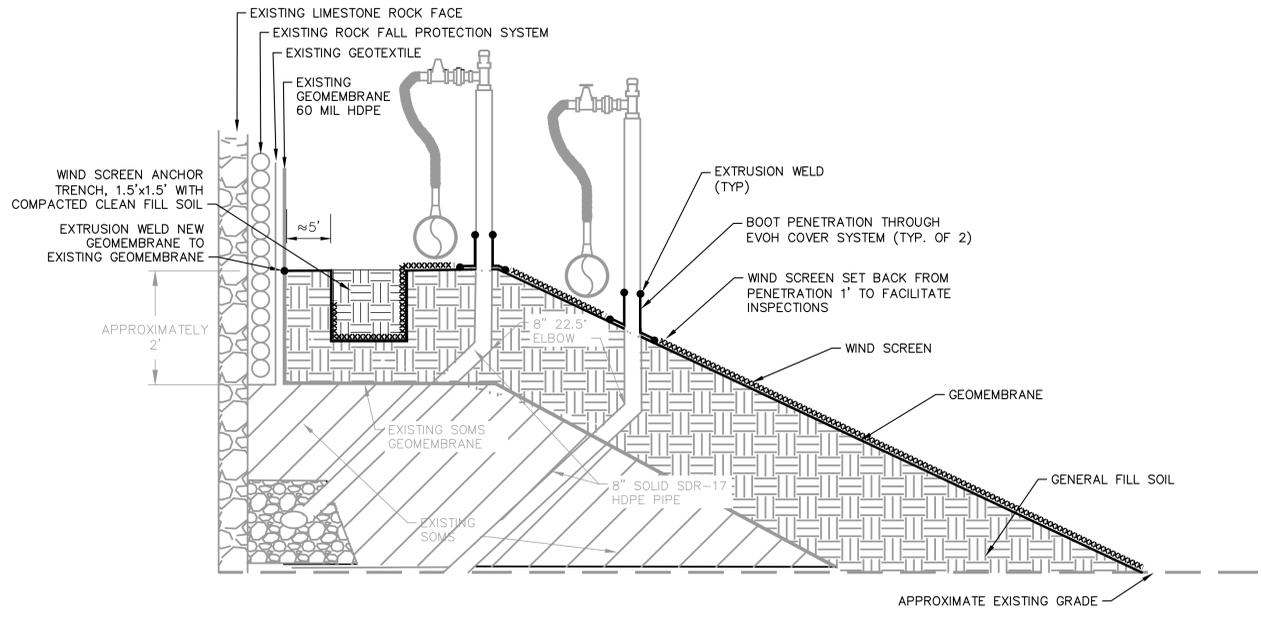


NOTES:
1. CHANNEL SLOPE IS APPROXIMATELY 5%. THE 100-YR FLOW DEPTH IS APPROX. 0.75 FT.

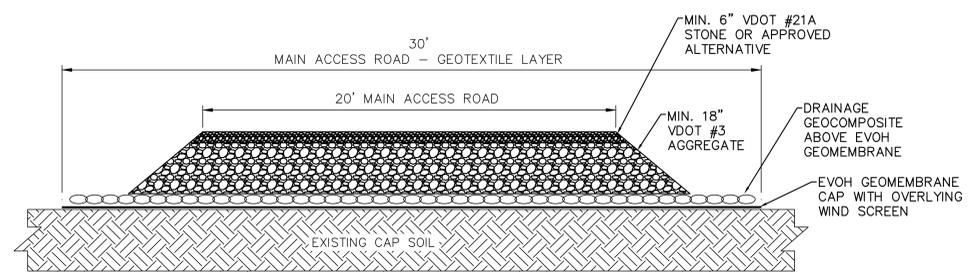
2 STORMWATER CHANNEL TIE-IN WITHOUT ADJACENT ROAD
6/11 NOT TO SCALE



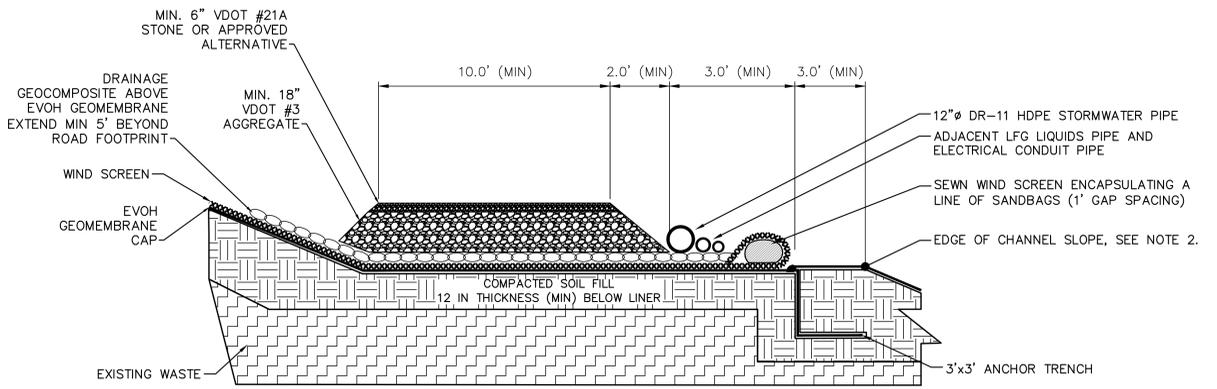
3 LFG COLLECTION STRIPS
6/11 NOT TO SCALE



4 EVOH COVER SYSTEM TIE-IN TO EXISTING SIDEWALL LINER
6/11 NOT TO SCALE



5 LIGHT-DUTY ACCESS ROAD
6/11 NOT TO SCALE



NOTES:
1. MAINTAIN 5% MINIMUM SLOPE ACROSS BENCH INTO STORMWATER CHANNEL.
2. MINIMUM BENCH ELEVATION = 1769.0'

6 LIGHT-DUTY ACCESS ROAD ALONG CHANNEL BENCH
6/11 NOT TO SCALE

Project: 02218208.05 Drawings: EVOH Cover System Design - SWP#588 Construction Plans VREF

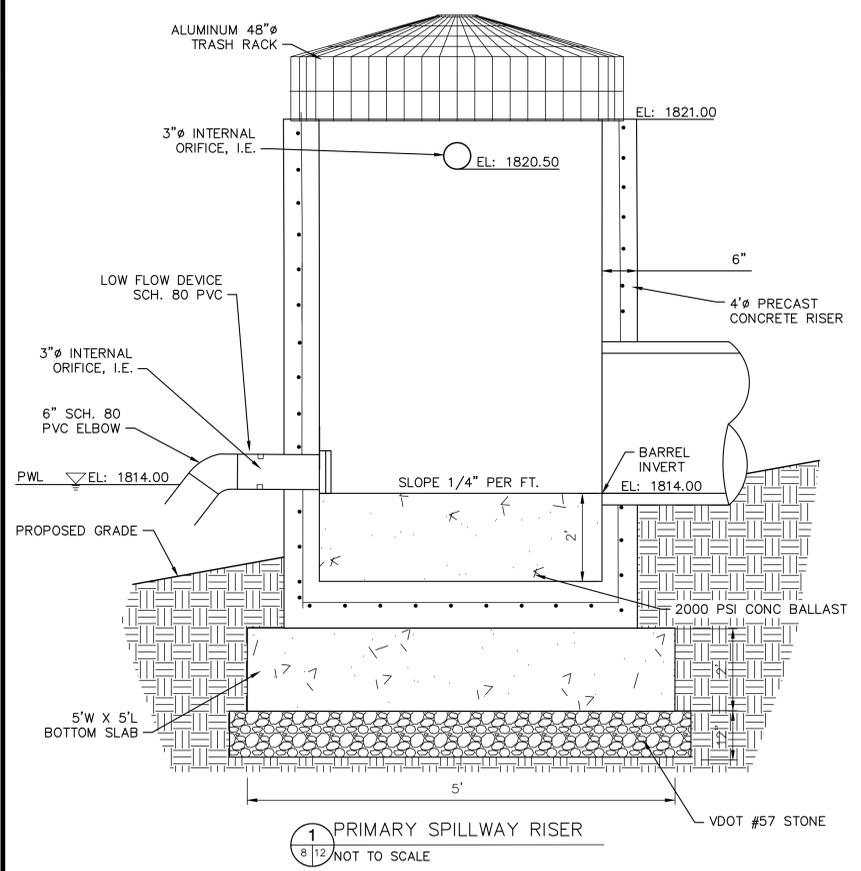


DATE	
REVISION	
NO.	

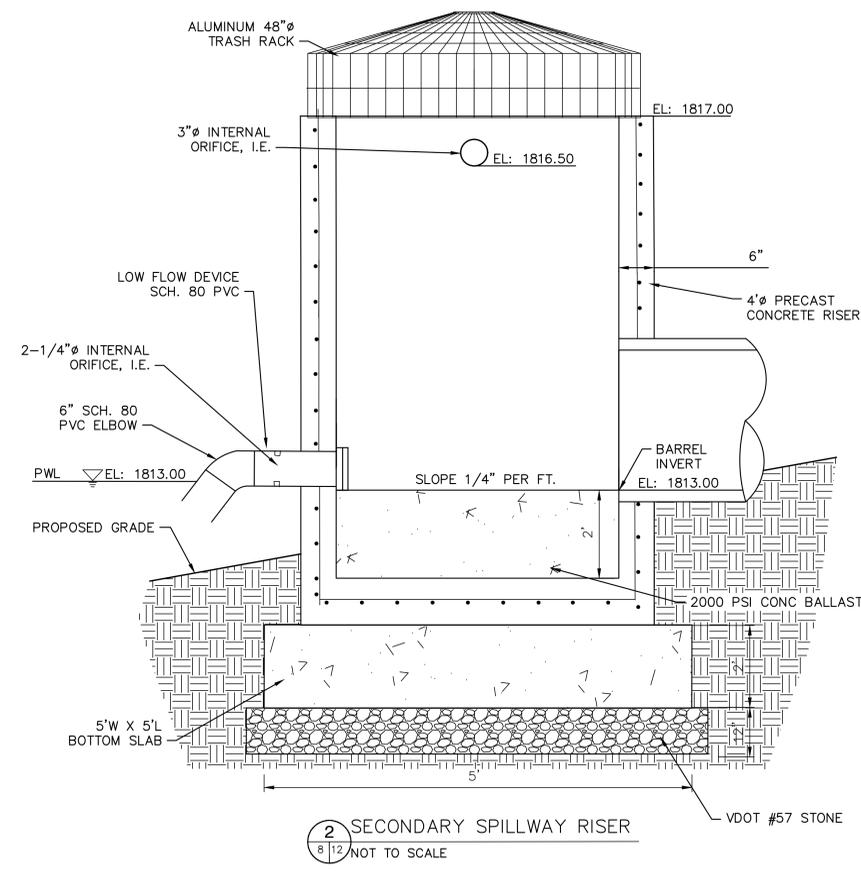
DETAILS 2
SHEET TITLE
PROJECT TITLE
SWP#588 INTERIM EVOH COVER SYSTEM
STORMWATER MANAGEMENT PLAN

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

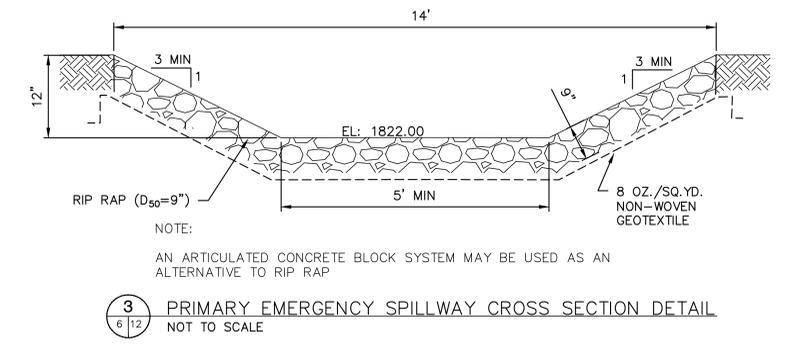
SCS ENGINEERS
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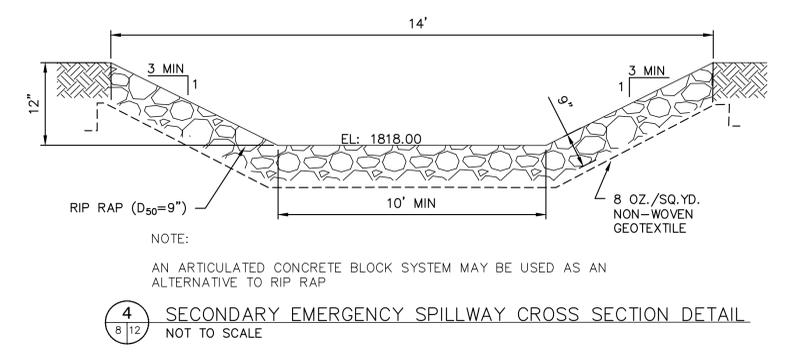
1 PRIMARY SPILLWAY RISER
8/12 NOT TO SCALE



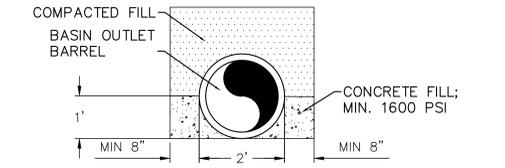
2 SECONDARY SPILLWAY RISER
8/12 NOT TO SCALE



3 PRIMARY EMERGENCY SPILLWAY CROSS SECTION DETAIL
8/12 NOT TO SCALE

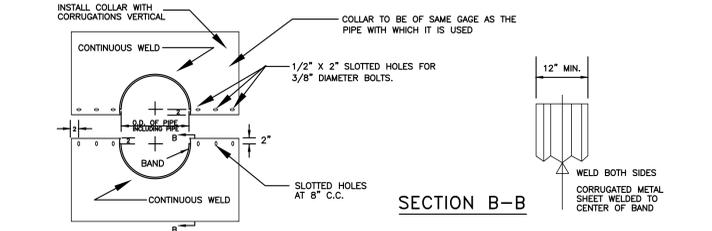


4 SECONDARY EMERGENCY SPILLWAY CROSS SECTION DETAIL
8/12 NOT TO SCALE



5 CONCRETE CRADLE FOR BARREL
10/12 NOT TO SCALE

DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR

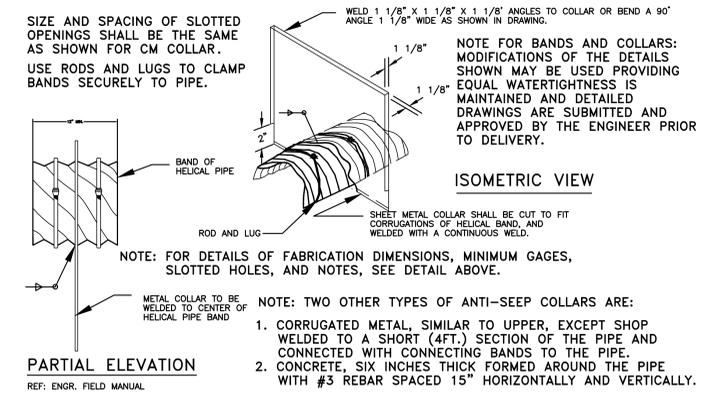


ELEVATION OF UNASSEMBLED COLLAR

NOTES FOR COLLARS:

- ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
- WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
- UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
- THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
- EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR



PARTIAL ELEVATION

NOTE: TWO OTHER TYPES OF ANTI-SEEP COLLARS ARE:

- CORRUGATED METAL, SIMILAR TO UPPER, EXCEPT SHOP WELDED TO A SHORT (4 FT.) SECTION OF THE PIPE AND CONNECTED WITH CONNECTING BANDS TO THE PIPE.
- CONCRETE, SIX INCHES THICK FORMED AROUND THE PIPE WITH #3 REBAR SPACED 15" HORIZONTALLY AND VERTICALLY.

SCS ENGINEERS

Environmental Consultants & Contractors
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804 378-7440 FAX 804 378-7433
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JOB NO. 02218208.16
SUBJECT Anti-Seep Collar Calculations for Culverts
SHEET NO. 1 OF 1
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/28/2023

Anti-Seep Collars

A) Determine length of barrel within saturated zone, using Plate 3.14-11 or the equation below:

$$L_s = Y(Z + 4)(1 + \frac{S}{0.25 - S})$$

Variables:

- S = Slope of the barrel in feet per foot = 0.0104
- Y = Depth of water in basin at spillway crest, (ft) = 7
- Z = Slope of upstream face of embankment, H:V ratio = 3
- Ls = Length of barrel in sat. zone (ft) = 51.1

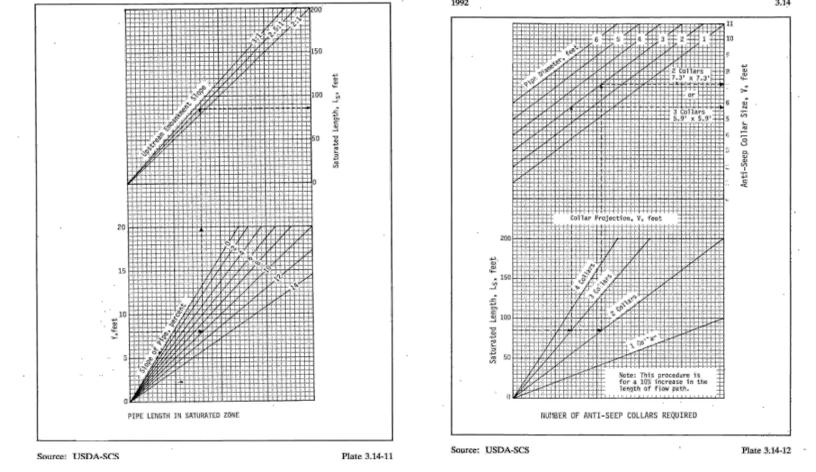
B) Enter Plate 3.14-12 with Ls. Select collar number, then determine anti-seep collar size based upon barrel diameter. See Plate 3.14-13 for detail

Selected number of anti-seep collars: 2

Anti-Seep collar size: 4.5 ft

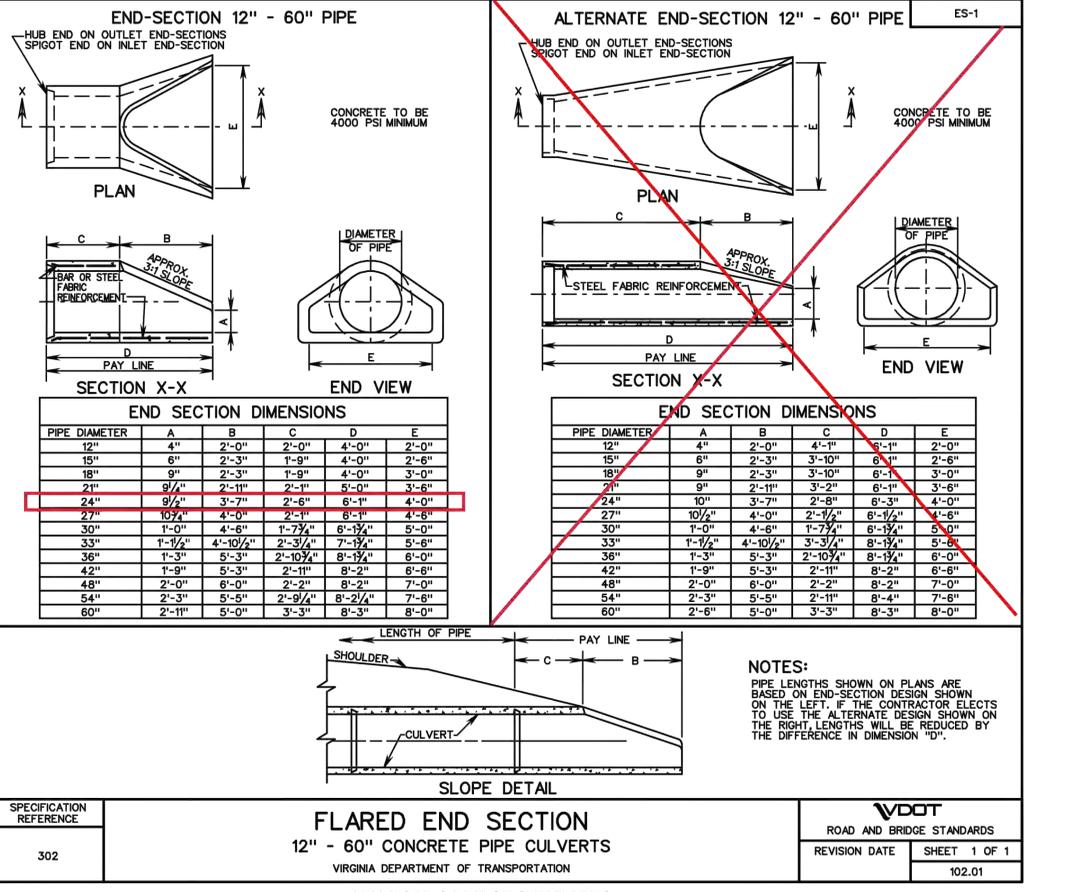
Notes: Collar Spacing = 14 x Projection of collar above pipe
Collars should not be located closer than 2 feet to a pipe joint

Note: An additional anti-seep collar for each culvert is proposed in the design profiles.



6 ANTI-SEEP COLLARS
8/12 NOT TO SCALE

2016 ROAD & BRIDGE STANDARDS



7 FLARED PIPE END DETAIL
8/12 NOT TO SCALE



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Mine or Swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Soils Spot

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:15,800 to 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: www.nrcs.usda.gov/wss
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sullivan County, Tennessee
Survey Area Date: Version 19, Sep 15, 2022

Soil Survey Area: Washington County Area and the City of Bristol, Virginia
Survey Area Date: Version 18, Sep 6, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND

MAP INFORMATION

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 5, 2022—Jun 19, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CnC2	Collegedale-Etowah complex, 5 to 12 percent slopes, eroded	1.3	0.2%
CnD3	Collegedale-Etowah complex, 12 to 20 percent slopes, severely eroded	0.5	0.1%
CnD	Collegedale-Urban land complex, 5 to 20 percent slopes	0.0	0.0%
MnF	Montevallo channery silt loam, 35 to 50 percent slopes	0.1	0.0%
TnD2	Talbot-Rock outcrop-Bradyville complex, 12 to 20 percent slopes, eroded	0.1	0.0%
Subtotals for Soil Survey Area		2.0	0.4%
Totals for Area of Interest		528.1	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2A	Atkins loam, 0 to 3 percent slopes, frequently flooded	5.7	1.1%
7A	Clubcaf silt loam, 0 to 3 percent slopes, frequently flooded	11.6	2.2%
16C	Frederick silt loam, 8 to 15 percent slopes	52.9	10.0%
16D	Frederick silt loam, 15 to 25 percent slopes	74.1	14.0%
17C	Frederick very gravelly silt loam, 7 to 15 percent slopes	6.3	1.2%
20D	Hagerstown silt loam, 15 to 25 percent slopes, very rocky	2.7	0.5%
23C	Hayter loam, 7 to 15 percent slopes	5.1	1.0%
45	Udorthents, 0 to 25 percent slopes	128.1	24.2%
47	Udorthents-Urban land complex, 0 to 25 percent slopes	103.2	19.5%
50D	Weikert silt loam, 15 to 25 percent slopes	81.1	15.4%
50E	Weikert silt loam, 25 to 50 percent slopes	42.8	8.1%
55B	Wyrick-Marble complex, 2 to 7 percent slopes	9.7	1.8%
55C	Wyrick-Marble complex, 7 to 15 percent slopes	2.8	0.5%

Minor Components

Clubcaf, silt loam, frequently flooded
 Percent of map unit: 1 percent
 Landform: Backswamps on flood plains
 Landform position (two-dimensional): Top slope
 Landform position (three-dimensional): Tread
 Down-slope shape: Concave
 Across-slope shape: Concave
 Other vegetative classification: Hydric Soils (G128XMO05VA)
 Hydric soil rating: Yes

45—Udorthents, 0 to 25 percent slopes

Map Unit Setting
 National map unit symbol: ktd
 Elevation: 1,450 to 3,670 feet
 Mean annual precipitation: 38 to 48 inches
 Mean annual air temperature: 52 to 55 degrees F
 Frost-free period: 160 to 190 days
 Farmland classification: Not prime farmland

Map Unit Composition
 Udorthents and similar soils: 70 percent
 Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
 Down-slope shape: Concave
 Across-slope shape: Linear
 Parent material: Fill material

Properties and qualities
 Slope: 0 to 25 percent
 Depth to restrictive feature: More than 80 inches
 Drainage class: Well drained
 Runoff class: Very high
 Depth to water table: More than 80 inches
 Frequency of flooding: None
 Frequency of ponding: None

47—Udorthents-Urban land complex, 0 to 25 percent slopes

Map Unit Setting
 National map unit symbol: khh
 Elevation: 1,570 to 2,230 feet
 Mean annual precipitation: 38 to 48 inches
 Mean annual air temperature: 52 to 55 degrees F
 Frost-free period: 160 to 190 days
 Farmland classification: Not prime farmland

Map Unit Composition
 Udorthents and similar soils: 40 percent
 Urban land: 35 percent
 Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
 Down-slope shape: Concave
 Across-slope shape: Linear
 Parent material: Fill material

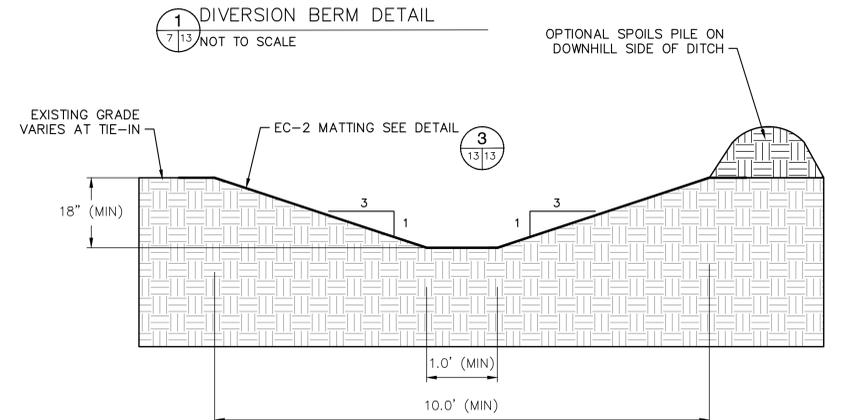
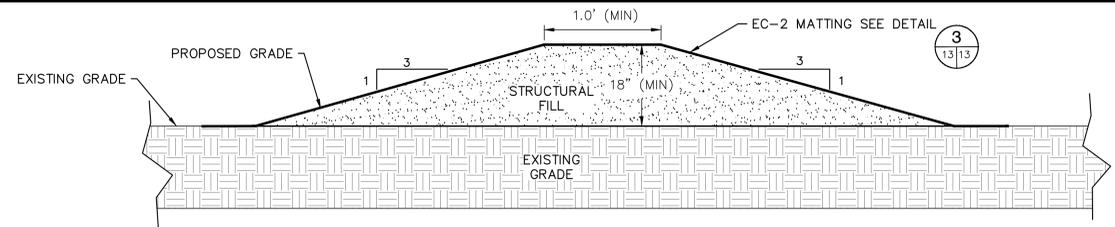
Properties and qualities
 Slope: 0 to 25 percent
 Depth to restrictive feature: More than 80 inches
 Drainage class: Well drained
 Runoff class: Very high
 Depth to water table: More than 80 inches
 Frequency of flooding: None
 Frequency of ponding: None

Description of Urban Land

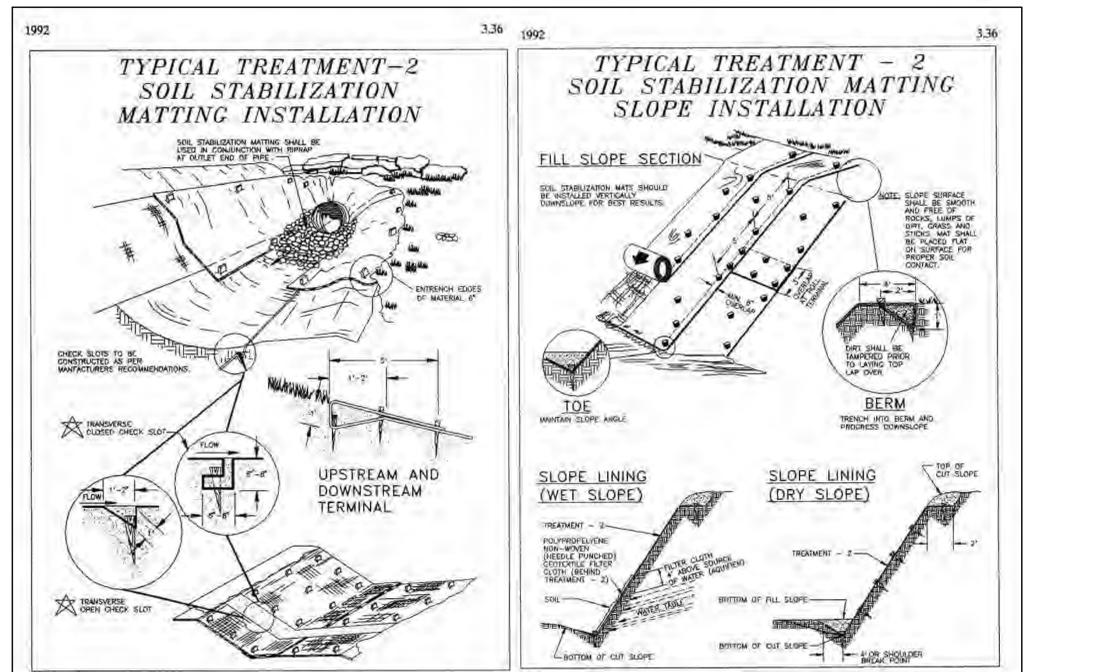
Setting
 Down-slope shape: Linear
 Across-slope shape: Linear
 Parent material: Buildings, pavement

50D—Weikert silt loam, 15 to 25 percent slopes

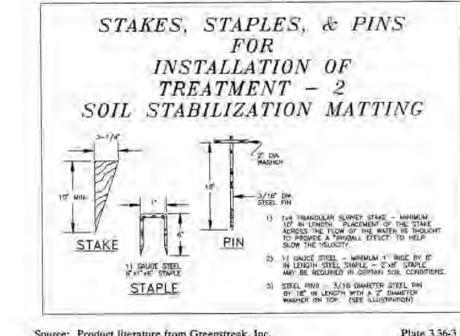
Map Unit Setting
 National map unit symbol: km4
 Elevation: 1,360 to 2,530 feet
 Mean annual precipitation: 38 to 48 inches
 Mean annual air temperature: 52 to 55 degrees F



NOTES:
 1. CHANNEL BOTTOM WIDTH AND SLOPE VARIES BASED ON CHANNEL



Source: VDOT Road and Bridge Standards Plate 3.36-4 Source: VDOT Road and Bridge Standards Plate 3.36-5



Source: Product literature from Greenstreak, Inc. Plate 3.36-3



PERMIT DRAWINGS
 NOT FOR CONSTRUCTION
 DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
 CHARLES WARREN
 #053809
 4/28/23
 PROFESSIONAL ENGINEER

NO.	DATE	REVISION

DETAILS 3

PROJECT TITLE
 SWP#588 INTERIM EVOH COVER SYSTEM
 STORMWATER MANAGEMENT PLAN

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

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 1000 W. MAIN STREET, SUITE 100
 BRISTOL, VA 24201
 PH: (804) 879-7440 FAX: (804) 879-7443

PROJ. NO. 20220616
 DWG. BY: JLV/SLA
 CHK. BY: CWW

CADD FILE: 02218208.05
 DATE: 4/28/23
 SCALE: AS SHOWN
 DRAWING NO. 13 of 21

Project: 02218208.05 Drawings: EVOH Cover System Design - SWP#588 Construction Plans VWEF



NO.	DATE	REVISION

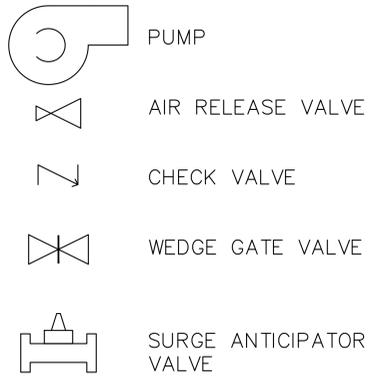
SHEET TITLE: **DETAILS 4 PUMPING SYSTEM SCHEMATIC**
PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

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

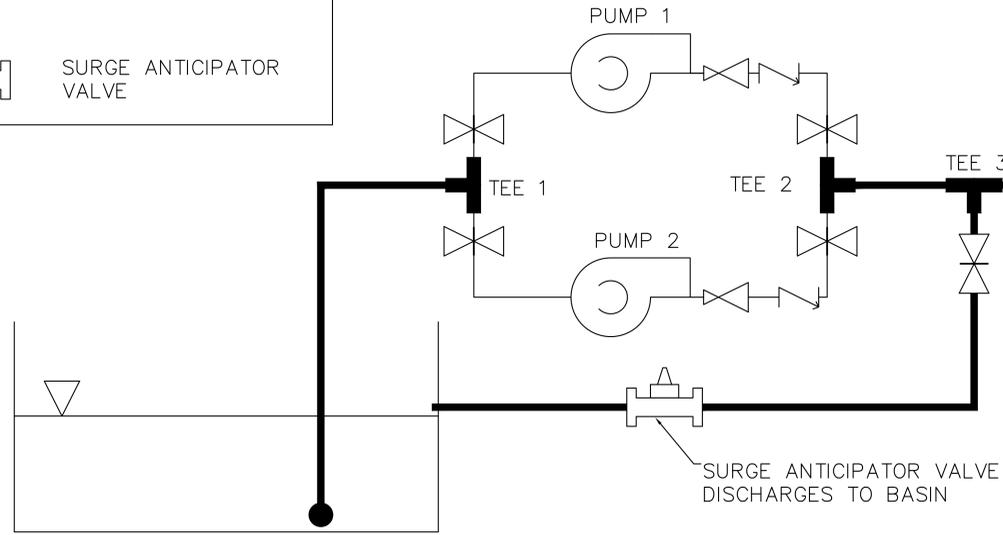
SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
10000 WOODLAND DRIVE
MANASSAS, VA 20108
PH: (804) 378-7440 FAX: (804) 378-7443
DWN: BTW / SJ/FA
CHK: BTW / SJ/FA
APP: BTW / SJ/FA
CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO.

LEGEND



APPROXIMATE PUMP INLET ELEVATION=1771'

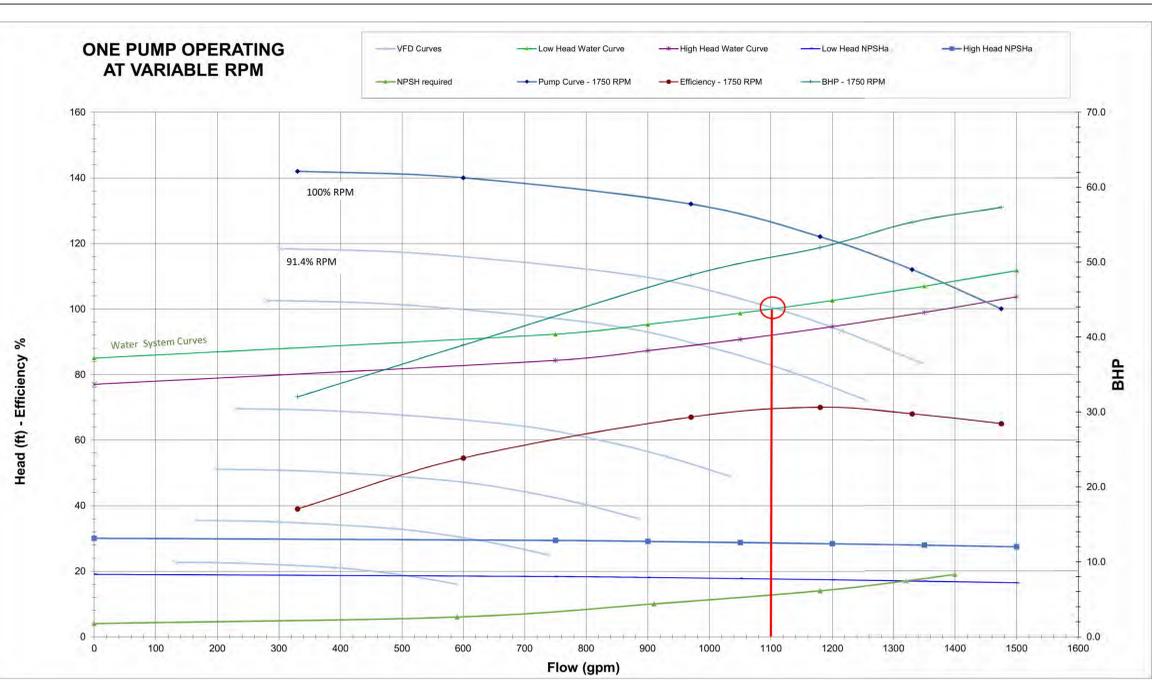


NOTES:

1. THIS DIAGRAM INDICATES THE RELATIVE POSITIONING OF VALVES AND FITTINGS. FOR CLARITY, ALL PUMPING SYSTEM FEATURES ARE NOT SHOWN.
2. THE PUMPING SYSTEM IS INTENDED TO BE OPERATED USING ONE PUMP AT A TIME. AN ALTERNATING SCHEDULE WILL BE ESTABLISHED.
3. MOTOR ACTUATED OR HYDRAULICALLY OPERATED CHECK VALVES WILL BE USED TO PREVENT SUDDEN OPENING AND CLOSING SURGES.
4. A SURGE ANTICIPATOR VALVE WILL BE INSTALLED ALONG THE DISCHARGE PIPE.
5. INSTALL TIME-METERING FOR EACH PUMP.
6. THE PUMPING SYSTEM WILL BE EQUIPPED WITH A VARIABLE FREQUENCY DRIVE.

1 PUMPING SYSTEM SCHEMATIC DIAGRAM
6/14 NOT TO SCALE

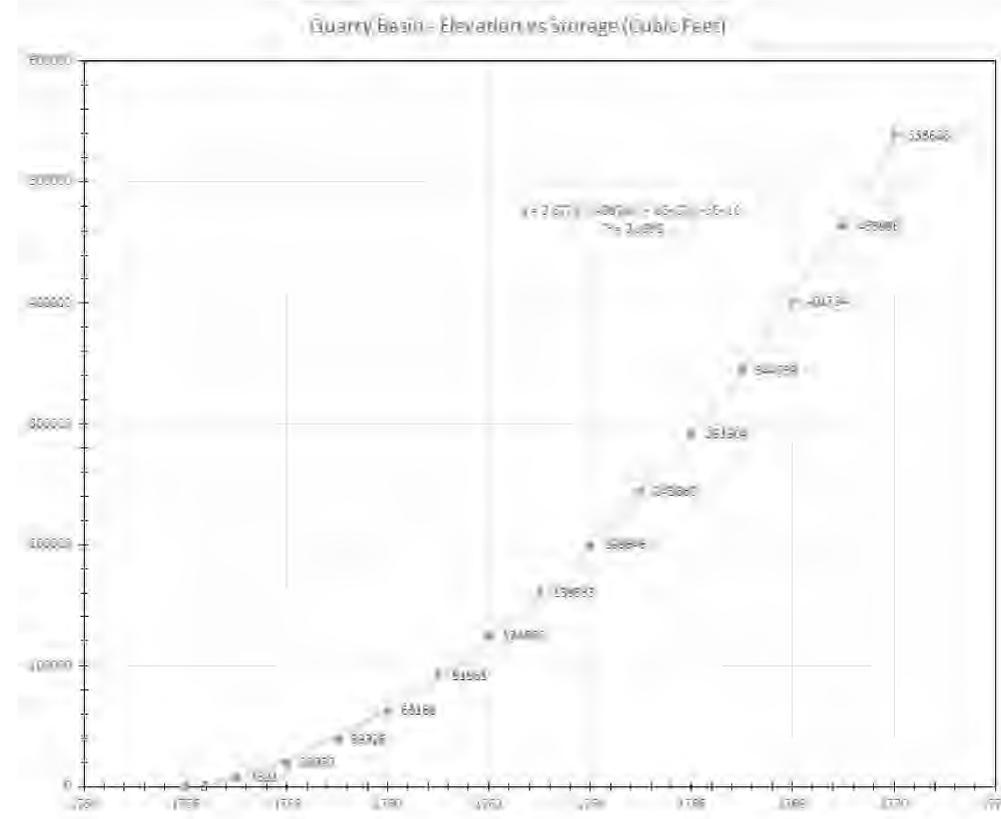
STORMWATER BASIN
HIGH WATER = 1769'
LOW WATER = 1760'



NOTES:

1. THE PUMP CURVE IS BASED UPON A GORMAN-RUPP MODEL U6A-B PUMP. THE OWNER MAY ELECT TO CHOOSE A DIFFERENT PUMP MODEL WITH COMPARABLE PERFORMANCE SO LONG AS THE ADEQUACY OF THE PUMP IS DEMONSTRATED.

2 PUMPING SYSTEM CURVES
6/14 NOT TO SCALE



3 QUARRY BASIN STAGE STORAGE
6/14

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 1 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Curve Number - Drainage Area A - Existing Primary Basin

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	7.63	34%	Good	C	73	Woods
B	8.45	38%	Good	C	82	Impervious Areas
C	0.95	3%	Good	C	92	Gravel Road
D	6.36	28%	Good	C	74	Open Space
E	1.16	7%	Good	C	89	Drift Road/Drift stockpile area
Total	22.67	100%			81	

VECH p. V-68 - V-69

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 2 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Curve Number - Drainage Area B - Runoff into Quarry

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	9.91	27%	Good	C	70	Woods
B	24.83	69%	Good	C	88	Impervious Areas (including roof-top landfill area)
C	0.96	3%	Good	C	92	Gravel Road
D	0.45	1%	Good	C	74	Open Space
E	0.28	0.8%	Good	C	89	Drift Road
Total	38.43	100%			81	

VECH p. V-68 - V-69

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 3 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Curve Number - Drainage Area C - Runoff into Secondary Basin

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	0.48	42%	Good	C	70	Woods
B	0.28	25%	Good	C	88	Impervious Areas (including roof-top landfill area)
C	0.25	22%	Good	C	92	Gravel Road
D	0.45	37%	Good	C	74	Open Space
E	0.28	0.8%	Good	C	89	Drift Road
Total	1.76	100%			78	

VECH p. V-68 - V-69

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 4 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Curve Number - Forested Condition

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	9.78	42%	Good	C	70	Woods
B	24.83	100%	Good	C	88	Impervious Areas (including roof-top landfill area)
C	0.95	3%	Good	C	92	Gravel Road
D	6.36	28%	Good	C	74	Open Space
E	1.16	7%	Good	C	89	Drift Road
Total	33.08	100%			81	

VECH p. V-68 - V-69

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 5 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Calculations

Storm	Pre-development			Post-development			Pre-development			Post-development			Pre-development			Post-development		
	Runoff (in)	Runoff (ft)	Vol (ac-ft)	Runoff (in)	Runoff (ft)	Vol (ac-ft)	Runoff (in)	Runoff (ft)	Vol (ac-ft)	Runoff (in)	Runoff (ft)	Vol (ac-ft)	Runoff (in)	Runoff (ft)	Vol (ac-ft)	Runoff (in)	Runoff (ft)	Vol (ac-ft)
1hr	1.00	0.10	0.19	1.00	0.10	0.19	1.00	0.10	0.19	1.00	0.10	0.19	1.00	0.10	0.19	1.00	0.10	0.19
2hr	2.15	0.21	0.39	2.15	0.21	0.39	2.15	0.21	0.39	2.15	0.21	0.39	2.15	0.21	0.39	2.15	0.21	0.39
3hr	2.54	0.25	0.47	2.54	0.25	0.47	2.54	0.25	0.47	2.54	0.25	0.47	2.54	0.25	0.47	2.54	0.25	0.47
10yr	3.34	0.33	0.62	3.34	0.33	0.62	3.34	0.33	0.62	3.34	0.33	0.62	3.34	0.33	0.62	3.34	0.33	0.62
25yr	3.78	0.37	0.67	3.78	0.37	0.67	3.78	0.37	0.67	3.78	0.37	0.67	3.78	0.37	0.67	3.78	0.37	0.67
100yr	4.45	0.44	0.79	4.45	0.44	0.79	4.45	0.44	0.79	4.45	0.44	0.79	4.45	0.44	0.79	4.45	0.44	0.79

VECH p. V-68 - V-69

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 6 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Time of Concentration - Pre-development Area A - E

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft ²	887,549			887,549	
Sheet Flow						
Manning's Roughness Coefficient, n		0.24				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope, s	ft/ft	0.02	0.01	0.01		
Time of Concentration	hr	0.40	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	195				
Watercourse slope, s	ft/ft	0.16				
Average velocity, V	ft/s	6.92	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft ²	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydraulic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Manning's Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.41	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	24.74	0.00	0.00	24.74	

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 7 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Time of Concentration - Pre-development Area B - Quarry

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft ²	1,558,377			1,558,377	
Sheet Flow						
Manning's Roughness Coefficient, n		0.40				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope, s	ft/ft	0.02	0.01	0.01		
Time of Concentration	hr	0.40	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	250				
Watercourse slope, s	ft/ft	0.16				
Average velocity, V	ft/s	6.92	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft ²	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydraulic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Manning's Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.41	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	24.74	0.00	0.00	24.74	

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 8 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Time of Concentration - Post-development Drainage Area A - E

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft ²	887,549			887,549	
Sheet Flow						
Manning's Roughness Coefficient, n		0.24				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope, s	ft/ft	0.03	0.01	0.01		
Time of Concentration	hr	0.23	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	195				
Watercourse slope, s	ft/ft	0.05				
Average velocity, V	ft/s	3.60	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.12	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft ²	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydraulic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Manning's Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.23	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	21.03	0.00	0.00	21.03	

Offices Nationwide

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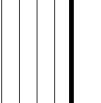
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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 9 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Time of Concentration - Post-development Drainage Area B - Quarry

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft ²	1,477,488			1,477,488	
Sheet Flow						
Manning's Roughness Coefficient, n		0.40				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope, s	ft/ft	0.03	0.01	0.01		
Time of Concentration	hr	0.23	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	195				
Watercourse slope, s	ft/ft	0.16				
Average velocity, V	ft/s	6.92	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft ²	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydraulic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Manning's Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.23	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	17.24	0.00	0.00	17.24	

Offices Nationwide



DATE

REVISION

NO.

PROJECT TITLE

STORMWATER CALCULATIONS 1

SWP#588 INTERIM EVOH COVER SYSTEM

STORMWATER MANAGEMENT PLAN

CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY

2655 VALLEY DRIVE

BRISTOL, VA 24201

CLIENT

SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.

15021 MIDLOTHIAN TURNPIKE, SUITE 305, MIDLOTHIAN, VA 23113

PH: (804) 378-7440 FAX: (804) 378-7433

DATE: 4/28/23

SCALE: AS SHOWN

DRAWING NO. 02218208.05

DATE: 4/28/23

SCALE: AS SHOWN

DRAWING NO. 02218208.05

15 of 21

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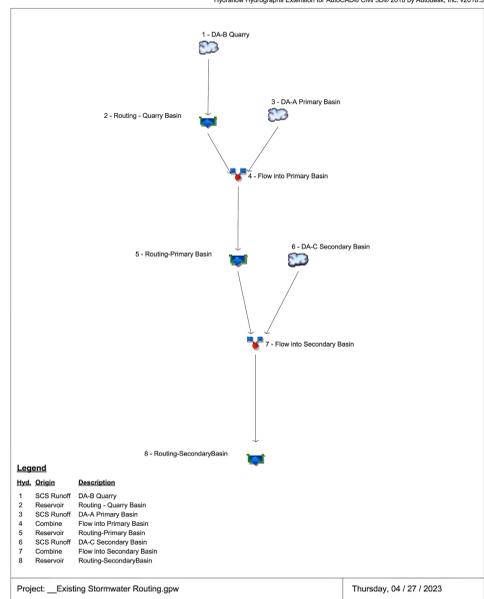
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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 7 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Time of Concentration - Post-development Drainage Area A - E

||
||
||

Watershed Model Schematic



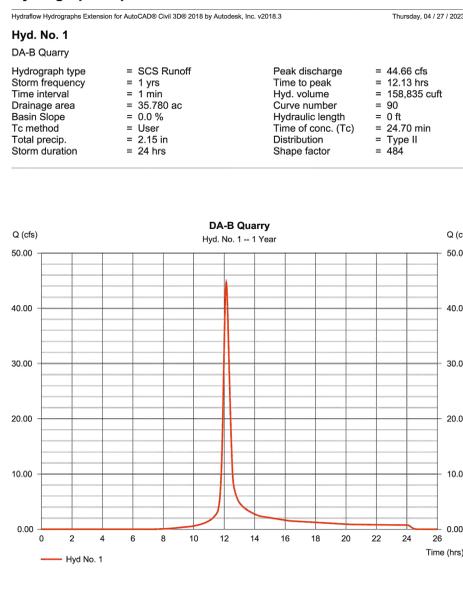
Hydrograph Summary Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Thursday, 04 / 27 / 2023

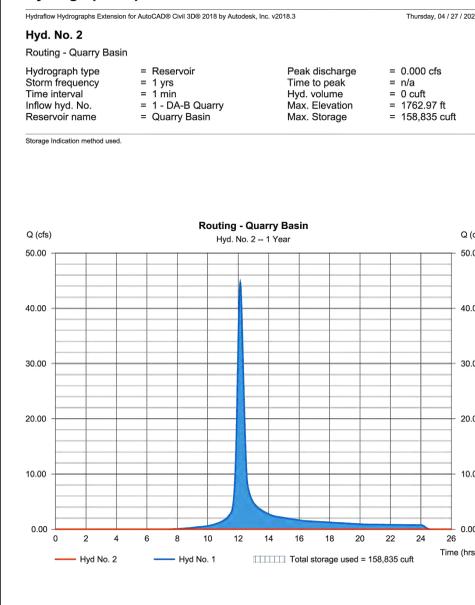
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hydro (cfs)	Maximum elevation (ft)	Total stage used (cuft)	Hydrograph Description
1	SCS Runoff	44.66	1	728	158,835	—	—	—	DA-B Quarry
2	Reservoir	0.000	1	n/a	0	1762.97	158,835	—	Routing - Quarry Basin
3	SCS Runoff	16.83	1	727	58,297	—	—	—	DA-A Primary Basin
4	Combine	16.83	1	727	58,297	2.3	—	—	Flow into Primary Basin
5	Reservoir	0.161	1	1456	18,929	4	1822.16	302,105	Routing-Primary Basin
6	SCS Runoff	1.043	1	720	2,466	—	—	—	DA-C Secondary Basin
7	Combine	1.068	1	720	21,393	5.6	—	—	Flow into Secondary Basin
8	Reservoir	0.177	1	1442	20,992	7	1818.00	13,570	Routing-SecondaryBasin

Project: Existing Stormwater Routing.gpw Return Period: 1 Year Thursday, 04 / 27 / 2023

Hydrograph Report



Hydrograph Report



Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Thursday, 04 / 27 / 2023

Pond No. 1 - Quarry Basin

Pond Data
Pond storage is based on user-defined values.

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1758.00	n/a	0	0
1.00	1757.00	n/a	4,696	4,696
2.00	1756.00	n/a	9,391	13,737
3.00	1755.00	n/a	14,119	28,546
4.00	1754.00	n/a	18,929	48,838
5.00	1753.00	n/a	23,777	74,665
6.00	1752.00	n/a	28,665	106,062
7.00	1751.00	n/a	33,591	143,027
8.00	1750.00	n/a	38,554	185,927
9.00	1749.00	n/a	43,554	234,827
10.00	1748.00	n/a	48,591	289,742
11.00	1747.00	n/a	53,665	350,033
12.00	1746.00	n/a	58,777	416,871
13.00	1745.00	n/a	63,926	489,954
14.00	1744.00	n/a	69,112	569,273

Culvert / Orifice Structures Weir Structures

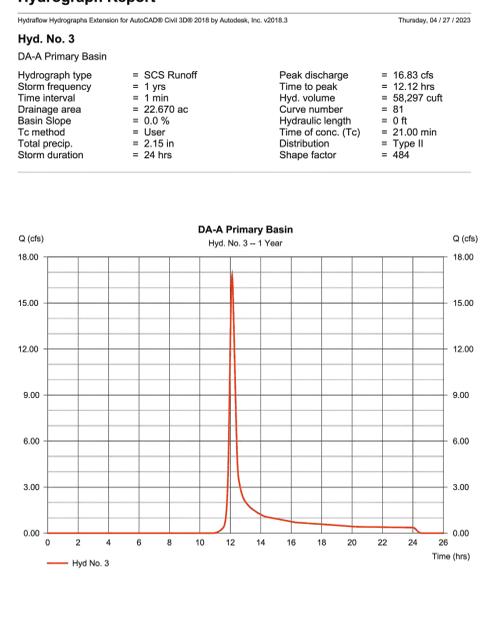
[A]	[B]	[C]	[Pr/Rat]	Crest Len (ft)	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00	Crest EL (ft)	= 0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00	Span (ft)	= 0.00	0.00	0.00
No. Barrels	= 0	0	0	0	Weir Coeff.	= 3.33	3.33	3.33
Invert EL (ft)	= 0.00	0.00	0.00	0.00	Weir Type	=		
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	=		
Slope (%)	= 0.13	0.13	0.13	n/a	Exfil (in/hr)	= 0.000 (by Weir area)		
N-Value	= 0.00	0.00	0.00	n/a	TW Elev. (ft)	= 0.00		
Orifice Coeff.	= 0.60	0.60	0.60	0.60				
Multi-Stage	= n/a	No	No	No				

Note: Culvert/Orifice outfalls are analyzed under inlet (I) and outlet (O) control. Weir flows checked for orifice conditions (C) and submerged (S).

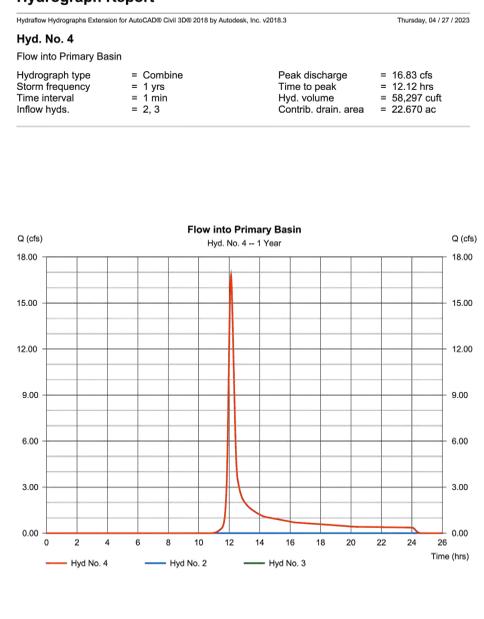
Stage (ft) vs Discharge (cfs)

Stage / Discharge Hyd. No. 1 - 1 Year

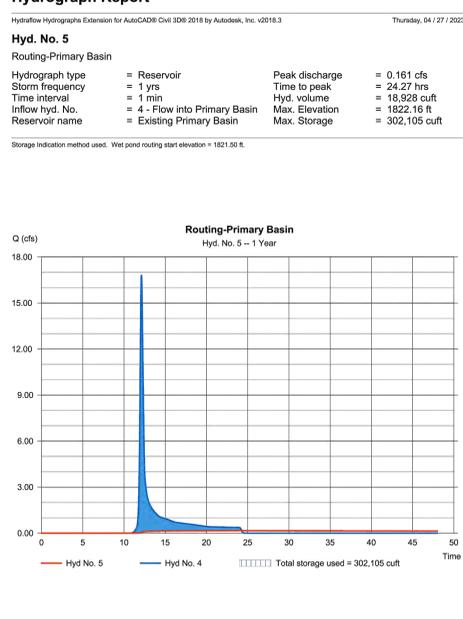
Hydrograph Report



Hydrograph Report



Hydrograph Report



Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Thursday, 04 / 27 / 2023

Pond No. 2 - Existing Primary Basin

Pond Data
Pond storage is based on user-defined values.

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1818.00	n/a	0	0
1.00	1819.00	n/a	66,448	66,448
2.00	1820.00	n/a	132,896	132,896
3.00	1821.00	n/a	199,344	199,344
4.00	1822.00	n/a	265,792	265,792
5.00	1823.00	n/a	332,240	332,240
6.00	1824.00	n/a	398,688	398,688

Culvert / Orifice Structures Weir Structures

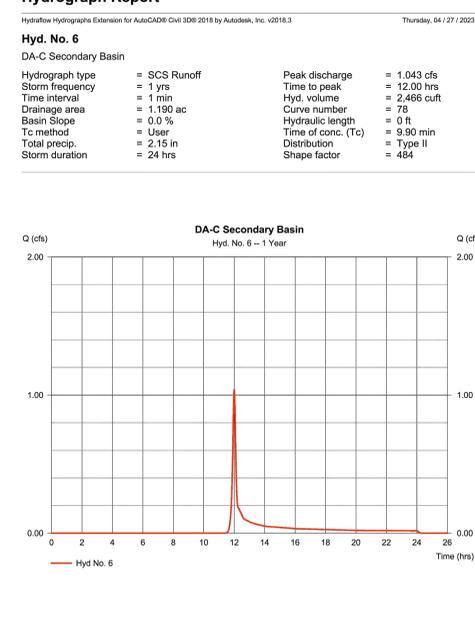
[A]	[B]	[C]	[Pr/Rat]	Crest Len (ft)	[A]	[B]	[C]	[D]
Rise (in)	= 12.00	3.00	Invert	Invert	Crest EL (ft)	= 1823.30	1823.00	0.00
Span (in)	= 12.00	3.00	12.00	0.00	Span (ft)	= 12.00	3.00	0.00
No. Barrels	= 1	1	1	1	Weir Coeff.	= 3.33	3.33	3.33
Invert EL (ft)	= 1821.50	1821.50	1818.00	0.00	Weir Type	=		
Length (ft)	= 15.00	0.00	30.00	0.00	Multi-Stage	=		
Slope (%)	= 0.30	0.00	0.00	n/a	Exfil (in/hr)	= 0.000 (by Weir area)		
N-Value	= 0.13	0.13	0.11	n/a	TW Elev. (ft)	= 0.00		
Orifice Coeff.	= 0.60	0.60	0.60	0.60				
Multi-Stage	= n/a	No	No	No				

Note: Culvert/Orifice outfalls are analyzed under inlet (I) and outlet (O) control. Weir flows checked for orifice conditions (C) and submerged (S).

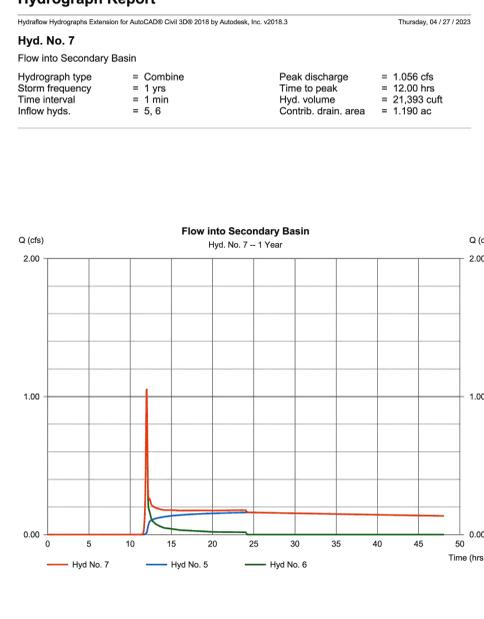
Stage (ft) vs Discharge (cfs)

Stage / Discharge Hyd. No. 2 - 1 Year

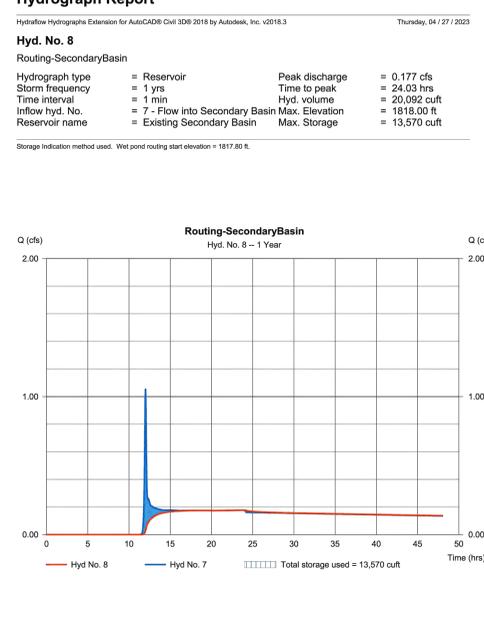
Hydrograph Report



Hydrograph Report



Hydrograph Report



Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Thursday, 04 / 27 / 2023

Pond No. 3 - Existing Secondary Basin

Pond Data
Pond storage is based on user-defined values.

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1816.00	n/a	0	0
1.00	1817.00	n/a	6,038	6,038
2.00	1818.00	n/a	12,076	12,076
3.00	1819.00	n/a	18,114	18,114

Culvert / Orifice Structures Weir Structures

[A]	[B]	[C]	[Pr/Rat]	Crest Len (ft)	[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.00	0.00	0.00	Crest EL (ft)	= 1819.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00	Span (ft)	= 12.00	0.00	0.00
No. Barrels	= 1	0	0	0	Weir Coeff.	= 3.33	3.33	3.33
Invert EL (ft)	= 1817.50	0.00	0.00	0.00	Weir Type	=		
Length (ft)	= 25.00	0.00	0.00	0.00	Multi-Stage	=		
Slope (%)	= 4.00	0.00	0.00	n/a	Exfil (in/hr)	= 0.000 (by Weir area)		
N-Value	= 0.12	0.13	0.13	n/a	TW Elev. (ft)	= 0.00		
Orifice Coeff.	= 0.60	0.60	0.60	0.60				
Multi-Stage	= n/a	No	No	No				

Note: Culvert/Orifice outfalls are analyzed under inlet (I) and outlet (O) control. Weir flows checked for orifice conditions (C) and submerged (S).

Stage (ft) vs Discharge (cfs)

Stage / Discharge Hyd. No. 3 - 1 Year

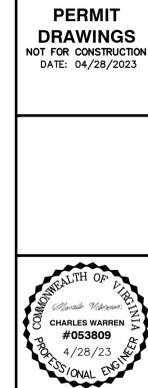
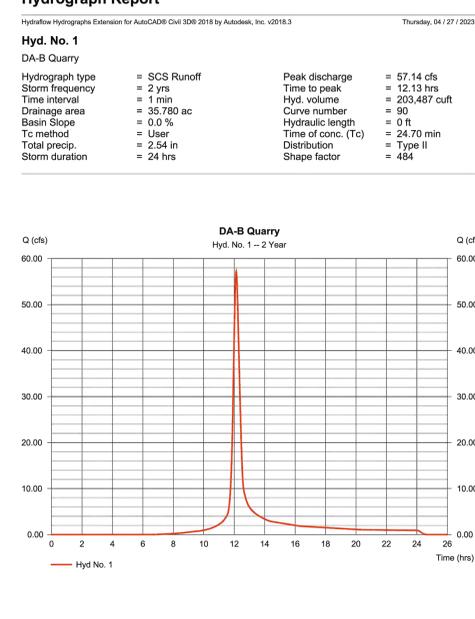
Hydrograph Summary Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Thursday, 04 / 27 / 2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hydro (cfs)	Maximum elevation (ft)	Total stage used (cuft)	Hydrograph Description
1	SCS Runoff	57.14	1	728	203,487	—	—	—	DA-B Quarry
2	Reservoir	0.000	1	n/a	0	1764.01	203,487	—	Routing - Quarry Basin
3	SCS Runoff	23.89	1	727	80,874	—	—	—	DA-A Primary Basin
4	Combine	23.89	1	727	80,874	2.3	—	—	Flow into Primary Basin
5	Reservoir	0.197	1	1456	23,539	4	1822.41	322,520	Routing-Primary Basin
6	SCS Runoff	1.028	1	720	3,516	—	—	—	DA-C Secondary Basin
7	Combine	1.559	1	720	27,565	5.6	—	—	Flow into Secondary Basin
8	Reservoir	0.244	1	806	25,500	7	1818.03	13,758	Routing-SecondaryBasin

Project: Existing Stormwater Routing.gpw Return Period: 2 Year Thursday, 04 / 27 / 2023

Hydrograph Report



NO.	REVISION	DATE

SHEET TITLE: STORMWATER CALCULATIONS 2
PROJECT TITLE: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
SWP#588 INTERIM EVOH COVER SYSTEM
STORMWATER MANAGEMENT PLAN
BRISTOL, VA 24201

CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
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SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
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DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 16 of 21

DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 16 of 21

Hydrograph Report

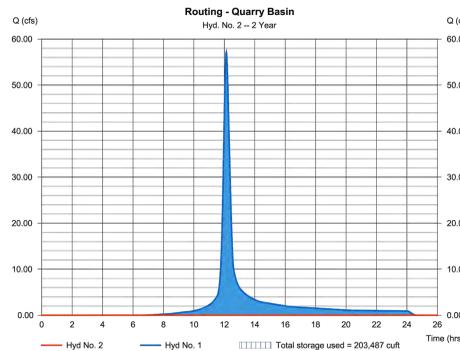
16

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 2
 Routing - Quarry Basin

Hydrograph type = Reservoir Peak discharge = 0.000 cfs
 Storm frequency = 2 yrs Time to peak = n/a
 Time interval = 1 min Hyd. volume = 0 cuft
 Inflow hyd. No. = 1 - DA-B Quarry Max. Elevation = 1764.01 ft
 Reservoir name = Quarry Basin Max. Storage = 203,487 cuft

Storage indication method used.



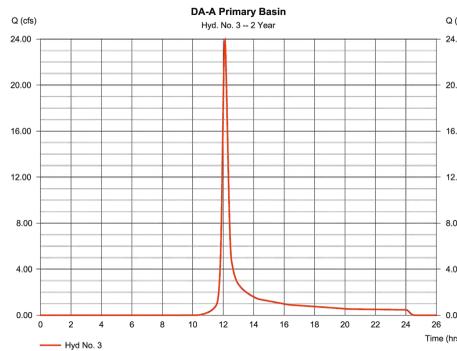
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 3
 DA-A Primary Basin

Hydrograph type = SCS Runoff Peak discharge = 23.89 cfs
 Storm frequency = 1 yrs Time to peak = 12.12 hrs
 Time interval = 1 min Hyd. volume = 80,674 cuft
 Drainage area = 22,670 ac Curve number = 81
 Basin Slope = 0.0 % Hydraulic length = 0 ft
 Tc method = User Time of conc. (Tc) = 21.00 min
 Total precip. = 2.54 in Distribution = Type II
 Storm duration = 24 hrs Shape factor = 484



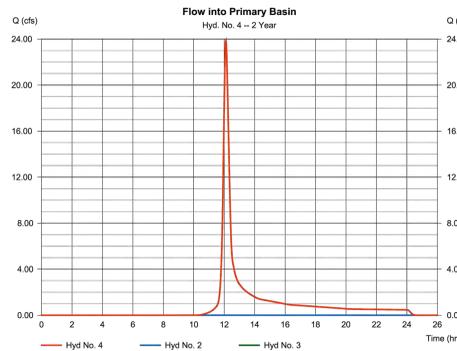
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 4
 Flow into Primary Basin

Hydrograph type = Combine Peak discharge = 23.89 cfs
 Storm frequency = 2 yrs Time to peak = 12.12 hrs
 Time interval = 1 min Hyd. volume = 80,674 cuft
 Inflow hyd. No. = 2, 3 Contrib. drain. area = 22,670 ac



Hydrograph Report

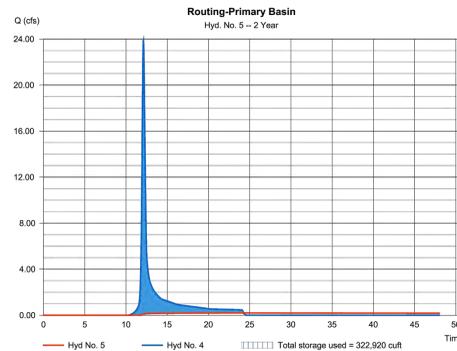
19

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 5
 Routing-Primary Basin

Hydrograph type = Reservoir Peak discharge = 0.197 cfs
 Storm frequency = 2 yrs Time to peak = 24.27 hrs
 Time interval = 1 min Hyd. volume = 23,539 cuft
 Inflow hyd. No. = 4 - Flow into Primary Basin Max. Elevation = 1822.41 ft
 Reservoir name = Existing Primary Basin Max. Storage = 322,920 cuft

Storage indication method used. Wet pond routing start elevation = 1821.50 ft.



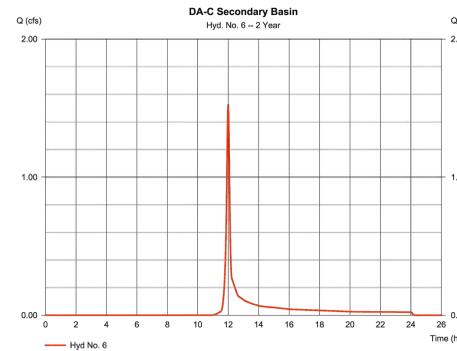
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 6
 DA-C Secondary Basin

Hydrograph type = SCS Runoff Peak discharge = 1.528 cfs
 Storm frequency = 2 yrs Time to peak = 12.00 hrs
 Time interval = 1 min Hyd. volume = 3,516 cuft
 Drainage area = 1,190 ac Curve number = 78
 Basin Slope = 0.0 % Hydraulic length = 0 ft
 Tc method = User Time of conc. (Tc) = 9.90 min
 Total precip. = 2.54 in Distribution = Type II
 Storm duration = 24 hrs Shape factor = 484



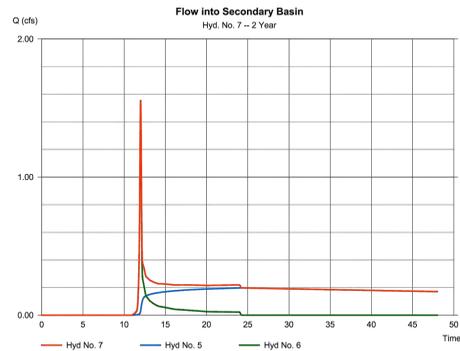
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 7
 Flow into Secondary Basin

Hydrograph type = Combine Peak discharge = 1.559 cfs
 Storm frequency = 2 yrs Time to peak = 12.00 hrs
 Time interval = 1 min Hyd. volume = 27,055 cuft
 Inflow hyd. No. = 5, 6 Contrib. drain. area = 1,190 ac



Hydrograph Report

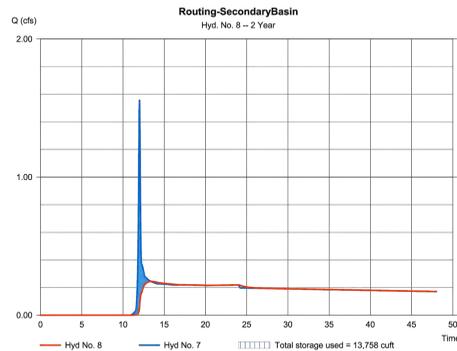
22

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 8
 Routing-SecondaryBasin

Hydrograph type = Reservoir Peak discharge = 0.244 cfs
 Storm frequency = 2 yrs Time to peak = 13.43 hrs
 Time interval = 1 min Hyd. volume = 25,550 cuft
 Inflow hyd. No. = 7 - Flow into Secondary Basin Max. Elevation = 1818.03 ft
 Reservoir name = Existing Secondary Basin Max. Storage = 13,758 cuft

Storage indication method used. Wet pond routing start elevation = 1817.80 ft.



Hydrograph Summary Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph Description
1	SCS Runoff	83.16	1	728	298,546	---	---	---	DA-B Quarry
2	Reservoir	0.000	1	n/a	0	1	1765.92	298,546	Routing - Quarry Basin
3	SCS Runoff	39.71	1	726	131,267	---	---	---	DA-A Primary Basin
4	Combine	39.71	1	726	131,267	2, 3	---	---	Flow into Primary Basin
5	Reservoir	0.263	1	1457	31,997	4	1822.99	370,642	Routing-Primary Basin
6	SCS Runoff	2.627	1	720	5,948	---	---	---	DA-C Secondary Basin
7	Combine	2.713	1	720	37,944	5, 6	---	---	Flow into Secondary Basin
8	Reservoir	0.555	1	740	38,256	7	1818.17	14,581	Routing-SecondaryBasin

Existing Stormwater Routing.gpw Return Period: 10 Year Thursday, 04 / 27 / 2023

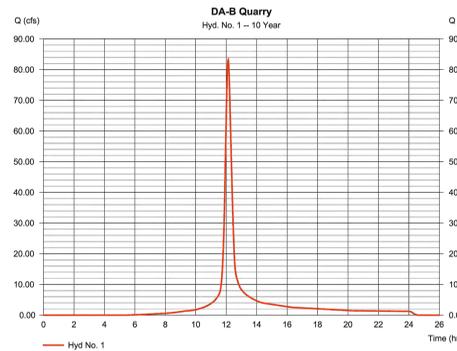
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 1
 DA-B Quarry

Hydrograph type = SCS Runoff Peak discharge = 83.16 cfs
 Storm frequency = 10 yrs Time to peak = 12.13 hrs
 Time interval = 1 min Hyd. volume = 298,546 cuft
 Drainage area = 35,790 ac Curve number = 90
 Basin Slope = 0.0 % Hydraulic length = 0 ft
 Tc method = User Time of conc. (Tc) = 24.70 min
 Total precip. = 3.34 in Distribution = Type II
 Storm duration = 24 hrs Shape factor = 484



Hydrograph Report

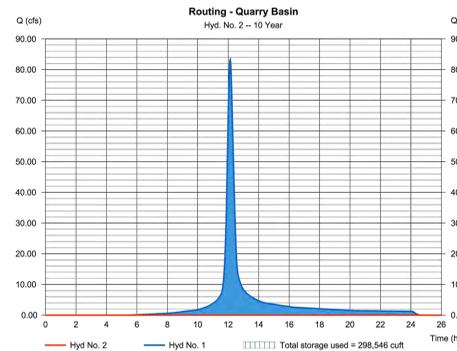
25

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 2
 Routing - Quarry Basin

Hydrograph type = Reservoir Peak discharge = 0.000 cfs
 Storm frequency = 10 yrs Time to peak = n/a
 Time interval = 1 min Hyd. volume = 0 cuft
 Inflow hyd. No. = 1 - DA-B Quarry Max. Elevation = 1765.92 ft
 Reservoir name = Quarry Basin Max. Storage = 298,546 cuft

Storage indication method used.



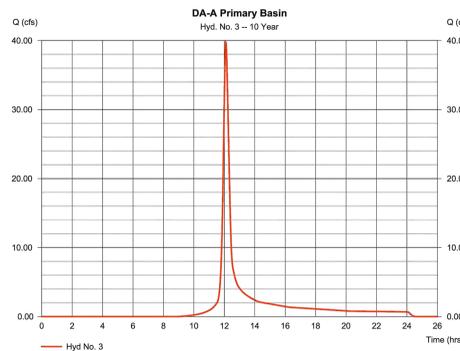
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 3
 DA-A Primary Basin

Hydrograph type = SCS Runoff Peak discharge = 39.71 cfs
 Storm frequency = 10 yrs Time to peak = 12.10 hrs
 Time interval = 1 min Hyd. volume = 131,267 cuft
 Drainage area = 22,670 ac Curve number = 81
 Basin Slope = 0.0 % Hydraulic length = 0 ft
 Tc method = User Time of conc. (Tc) = 21.00 min
 Total precip. = 3.34 in Distribution = Type II
 Storm duration = 24 hrs Shape factor = 484



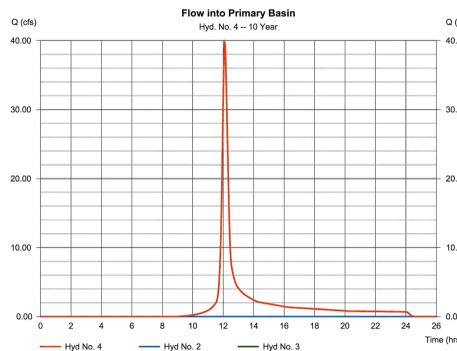
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 4
 Flow into Primary Basin

Hydrograph type = Combine Peak discharge = 39.71 cfs
 Storm frequency = 10 yrs Time to peak = 12.10 hrs
 Time interval = 1 min Hyd. volume = 131,267 cuft
 Inflow hyd. No. = 2, 3 Contrib. drain. area = 22,670 ac



Hydrograph Report

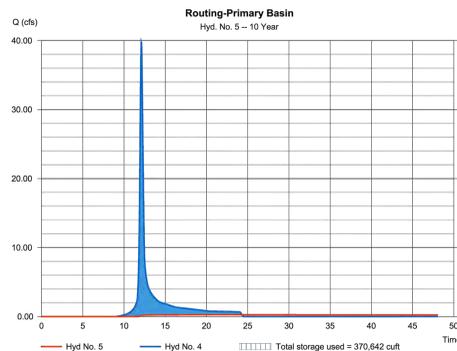
28

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 5
 Routing-Primary Basin

Hydrograph type = Reservoir Peak discharge = 0.263 cfs
 Storm frequency = 10 yrs Time to peak = 24.28 hrs
 Time interval = 1 min Hyd. volume = 31,997 cuft
 Inflow hyd. No. = 4 - Flow into Primary Basin Max. Elevation = 1822.99 ft
 Reservoir name = Existing Primary Basin Max. Storage = 370,642 cuft

Storage indication method used. Wet pond routing start elevation = 1821.50 ft.



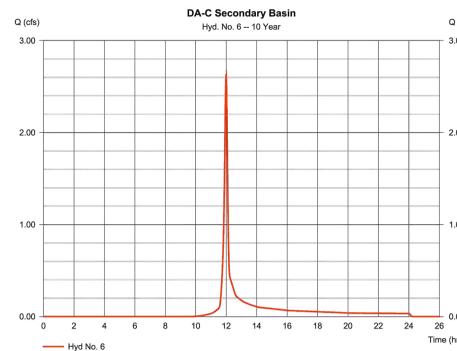
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 6
 DA-C Secondary Basin

Hydrograph type = SCS Runoff Peak discharge = 2.627 cfs
 Storm frequency = 10 yrs Time to peak = 12.00 hrs
 Time interval = 1 min Hyd. volume = 5,948 cuft
 Drainage area = 1,190 ac Curve number = 78
 Basin Slope = 0.0 % Hydraulic length = 0 ft
 Tc method = User Time of conc. (Tc) = 9.90 min
 Total precip. = 3.34 in Distribution = Type II
 Storm duration = 24 hrs Shape factor = 484



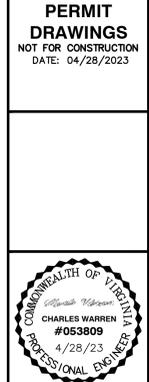
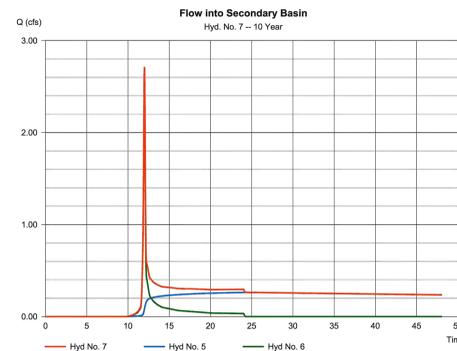
Hydrograph Report

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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Thursday, 04 / 27 / 2023

Hyd. No. 7
 Flow into Secondary Basin

Hydrograph type = Combine Peak discharge = 2.713 cfs
 Storm frequency = 10 yrs Time to peak = 12.00 hrs
 Time interval = 1 min Hyd. volume = 37,944 cuft
 Inflow hyd. No. = 5, 6 Contrib. drain. area = 1,190 ac



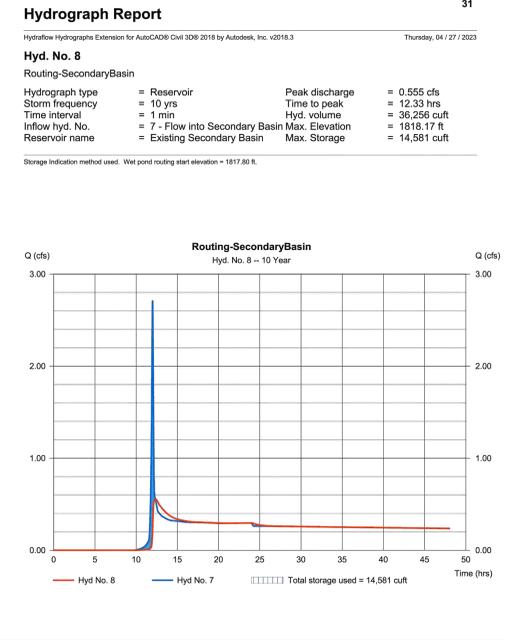
DATE	
REVISION	
NO.	

SHEET TITLE: STORMWATER CALCULATIONS 3
 PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
 2655 VALLEY DRIVE
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CADD FILE: 02218208.05
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 SCALE: AS SHOWN
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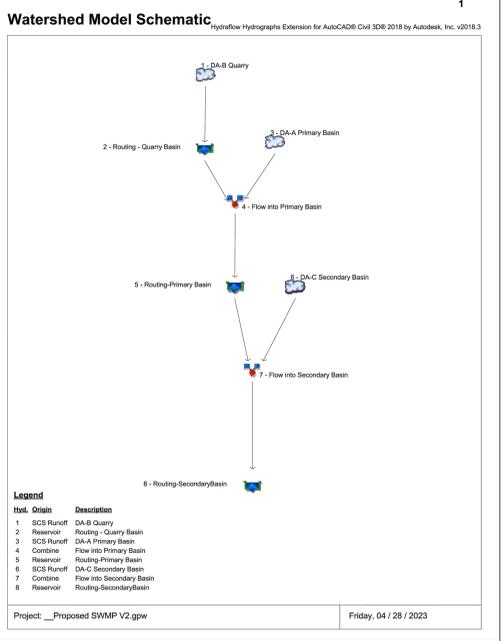
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END OF EXISTING CONDITIONS STORMWATER ANALYSIS

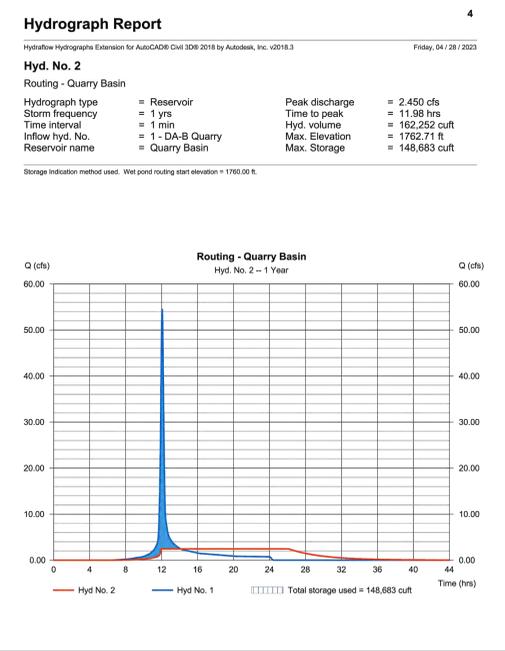
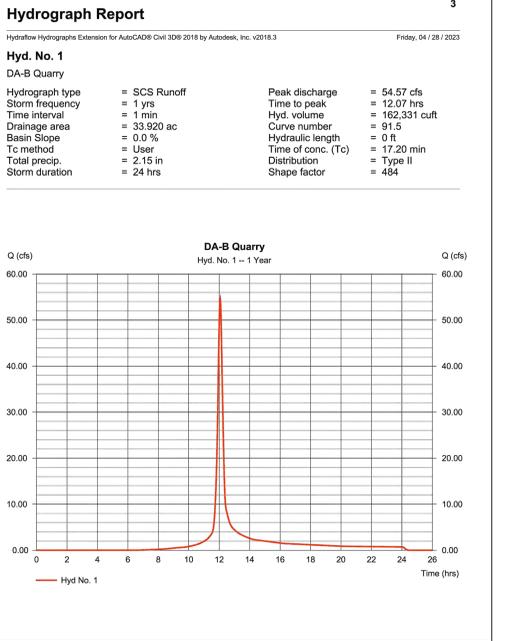


Hydrograph Summary Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow (hyds)	Maximum elevation (ft)	Total stage used (cuft)	Hydrograph Description
1	SCS Runoff	54.57	1	724	162,331	---	---	---	DA-B Quarry
2	Reservoir	2,450	1	719	162,252	1	1762.71	148,683	Routing - Quarry Basin
3	SCS Runoff	16.83	1	727	58,297	---	---	---	DA-A Primary Basin
4	Combine	19.28	1	727	220,949	2, 3	---	---	Flow into Primary Basin
5	Reservoir	0.417	1	1956	48,143	4	1817.38	314,773	Routing-Primary Basin
6	SCS Runoff	1,320	1	720	3,031	---	---	---	DA-C Secondary Basin
7	Combine	1,390	1	720	51,174	5, 6	---	---	Flow into Secondary Basin
8	Reservoir	0.221	1	2880	20,179	7	1815.94	30,990	Routing-SecondaryBasin

Project: __Proposed SWMP V2.gwg Return Period: 1 Year Friday, 04 / 28 / 2023



Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Pond No. 1 - Quarry Basin

Pond Data
Pond storage is based on user-defined values.

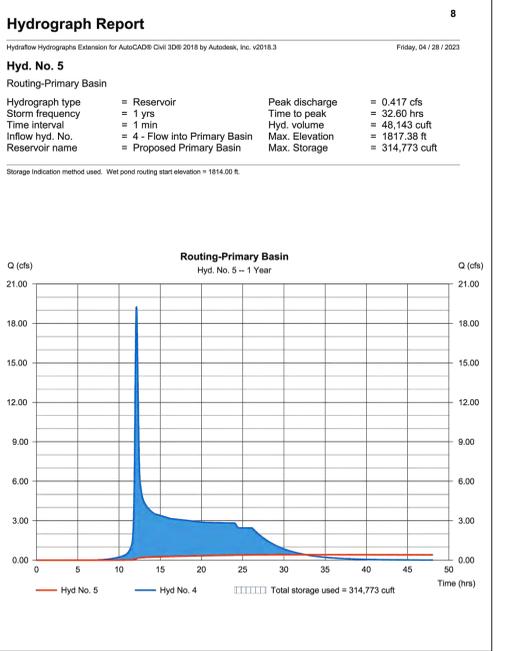
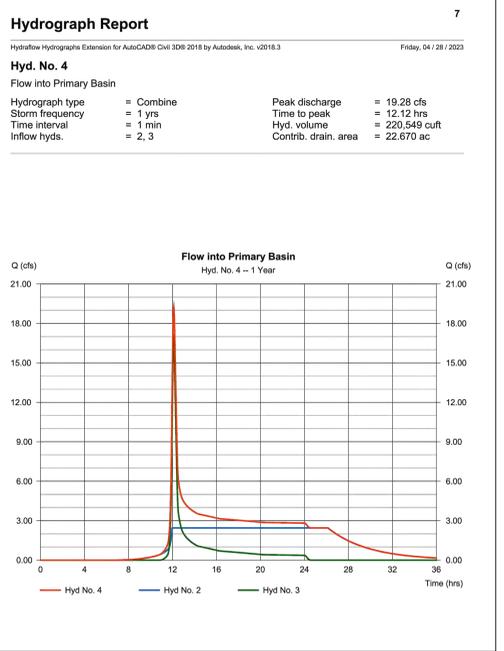
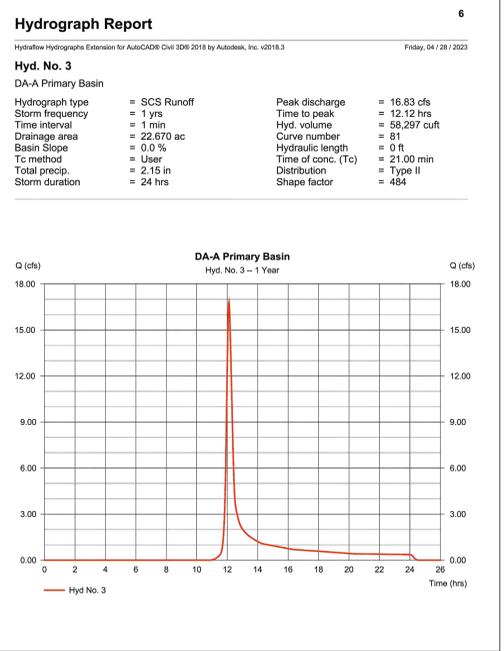
Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1762.00	n/a	0	0
1.00	1767.00	n/a	4,696	4,696
2.00	1768.00	n/a	9,031	13,727
3.00	1769.00	n/a	14,819	28,546
4.00	1769.00	n/a	24,299	52,829
5.00	1769.00	n/a	32,197	85,026
6.00	1769.00	n/a	38,271	123,297
7.00	1769.00	n/a	43,295	166,592
8.00	1769.00	n/a	47,841	214,433
9.00	1769.00	n/a	51,961	266,394
10.00	1769.00	n/a	55,284	321,678
11.00	1769.00	n/a	58,284	380,362
12.00	1769.00	n/a	60,589	441,951
13.00	1769.00	n/a	62,633	506,584
14.00	1770.00	n/a	70,299	576,883

Culvert / Office Structures

	[A]	[B]	[C]	[P/R/R]		[A]	[B]	[C]	[D]
Rise (ft)	Inactive	Inactive	Inactive	Inactive	Crest Len (ft)	= 0.00	0.00	0.00	0.00
Span (ft)	= 0.00	0.00	0.00	0.00	Crest Eil. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert Eil. (ft)	= 0.00	0.00	0.00	0.00	Weir Type	=	---	---	---
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	0.00					
N-Value	= 0.13	0.13	0.13	n/a	Exit (in/hr)	= 0.000 (By Wet area)			
Orifice Coeff.	= 0.60	0.60	0.60	0.60	TW Elev. (ft)	= 0.00			
Multi-Stage	= n/a	No	No	No					

Note: Culvert/Office outfalls are analyzed under wet (c) and outlet (cc) control. Weir flows checked for orifice conditions (cc) and submergence (cc).

Stage / Discharge



Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Pond No. 2 - Proposed Primary Basin

Pond Data
Pond storage is based on user-defined values.

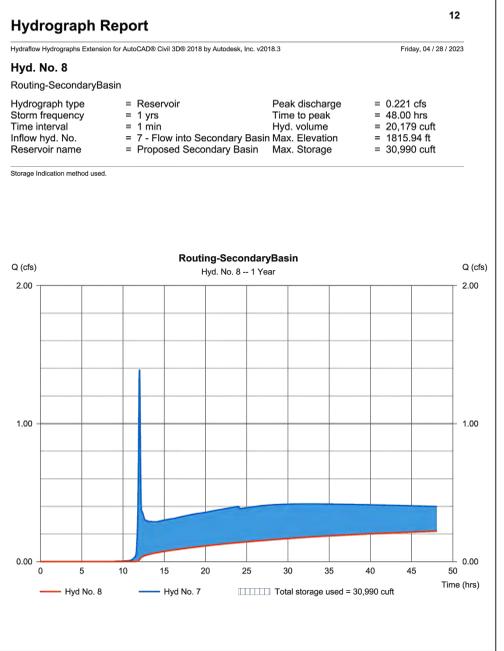
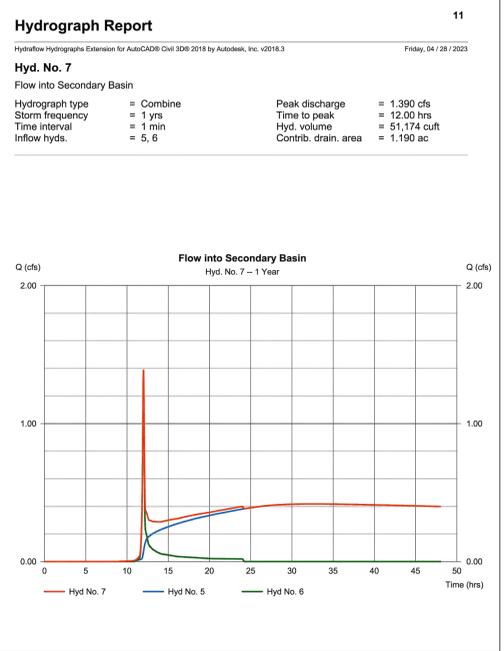
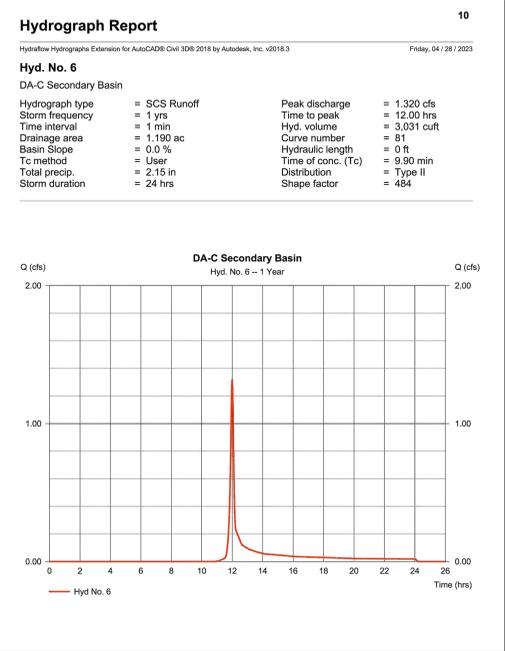
Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1810.00	n/a	0	0
1.00	1811.00	n/a	12,838	12,838
2.00	1812.00	n/a	31,318	44,154
3.00	1813.00	n/a	50,434	94,588
4.00	1814.00	n/a	69,852	164,440
5.00	1815.00	n/a	89,270	253,710
6.00	1816.00	n/a	108,688	362,398
7.00	1817.00	n/a	128,106	490,504
8.00	1818.00	n/a	147,524	638,028
9.00	1819.00	n/a	166,942	804,970
10.00	1820.00	n/a	186,360	991,330
11.00	1821.00	n/a	205,778	1,197,108
12.00	1822.00	n/a	225,196	1,422,304
13.00	1823.00	n/a	244,614	1,666,918

Culvert / Office Structures

	[A]	[B]	[C]	[P/R/R]		[A]	[B]	[C]	[D]
Rise (ft)	= 24.00	3.00	3.00	Inactive	Crest Len (ft)	= 12.57	10.00	Inactive	0.00
Span (ft)	= 24.00	3.00	3.00	0.00	Crest Eil. (ft)	= 1821.00	1820.00	1820.00	0.00
No. Barrels	= 1	1	1	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert Eil. (ft)	= 1814.00	1810.00	1820.00	0.00	Weir Type	= 1	10 sqft	Rect	---
Length (ft)	= 95.63	0.00	30.00	0.00	Multi-Stage	= Yes	Yes	No	No
Slope (%)	= 1.00	0.00	0.00	n/a					
N-Value	= 0.11	0.13	0.13	n/a	Exit (in/hr)	= 0.000 (By Wet area)			
Orifice Coeff.	= 0.60	0.60	0.60	0.60	TW Elev. (ft)	= 0.00			
Multi-Stage	= n/a	Yes	Yes	No					

Note: Culvert/Office outfalls are analyzed under wet (c) and outlet (cc) control. Weir flows checked for orifice conditions (cc) and submergence (cc).

Stage / Discharge



Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Pond No. 3 - Proposed Secondary Basin

Pond Data
Pond storage is based on user-defined values.

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1813.00	n/a	0	0
1.00	1814.00	n/a	8,368	8,368
2.00	1815.00	n/a	10,305	18,673
3.00	1816.00	n/a	11,826	30,499
4.00	1817.00	n/a	13,227	43,726
5.00	1818.00	n/a	14,700	58,426
6.00	1819.00	n/a	16,349	74,775

Culvert / Office Structures

	[A]	[B]	[C]	[P/R/R]		[A]	[B]	[C]	[D]
Rise (ft)	= 24.00	2.25	3.00	0.00	Crest Len (ft)	= 12.57	10.00	Inactive	0.00
Span (ft)	= 24.00	2.25	3.00	0.00	Crest Eil. (ft)	= 1817.00	1816.00	1816.00	0.00
No. Barrels	= 1	1	1	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert Eil. (ft)	= 1813.00	1813.00	1816.00	0.00	Weir Type	= 1	10 sqft	Rect	---
Length (ft)	= 70.36	0.00	0.00	0.00	Multi-Stage	= Yes	Yes	5 sqft	---
Slope (%)	= 1.42	0.00	0.00	n/a					
N-Value	= 0.11	0.13	0.13	n/a	Exit (in/hr)	= 0.000 (By Wet area)			
Orifice Coeff.	= 0.60	0.60	0.60	0.60	TW Elev. (ft)	= 0.00			
Multi-Stage	= n/a	Yes	Yes	No					

Note: Culvert/Office outfalls are analyzed under wet (c) and outlet (cc) control. Weir flows checked for orifice conditions (cc) and submergence (cc).

Stage / Discharge

PERMIT DRAWINGS NOT FOR CONSTRUCTION DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
 CHARLES WARREN
 #053809
 4/28/23
 PROFESSIONAL ENGINEER

DATE: _____
 REVISION: _____

NO. _____

SHEET TITLE: **STORMWATER CALCULATIONS 4**

PROJECT TITLE: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**

SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

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

DESIGNED BY: _____
 CHECKED BY: _____
 DRAWN BY: _____
 DATE: _____

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 10000 WOODLAND AVENUE
 PHOENIX, AZ 85024
 PH: (602) 997-4140 FAX: (602) 997-4243

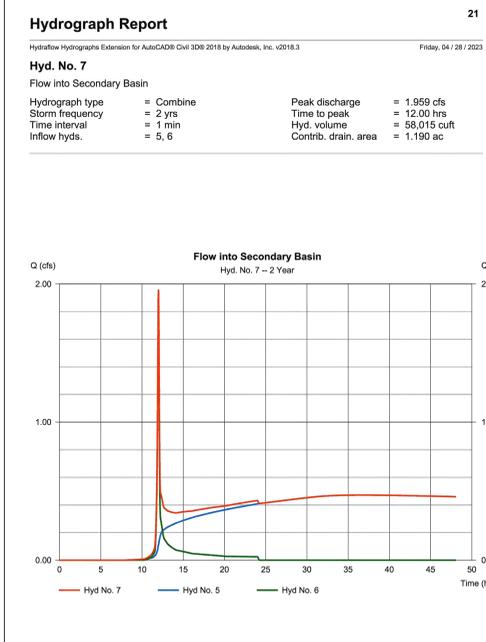
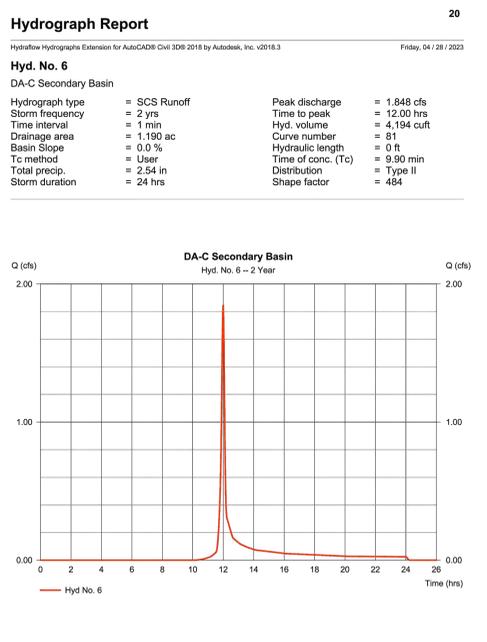
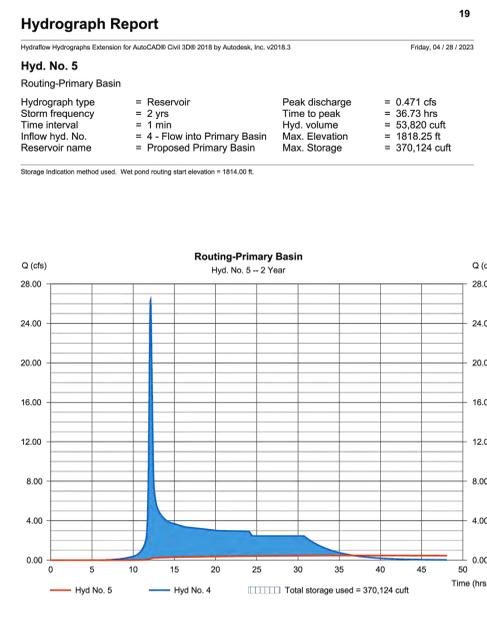
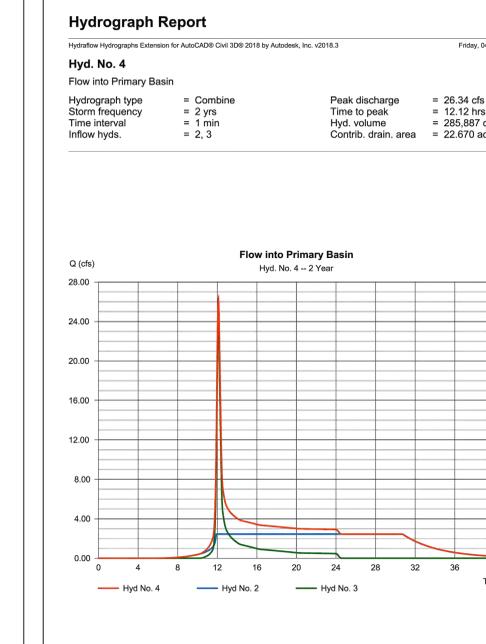
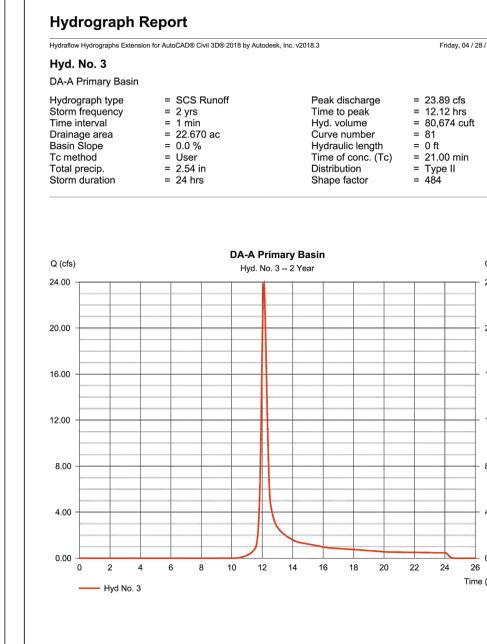
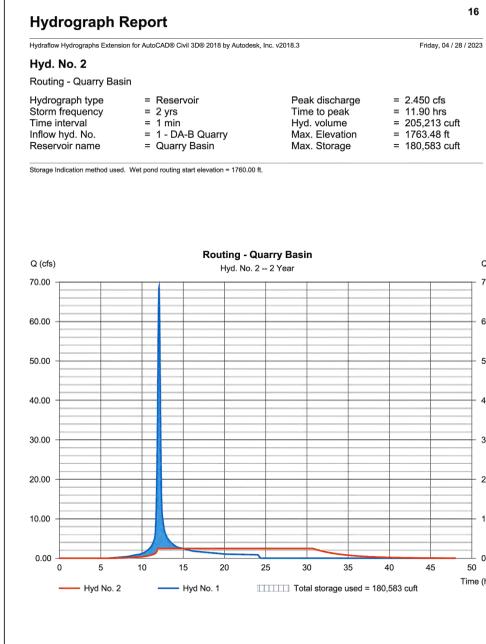
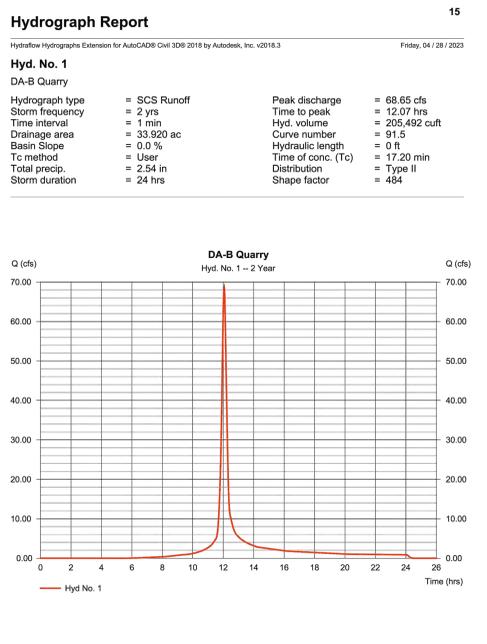
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 DATE: 4/28/23
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 DRAWING NO. 18 of 21

Hydrograph Summary Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Friday, 04 / 28 / 2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph Description
1	SCS Runoff	68.65	1	724	205,492	---	---	---	DA-B Quarry
2	Reservoir	2,450	1	714	205,213	1	1763.48	180,583	Routing - Quarry Basin
3	SCS Runoff	23.89	1	727	80,674	---	---	---	DA-A Primary Basin
4	Combine	26.34	1	727	285,887	2, 3	---	---	Flow into Primary Basin
5	Reservoir	0.471	1	2204	53,820	4	1818.25	370,124	Routing-Primary Basin
6	SCS Runoff	1,848	1	720	4,194	---	---	---	DA-C Secondary Basin
7	Combine	1,959	1	720	58,015	5, 6	---	---	Flow into Secondary Basin
8	Reservoir	0.236	1	2880	21,859	7	1816.33	36,149	Routing-SecondaryBasin

___Proposed SWMP V2.gpw Return Period: 2 Year Friday, 04 / 28 / 2023

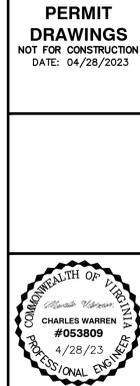
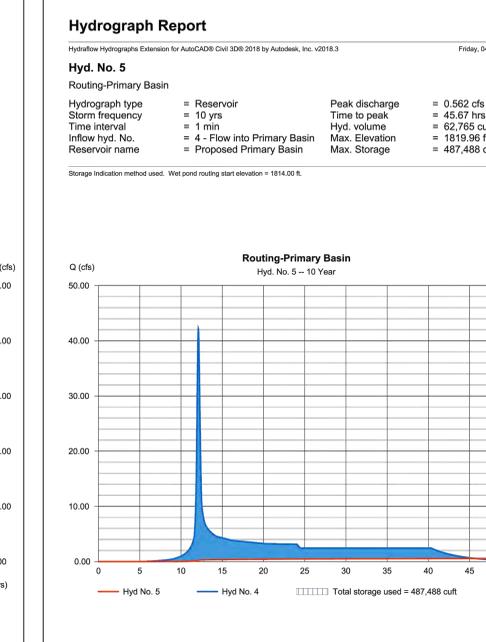
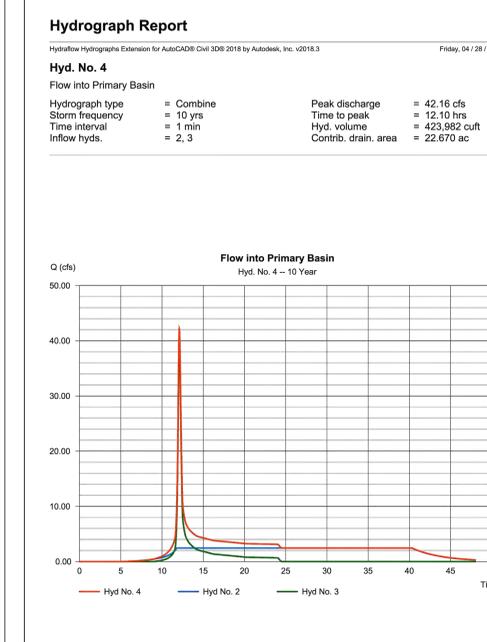
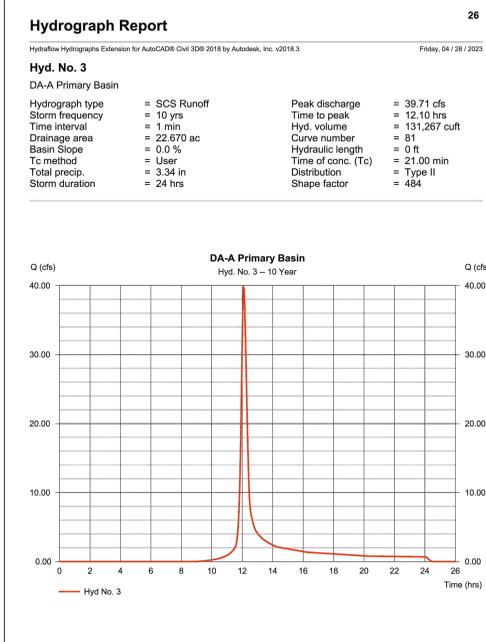
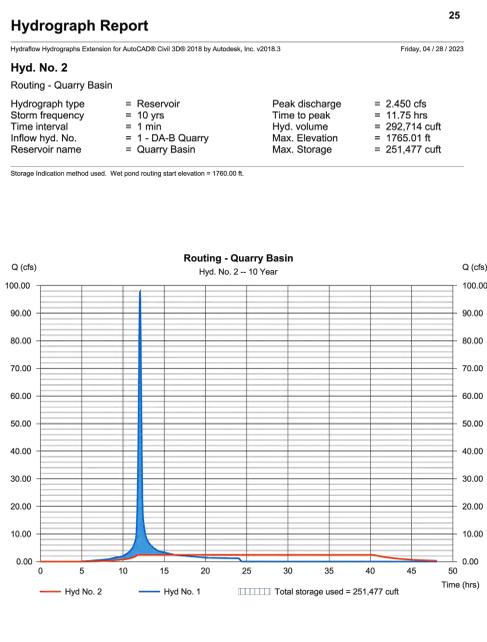
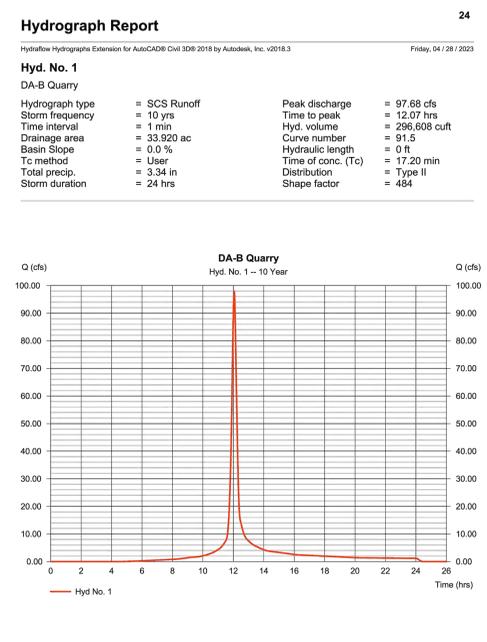


Hydrograph Summary Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3
Friday, 04 / 28 / 2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph Description
1	SCS Runoff	68.65	1	724	205,492	---	---	---	DA-B Quarry
2	Reservoir	2,450	1	705	202,714	1	1765.01	251,477	Routing - Quarry Basin
3	SCS Runoff	39.71	1	726	131,267	---	---	---	DA-A Primary Basin
4	Combine	42.16	1	726	423,982	2, 3	---	---	Flow into Primary Basin
5	Reservoir	0.562	1	2740	62,765	4	1819.96	487,468	Routing-Primary Basin
6	SCS Runoff	3,017	1	719	6,825	---	---	---	DA-C Secondary Basin
7	Combine	3,187	1	720	69,590	5, 6	---	---	Flow into Secondary Basin
8	Reservoir	0.375	1	2880	26,069	7	1816.89	43,496	Routing-SecondaryBasin

___Proposed SWMP V2.gpw Return Period: 10 Year Friday, 04 / 28 / 2023



DATE	
REVISION	
NO.	

SHEET TITLE: STORMWATER CALCULATIONS 5
 PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

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

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 10000 WOODLAND AVENUE, SUITE 100
 PHOENIX, AZ 85024
 TEL: (602) 997-7440 FAX: (602) 997-7443

DATE: 4/28/23
 SCALE: AS SHOWN
 DRAWING NO.: 19 of 21

Project: 02218208.05 Drawings: EVOH Cover System Design - SWP#588 Construction Plans V02F

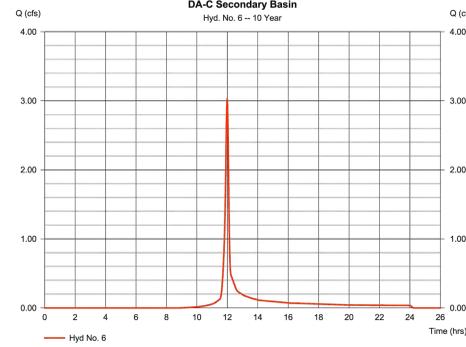
Hydrograph Report

29

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 6
DA-C Secondary Basin

Hydrograph type = SCS Runoff	Peak discharge = 3.017 cfs
Storm frequency = 10 yrs	Time to peak = 11.98 hrs
Time interval = 1 min	Hyd. volume = 6,825 cuft
Drainage area = 1.190 ac	Curve number = 81
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 9.90 min
Total precip. = 3.34 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484



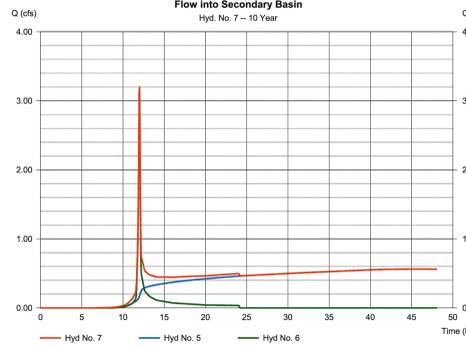
Hydrograph Report

30

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 7
Flow into Secondary Basin

Hydrograph type = Combine	Peak discharge = 3.187 cfs
Storm frequency = 10 yrs	Time to peak = 12.00 hrs
Time interval = 1 min	Hyd. volume = 69,590 cuft
Inflow hydro. = 5, 6	Contrib. drain. area = 1.190 ac



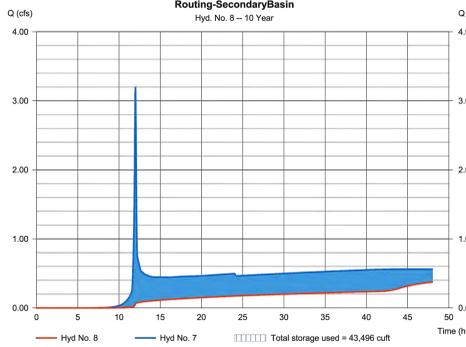
Hydrograph Report

31

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 8
Routing-SecondaryBasin

Hydrograph type = Reservoir	Peak discharge = 0.375 cfs
Storm frequency = 10 yrs	Time to peak = 48.00 hrs
Time interval = 1 min	Hyd. volume = 26,089 cuft
Inflow hydro. No. = 7 - Flow into Secondary Basin	Max. Elevation = 1816.88 ft
Reservoir name = Proposed Secondary Basin	Max. Storage = 43,496 cuft



Hydrograph Summary Report

32

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time to Peak (min)	Time to Peak (hrs)	Hyd. volume (cuft)	Inflow hydro.	Maximum elevation (ft)	Total surge used (cuft)	Hydrograph Description
1	SCS Runoff	137.93	1	723	426,229	---	---	---	DA-B Quarry
2	Reservoir	2.450	1	671	342,092	1	1766.99	358,553	Routing - Quarry Basin
3	SCS Runoff	63.36	1	726	208,114	---	---	---	DA-A Primary Basin
4	Combine	65.81	1	726	550,206	2, 3	---	---	Flow into Primary Basin
5	Reservoir	2.438	1	2880	101,534	4	1821.11	573,719	Routing-Primary Basin
6	SCS Runoff	4.763	1	719	10,820	---	---	---	DA-C Secondary Basin
7	Combine	4.999	1	719	112,354	5, 6	---	---	Flow into Secondary Basin
8	Reservoir	2.436	1	2880	65,474	7	1817.13	46,880	Routing-SecondaryBasin

STORMWATER ANALYSIS SUMMARY FOR 10-YEAR STORM EVENT

Proposed SWMP V2.gpw Return Period: 100 Year Friday, 04 / 28 / 2023

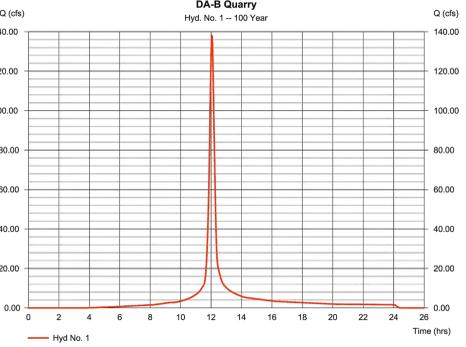
Hydrograph 100 YEAR STORM EVENT HYDROGRAPHS:

33

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 1
DA-B Quarry

Hydrograph type = SCS Runoff	Peak discharge = 137.93 cfs
Storm frequency = 100 yrs	Time to peak = 12.05 hrs
Time interval = 1 min	Hyd. volume = 426,229 cuft
Drainage area = 33,920 ac	Curve number = 81.5
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 17.20 min
Total precip. = 4.45 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484



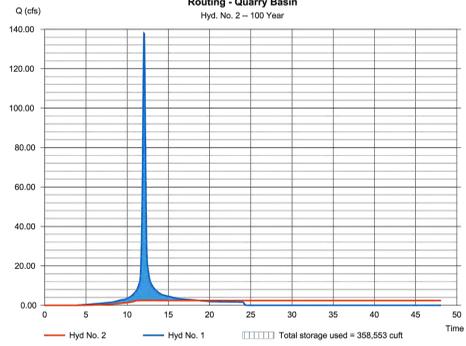
Hydrograph Report

34

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 2
Routing - Quarry Basin

Hydrograph type = Reservoir	Peak discharge = 2.450 cfs
Storm frequency = 100 yrs	Time to peak = 11.18 hrs
Time interval = 1 min	Hyd. volume = 342,092 cuft
Inflow hydro. No. = 1 - DA-B Quarry	Max. Elevation = 1766.99 ft
Reservoir name = Quarry Basin	Max. Storage = 358,553 cuft



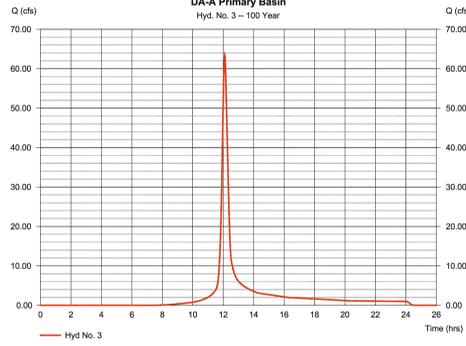
Hydrograph Report

35

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 3
DA-A Primary Basin

Hydrograph type = SCS Runoff	Peak discharge = 63.36 cfs
Storm frequency = 100 yrs	Time to peak = 12.10 hrs
Time interval = 1 min	Hyd. volume = 208,114 cuft
Drainage area = 22,670 ac	Curve number = 81
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 21.00 min
Total precip. = 4.45 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484



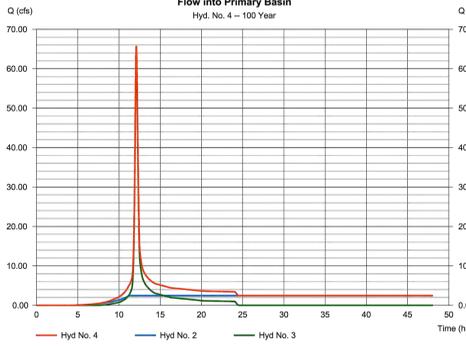
Hydrograph Report

36

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 4
Flow into Primary Basin

Hydrograph type = Combine	Peak discharge = 65.81 cfs
Storm frequency = 100 yrs	Time to peak = 12.10 hrs
Time interval = 1 min	Hyd. volume = 550,206 cuft
Inflow hydro. = 2, 3	Contrib. drain. area = 22,670 ac



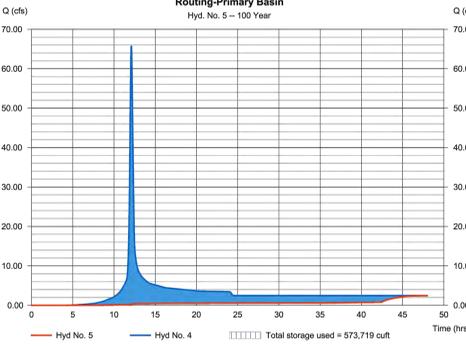
Hydrograph Report

37

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 5
Routing-Primary Basin

Hydrograph type = Reservoir	Peak discharge = 2.438 cfs
Storm frequency = 100 yrs	Time to peak = 48.00 hrs
Time interval = 1 min	Hyd. volume = 101,534 cuft
Inflow hydro. No. = 4 - Flow into Primary Basin	Max. Elevation = 1821.11 ft
Reservoir name = Proposed Primary Basin	Max. Storage = 573,719 cuft



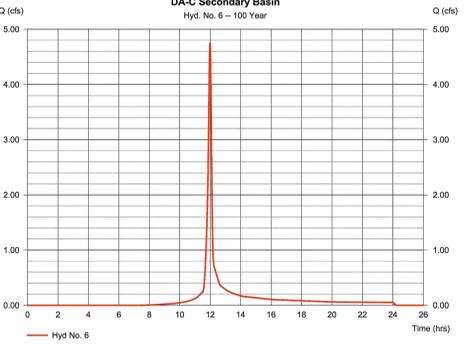
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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 6
DA-C Secondary Basin

Hydrograph type = SCS Runoff	Peak discharge = 4.763 cfs
Storm frequency = 100 yrs	Time to peak = 11.98 hrs
Time interval = 1 min	Hyd. volume = 10,820 cuft
Drainage area = 1.190 ac	Curve number = 81
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 9.90 min
Total precip. = 4.45 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484



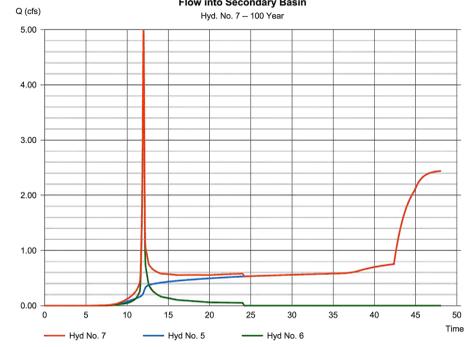
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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 7
Flow into Secondary Basin

Hydrograph type = Combine	Peak discharge = 4.999 cfs
Storm frequency = 100 yrs	Time to peak = 11.98 hrs
Time interval = 1 min	Hyd. volume = 112,354 cuft
Inflow hydro. = 5, 6	Contrib. drain. area = 1.190 ac



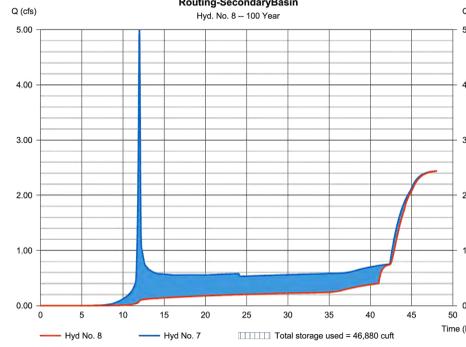
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Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 Friday, 04 / 28 / 2023

Hyd. No. 8
Routing-SecondaryBasin

Hydrograph type = Reservoir	Peak discharge = 2.436 cfs
Storm frequency = 100 yrs	Time to peak = 48.00 hrs
Time interval = 1 min	Hyd. volume = 65,474 cuft
Inflow hydro. No. = 7 - Flow into Secondary Basin	Max. Elevation = 1817.13 ft
Reservoir name = Proposed Secondary Basin	Max. Storage = 46,880 cuft



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END OF POST-EVOH COVER SYSTEM INSTALLATION 10-YEAR STORMWATER ANALYSIS.



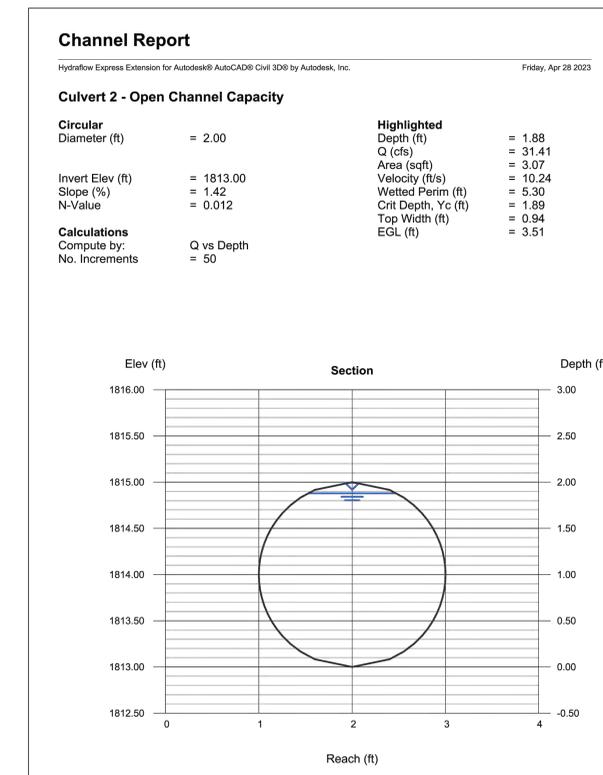
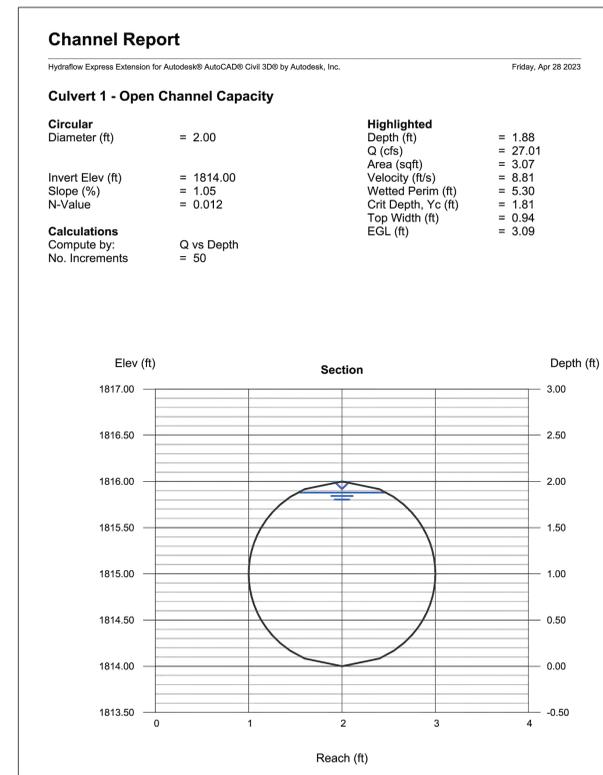
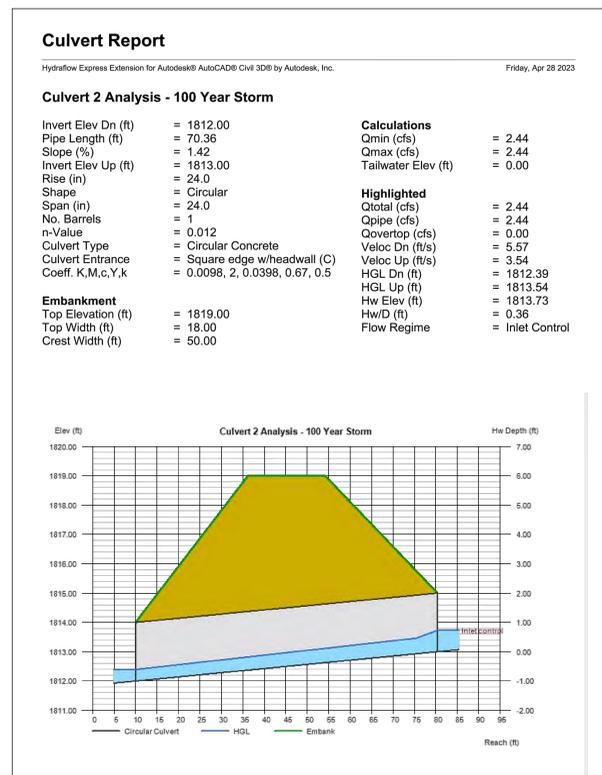
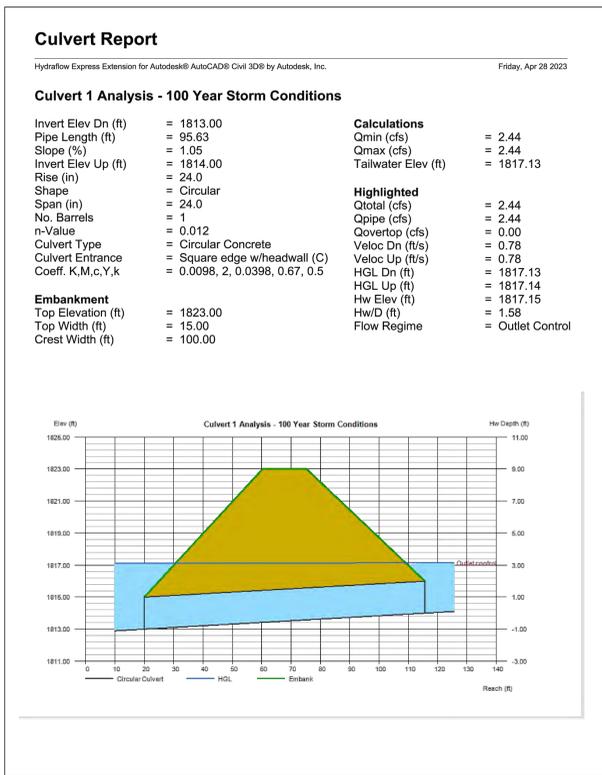
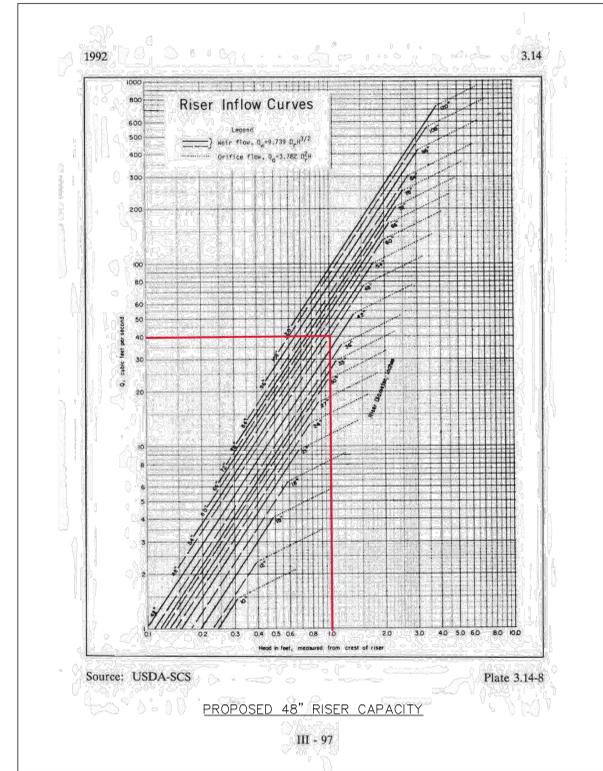
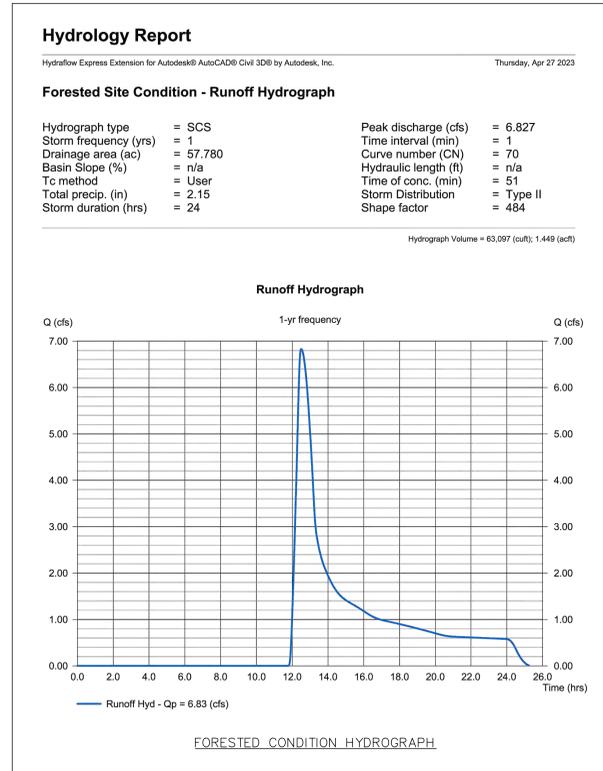
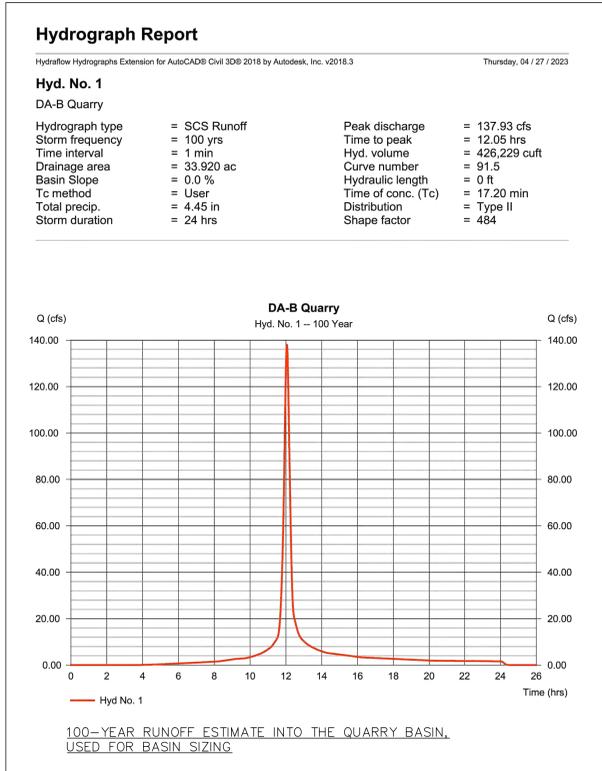
DATE	
REVISION	
NO.	

SHEET TITLE: STORMWATER CALCULATIONS 6
PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
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CLIENT: SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 10000 WOODBURN VA 22153 PH: (804) 878-7440 FAX: (804) 878-7443

CADD FILE: 02218208.05
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SCALE: AS SHOWN
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NO.	DATE	REVISION

SHEET TITLE: **STORMWATER CALCULATIONS 7**
PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
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