Sludge Sedimentation Basins Inflow Design Flood Control System Plan

Clover Power Station
Clover, Virginia

October 2021

Prepared For:

Virginia Electric and Power Company
4091 Clover Road
Clover, Virginia 24534

Prepared By:

TRC
50 International Drive, Suite 150
Greenville, South Carolina 29615

Jonathan Hotstream
Senior Scientist

Nakia Addison, P.E.
Project Manager

TABLE OF CONTENTS

FIGURES

APPENDICES

Revision History

Revision Number	Revision Date	Section Revised	Summary of Revisions
0	10/3/2016		Initial Issue
1	10/14/2021	1, 2, 3, App. A and C	Periodic 5-year revision.

1.0 Background

Virginia Electric and Power Company d/b/a Dominion Virginia Power (Dominion) owns[1] and operates the Clover Power Station. The purpose of this Inflow Design Flood Control System Plan (Plan) is to present the flood control features of the two retrofitted sludge sedimentation basins at the Clover Power Station. These two basins are managed in a manner that controls the inflow design flood, as required by the United States Environmental Protection Agency's (USEPA) final coal combustion residuals (CCR) rule, Title 40 Code of Federal Regulations (40 CFR) Part 257 Subpart D - "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments." The basins are considered existing surface impoundments according to the CCR rule (40 CFR 257.53).

[1] Old Dominion Electric Cooperative owns a 50% undivided interest in the Clover Power Station.

2.0 Inflow Design Flood Control

Hydrologic and hydraulic capacity requirements for CCR surface impoundments are set forth in 40 CFR 257.82. The sludge sedimentation basins are classified as Low Hazard in accordance with 40 CFR 57.73 and 40 CFR 257.74. Based on the Low Hazard potential classification, the CCR unit must adequately manage flow into the unit during and following the peak discharge of the 100-year flood (40 CFR 257.82(a)(3)(iii)).

The sludge sedimentation basins were designed in accordance with 40 CFR 257.82(a)(1), (2) and (3), requiring the CCR units to adequately manage inflows during and following peak discharge and to manage outflows to collect and control peak discharge for a 100-year flood due to the Low Hazard classification.

The Flood Insurance Rate Map for the Clover Power Station (National Flood Insurance Program 2009) indicates that the basins are located in an area determined to be outside the 0.2% annual chance flood, refer to Appendix B. Figures 1 and 2 show the extents of the 100-year flood. The basins are located in an area that is above the 100-year flood elevation; therefore, the basins will not experience surface water inflow during the design flood event. The basins have been designed with several inflow features presented in the sections below to mitigate and control floods.

2.1 Basin Operation

The sludge sedimentation basins are utilized for managing Station low volume process wastewaters. The basins are operated in parallel. Both basins are typically active and available to receive low volume wastewaters from the Station. As needed, accumulated solids are dewatered, removed, and transported to the Station's CCR landfill for disposal. The basins were designed to operate with freeboard, height difference from the top of the berm to the water level, to provide additional short-term storage in the basins.

The water level in the active basin is monitored by level transmitters located in the pump station wet well and during weekly visual inspections. The pump system is programmed to remove water from the basin based on high and low level switches. In addition to level switches, there are high and low level alarms that notify control operators in the Station of needed action.

The following control measures are implemented during basin operation to control the water levels in the basins:

- Operate the basins in parallel during typical operations. The system has the ability to operate the basins independently and isolate each basin for operation, maintenance and cleaning. Based on this use pattern, only one basin is at the operating water level at a time.
- Operate pumps as needed to control the basin water levels.
- Regularly check and maintain grades surrounding the basins to minimize the area contributing to storm water run-on.

2.2 Run-on Control

The basins were designed to control the storm water run-on from a 100-year, 24-hour storm event based upon the Precipitation Frequency Estimates from the National Oceanic and Atmospheric Administration. The storm water run-on volume calculated for the design storm was compared to the storage capacity above the operating water elevation. The evaluation determined that there is sufficient capacity in the basins when operating with 1.5 feet of freeboard, refer to Appendix C.

2.3 Pumping Capacity

The pump station is equipped with two Lawrence VPL3200 pumps with a rated pumping capacity of 410 gallons per minute (gpm) at 110 feet of head. The two pump configuration provides a duty pump and a backup pump in the event of malfunction, maintenance, or repair of the duty pump. A calculation was performed to determine the length of time required to remove the anticipated run-on due to a 100-year, 24-hour storm event, refer to Appendix B. The calculation was performed using only the capacity of the duty pump and resulted in a required time of 51 hours or approximately 2 days to remove the anticipated storm water run-on from both basins. This calculation shows that pumping rates are sufficient in controlling water levels in the basins.

2.4 Conclusions

The basins meet the requirements of 40 CFR 257.82 of adequately controlling the inflows and outflows of peak discharge at the Clover Power Station for the following reasons:

- The basins are located above the 100-year floodplain.
- The basins were adequately designed to manage precipitation volumes resulting from a 100-year, 24-hour storm event.
- The pumping rates are sufficient to control the water levels in both basins.

3.0 Amendment and Periodic Plan Revision

This Plan has been completed in compliance with the requirements set forth in 40 CFR 257.82. This document will be placed in the Station's CCR operating record, posted to the publicly accessible CCR website, and government notifications will be provided.

A periodic inflow design flood control system plan must be prepared every 5 years from the completion date of this Plan. The next Plan update is required by October 2026.

The Plan must be amended whenever the periodic review period is reached or if changes in site conditions occur that will sustainably affect the current written Plan.

4.0 References

TRC Engineers, Inc. 2021. Initial Hazard Potential Classification – Sludge Sedimentation Basins Clover Power Station. October 2021.

National Flood Insurance Program. 2009. Flood Insurance Rate Map: Halifax County Virginia Panel 350 of 625. Map Number 51083C0350D. Effective Date October 16, 2009. Federal Emergency Management Agency. Washington, D.C.

5.0 Certification

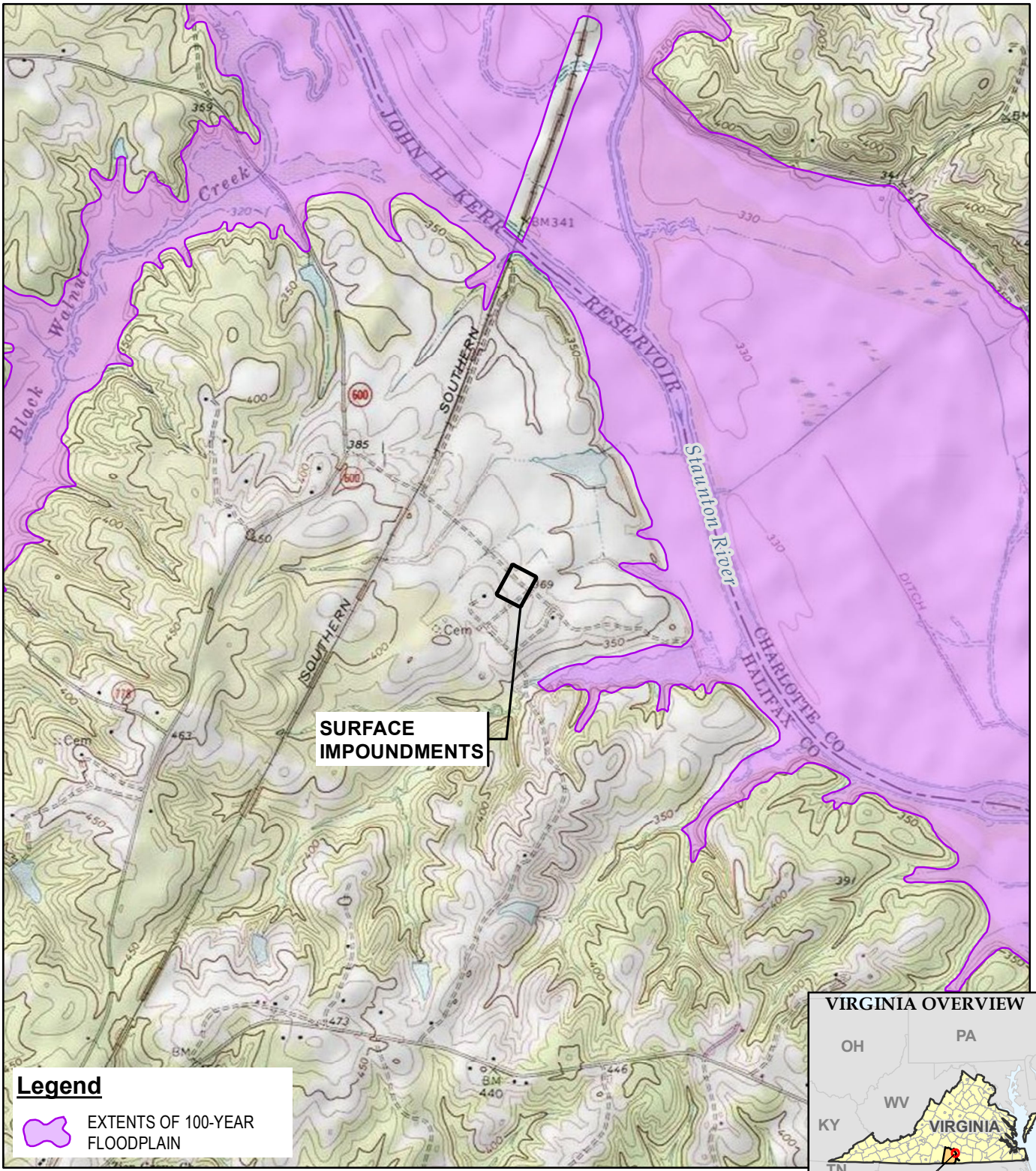
I, the undersigned Virginia Professional Engineer, hereby certify that I am familiar with the technical requirements of 40 CFR 257 Subpart D. I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of paragraph (a) of in 40 CFR 257.82.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Virginia Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.

Nakia Addison, P.E.	58245
Printed Name of Professional Engineer	Commonwealth of Virginia License Number
Signature of Professional Engineer	October 14, 2021
	Date

Saved By: AFOJTIK on 10/11/2021, 17:27:58 PM

TRC - GIS



-BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES, 1982.
-FLOOD DATA ACQUIRED FROM FEMA NATIONAL FLOOD HAZARD LAYER (NFHL).

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

E:\Projects\Dominion\CloverVA\430492\430492c.mxd

TRC

50 International Drive
Suite 150
Greenville, SC 29615
Phone: 864.281.0030

DOMINION RESOURCES SERVICES, INC.
CLOVER POWER STATION
CLOVER, HALIFAX COUNTY, VIRGINIA

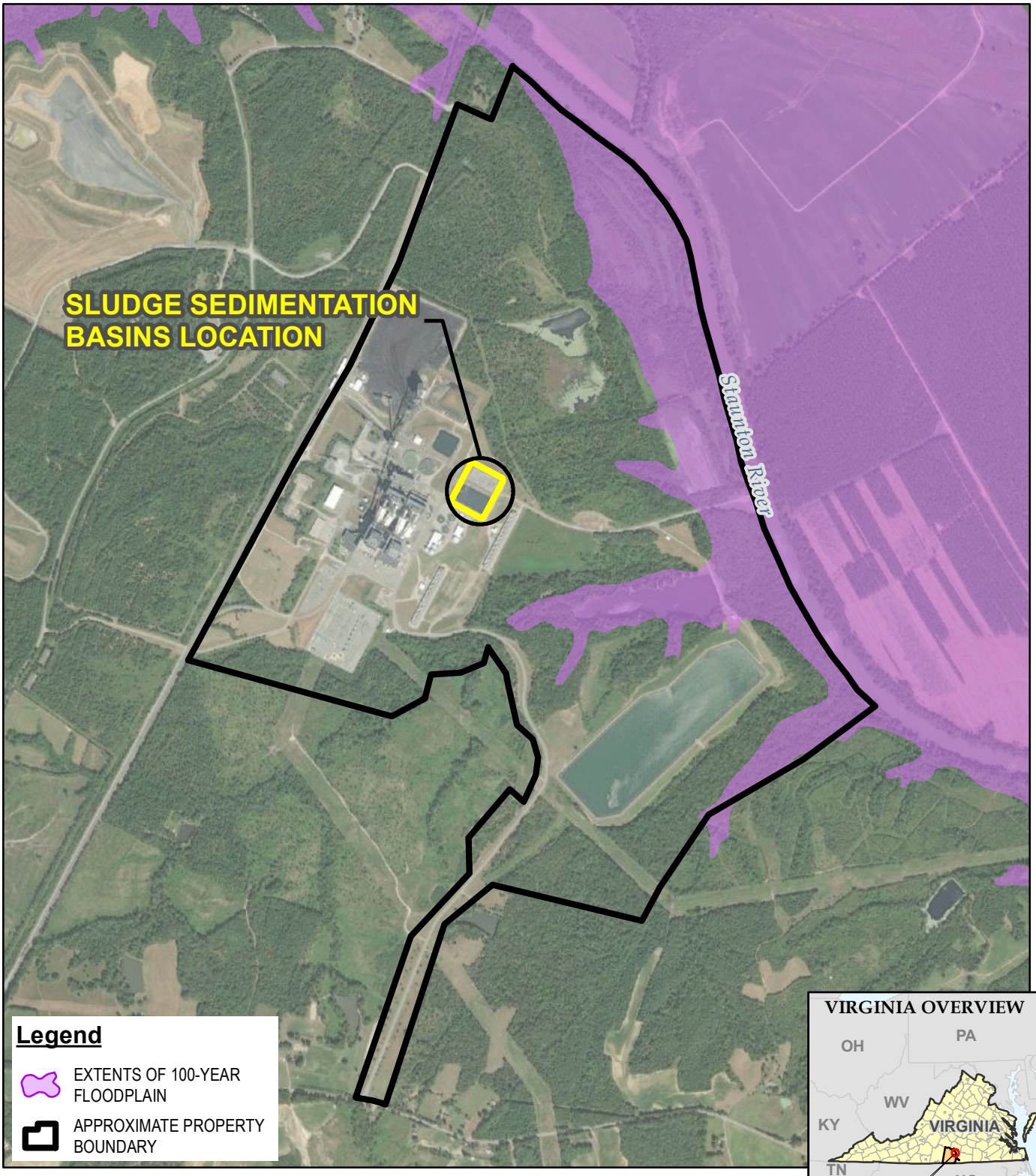
INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
SITE LOCATION MAP

DRAWN BY:	A FOJTIK
APPROVED BY:	J. HOTSTREAM
PROJECT NO:	430492
FILE NO.	430492c.mxd
DATE:	OCTOBER 2021

FIGURE 1

Saved By: AFOJTIK on 10/11/2021, 17:28:49 PM

TRC - GIS



-BASE MAP FROM COMMONWEALTH OF VIRGINIA ORTHOPHOTOGRAPHY, 2013.
-FLOOD DATA ACQUIRED FROM FEMA NATIONAL FLOOD HAZARD LAYER (NFHL).

1 " = 1,500 '
1:18,000

0 1,500 3,000 Feet

E:\Projects\Dominion\CloverVA\430492\430492d.mxd

TRC
50 International Drive
Suite 150
Greenville, SC 29615
Phone: 864.281.0030

DOMINION RESOURCES SERVICES, INC.
CLOVER POWER STATION
CLOVER, HALIFAX COUNTY, VIRGINIA

INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
SITE OVERVIEW MAP

DRAWN BY:	A FOJTIK
APPROVED BY:	J. HOTSTREAM
PROJECT NO:	430492
FILE NO.	430492d.mxd
DATE:	OCTOBER 2021

FIGURE 2

Appendix A: Selected Retrofit Design Drawings

CLOVER POWER STATION

RETROFIT - SLUDGE SEDIMENTATION BASINS
AS-BUILT DRAWINGS

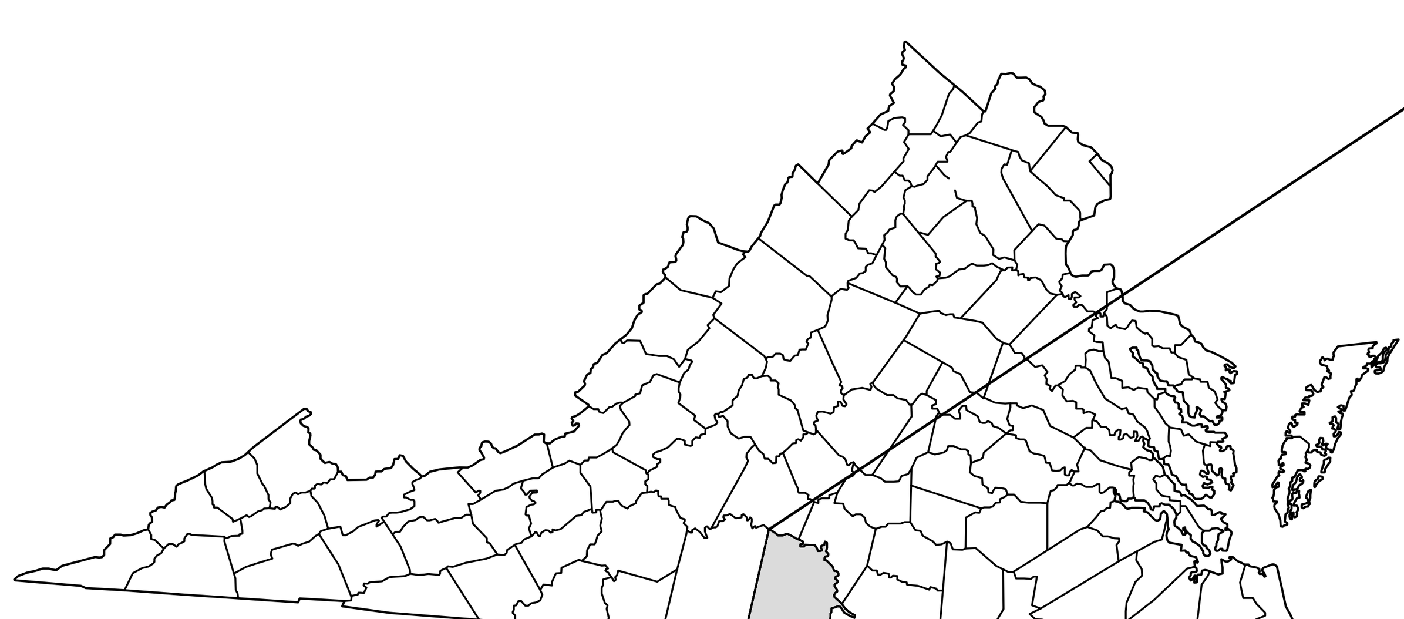
PREPARED FOR: DOMINION RESOURCES SERVICES, INC.
CLOVER POWER STATION
CLOVER, VIRGINIA

PREPARED BY: TRC ENGINEERS, INC.
GREENVILLE, SOUTH CAROLINA

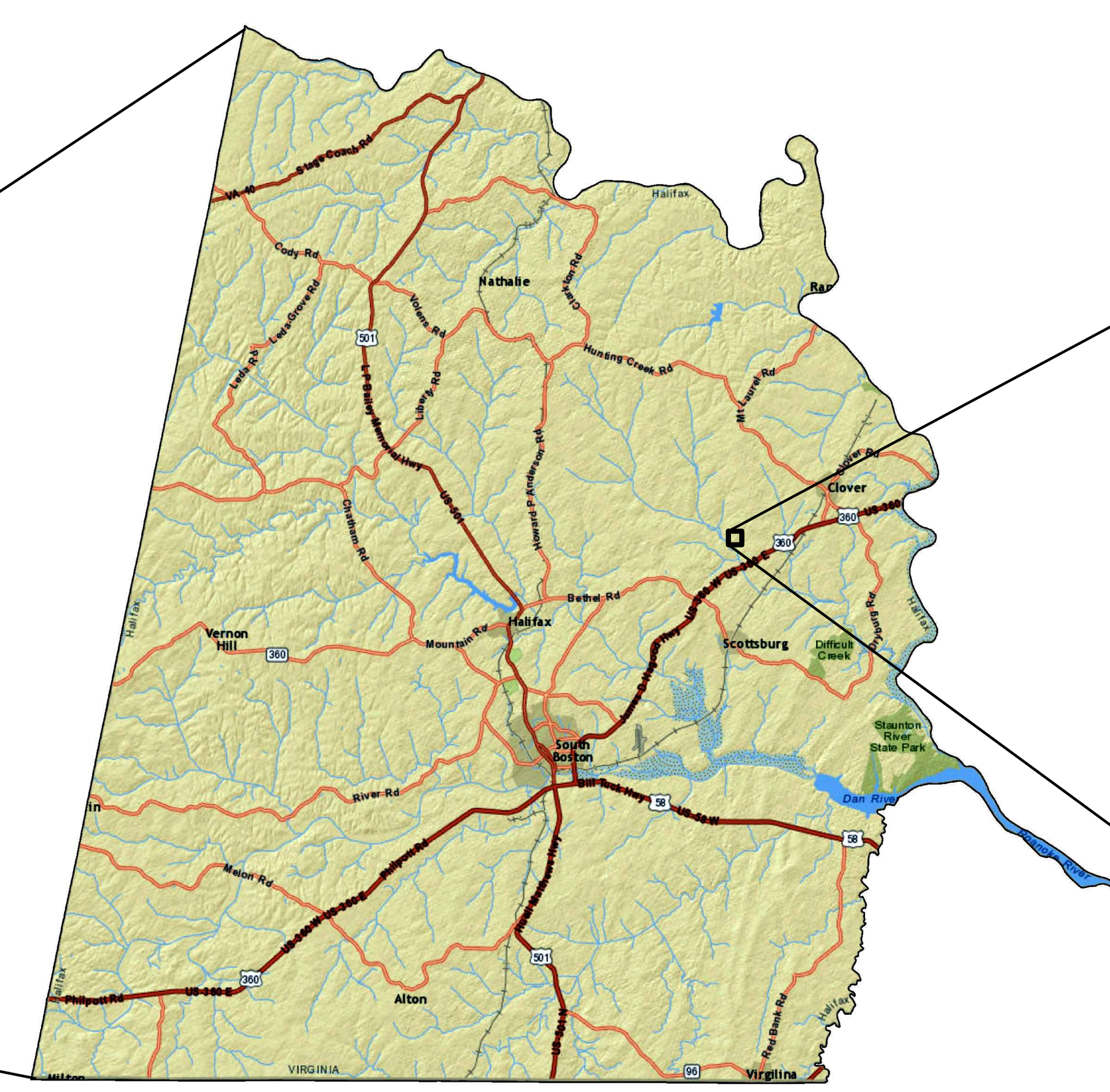
DATE: NOVEMBER 2016
REVISED JULY 2017
REVISED SEPTEMBER 2017
REVISED SEPTEMBER 2019

SHEET INDEX

SHEET NUMBER	SHEET TITLE	REVISION
66706-15348-CWSG-S3100	TITLE SHEET	
66706-15348-CWSG-S3101	GENERAL NOTES - CIVIL, MECHANICAL, STRUCTURAL	2
66706-15348-CWSG-S3102	GENERAL NOTES - CIVIL, MECHANICAL, STRUCTURAL	1
66706-15348-CWSG-S3103	CIVIL STANDARD LEGEND	5
66706-15348-CWSG-S3104	EXISTING CONDITIONS	3
66706-15348-CWSG-S3105	SUGGESTED CONSTRUCTION SEQUENCE PLAN	5
66706-15348-CWSG-S3106	EROSION AND SEDIMENT CONTROL PLAN	5
66706-15348-CWSG-S3107	OVERVIEW NORTH AND SOUTH BASINS	5
66706-15348-CWSG-S3108	NORTH BASIN LINER SUBBASE GRADES	5
66706-15348-CWSG-S3108B	NORTH BASIN LINER BASE GRADES	5
66706-15348-CWSG-S3108C	NORTH BASIN PANEL LAYOUT	2
66706-15348-CWSG-S3109	NORTH BASIN BASE AND PAVING	5
66706-15348-CWSG-S3110	NORTH BASIN CROSS SECTIONS	2
66706-15348-CWSG-S3111	SOUTH BASIN LINER SUBBASE GRADES	5
66706-15348-CWSG-S3111B	SOUTH BASIN LINER BASE GRADES	5
66706-15348-CWSG-S3111C	SOUTH BASIN PANEL LAYOUT	2
66706-15348-CWSG-S3112	SOUTH BASIN BASE AND PAVING	5
66706-15348-CWSG-S3113	SOUTH BASIN CROSS SECTIONS	3
66706-15348-CWSG-S3114	CIVIL DETAILS - NORTH AND SOUTH BASINS	5
66706-15348-CWSG-S3115	CIVIL DETAILS - NORTH AND SOUTH BASINS	5
66706-15348-CWSG-S3116	CIVIL DETAILS - SOUTH BASIN	3
66706-15348-CWSG-S3117	CIVIL DETAILS - SOUTH BASIN	5
66706-15348-CWSG-S3118	CIVIL DETAILS	5
66706-15348-CWSG-S3119	CIVIL DETAILS - EROSION AND SEDIMENT CONTROL	3
66706-15348-CWSG-M2647	MECHANICAL P&ID	1
66706-15348-CWSG-M4000	YARD PIPING PROFILES	2
66706-15348-CWSG-M4000A	YARD PIPING PROFILES	2
66706-15348-CWSG-M4001	PUMP STATION PLAN VIEW	1
66706-15348-CWSG-M4002	PUMP STATION SECTION VIEWS	1
66706-15348-CWSG-M4003	FLOW SPLIT BOX PLAN AND SECTIONS	1
66706-15348-CWSG-M4004	TEMPORARY PUMP STATION PLAN	1
66706-15348-CWSG-M4005	MECHANICAL DETAILS 1	1
66706-15348-CWSG-M4006	MECHANICAL DETAILS 2	1
66706-15348-CWSG-S6200	STRUCTURAL - SLUDGE PUMP STATION	1
66706-15348-CWSG-S6201	STRUCTURAL - SLUDGE PUMP STATION	1
66706-15348-CWSG-S6202	STRUCTURAL - FLOW SPLIT BOX	1
66706-15348-CWSG-S6203	STRUCTURAL - TYPICAL SECTIONS AND DETAILS	1
66706-15348-CWSG-S6204	STRUCTURAL/ARCHITECTURAL - SECTIONS & DETAILS	1
66706-15348-CWSG-E1001	ELECTRICAL SYMBOLS AND ABBREVIATIONS	1
66706-15348-CWSG-E1002	ELECTRICAL SITE PLAN - DEMO	1
66706-15348-CWSG-E1003	ELECTRICAL SITE PLAN - PROPOSED	1
66706-15348-CWSG-E1004	ELECTRICAL ONELINE	1
66706-15348-CWSG-E1005	ELECTRICAL DETAILS AND ENLARGED PLANS	1
66706-15348-CWSG-E1006	ELECTRICAL DETAILS	1
66706-15348-CWSG-E1007	ELECTRICAL DETAILS AND RACEWAY SCHEDULE	1
66706-15348-CWSG-E1008	CABLE AND PANEL SCHEDULE	1



VIRGINIA



HALIFAX COUNTY

SITE LOCATOR
1" = 600'

COMMONWEALTH OF VIRGINIA
R. KENT NILSSON
Lic. No. 026477
PROFESSIONAL ENGINEER
9/19/19

TRC
50 International Drive
Patewood Plaza Three, Suite 150
Greenville, SC 29615
Phone: 864.281.0030

NOTES

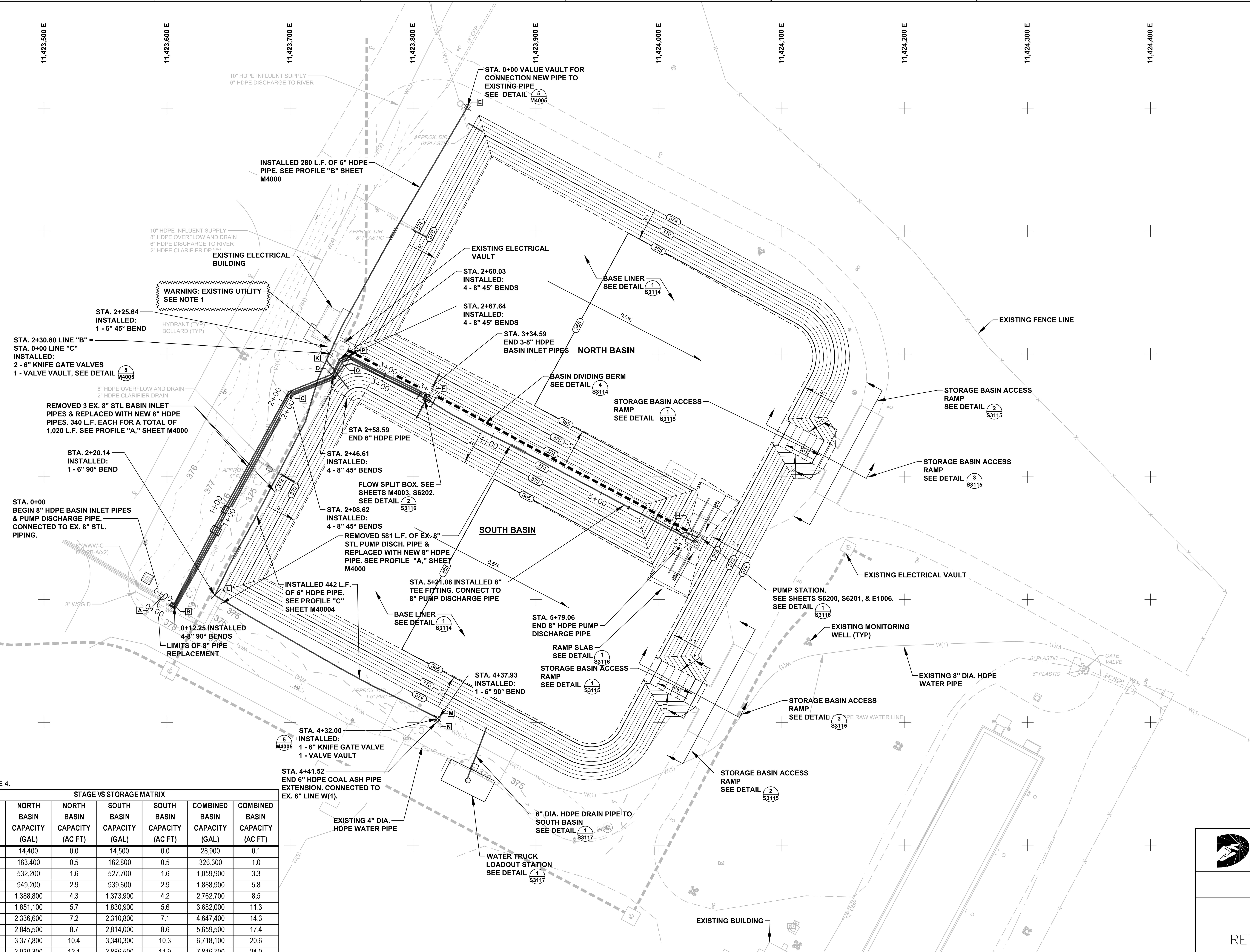
1. REFER TO PLAN SHEET S3103 OF THIS PLAN SET FOR STANDARD LEGEND NOTES AND CONTROL POINT LOCATIONS.
2. GRADES SHOWN ARE BASE GRADES (TOP OF CLAY).

5+00 STATIONING FOR PIPE PROFILES SHOWN ON PLAN SHEET M4000.

ADDITIONAL NOTES

1. BURIED ELECTRICAL DUCT BANK IN DIVIDER BERM AND NORTHWEST OF BASINS. USE CAUTION DURING EXCAVATION.
2. HDPE YARD PIPING SHALL BE CLASS DR-17 WITH WORKING PRESSURE RATING OF 125 PSI. PIPE AND FITTINGS SHALL MEET THE REQUIREMENTS OF AWWA C906 AND ASTM D2239. PIPE SIZE NOTED INDICATES THE INSIDE DIAMETER.
3. PROVIDE THRUST BLOCKING FOR ALL BURIED PIPE BENDS AS DESCRIBED IN DETAIL 9, SHEET M4006.
4. TABLE PROVIDES VOLUMES BASED ON DESIGN GRADES.

COMMONWEALTH OF VIRGINIA
B. KENT NILSSON
Lic. No. 026477
PROFESSIONAL ENGINEER
9/19/19



11,423,500 E
11,423,600 E
11,423,700 E
11,423,800 E
11,423,900 E
11,424,000 E
11,424,100 E
11,424,200 E
11,424,300 E
11,424,400 E
11,424,500 E
3,476,600 N
3,476,500 N
3,476,100 N
STA. 0+00 VALUE VAULT FOR CONNECTION NEW PIPE TO EXISTING PIPE SEE DETAIL 5 M4005
10" HDPE INFLUENT SUPPLY
8" HDPE DISCHARGE TO RIVER
INSTALLED 280 L.F. OF 6" HDPE PIPE. SEE PROFILE "B" SHEET M4000
EXISTING ELECTRICAL BUILDING
WARNING: EXISTING UTILITY SEE NOTE 1
EXISTING ELECTRICAL VAULT
STA. 2+60.03 INSTALLED: 4 - 8" 45° BENDS
STA. 2+67.64 INSTALLED: 4 - 8" 45° BENDS
BASE LINER SEE DETAIL 1 S3114
STA. 2+25.64 INSTALLED: 1 - 6" 45° BEND
STA. 2+30.80 LINE "B" = STA. 0+00 LINE "C" INSTALLED: 2 - 6" KNIFE GATE VALVES 1 - VALVE VAULT, SEE DETAIL 5 M4005
STA. 3+34.59 END 3-8" HDPE BASIN INLET PIPES
NORTH BASIN
EXISTING FENCE LINE
BASIN DIVIDING BERM SEE DETAIL 4 S3114
STORAGE BASIN ACCESS RAMP SEE DETAIL 1 S3115
STORAGE BASIN ACCESS RAMP SEE DETAIL 2 S3115
REMOVED 3 EX. 8" STL BASIN INLET PIPES & REPLACED WITH NEW 8" HDPE PIPES. 340 L.F. EACH FOR A TOTAL OF 1,020 L.F. SEE PROFILE "A," SHEET M4000
STA 2+58.59 END 6" HDPE PIPE
STA. 2+20.14 INSTALLED: 1 - 6" 90° BEND
STA. 2+46.61 INSTALLED: 4 - 8" 45° BENDS
STORAGE BASIN ACCESS RAMP SEE DETAIL 3 S3115
FLOW SPLIT BOX. SEE SHEETS M4003, S6202. SEE DETAIL 2 S3116
STA. 0+00 BEGIN 8" HDPE BASIN INLET PIPES & PUMP DISCHARGE PIPE. CONNECTED TO EX. 8" STL. PIPING.
STA. 2+08.62 INSTALLED: 4 - 8" 45° BENDS
REMOVED 581 L.F. OF EX. 8" STL PUMP DISCH. PIPE & REPLACED WITH NEW 8" HDPE PIPE. SEE PROFILE "A," SHEET M4000
SOUTH BASIN
INSTALLED 442 L.F. OF 6" HDPE PIPE. SEE PROFILE "C" SHEET M40004
STA. 5+21.08 INSTALLED 8" TEE FITTING. CONNECT TO 8" PUMP DISCHARGE PIPE
EXISTING ELECTRICAL VAULT
PUMP STATION. SEE SHEETS S6200, S6201, & E1006. SEE DETAIL 1 S3116
BASE LINER SEE DETAIL 1 S3114
STA. 5+79.06 END 8" HDPE PUMP DISCHARGE PIPE
EXISTING MONITORING WELL (TYP)
0+12.25 INSTALLED 4-8" 90° BENDS
LIMITS OF 8" PIPE REPLACEMENT
RAMP SLAB SEE DETAIL 1 S3116
STORAGE BASIN ACCESS RAMP SEE DETAIL 1 S3115
EXISTING 8" DIA. HDPE WATER PIPE
STA. 4+37.93 INSTALLED: 1 - 6" 90° BEND
STORAGE BASIN ACCESS RAMP SEE DETAIL 3 S3116
STA. 4+32.00 INSTALLED: 1 - 6" KNIFE GATE VALVE 1 - VALVE VAULT 5 M4005
STA. 4+41.52 END 6" HDPE COAL ASH PIPE EXTENSION. CONNECTED TO EX. 6" LINE W(1).
STORAGE BASIN ACCESS RAMP SEE DETAIL 2 S3115
EXISTING 4" DIA. HDPE WATER PIPE
6" DIA. HDPE DRAIN PIPE TO SOUTH BASIN SEE DETAIL 1 S3117
WATER TRUCK LOADOUT STATION SEE DETAIL 1 S3117
EXISTING BUILDING
0 40 80 120 160
SCALE IN FEET
N

NAD83 CONSTRUCTION COORDINATES				
TAG	OBJECT (CENTERLINE)	NORTHING	EASTING	REFERENCE SHEETS
A	8" PIPE STA. 0+00	3476201.45	11423595.33	M4002
B	8" PIPE STA. 0+12.25 (90° BEND)	3476195.40	11423605.99	M4002
C	8" PIPE STA. 2+08.62 (45° BEND)	3476367.93	11423699.75	M4002
D	8" PIPE STA. 2+46.61 (45° BEND)	3476382.19	11423734.82	M4002
E	6" HDPE VALVE VAULT	3476600.92	11423844.25	M4002, M4005
F	FLOW SPLIT BOX	3476364.65	11423811.46	M4003, S6202
H	PUMP STATION	3476249.01	11424029.00	M4001, M4002, S6200, S6201, E1005
K	6" HDPE VALVE VAULT	3476400.28	11423732.40	M4005
L	6" PIPE STA. 2+20.14 (90° BEND)	3476203.44	11423638.83	M4000A
M	6" HDPE VALVE VAULT	3476103.11	11423820.04	M4005
N	6" HDPE PIPE CONNECTION	3476100.21	11423819.24	M4000A
O	8" PIPE STA. 2+60.03 (45° BEND)	3476394.08	11423741.04	M4002
P	8" PIPE STA. 2+67.64 (45° BEND)	3476397.38	11423747.90	M4002

SEE NOTE 4.

STAGE VS STORAGE MATRIX						
ELEVATION	NORTH BASIN CAPACITY (GAL)	NORTH BASIN CAPACITY (AC FT)	SOUTH BASIN CAPACITY (GAL)	SOUTH BASIN CAPACITY (AC FT)	COMBINED BASIN CAPACITY (GAL)	COMBINED BASIN CAPACITY (AC FT)
365	14,400	0.0	14,500	0.0	28,900	0.1
366	163,400	0.5	162,800	0.5	326,300	1.0
367	532,200	1.6	527,700	1.6	1,059,900	3.3
368	949,200	2.9	939,600	2.9	1,888,900	5.8
369	1,388,800	4.3	1,373,900	4.2	2,762,700	8.5
370	1,851,100	5.7	1,830,900	5.6	3,682,000	11.3
371	2,336,600	7.2	2,310,800	7.1	4,647,400	14.3
372	2,845,500	8.7	2,814,000	8.6	5,659,500	17.4
373	3,377,800	10.4	3,340,300	10.3	6,718,100	20.6
374	3,930,300	12.1	3,886,500	11.9	7,816,700	24.0

Dominion

TRC

POWER GENERATION ENGINEERING
RICHMOND, VIRGINIA

OVERVIEW NORTH AND SOUTH BASINS

RETROFIT – SLUDGE SEDIMENTATION BASINS
CLOVER, VIRGINIA

REV	DESCRIPTION	DATE	DSGN	DRWN	CHKD	DSGN SUPV	PROJ ENGR	CIVIL ENGR	ELEC ENGR	MECH ENGR	ARCH	E.M. ENGR	I&C ENGR
5	AS-BUILT	09 13 2019	DM	TAF	JNH		NA	RKN	CS	DS			
4	NORTH BASIN RETROFIT AS-BUILT	08 01 2018	DM	TAF	JNH		NA	RKN	CS	DS			
3	UPDATED SUBBASE GRADES AND PIPING REVISIONS	09 15 2017	DM	LLS	JNH		NA	RKN					
2	UPDATES TO EROSION AND SEDIMENT CONTROL SHEET AND EXISTING CONDITIONS	07 24 2017	DM	LLS	JNH		NA	RKN					
1	REVISED LINER SYSTEM	11 16 2016	DM	LLS	JNH		NA	RKN	CS	DS			

DSGN D.MARSHALL | DSGN SUPV —
DRWN L. STORMER | ENGR SUPV —
CHKD JH | PROJ ENGR —
DISPL ENGR --- | SCALE: AS NOTED

DATE NOVEMBER 2016
DGNSPEC FOR FILE VERIFICATION
DRAWING NO. 66706-15348-CWSG-S3107 REV. 5
UNLESS OTHERWISE NOTED SH 8 OF 41

DRAWING NAME: J:\Dominion Resources\Clover\232002 - Liner Construction Documentation -REV000006\232002.SHT05-SB.dwg --- PLOT DATE: December 10, 2019 - 12:31PM --- LAYOUT: 66706-15348-CWSG-S3107

LINE LIST:

LINE ID	DESC	DIA	PIPE MATERIAL	WORKING PRESSURE	DESIGN PRESSURE	TEST PRESSURE	TEMP	MATERIAL PUMPED
	FROM COAL POND TO SOUTH SLUDGE POND	6	HDPE	50 PSI	100 PSI	150 PSI	90-110 F	WATER
WWC-A	FROM CHEMICAL WASTE	8	HDPE	50 PSI	100 PSI	150 PSI	125 F	WASTEWATER
DPB-B	RECLAIM TANK BLOWDOWN	8	HDPE	70 PSI	100 PSI	150 PSI	110 F	RECLAIMED WATER
DPB-C	AQC BLDG SUMP PUMP DISCH	8	HDPE	60 PSI	100 PSI	150 PSI	110 F	WATER
WSG-D	SLUDGE STORAGE POND PUMP DISCHARGE (ABOVE GROUND)	4/6	DI	50 PSI	100 PSI	150 PSI	120 F	WATER
WSG-D	SLUDGE STORAGE POND PUMP DISCHARGE (BURIED)	8	HDPE	50 PSI	100 PSI	150 PSI	120 F	WATER
2	DISCHARGE TO RAW WATER STORAGE POND(BURIED)	8	HDPE					WATER

CLOV-00-WSG-UV-1
PI P2B
(E) CWSG-BV-12
1" (E) CWSG-BV-23
V 1" (E) CWSG-BV-28
CLOV-00-WSG-UV-2
P2A PI
(E) CWSG-BV-10
1" (E) CWSG-BV-21
V 1" (E) CWSG-BV-27
8" WSG-D
UNIT 1 AND UNIT 2 THICKENER FEED TANK 18913-3E-4609
PROP. EXIST.
YAR P2B
YSR P2B
YIR P2B
HOA
HS P2B
6"
YAR P2A
YSR P2A
YIR P2A
HOA
HS P2A
6"
4"
4"
(E) WSGP-2B
SLUDGE BASIN PUMPS (410 GPM @ 110 FT)
(E) WSGP-2A
NORTH INLET CHANNEL
SOUTH INLET CHANNEL
CLOV-00-WSG-GAT-3
CLOV-00-WSG-GAT-1
CLOV-00-WSG-GAT-2
CLOV-00-WSG-GAT-6
CLOV-00-WSG-GAT-4
CLOV-00-WSG-GAT-5
LAHH LALL
LT 1
CLOV-00-WSG-LT-3
4
LSHH LSH LSL LSLL
WET WELL
SLUDGE SEDIMENTATION BASIN PUMP STATION
EQUALIZATION TANK OVERFLOW & DRAIN
8" 15348-CWWM-M2001
CLARIFIER DRAIN
2" 15348-CWWM-M2002
NORTH SLUDGE SEDIMENTATION BASIN
CLOV-00-WSG-BV-40
14"
SLUDGE SEDIMENTATION BASIN FLOW SPLIT BOX
CLOV-00-WSG-BV-41
14"
SOUTH SLUDGE SEDIMENTATION BASIN
8" EQUALIZATION TANK OVERFLOW & DRAIN 15348-CWWM-M2001
2" CLARIFIER DRAIN 15348-CWWM-M2002
CLOV-00-WSG-BSN-1
CLOV-00-WSG-BSN-2
8" DPB-C
8" DPB-B
8" WWC-A
PROP. EXIST.
2
(E) 8" DISCHARGE TO RAW WATER STORAGE POND
REF. DWG 15348-CWSA-M2661
REF. DWG 15348-CWWM-M2003
5
CHEM WASTE PUMPS 641-1
RECLAIM TANK BLOWDOWN 280C-1
AQCS BLDG SUMPS 280C-2
5
CLOV-00-WSG-BV-39
CLOV-00-WSG-BV-38
6"
6"
VALVE VAULT
CLOV-00-WSG-BV-36
VALVE VAULT
CLOV-00-WSG-BV-35
VALVE VAULT
6"
CLOV-00-WSG-BV-34
6"
COAL PILE PUMP DISCHARGE 15348-CWWE-M2645

LEGEND AND ABBREVIATIONS

- FE 0101 — EXISTING DEVICE
- YSR M0101 — FIELD LOCATED DEVICE
- YSR M0101 — PANEL MOUNTED DEVICE
- YIR M0101 — STATUS INDICATOR LIGHT
- YAR M0101 — OPERATOR INTERFACE
- HS P2A — HAND-OFF-AUTO SWITCH
- PROPOSED PROCESS
- EXISTING PROCESS
- BUILDING LIMITS
- A-M2 — FLOW CONTINUATION
- C — FLOW CONTINUATION ON THIS SHEET
- AIR RELEASE VALVE
- SUBMERSIBLE PUMP
- CENTRIFUGAL PUMP
- BUTTERFLY VALVE
- M — MOTORIZED PLUG VALVE
- CHECK VALVE
- DIRECTION OF FLOW
- CAP OR PLUG
- REDUCER
- M — MIXER
- SLIDE GATE
- BALL VALVE
- GATE VALVE
- PLUG VALVE
- DIAPHRAGM VALVE
- WEIR GATE
- MANHOLE
- JACKETED PIPE

AAH	ANALYZER ALARM HIGH	PI	PRESSURE INDICATOR
AAL	ANALYZER ALARM LOW	PIV	PRESSURE INDICATOR-VACUUM
AI	ANALYZER INDICATOR	PSV	PRESSURE SAFETY VALVE
AIT	ANALYZER INDICATOR/ TRANSMITTER	TAH	TEMP. ALARM HIGH
		TI	TEMP. INDICATE
ARV	AIR RELEASE/ VACUUM VALVE	TSH	TEMP. SWITCH HIGH
ASH	ANALYZER SWITCH HIGH	TSL	TEMP. SWITCH LOW
ASL	ANALYZER SWITCH LOW	VI	VACUUM INDICATOR
AT	ANALYZER TRANSMITTER	VT	VACUUM TRANSMITTER
FE	FLOW ELEMENT	YA	STATUS ALARM
FI	FLOW INDICATOR	YAR	STATUS ALARM RUN
HS	HAND SWITCH	YAS	STATUS ALARM STOP
LAHH	LEVEL ALARM HIGH/HIGH	YIC	STATUS INDICATE CLOSE
LSH	LEVEL SWITCH HIGH	YIO	STATUS INDICATE OPEN
LSHH	LEVEL SWITCH HIGH/HIGH	YIR	STATUS INDICATE RUN
LSLL	LEVEL SWITCH LOW/LOW	YIS	STATUS INDICATE STOP
LALL	LEVEL ALARM LOW/LOW	YSR	STATUS SWITCH RUN
LSL	LEVEL SWITCH LOW	ZA	POSITION ALARM
LS	LEVEL SWITCH	ZAC	POSITION ALARM CLOSE
LT	LEVEL TRANSMITTER	ZAO	POSITION ALARM OPEN
MOV	MOTORIZED VALVE	ZIC	POSITION INDICATE CLOSE
MS	MOISTURE SENSOR	ZIO	POSITION INDICATE OPEN
PHIT	pH INDICATOR/TRANSMITTER	ZSC	POSITION SWITCH CLOSE
		ZSO	POSITION SWITCH OPEN

NOTES:

1. ALL EXISTING COMPONENTS ARE CALLED OUT BY THE FULL FUNCTIONAL LOCATION NUMBER (IF KNOWN) AND ARE PREFIXED WITH '(E)'.

COMMONWEALTH OF VIRGINIA
J. DAMON SAMS
Lic. No. 055523
9/19/19
PROFESSIONAL ENGINEER

REV	DATE	DSGN	DRWN	CHKD	DSGN SUPV	PROJ ENGR	CIVIL ENGR	ELEC ENGR	MECH ENGR	ARCH	E.M. ENGR	I&C ENGR	DESCRIPTION
5	09 13 2019	DM	TAF	JNH		NA	RKN	CS	DS				AS-BUILTS
4	06 06 2018	DM	TAF	JNH		NA	RKN	CS	DS				SOUTH BASIN RETROFIT AS-BUILT
3	08 01 2018	DM	TAF	JNH		NA	RKN	CS	DS				NORTH BASIN RETROFIT AS-BUILT
2	09 15 2017	DM	LLS	JNH		NA	RKN						UPDATED SUBBASE GRADES AND PIPING REVISIONS
1	11 16 2016	DM	LLS	JNH		NA	RKN	CS	DS				REVISED LINER SYSTEM

Dominion
TRC

POWER GENERATION ENGINEERING
RICHMOND, VIRGINIA

MECHANICAL P&ID

RETROFIT – SLUDGE SEDIMENTATION BASINS CLOVER POWER STATION

DSGN	DSAMS	DSGN SUPV	DATE APRIL 2016 DGNSPEC FOR FILE VERIFICATION
DRWN	DSAMS	ENGR SUPV	DRAWING NO. 66706-15348-CWSG-M2647 REV. 2
CHKD	CBELL	PROJ ENGR	
DISPL ENGR	XXX	SCALE: AS NOTED	UNLESS OTHERWISE NOTED SH 22 OF 41

Appendix B: Flood Insurance Rate Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0 foot North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Virginia State Plane South zone. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the Commonwealth of Virginia, through the Virginia Geographic Network Division of its Department of Technology Planning (VGIN). These data were produced at scales of 1:2,400 and 1:4,800 from one-foot and two-foot resolution digital orthoimagery flown in Spring 2002.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
3976^{000}mN	1000-meter Universal Transverse Mercator grid values, zone 17
600000 FT	5000-foot grid ticks: Virginia State Plane coordinate system, South zone (FIPSZONE 4502), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
●M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
October 16, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0350D

FIRM

FLOOD INSURANCE RATE MAP

HALIFAX COUNTY, VIRGINIA
AND INCORPORATED AREAS

PANEL 350 OF 625

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HALIFAX COUNTY	510188	0350	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
51083C0350D

EFFECTIVE DATE
OCTOBER 16, 2009

Federal Emergency Management Agency

Appendix C: Storm Water Calculations

- Storm Water Run-On Estimate
- Pumping Time Estimate

Storm Water Run-On Estimate

PROJECT / LOCATION: Clover Power Station - Clover, Virginia		PROJECT / PROPOSAL NO.
SUBJECT: Storm Water Capacity of North and South Basins		430492.0000
PREPARED BY: K. Thelen	DATE: 10/7/2021	FINAL ☐
CHECKED BY: J. Hotstream	DATE: 10/8/2021	REVISION ☐

Purpose: Determine the minimum freeboard necessary to control inflow from a 24-hour, 100-year storm event

Methodology:

1.) Determine the volume storm water runoff volume that flows into the basins from the 100 year, 24 hour storm event

V_R	=	Volume of Runoff		
Area	=	5.78	ac	
Rainfall Rate	=	8.01	in	Design storm data from NOAA, refer to attached sheets

V_R = Area * Rainfall Rate

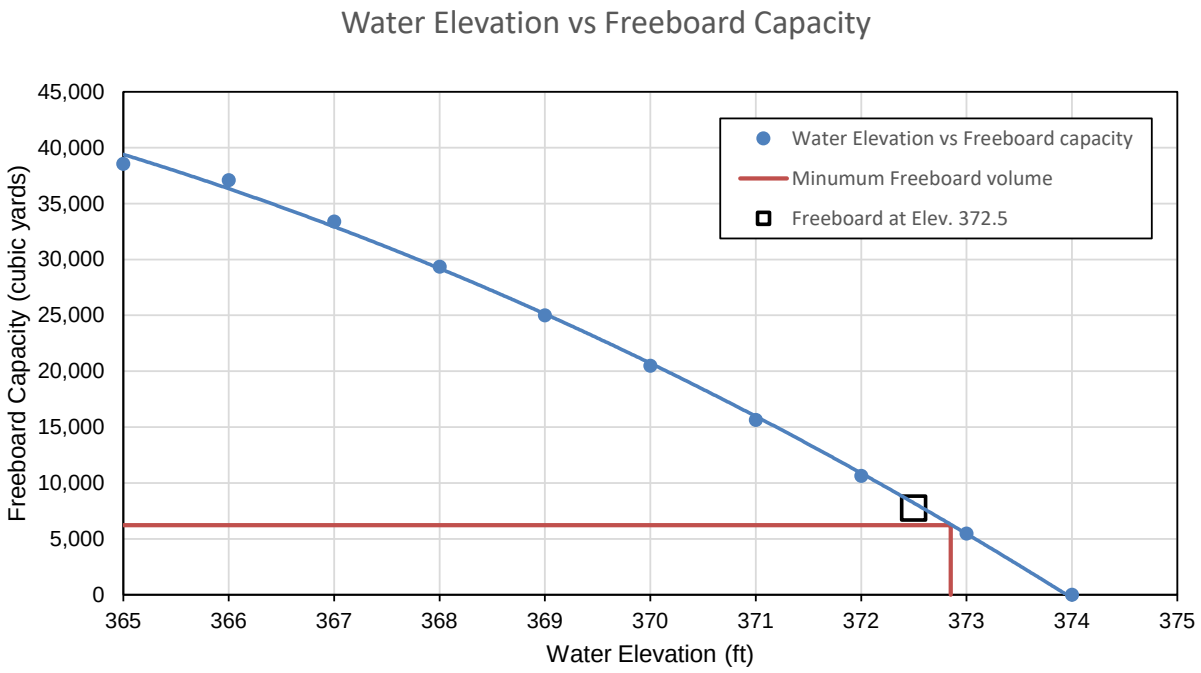
V_R = 6,224 cy

PROJECT / LOCATION: Clover Power Station - Clover, Virginia		PROJECT / PROPOSAL NO.
SUBJECT: Storm Water Capacity of North and South Basins		430492.0000
PREPARED BY: K. Thelen	DATE: 10/7/2021	FINAL ☐
CHECKED BY: J. Hotstream	DATE: 10/8/2021	REVISION ☐

2.) Find the minimum freeboard elevation which will allow sufficient capacity to control inflow from the 100-year, 24-hour storm event

2a) Plot Freeboard Storage vs Freeboard Elevation

*plot developed from stage-storage data, refer to attached table



Find minimum Freeboard Elevation such that SFB > VR

$E_{FB,\,min}$ = 372.85 ft

3.) Choose a conservative Freeboard Elevation, then compare to VR

$E_{FB,\,cons}$ = 372.5 ft

- If freeboard volume (S_{FB}) > V_R, then sufficient freeboard is provided

S_{FB} = 7,749 cy at Elevation 372.5 feet

V_R = 6,224 cy

S_{FB} > V_R

Conclusion: Because the S_{FB} > V_R, the 1.5 feet of freeboard is capable of containing the runoff volume of the 100-year, 24-hour storm event

PROJECT / LOCATION: Clover Power Station - Clover, Virginia		PROJECT / PROPOSAL NO.
SUBJECT: Storm Water Capacity of North and South Basins		430492.0000
PREPARED BY: K. Thelen	DATE: 10/7/2021	FINAL ☐
CHECKED BY: J. Hotstream	DATE: 10/8/2021	REVISION ☐

ATTACHMENTS

From Drawing 6607-15348-CWSG-S3107:

STAGE VS STORAGE MATRIX

ELEV.	North Pond Capacity (CY)	North Pond Capacity (CF)	South Pond Capacity (CY)	South Pond Capacity (CF)	Total Pond Capacity (CY)	Total Pond Capacity (CF)	COMBINED POND CAPACITY (AC FT)	CAPACITY ABOVE TO CREST (AC FT)	CAPACITY ABOVE TO CREST (CY)
365	71	1,924	72	1,937	143	3,861	0.1	23.9	38,561
366	809	21,848	806	21,769	1,615	43,617	1.0	23.0	37,089
367	2,635	71,145	2,613	70,546	5,248	141,691	3.3	20.7	33,457
368	4,700	126,904	4,652	125,617	9,353	252,521	5.8	18.2	29,352
369	6,877	185,666	6,803	183,678	13,679	369,344	8.5	15.5	25,025
370	9,166	247,477	9,066	244,769	18,231	492,246	11.3	12.7	20,473
371	11,570	312,381	11,442	308,930	23,012	621,311	14.3	9.7	15,693
372	14,090	380,420	13,933	376,200	28,023	756,620	17.4	6.6	10,681
373	16,725	451,579	16,539	446,560	33,264	898,138	20.6	3.4	5,440
374	19,461	525,435	19,244	519,583	38,704	1,045,018	24.0	0.0	0

NOAA Atlas 14, Volume 2, Version 3
Location name: Randolph, Virginia, USA*
Latitude: 36.8698°, Longitude: -78.7018°
Elevation: 372.82 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.364** (0.324-0.408)	**0.430** (0.384-0.482)	**0.504** (0.449-0.564)	**0.564** (0.502-0.629)	**0.632** (0.560-0.703)	**0.681** (0.600-0.756)	**0.727** (0.639-0.808)	**0.767** (0.670-0.854)	**0.815** (0.708-0.908)	**0.852** (0.734-0.950)
10-min	**0.582** (0.518-0.652)	**0.688** (0.614-0.771)	**0.808** (0.720-0.903)	**0.903** (0.803-1.01)	**1.01** (0.892-1.12)	**1.08** (0.956-1.21)	**1.16** (1.01-1.28)	**1.22** (1.06-1.35)	**1.29** (1.12-1.44)	**1.34** (1.16-1.50)
15-min	**0.727** (0.648-0.815)	**0.865** (0.771-0.969)	**1.02** (0.910-1.14)	**1.14** (1.02-1.27)	**1.28** (1.13-1.42)	**1.37** (1.21-1.53)	**1.46** (1.28-1.62)	**1.54** (1.34-1.71)	**1.62** (1.41-1.81)	**1.68** (1.45-1.88)
30-min	**0.997** (0.888-1.12)	**1.20** (1.07-1.34)	**1.45** (1.29-1.62)	**1.65** (1.47-1.85)	**1.89** (1.68-2.10)	**2.07** (1.82-2.30)	**2.24** (1.97-2.49)	**2.39** (2.09-2.66)	**2.58** (2.24-2.88)	**2.73** (2.35-3.04)
60-min	**1.24** (1.11-1.39)	**1.50** (1.34-1.68)	**1.86** (1.66-2.08)	**2.15** (1.92-2.40)	**2.52** (2.23-2.80)	**2.80** (2.47-3.11)	**3.08** (2.71-3.42)	**3.35** (2.93-3.73)	**3.70** (3.22-4.13)	**3.98** (3.43-4.44)
2-hr	**1.47** (1.31-1.66)	**1.77** (1.57-1.99)	**2.21** (1.96-2.49)	**2.59** (2.29-2.90)	**3.07** (2.70-3.43)	**3.47** (3.03-3.86)	**3.87** (3.35-4.30)	**4.27** (3.68-4.75)	**4.82** (4.11-5.36)	**5.25** (4.45-5.85)
3-hr	**1.57** (1.40-1.77)	**1.90** (1.69-2.14)	**2.37** (2.10-2.67)	**2.77** (2.45-3.11)	**3.29** (2.90-3.69)	**3.72** (3.25-4.16)	**4.15** (3.61-4.63)	**4.58** (3.96-5.11)	**5.17** (4.42-5.77)	**5.64** (4.78-6.30)
6-hr	**1.92** (1.70-2.17)	**2.31** (2.05-2.61)	**2.88** (2.55-3.26)	**3.39** (2.99-3.82)	**4.06** (3.56-4.57)	**4.64** (4.04-5.21)	**5.23** (4.52-5.87)	**5.86** (5.01-6.55)	**6.73** (5.68-7.50)	**7.45** (6.21-8.31)
12-hr	**2.30** (2.07-2.60)	**2.77** (2.49-3.13)	**3.47** (3.11-3.91)	**4.12** (3.67-4.63)	**5.00** (4.42-5.59)	**5.77** (5.06-6.42)	**6.59** (5.7[illegible]-7.30)	**7.46** (6.41-8.26)	**8.73** (7.37-9.64)	**9.82** (8.16-10.9)
24-hr	**2.68** (2.46-2.95)	**3.25** (2.98-3.58)	**4.15** (3.79-4.57)	**4.90** (4.47-5.39)	**6.02** (5.44-6.59)	**6.97** (6.27-7.63)	**8.01** (7.15-8.75)	**9.15** (8.10-9.99)	**10.8** (9.46-11.8)	**12.3** (10.6-13.4)
2-day	**3.15** (2.90-3.45)	**3.82** (3.52-4.18)	**4.84** (4.45-5.29)	**5.68** (5.21-6.20)	**6.89** (6.29-7.52)	**7.91** (7.18-8.63)	**9.00** (8.11-9.82)	**10.2** (9.10-11.1)	**11.9** (10.5-13.0)	**13.3** (11.6-14.6)
3-day	**3.33** (3.07-3.65)	**4.03** (3.72-4.42)	**5.11** (4.70-5.59)	**6.00** (5.50-6.56)	**7.28** (6.64-7.95)	**8.34** (7.57-9.10)	**9.49** (8.55-10.4)	**10.7** (9.59-11.7)	**12.5** (11.1-13.7)	**14.0** (12.2-15.3)
4-day	**3.52** (3.23-3.85)	**4.25** (3.91-4.66)	**5.39** (4.95-5.89)	**6.32** (5.79-6.91)	**7.66** (6.99-8.37)	**8.78** (7.97-9.57)	**9.98** (9.00-10.9)	**11.3** (10.1-12.3)	**13.1** (11.6-14.4)	**14.7** (12.9-16.1)
7-day	**4.05** (3.73-4.42)	**4.87** (4.49-5.32)	**6.07** (5.59-6.62)	**7.06** (6.48-7.69)	**8.47** (7.73-9.22)	**9.64** (8.76-10.5)	**10.9** (9.82-11.8)	**12.2** (10.9-13.3)	**14.1** (12.5-15.4)	**15.7** (13.7-17.1)
10-day	**4.60** (4.26-5.00)	**5.51** (5.10-5.99)	**6.80** (6.28-7.38)	**7.83** (7.23-8.50)	**9.30** (8.55-10.1)	**10.5** (9.60-11.4)	**11.7** (10.7-12.7)	**13.1** (11.8-14.1)	**14.9** (13.3-16.2)	**16.4** (14.6-17.8)
20-day	**6.23** (5.81-6.71)	**7.42** (6.92-7.98)	**8.96** (8.34-9.63)	**10.2** (9.44-10.9)	**11.8** (10.9-12.7)	**13.1** (12.1-14.1)	**14.4** (13.2-15.5)	**15.7** (14.4-16.9)	**17.5** (15.9-18.9)	**18.9** (17.1-20.4)
30-day	**7.70** (7.23-8.20)	**9.12** (8.57-9.70)	**10.8** (10.1-11.5)	**12.0** (11.3-12.8)	**13.7** (12.8-14.5)	**14.9** (13.9-15.8)	**16.1** (15.0-17.1)	**17.3** (16.1-18.4)	**18.9** (17.4-20.1)	**20.0** (18.4-21.4)
45-day	**9.71** (9.16-10.3)	**11.5** (10.8-12.1)	**13.4** (12.6-14.2)	**14.8** (13.9-15.7)	**16.7** (15.6-17.6)	**18.0** (16.9-19.1)	**19.3** (18.1-20.5)	**20.6** (19.2-21.9)	**22.2** (20.6-23.6)	**23.4** (21.6-24.9)
60-day	**11.6** (11.0-12.2)	**13.6** (12.9-14.4)	**15.7** (14.8-16.6)	**17.3** (16.3-18.2)	**19.3** (18.2-20.3)	**20.7** (19.5-21.9)	**22.1** (20.8-23.4)	**23.4** (21.9-24.8)	**25.1** (23.4-26.6)	**26.2** (24.4-27.9)

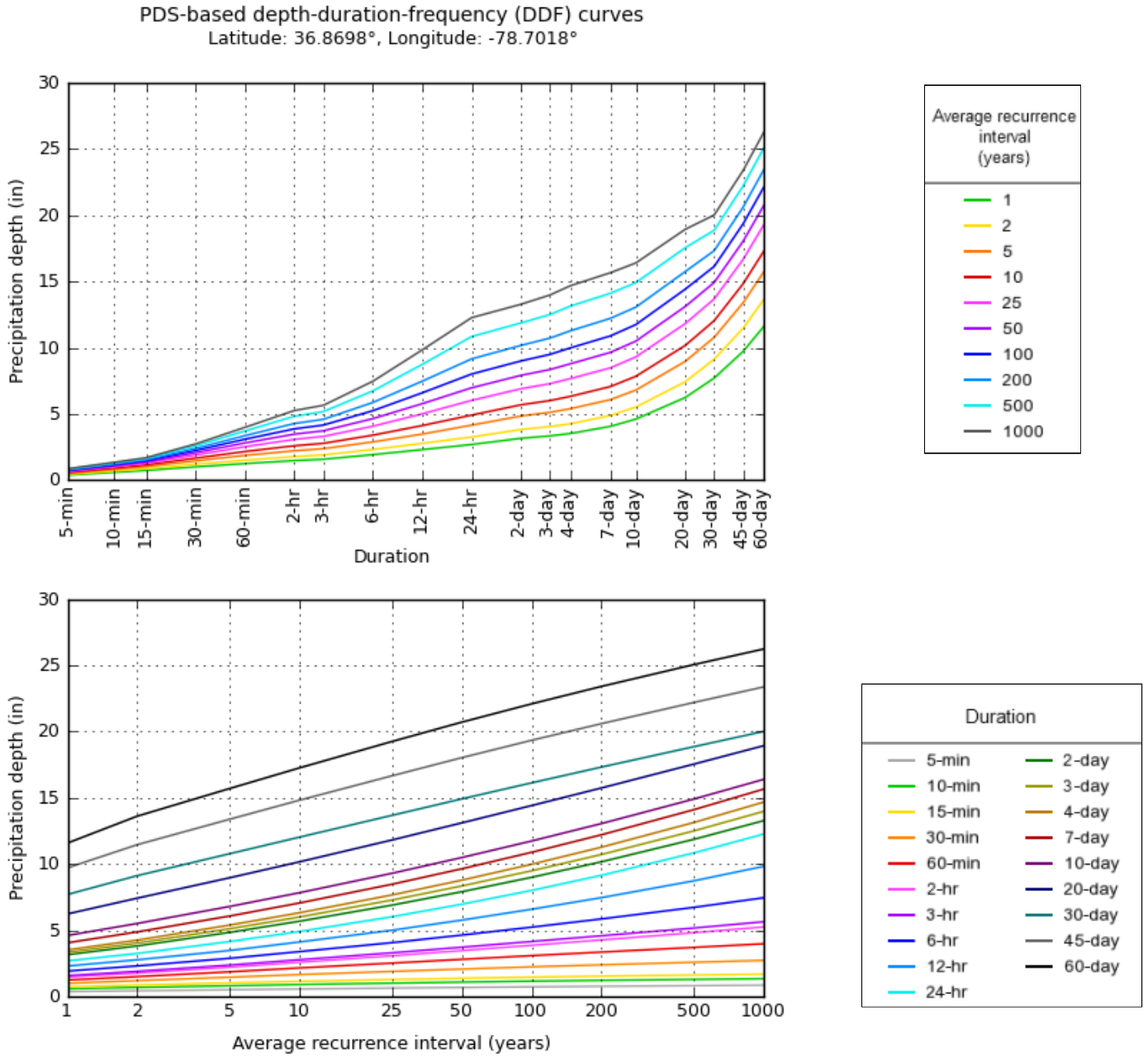
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



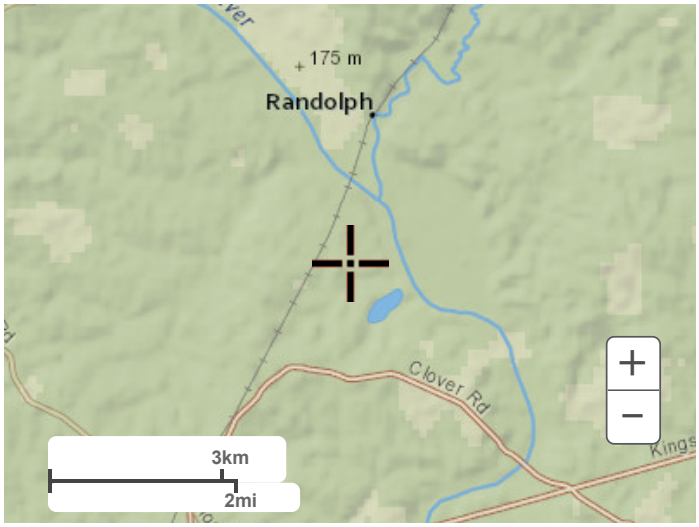
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Sun Aug 22 07:38:18 2021

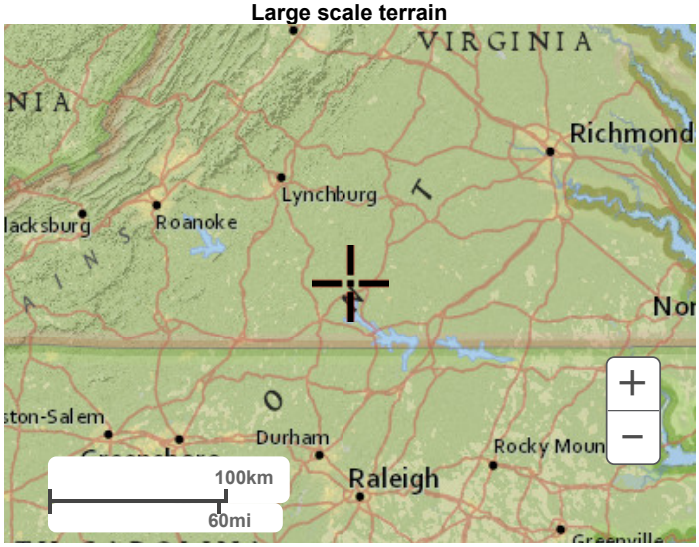
Back to Top

Maps & aerials

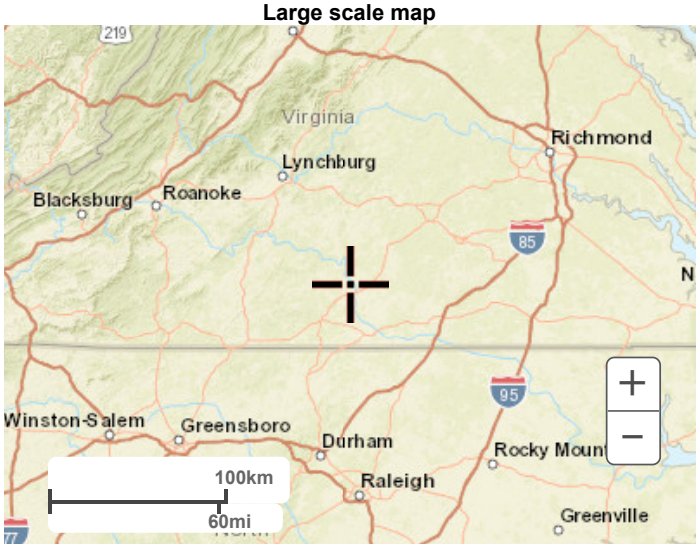
Small scale terrain



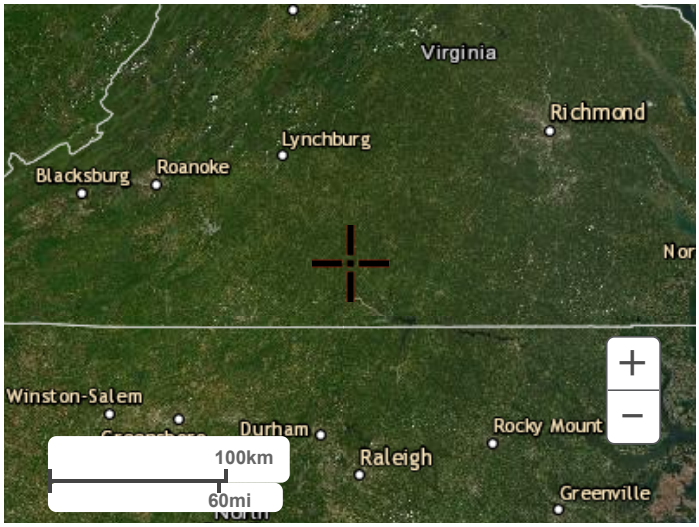
Large scale terrain



Large scale map



Large scale aerial

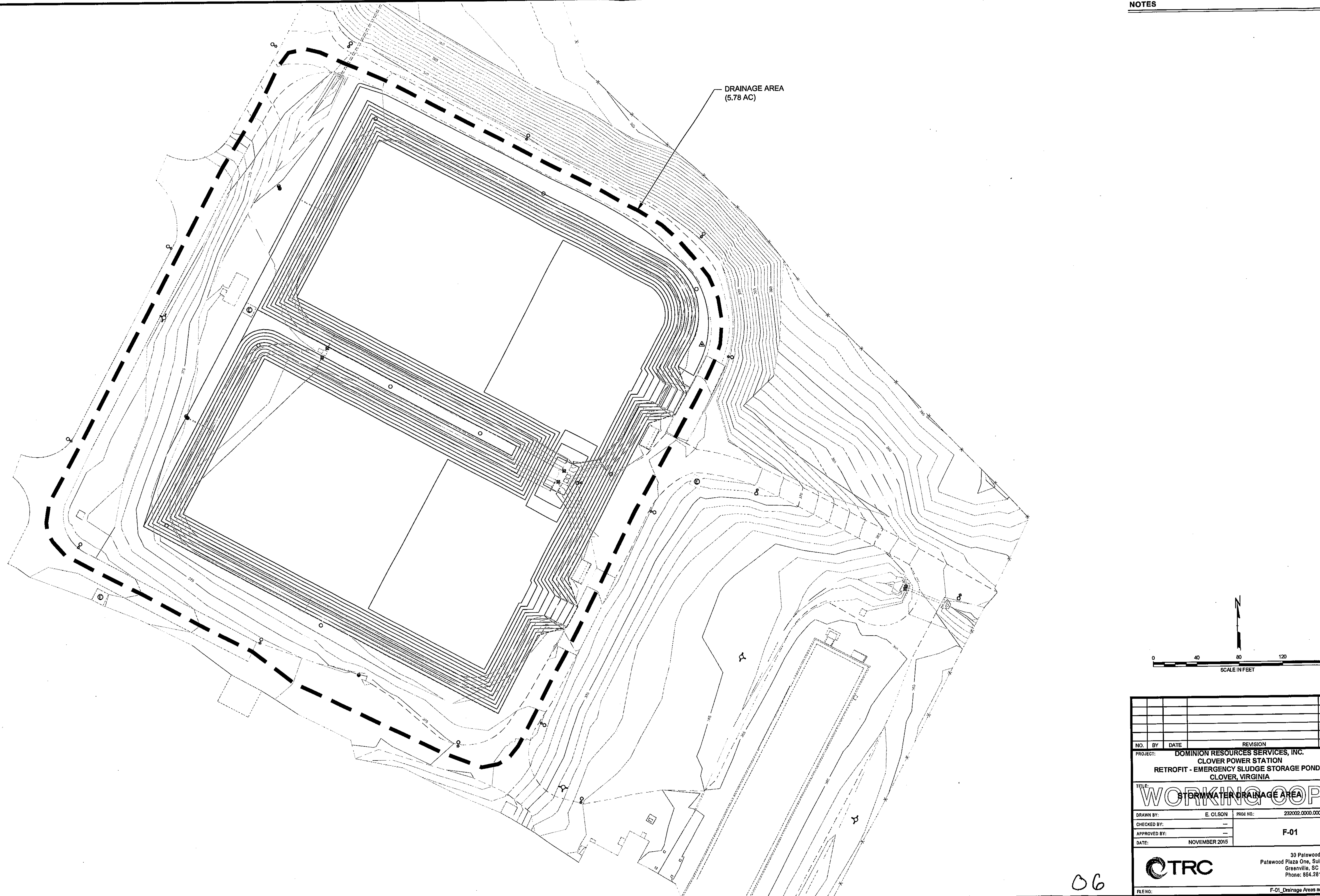


Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOTES



NO.	BY	DATE	REVISION	APP'D.

PROJECT: DOMINION RESOURCES SERVICES, INC.
CLOVER POWER STATION
RETROFIT - EMERGENCY SLUDGE STORAGE PONDS
CLOVER, VIRGINIA

TITLE: STORMWATER DRAINAGE AREA

WORKING COPY

DRAWN BY:	E. OLSON	PROJ. NO.:	232002.0000.0000 000004
CHECKED BY:	—		F-01
APPROVED BY:	—		
DATE:	NOVEMBER 2015		

TRC

30 Patewood Drive
Patewood Plaza One, Suite 300
Greenville, SC 29615
Phone: 864.281.0030

FILE NO.: F-01_Drainage Areas and Tc.dwg

06

Pumping Time Estimate

PROJECT / LOCATION: Clover Power Station - Clover, Virginia		PROJECT / PROPOSAL NO.
SUBJECT: Estimated Pump Down Time		430492.0000
PREPARED BY: K. Thelen	DATE: 7/29/21	FINAL ☐
CHECKED BY: J. Hotstream	DATE: 8/22/21	REVISION ☐

Purpose: Determine the amount of time needed for a Lawrence VPL3200 Pump to remove the storm water collected during the 100-year, 24-hour storm event to design operation elevation (ELE 372)

Methodology:

1.) Use the volume of runoff collected in the basins for the 100-year, 24-hour storm (V R) from the Freeboard Volume Calculation

- Volume of Runoff

V_R = 6,224 cy

2.) Use pump capacity rating to determine amount of time to lower the water level in both basins to ELE 372

-Assume only one pump is operational for both ponds

Pump Rate = 410 gallons per minute (gpm)

V_R = 6,224 cy

V_R = 1,257,086 gal

$$\text{Time} = \frac{V_R}{\text{Pump Rate}}$$

Time = 3,066 min

= 51.1 hr

= 2.1 days

Conclusion: It will take approximately 2 days to pump out the storm water to reestablish freeboard after the 100-year, 24-hour storm event.
This calculation assumes that only one pump will be in operation to remove stormwater.