



HISTORY OF CONSTRUCTION

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HISTORY OF CONSTRUCTION

**Possum Point Power Station CCR Surface
Impoundment: Pond E**



Submitted To: Possum Point Power Station
19000 Possum Point Road
Dumfries, VA 22026

Submitted By: Golder Associates Inc.
2108 W. Laburnum Avenue, Suite 200
Richmond, VA 23227

April 2018

Project No. 16-62150





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1.0 CERTIFICATION

This History of Construction for the Possum Point Power Station's Pond E was prepared by Golder Associates Inc. (Golder). The document and Certification/Statement of Professional Opinion are based on and limited to information that Golder has relied on from Dominion and others, but not independently verified, as well as work products produced by Golder.

On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia that this document has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, at the same time, and in the same locale. It is my professional opinion that the document was prepared consistent with the requirements in §257.73(c) of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015, with an effective date of October 19, 2015 [40 CFR §257.73(c)], as well as with the requirements in §257.100 resulting from the EPA's "Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Extension of Compliance Deadlines for Certain Inactive Surface Impoundments; Response to Partial Vacatur" published in the Federal Register on August 5, 2016 with an effective date of October 4, 2016 (40 CFR §257.100).

The use of the word "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion, and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

Daniel McGrath
Print Name

Associate and Senior Consultant
Title

Daniel McGrath
Signature

4/13/18
Date



2.0 INTRODUCTION

This History of Construction was prepared for the Possum Point Power Station's (Station) existing Coal Combustion Residuals (CCR) inactive surface impoundment, Pond E. The Station, owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion), is located in Dumfries, Virginia at 19000 Possum Point Road, adjacent to Quantico Creek. This History of Construction was prepared in accordance with 40 CFR Part §257, Subpart D and is consistent with the requirements of 40 CFR §257.73(c).

All elevations noted in this report are referenced to the local site elevation datum of North American Vertical Datum of 1988 (NAVD 88).

3.0 HISTORY OF CONSTRUCTION

3.1 CCR Unit

Pond E is located on the north side of Possum Point Road near the Station, as shown in the attached 2013 United States Geological Survey (USGS) 7½-minute topographic quadrangle map (Appendix A). Pond E was used as a water treatment pond to settle and manage low-volume wastewaters including CCR. In 2003, the Station converted from a coal-fired power plant to a natural gas-fired power plant, and the pond was not used for newly produced sluiced ash after this conversion.

Pond E is owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion). Dominion's address, as well as contact information for the Station, is provided below.

Virginia Electric and Power Company
5000 Dominion Boulevard
Glen Allen, VA 23060

Mr. David A. Craymer
Vice President, Power Generation System Operations
Virginia Electric and Power Company
5000 Dominion Boulevard
Glen Allen, VA 23060

The Pond E surface impoundment is regulated under the following permits:

- Virginia Department of Environmental Quality (DEQ) Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0002071
- Virginia Department of Conservation and Recreation (DCR) Operations and Maintenance Certificate, Inventory No. 153021 (Legacy No. 15321)

Long-term management of Pond E, which includes closure and groundwater monitoring, will be governed by the Virginia DEQ Solid Waste Management Regulations (VSWMR) Permit No. 617, once issued. The embankments are regulated by DCR under the Impounding Structure Regulations (4VAC50-20 *et seq.*).

3.2 Watershed

Pond E is located within the Quantico Creek Watershed (USGS Hydrologic Unit Code 020700110104), which is approximately 24,839.5 acres. Pond E has a contributing drainage area of approximately 94.6 acres.

3.3 Foundation and Abutments

Pond E was constructed as an embankment across a drainage feature in the rising natural hillside. The natural soils in the hillside area are typical alluvial Coastal Plain soils consisting of sandy loams developed from feldspathic sediments in the Coastal Plain terraces and stratified marine sediments. The predominant soil groups are the Dumfries series and Quantico series, which are well-draining. Material properties for the various strata were interpreted based on subsurface data and site reconnaissance taken from previous Dominion investigations, analyses, and reports included in Dominion's 1985 "Ash Pond 'E' Boring Logs and Laboratory Test Data" performed by the Law Engineering Testing Company, and are presented in Table 1 below. Additional information on the geotechnical exploration and sources of material properties is presented in the report titled *Safety Factor Assessment – Pond E* (Golder 2018).

Table 1: Selected Material Properties for Pond E Embankment Analysis

Material	Drained Strength		Undrained Strength		Unit Weight (pcf)
	ϕ' (degrees)	c' (psf)	ϕ (degrees)	c (psf)	
Dike Fill	29	100	14	290	120
Fine Grained / Organic Alluvium	24	0	12.4	400	100
Coarse Grained Alluvium	30	0	N/A	N/A	120
Fine Grained Terrace Deposits	28	75	12.4	400	120
Coarse Grained Terrace Deposits	34	0	N/A	N/A	125
Cretaceous Sediments	40	0	0	3000	130

3.4 Construction Details

3.4.1 Sluiced Ash Pond

Pond E construction started in 1967 and finished in 1968. Borrow source information is limited, but the original design drawings show a borrow area within the planned footprint of the pond, suggesting that at least some of the embankment material was excavated from onsite soils. The natural soils in the hillside around the impoundment are described above. The top of the embankment serves as the perimeter road and is surfaced with gravel.

The pond embankment extends westward approximately 1,400 feet along Possum Point Road, then the embankment turns and continues northeast approximately 1,300 feet along a ridge, terminating in the existing hillside. The embankment was initially built to elevation 40 ft with a 12-ft top width, 1.5:1 (H:V)

interior side slopes, and 2:1 exterior side slopes. In locations where the planned embankment crossed marsh areas, principally the center section and some stretches of the western embankment, the marsh soils were excavated to firm soil and replaced with coarse fill for drainage. From the design drawings, the embankment appears to be zoned with different materials on the interior and exterior of the embankment, with one of the zones likely having a lower permeability. The 1985 analysis, however, shows layered clay and sand layers in the embankment. A toe drain was installed along the exterior toe of the embankment.

The principal spillway is a 72-inch wide, rectangular riser structure fitted with stoplogs to approximately elevation 38.3 ft. The riser structure discharges through a 72-inch corrugated metal pipe (CMP) into the adjacent unnamed tributary of Quantico Creek.

3.4.2 Construction of Additional Ponds

In the late 1970s, the footprint of Pond E was modified on the eastern edge for construction of a new Metals Pond. The first Metals Pond was constructed in 1979 and a second Metals Pond was constructed north of the first, and adjacent to Pond E, in the early 1990s.

Pond D was constructed in 1988 for additional sluiced ash storage. The discharge from Pond D was routed into the southeastern corner of Pond E to provide additional settling capacity. At the same time, the Pond E embankment crest height of at least elevation 40 feet was verified and reestablished as necessary.

3.4.3 Pond Closure

In 2015, Dominion began permitting and designing the closure of Pond E in accordance with 40 CFR §257.102(c) by removal of CCR. Closure by removal activities for Pond E are ongoing at this time. Closure details are included in the unit's Closure Plan.

3.5 Engineering Drawings

Selected original design drawings are presented in Appendix B. Recent survey data showing Pond E after removal of CCR, dated April 28, 2017, is provided in Appendix C.

3.6 Instrumentation

An existing groundwater monitoring well network for the pond is in place, and groundwater levels and constituents are recorded at least twice per year. The wells are shown in Appendix C.

3.7 Stage-Storage Capacity Curve

Using the April 2017 survey, the available stage-storage capacity is provided in Table 2 and Figure 1.

Table 2: Existing Stage-Storage Capacity

Elevation	Area	Volume	Cumulative Volume
(ft)	(acres)	(ac-ft)	(ac-ft)
40.00	38.03	75.48	892.86
38.00	37.45	74.30	817.38
36.00	36.85	73.00	743.08
34.00	36.16	71.48	670.08
32.00	35.33	69.82	598.60
30.00	34.50	67.96	528.78
28.00	33.47	65.57	460.82
26.00	32.11	62.98	395.25
24.00	30.87	60.11	332.27
22.00	29.25	56.62	272.16
20.00	27.38	48.52	215.54
18.00	21.26	39.62	167.02
16.00	18.39	34.26	127.40
14.00	15.90	12.01	93.14
12.00	12.88	20.32	64.39
10.00	7.66	12.89	44.07
8.00	5.30	9.43	31.18
6.00	4.15	7.29	21.75
4.00	3.16	5.70	14.46
2.00	2.55	4.56	8.76
0.00	2.02	3.22	4.20
-2.00	1.23	0.99	0.99
-3.00	0.76	-	-

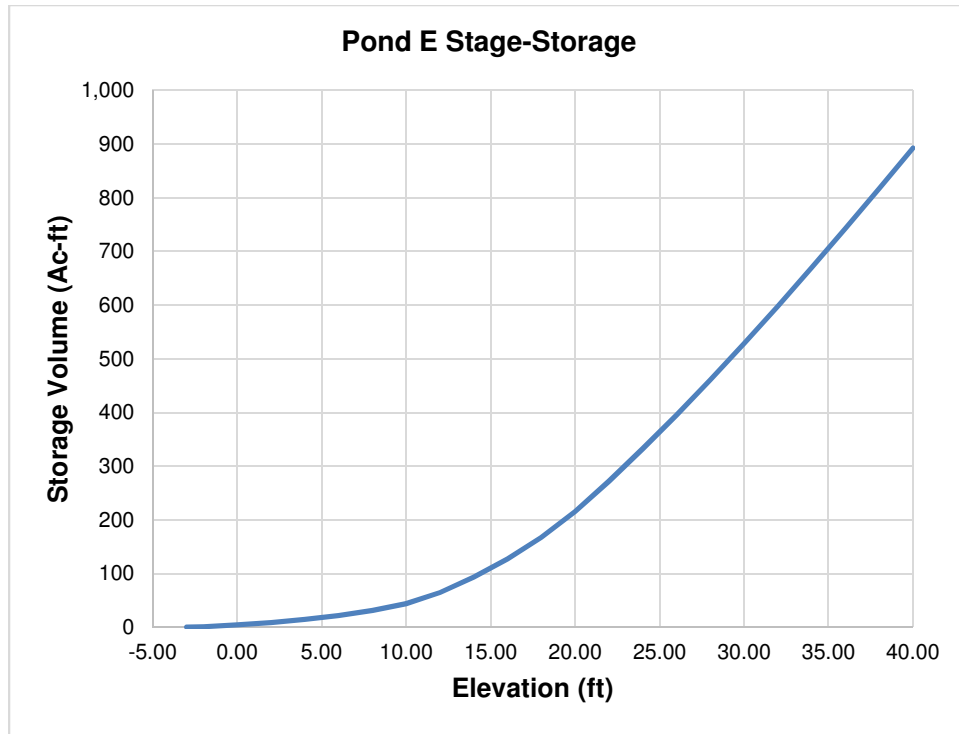
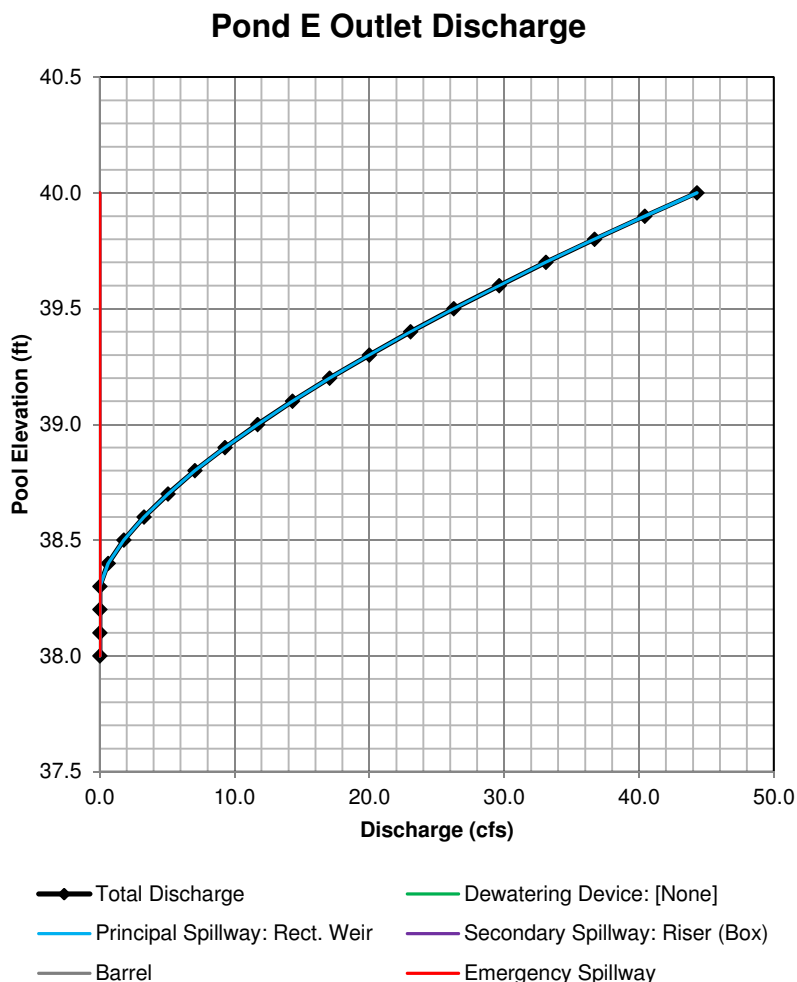


Figure 1: Pond E Stage-Storage Curve

3.8 Diversion and Spillway Details

There are no diversions in place to route stormwater flows around Pond E. Pond E receives stormwater runoff from the adjacent hillside and from within the embankments. The principal spillway is a 72-inch wide, rectangular riser structure fitted with stoplogs to approximately elevation 38.3 ft. The riser structure discharges through a 72-inch CMP into the adjacent unnamed tributary of Quantico Creek. As shown in the Inflow Design Flood Control System Plan, the culvert has adequate capacity to pass the flow from the 1,000-year storm event as required for a Significant hazard classification rating. The elevation-discharge rating for the discharge structure is shown below in Figure 2. The spillway capacity analysis is included in Appendix B of the Inflow Design Flood Control System Plan.

Water Elevation	Total Discharge
(ft)	(cfs)
38.00	0.00
38.10	0.00
38.20	0.00
38.30	0.00
38.40	0.63
38.50	1.79
38.60	3.28
38.70	5.05
38.80	7.06
38.90	9.29
39.00	11.70
39.10	14.30
39.20	17.06
39.30	19.98
39.40	23.05
39.50	26.26
39.60	29.61
39.70	33.10
39.80	36.71
39.90	40.44
40.00	44.29



3.9 Surveillance, Maintenance, and Repair

Inspections and maintenance are currently conducted in accordance with 40 CFR §257.83. General construction specifications and provisions for future surveillance, maintenance, and repair of Pond E are included in the Closure Plan. A Professional Engineer conducts annual inspections to satisfy the requirements of the DCR Dam Safety Regulations and the CCR Rule.

3.10 Records of Structural Instability

In 1977, a seep eroded along the discharge pipe, requiring repairs along the pipe and surrounding embankment. Dominion conducted major repairs of the embankment in the affected area, and replaced the original Reinforced Concrete Pipe (RCP) with a 72-inch CMP and a series of five anti-seep collars. No seeps have been recorded since the repairs.

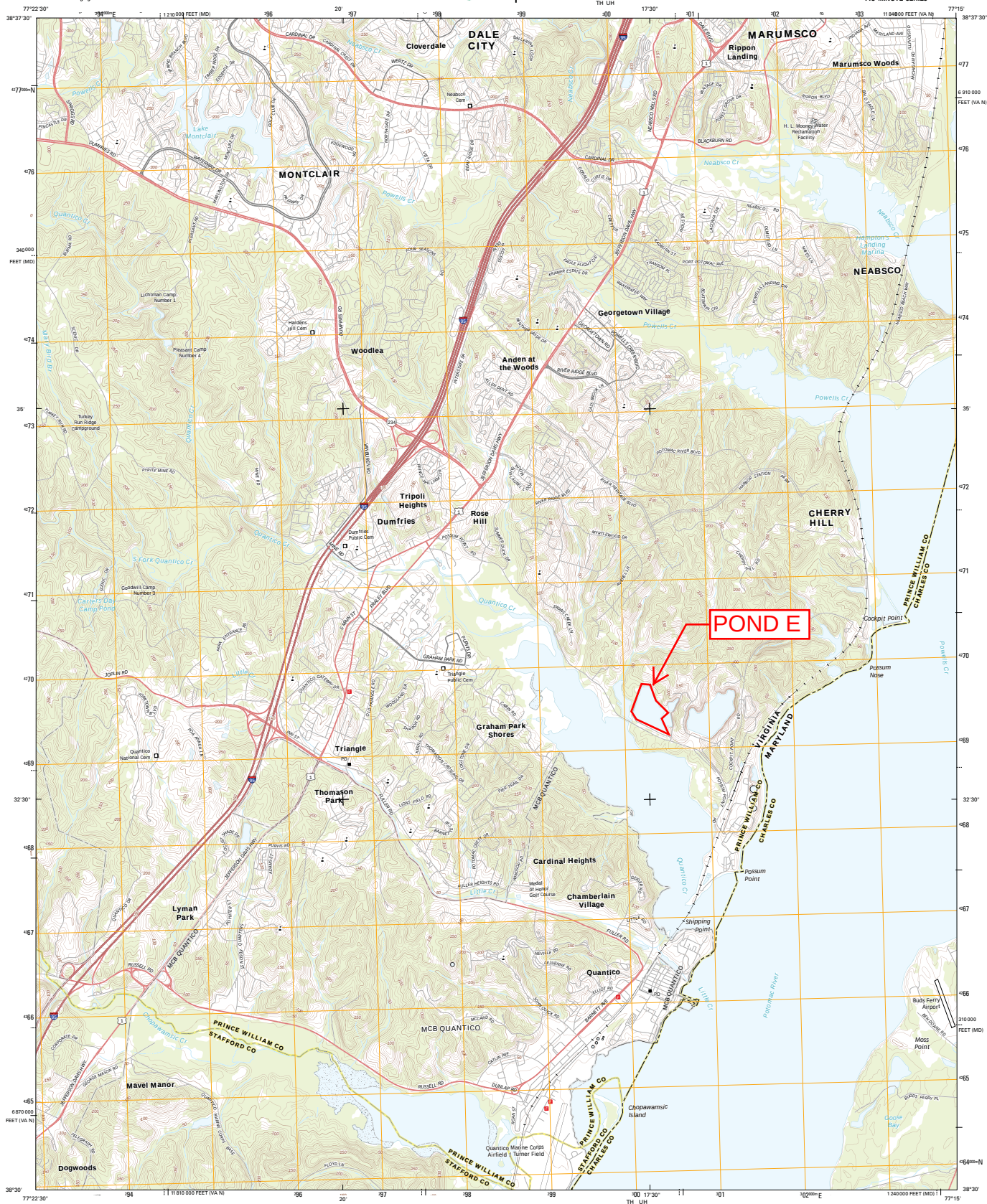
APPENDIX A
Site Location Map



U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

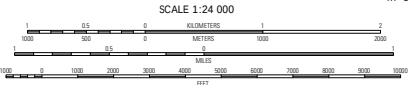
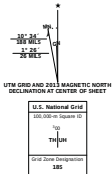


QUANTICO QUADRANGLE
VIRGINIA-MARYLAND
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84) Projection and
3,000-meter grid. Universal Transverse Mercator, Zone 18S
20,000-foot UTM. Virginia Coordinate System of 1983 (north
zone), Maryland Coordinate System of 1983

Imagery: NADP, May 2012
Roads: ©2006-2012 TomTom
Names: GNS, 2012
Hydrography: National Hydrography Dataset, 2012
Contours: National Elevation Dataset, 2008
Boundaries: Census, IBC, USGS, 1972 - 2012



SCALE 1:24,000
CONTOUR INTERVAL 10 FEET
NORTH AMERICAN DATUM OF 1983
This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2013.
A metadata file associated with this product is draft version 0.5.11



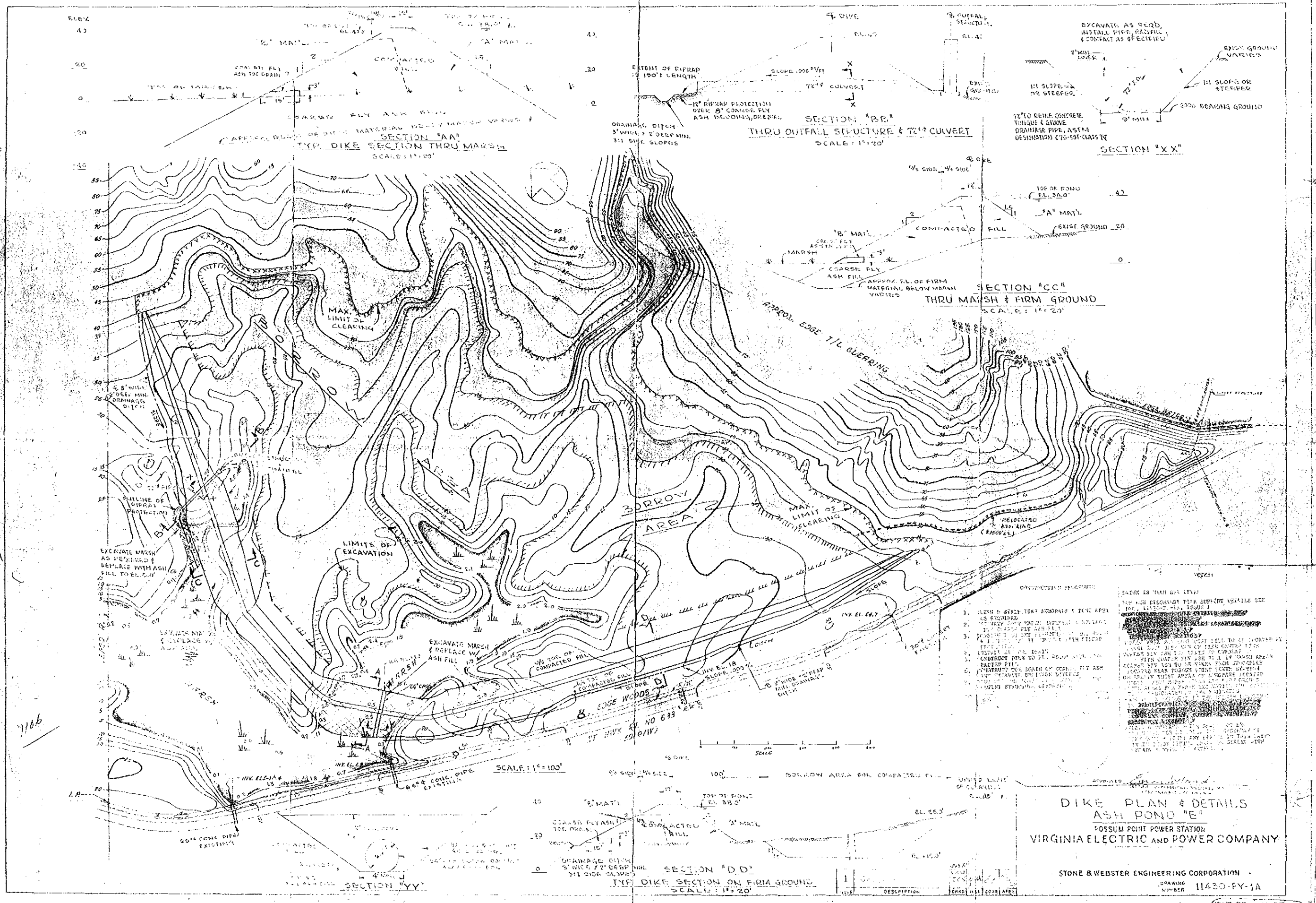
Independent	Occupied	Fort Belvoir
Japan	Quantico	Indian Head
Stafford	Windsor	Norfolk

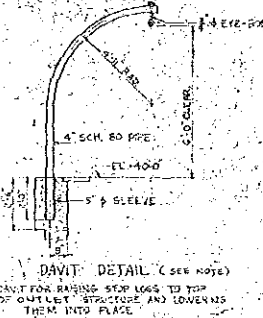
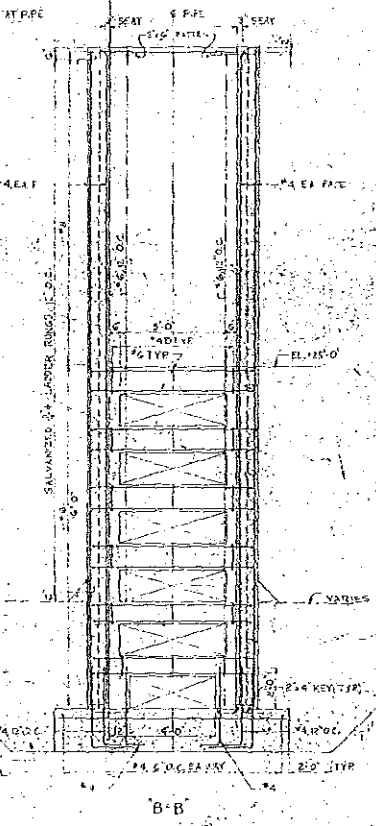
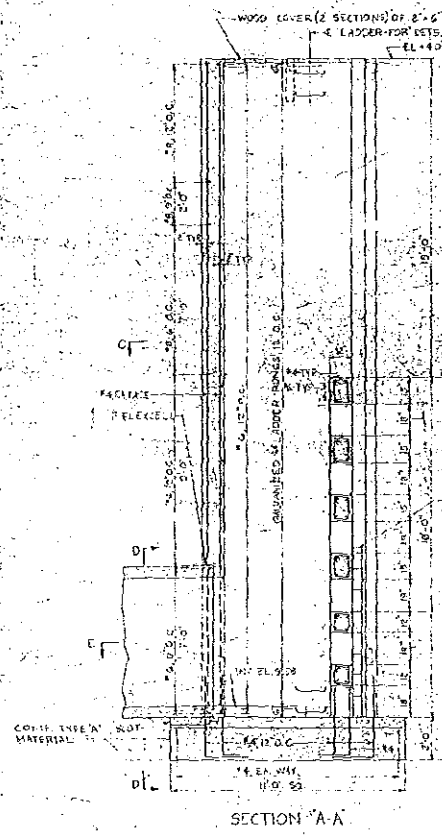
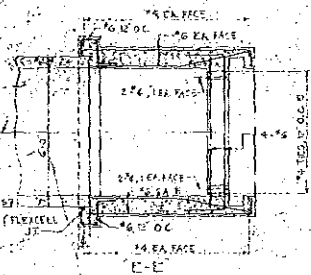
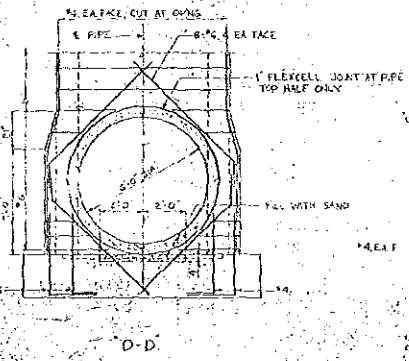
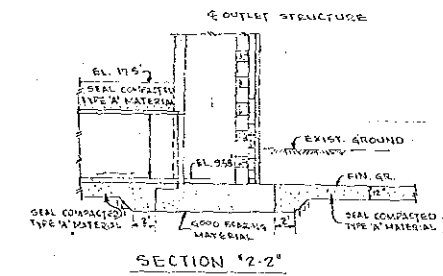
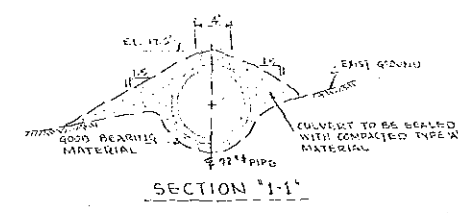
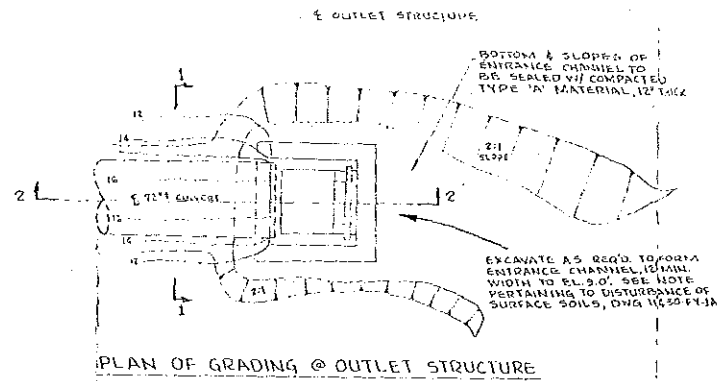
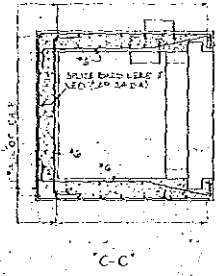
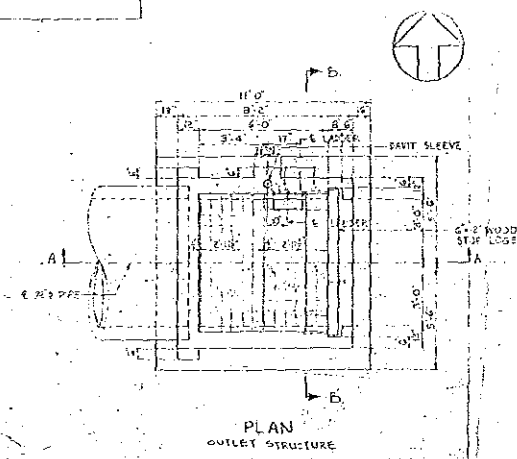
ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Interstate Route
Local Connector
Local Road
AMD
US Route
State Route

QUANTICO, VA-MD
2013

APPENDIX B

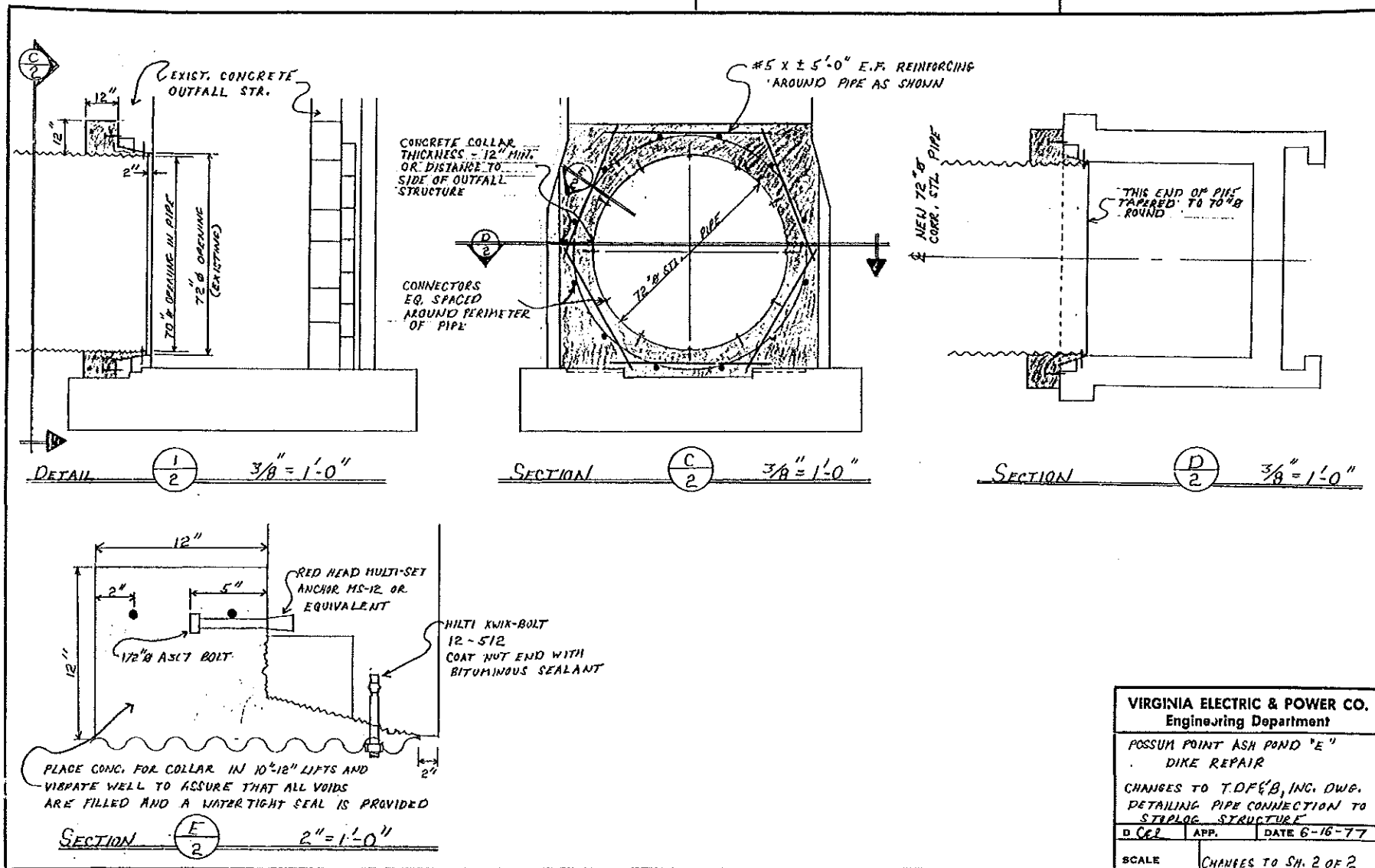
Design Plans





NOTES
 SCALE: 1"=1'-0"
 1. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE A.S.T.M. SPECIFICATIONS FOR STEEL PIPE.
 2. ALL JOINTS SHALL BE GASKETED WITH RUBBER GASKETS.
 3. THE STRUCTURE SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 2500 P.S.F. OF EARTH PRESSURE.
 4. THE STRUCTURE SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 1000 P.S.F. OF WATER PRESSURE.
 5. THE STRUCTURE SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 1000 P.S.F. OF WIND PRESSURE.
 6. THE STRUCTURE SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 1000 P.S.F. OF SEISMIC PRESSURE.
 7. IF MAT'L UNDER OUTLET STRUCTURE IS NOT FIRM, REPLACE WITH COMPACTED GRANULAR MAT'L, 18" MIN. THICK, AS DIRECTED BY ENGINEER.

DETAILS - OUTLET STRUCTURE			
ASH POND - E. POSSUM POINT POWER STATION, VIRGINIA ELECTRIC AND POWER COMPANY			
STONE & WEBSTER ENGINEERING CORPORATION			
11430-FY-2A			
NO.	DESCRIPTION	QTY	UNIT
1	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
2	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
3	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
4	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
5	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
6	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
7	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
8	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
9	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT
10	STEEL PIPE, 48" DIA., 12' LONG	1	LINEAL FOOT

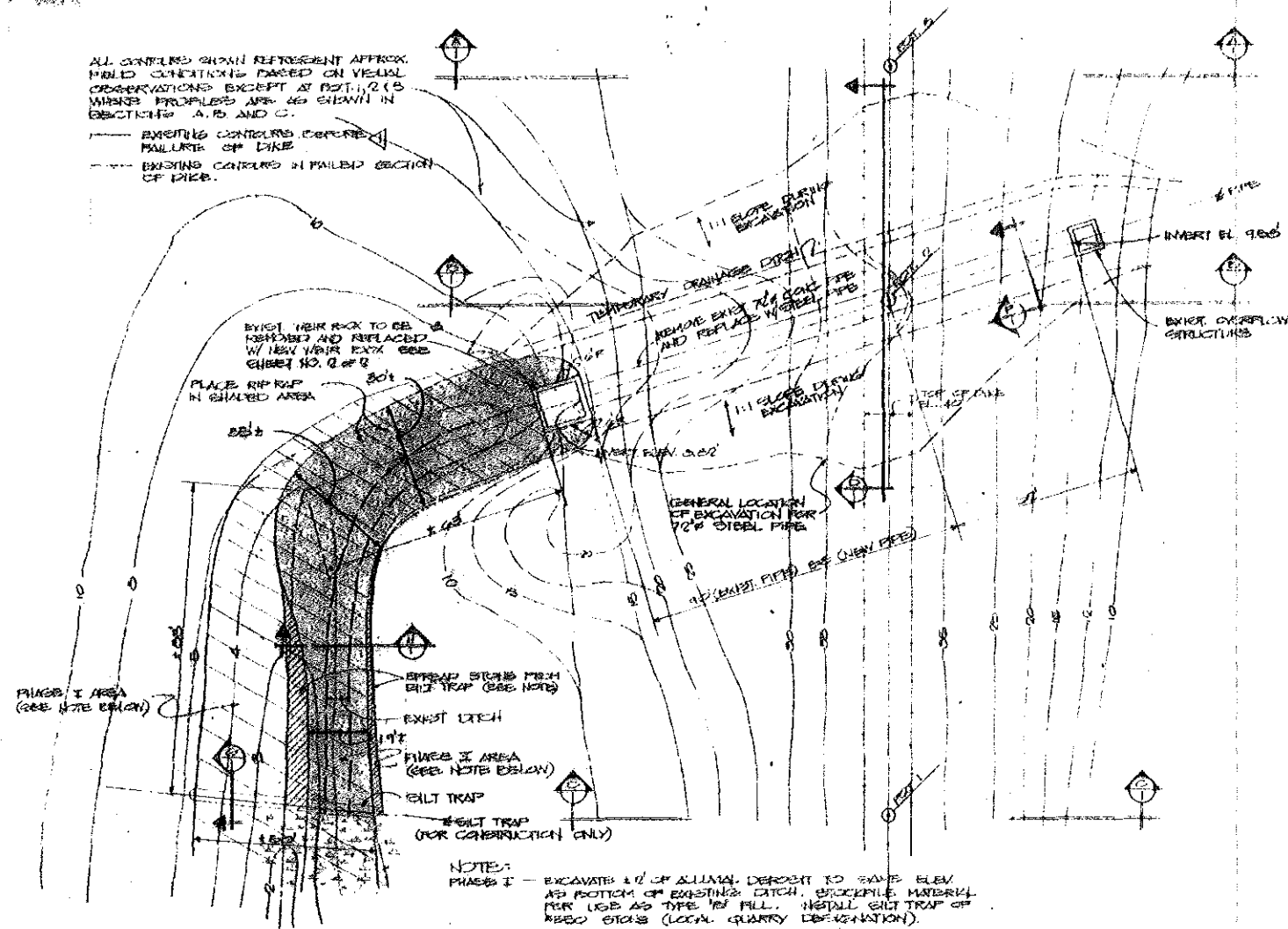


VIRGINIA ELECTRIC & POWER CO. Engineering Department		
POSSUM POINT ASH POND "E" DIKE REPAIR		
CHANGES TO T.D.F.C.B., INC. DWG. DETAILING PIPE CONNECTION TO STEPLOG STRUCTURE		
D. C. E.	APP.	DATE 6-16-77
SCALE	CHANGES TO SH. 2 OF 2	

77-36-SK #111.3

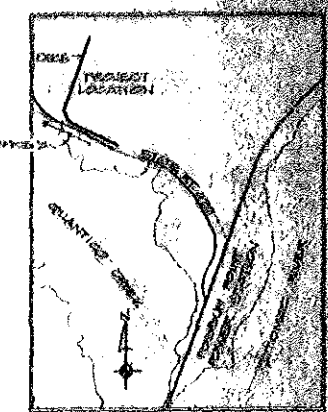
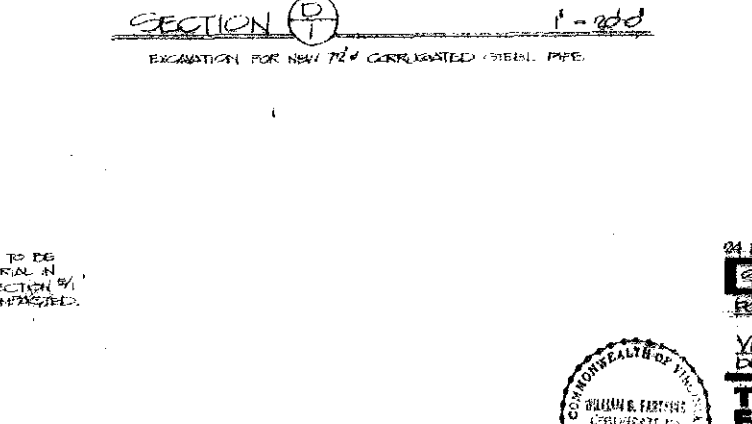
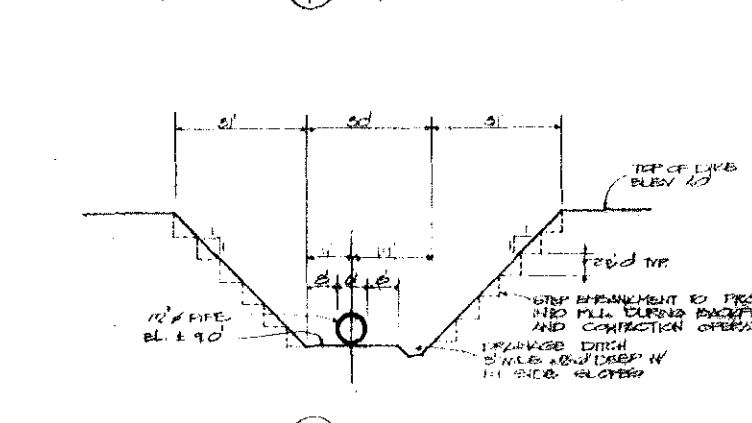
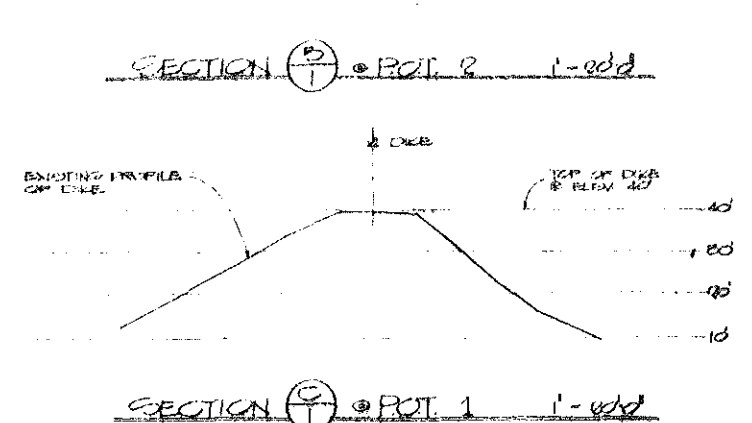
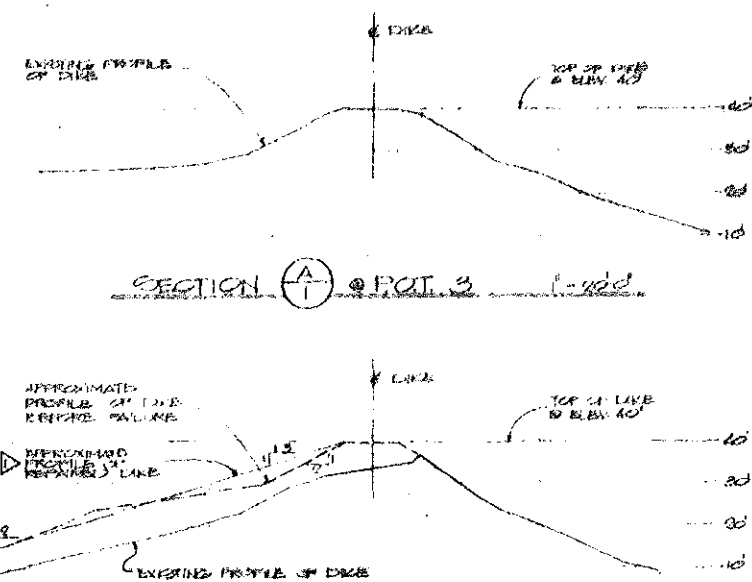
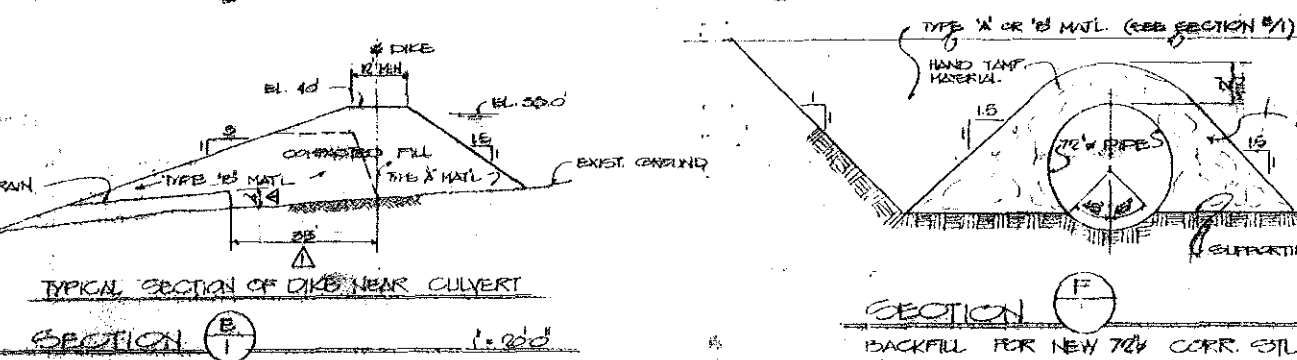
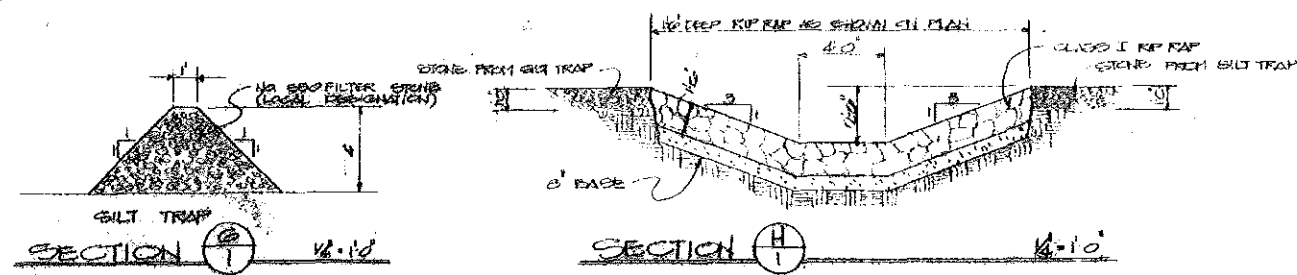
ALL CONTOURS SHOWN REPRESENT APPROX. FIELD CONDITIONS BASED ON VISUAL OBSERVATIONS EXCEPT AT POSTS 1, 2 & 3 WHERE PROFILES ARE AS SHOWN IN SECTIONS A, B AND C.

EXISTING CONTOURS BEFORE FAILURE OF DIKE
EXISTING CONTOURS IN FAILED SECTION OF DIKE.



NOTE:
PHASE I - EXCAVATE 1/2 OF ALLUVIAL DEPOSIT TO SAME ELEV. AS BOTTOM OF EXISTING DITCH. BACKFILL MATERIAL PER USE AS TYPE 'B' FILL. INSTALL SILT TRAP OF REED STICKS (LOCAL QUARRY DEFORMATION).
PHASE II - AFTER RECONSTRUCTION OF DIKE, CUT EXISTING DITCH TO MAKE NEW DITCH AS SHOWN. ADD RP RAP TO AREAS SHOWN AND REMOVE SILT TRAP. DEPOSIT STICKS FROM SILT TRAP AS SHOWN.

SITE PLAN



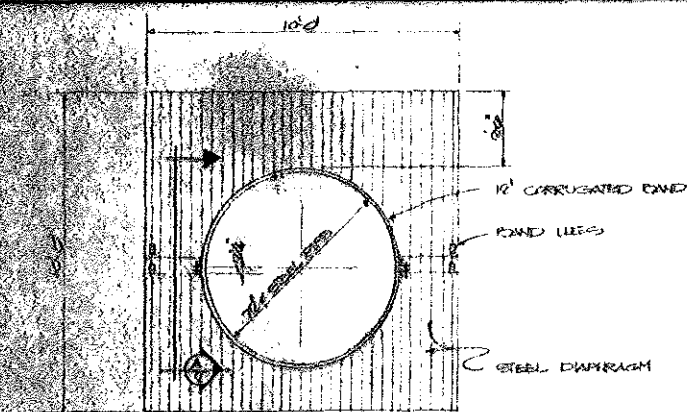
LOCATION PLAN

NOTES:

1. Dike sections from survey by Torrence Dreehl & Farthing dated 5 December 1977.
2. EXISTING DIKE AS SHOWN AND EXCAVATED MATERIAL REMOVED FROM DIKE DESIGNATED EXISTING FOR RECONSTRUCTION OF DIKE.
3. RECONSTRUCTION OF DIKE SHALL BE DONE TO GENERALIZE EXISTING DIKE EXCEPT THAT THE EXISTING DIKE SHALL BE RECONSTRUCTED TO THE EXISTING DIKE EXCEPT THAT THE EXISTING DIKE SHALL BE RECONSTRUCTED TO THE EXISTING DIKE.
4. DESIGN OF DIKE AFTER RECONSTRUCTION SHALL BE AS SHOWN.
5. FOLLOWING RECONSTRUCTION OF DIKE, TOP OF DIKE TO BE RECONSTRUCTED TO ELEVATION 40 AND EXISTING FILLING AND ANY CHANGES INCLUDING TO BE RECONSTRUCTED TO BE RECONSTRUCTED.

24 MAY 1977 GENERAL REVISIONS

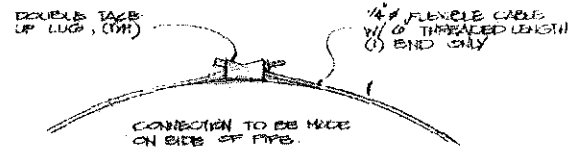
SITE PLAN, SECTIONS AND DETAILS DESIGNED BY: TORRENCE DREEHL & FARTHING ENGINEERS AND ARCHITECTS 1000 E. 10th Street, Suite 200, Norfolk, VA 23502 703-722-1111		DATE: 11/77 BY: TDF 1-2
---	--	--



DIAPHRAGM ELEVATION

9'-10"

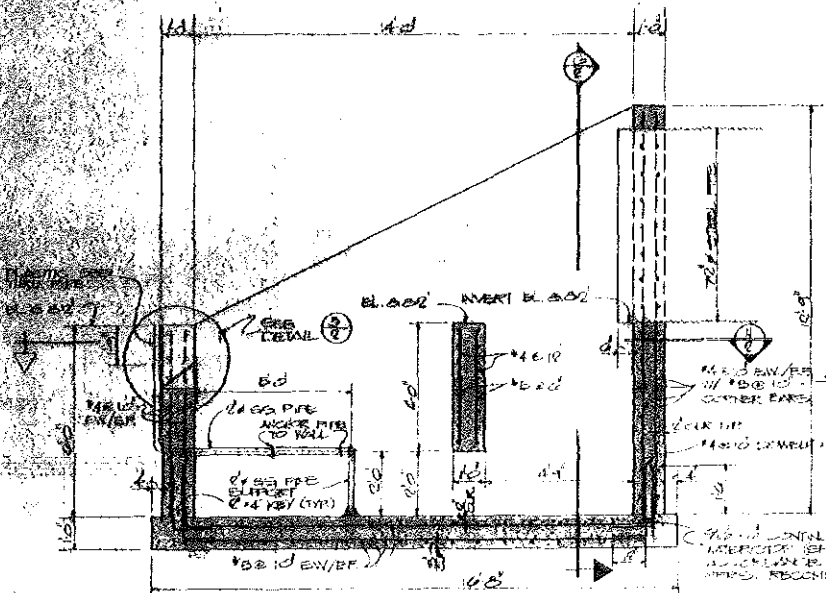
SECTION A-A 12'-10"



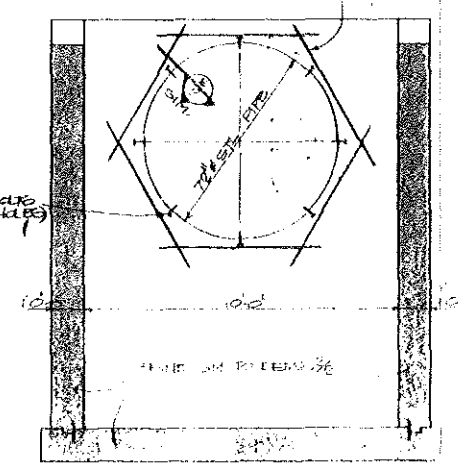
SECTION B-B 12'-10"

TYPICAL PIPE CONNECTION DETAILS

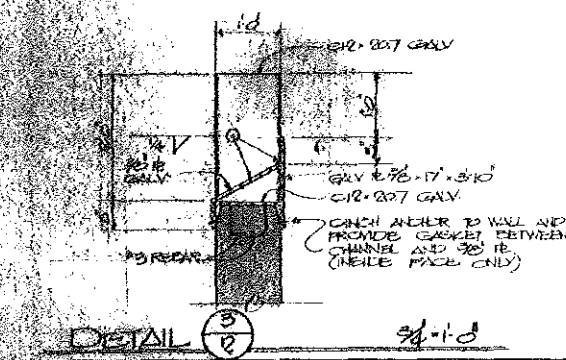
12'-10"



DETAIL 1 9'-10"



SECTION C-C 9'-10"



DETAIL 2 9'-10"

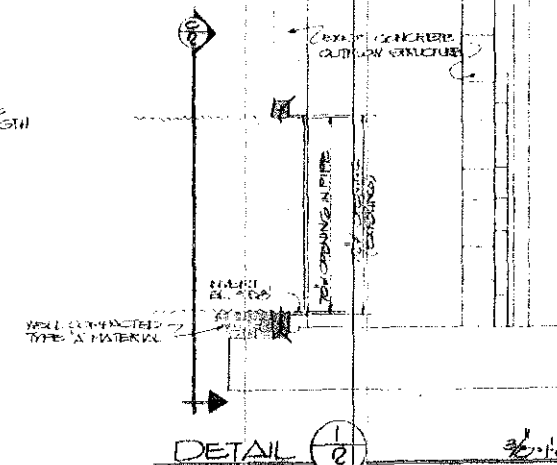
NOTES:

1. CONCRETE SHALL HAVE A 14 DAY COMPRESSIVE STRENGTH OF 2500 PSI AND SHALL CONTAIN THE FOLLOWING REQUIREMENTS:
 - a. CONCRETE AGGREGATE WITH C.S. SIZE 1/2" MAX.
 - b. PIPE AGGREGATE IN ACCORDANCE WITH ASTM C92.
 - c. MAXIMUM WATER-CEMENT RATIO = 0.45.
 - d. MINIMUM CEMENT CONTENT = 600 LB/CY.
 - e. AIR ENTRAINMENT 6% ± 1%.
 - f. SLUMP = MAXIMUM 4".
2. CONCRETE SHALL BE WELL VIBRATED TO PROVIDE A DENSE WATER RESISTANT MIXTURE WITHOUT HONEYCOMBS.
3. CONCRETE TEMPERATURE SHALL NOT EXCEED 75°F.
4. REINFORCING SHALL BE ASTM A615 GRADE 60.
5. CONTRACTOR SHALL SUBMIT THREE (3) COPIES OF REINFORCING SCHEDULE DRAWINGS AND CONCRETE DESIGN MIX TO VPRC FOR APPROVAL.

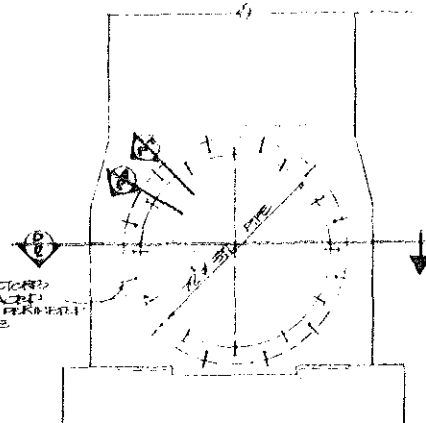
6. 12" DIAMETER CORRODED CORRUGATED STEEL PIPE WITH PAVED INVERT, ANTI-SURFACE COLLAPSE AND TYPE III PORTLAND CEMENT RINGS WITH GASKETS AND GASKETS TO BE PROVIDED BY VPRC.
7. PIPE AND ANTI-SURFACE COLLAPSE RINGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. (VPRC STEEL CORP.)

SECTION THROUGH PIPE 1'-0"

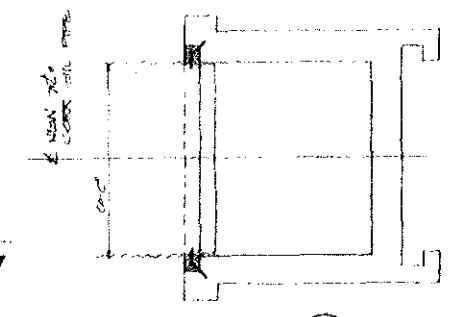
PIPE SECTION DETAILS 6'-10"



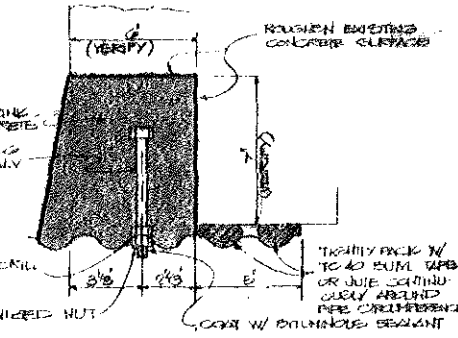
DETAIL 1 9'-10"



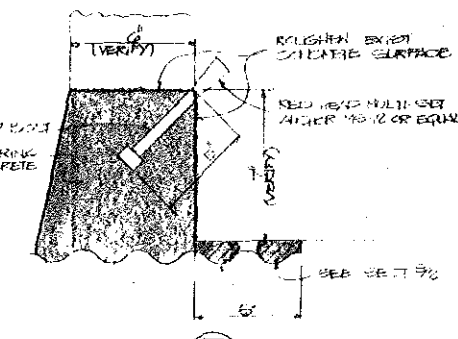
SECTION D-D 9'-10"



SECTION E-E 9'-10"



SECTION F-F 9'-10"



SECTION G-G 9'-10"

24 MAY 1977 GENERAL REVISIONS

SECTIONS AND DETAILS

FORUM POINT, VPRC, AND E
PIPE, REPAIR, AND
VIRGINIA ELECTRIC AND POWER CO.
CUMMERS VIRGINIA

**TORRENCE DREELIN
FARHING & BUFORD
INC**
a professional corporation
ENGINEERS - ARCHITECTS
suite 600 seaboard building richmond virginia
804 358-9111 23200

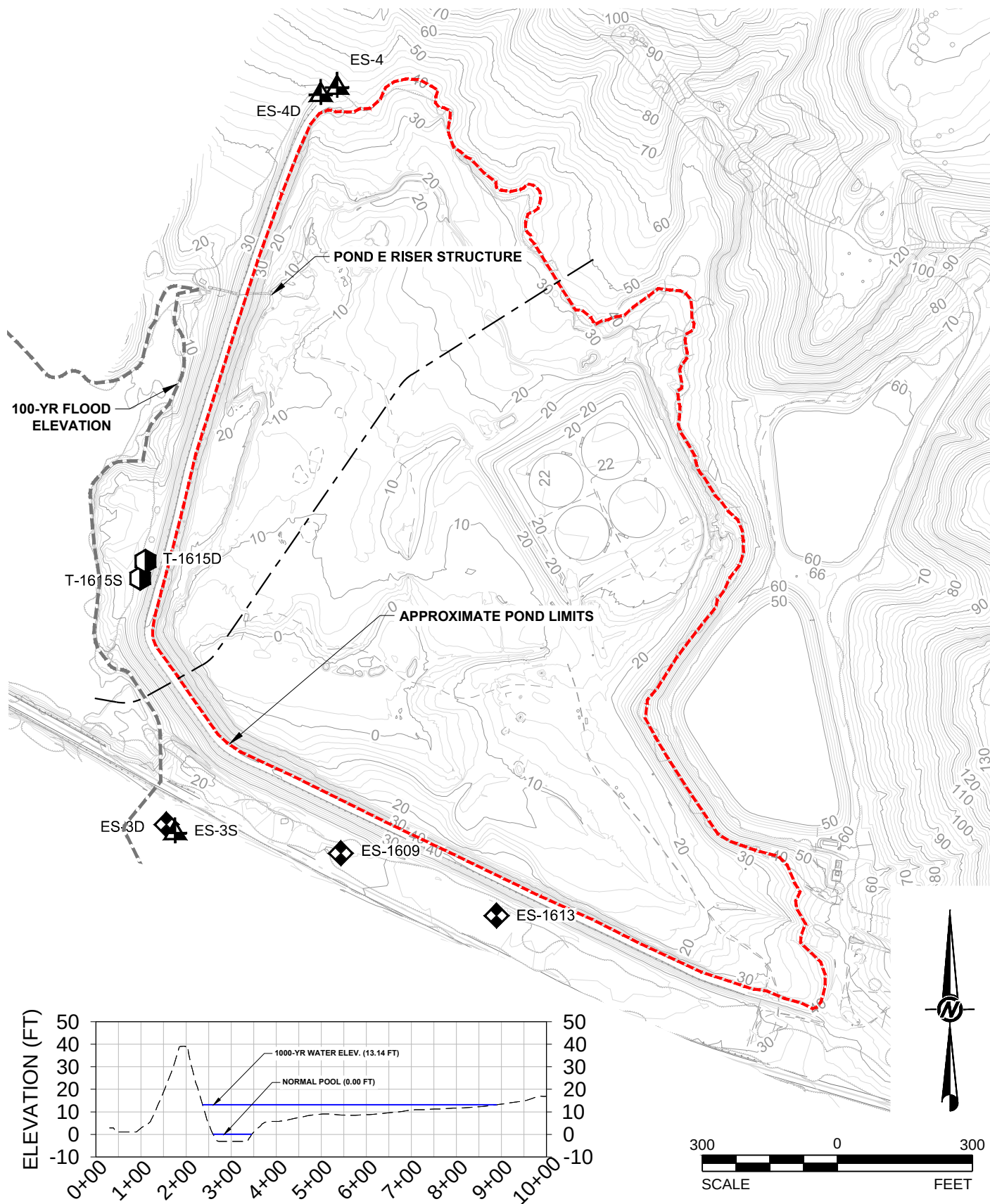
designed by: FAF
checked by: HEC
date: 9 MAY 77
project no: 77-36
sheet no: 2 of 2



APPENDIX C

Existing Condition Drawing

Path: G:\Projects\Dominion\Possum Point\16-2150 Engineering\CCR Inactive Demonstrations\Hist Of Constr Attach\Existing Conditions.dwg



CLIENT
DOMINION ENERGY
POSSUM POINT POWER STATION

PROJECT
HISTORY OF CONSTRUCTION

CONSULTANT



YYYY-MM-DD 2018-02-01

DESIGNED KAL

PREPARED KAL

REVIEWED DPM

APPROVED

TITLE
**POND E EXISTING CONDITIONS
APRIL 2017 SURVEY**

PROJECT NO.
16-62150

REV.

APP C

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

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Inc.
2108 W. Laburnum Avenue, Suite 200
Richmond, VA 23227 USA
Tel: (804) 358-7900
Fax: (804) 358-2900



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