HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

12 October 2016
File No. 40373-345

SUBJECT: CCR History of Construction
Pond 3A
Dayton Power & Light Company
J.M. Stuart Electric Generating Station
Aberdeen, Ohio

Haley & Aldrich, Inc. (Haley & Aldrich) has assisted Dayton Power & Light Company (DP&L) with compiling the history of construction for Pond 3A at the J.M. Stuart Electric Generating Station. This work was performed in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities, 40 CFR Part 257, specifically §257.73(c)(1).

To the extent feasible, Dayton Power & Light Co. has provided documentation supporting the history of construction. Information on the history of construction Pond 3A is presented in the following sections.

§257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Owner: Dayton Power & Light Company
745 US Route 52
P.O. Box 468
Aberdeen, OH 45101

Name of Unit: Pond 3A

NID[1] ID/ODNR ID Number: OH03183/8535-012

§257.73(c)(1)(ii): The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7 ½ minute or 15 minute topographic quadrangle map or a topographic map of equivalent scale if a USGS map is not available.

Latitude: 38°38'02"
Longitude: 83°41'00"
The general facility location map is provided in **Appendix 1**.

[1] National Inventory of Dams is a database which documents dams in the United States and is maintained by the USACE.

§257.73(c)(1)(iii): A statement of the purpose for which the CCR unit is being used.

Pond 3A is a CCR impoundment that receives wet sluiced fly ash produced from the combustion of coal in the station generating units.

§257.73(c)(1)(iv): The name and size, in acres, of the watershed within which the CCR unit is located.

Watershed Name: DP&L Pond 3A
Watershed Area: 56 acres

Watershed delineation and associated area are included in **Appendix 2**, from a memorandum titled, "Pond 3A Inflow Design Flood Control System Plan," by Haley & Aldrich, dated October 2016.

§257.73(c)(1)(v): A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

The description of the physical and engineering properties of the foundation and abutment materials on which Pond 3A is constructed was discussed in a report entitled, "Assessment of Dam Safety Coal Combustion Surface Impoundments (Task 3) Final Report" by CHA, dated 26 March 2010, as well as a report entitled, "Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station" by Bowser-Morner, dated 30 January 1975.

Additional geotechnical properties of the dike and foundation are presented in a report entitled, "Ponds 3A, 5, 6 & 7 Slope Stability Investigation" by BBC&M Engineering, Inc. dated May 2010. Pertinent pages from these reports providing the required information are included in **Appendix 3**.

A subsurface exploration program, including work around Pond 3A, was performed as part of the CCR Rule compliance Safety Factor Assessment. The final report, entitled "Initial Safety Factor Assessment, J.M. Stuart Station, Ponds 3A, 5, 6, 7, and 10" by Haley & Aldrich, Inc., dated October 2016 details test borings and cone penetrometer soundings performed adjacent to the unit (see pages 5-7 and Appendix A). This report in its entirety is available to the public via the DP&L CCR Rule compliance website.

§257.73(c)(1)(vi): A statement of the type, size, range, and physical engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

Pond 3A was constructed in **1** zone/stage.

- The type, size, range, and physical engineering properties of the materials of each stage of Pond 3A are discussed in **"**Soil Investigation and Design for Proposed Fly Ash Dikes" dated 30 January 1975 and prepared by Bowser-Morner. Geotechnical properties of the berm and

foundation are presented in "Ponds 3A, 5, 6 & 7 Slope Stability Investigation by BBC&M Engineering, Inc. dated May 2010.

- The method of site preparation and construction of each zone of Pond 3A are discussed in "Soil Investigation and Design for Proposed Fly Ash Dikes" by Bowser- Morner, dated 30 January 1975.

- The approximate dates of construction for each zone/stage are as follows:
  - Zone/Stage 1: 1978

Pertinent pages from the above referenced reports are included in **Appendix 4**.

§257.73(c)(1)(vii): At a scale that details engineering structures and appurtenances relevant to the design, construction, operation and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Design drawings providing information listed above, as available are included in **Appendix 5**. Should the provided design drawings not include information identified in 257.73(c)(1)(vii), it should be assumed that design drawings including this information are not available.

§257.73(c)(1)(viii): A description of the type, purpose, and location of existing instrumentation.

The following instrumentation exists at Pond 3A:

- Staff Gage

The staff gage was installed to regularly monitor the water level in Pond 3A.

§257.73(c)(1)(ix): Area- capacity curves for the CCR unit.

A large number of DP&L historical facility documents was provided to Haley & Aldrich by DP&L, within which no record of area-capacity curves for Pond 3A was found.

§257.73(c)(1)(x): A description of each spillway and diversion design features and capacity calculations used in their determination.

Pond 3A maintains the following spillways/diversion design features:

- The Pond 3A spillway consists of a rectangular concrete decant structure located in the northeast corner of the pond. The level in the pond is controlled by removable stop logs installed in the structure. Water entering the decant structure flows into a 30-inch diameter reinforced concrete pipe (RCP) which penetrates the east embankment and discharges to a channel that conveys the flow to Pond 6.

A description of the Pond 3A spillway is discussed in a report entitled, "Assessment of Dam Safety Coal Combustion Surface Impoundments (Task 3) Final Report" by CHA dated 26 March 2010, and in a report entitled, "Dam Safety Inspection Report – J.M. Stuart Station Ash Pond 3A," by Ohio Department of Natural Resources, dated June 27, 2013. Pertinent pages from these reports providing the required information are included in **Appendix 6**.

§257.73(c)(1)(xi): The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

The construction specifications and provisions for surveillance, maintenance, and repair of Pond 3A are discussed in the following documents:

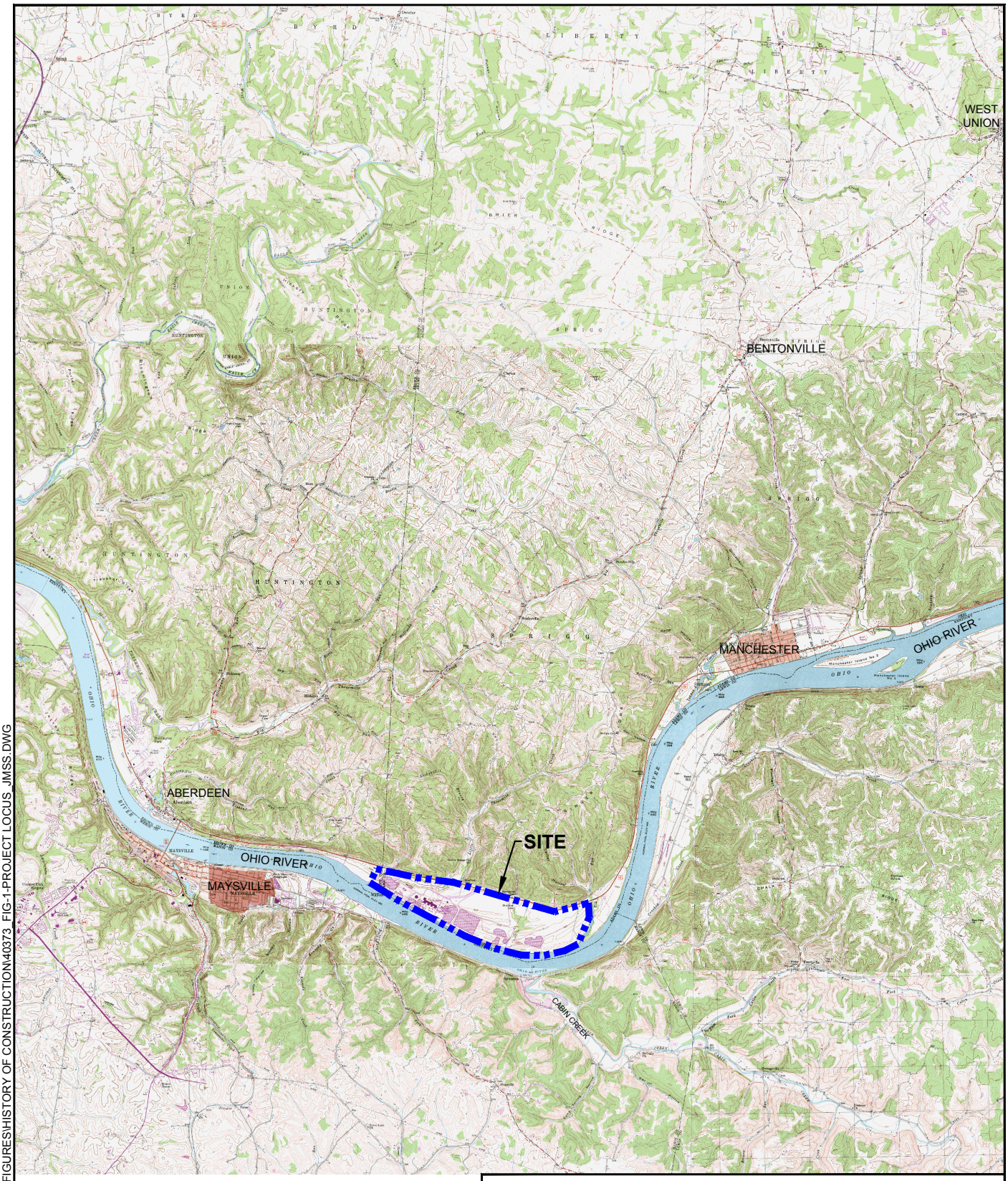
- "Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station," by Bowser-Morner Testing Laboratories, Inc., dated January 30, 1975.
- "Operation Maintenance and Inspection Manual Ash Impoundment Dike Stuart Electric Generating Station" by DP&L, dated April 2014.
- "Assessment of Dam Safety Coal Combustion Surface Impoundment (Task 3) Final Report" by CHA, dated 26 March 2010.

Pertinent pages from the above referenced reports are included in **Appendix 7**.

§257.73(c)(1)(xii): Any record or knowledge of structural instability of the CCR unit.

There are no records or knowledge of structural instability associated with Pond 3A.

APPENDIX 1
Site Locus



TOPO SOURCE: USGS TOPOGRAPHIC MAPS
RUSSELLVILLE, DECATUR, WEST UNION, MAYSVILLE EAST, MAYSVILLE WEST , MANCHESTER ISLANDS - OHIO
MAYS LICK, ORANGEBURG, TOLLESBORO - KENTUCKY
QUADRANGLES (2013)

HALEY ALDRICH

DAYTON POWER & LIGHT COMPANY
J. M. STUART GENERATING STATION
745 U.S. ROUTE 52
ABERDEEN, OHIO

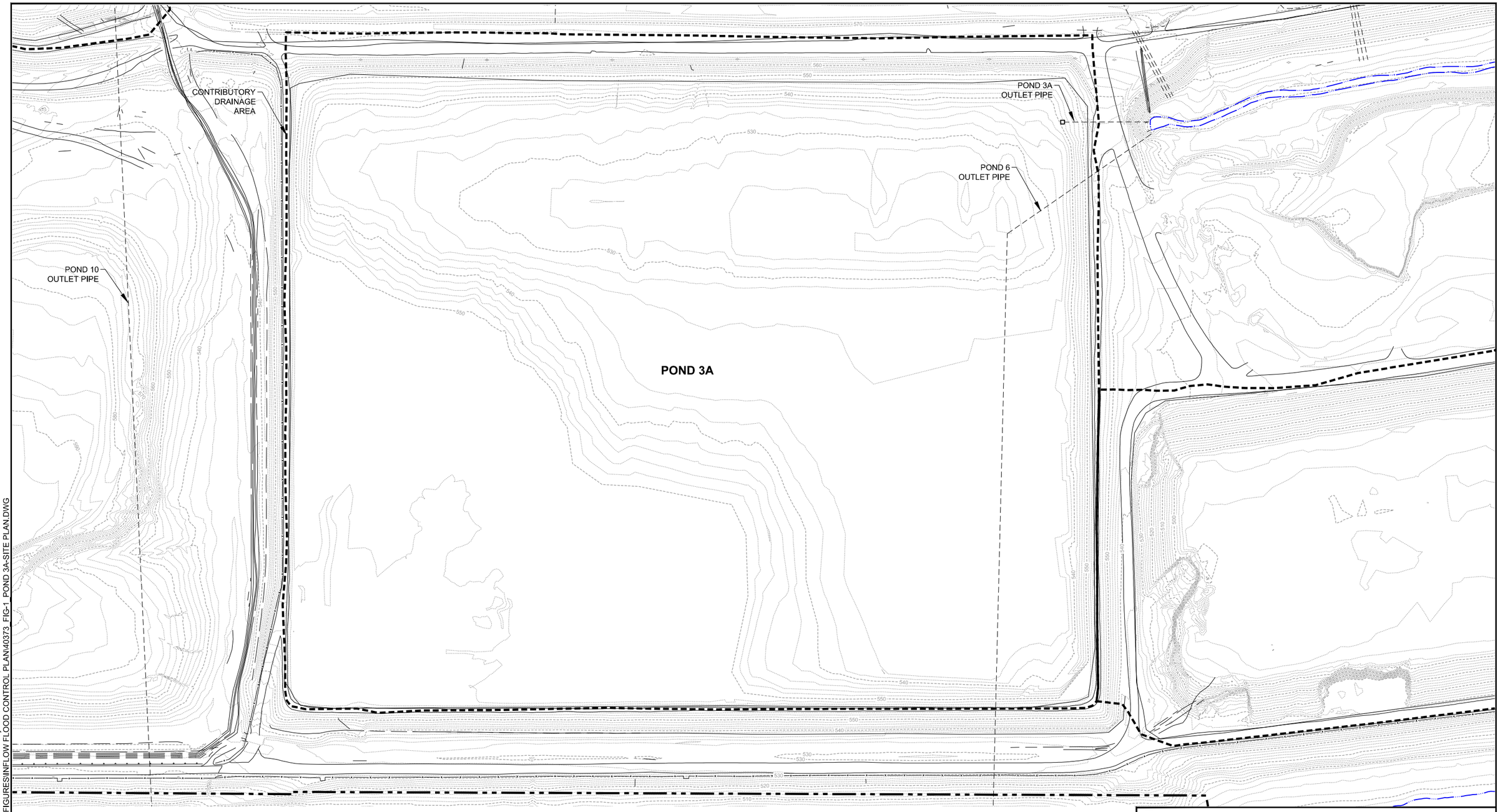
PROJECT LOCUS

APPROXIMATE SCALE: 1" = 10 000'
OCTOBER 2016

FIGURE 1

LUCAS, ANDY Printed: 9/30/2016 11:16 AM Layout: FIGURE 1
G:\40373_DP&LICAD-JMSS\GLOBAL\FIGURES\HISTORY OF CONSTRUCTION\40373_FIG-1-PROJECT LOCUS_JMSS.DWG

APPENDIX 2
Figure 1 and Appendix from:
Pond 3A Inflow Design Flood Control System Plan
By Haley & Aldrich, Dated October 2016



VARI, KATALIN Printed: 3/22/2016 1:24 PM Layout: P3A
G:\40373_DP&LICAD-JMSSIGLOBAL\FIGURES\INFLOW FLOOD CONTROL PLAN\40373_FIG-1_POND 3A-SITE PLAN.DWG

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- LEGEND ITEM 3
- LEGEND ITEM 4

NOTES

1. PLACEHOLDER FOR CURRENT DRAWING NOTES.

0 200
SCALE IN FEET

HALEY ALDRICH

DAYTON POWER & LIGHT COMPANY
J.M. STUART STATION
ABERDEEN, OHIO

POND 3A SITE PLAN

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 1

Summary for Subcatchment P3AS: Pond 3A Subcatchment

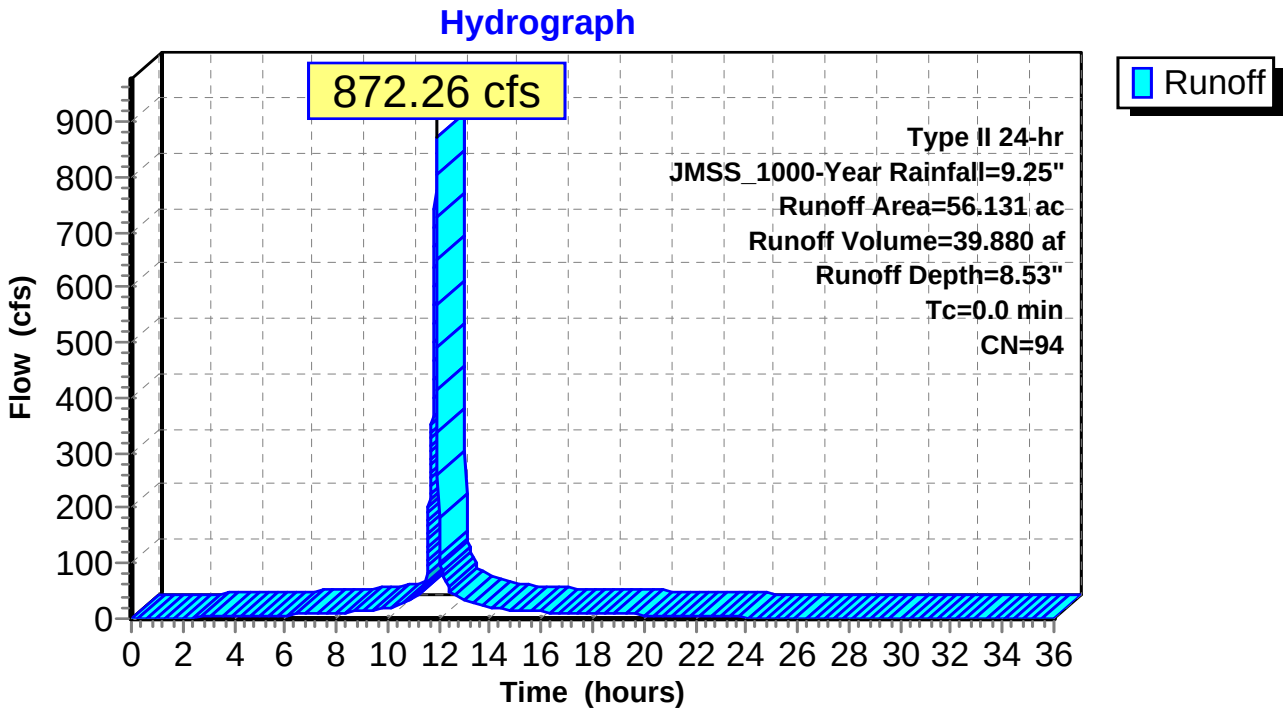
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 872.26 cfs @ 11.90 hrs, Volume= 39.880 af, Depth= 8.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type II 24-hr JMSS_1000-Year Rainfall=9.25"

Area (ac)	CN	Description
49.139	98	Water Surface, HSG B
6.992	69	Pasture/grassland/range, Fair, HSG B
56.131	94	Weighted Average
6.992		12.46% Pervious Area
49.139		87.54% Impervious Area

Subcatchment P3AS: Pond 3A Subcatchment



APPENDIX 3.1
Excerpt from:
Assessment of Dam Safety Coal Combustion Surface Impoundments (Task 3)
Final Report
By CHA, Dated 26 March 2010
Pages 102-104

3.3.3 Structural Adequacy & Stability – Ponds 5, 6, and 7/7A

CHA was not provided with information regarding stability analyses performed for Ponds 5, 6, and 7/7A. Without having received site specific subsurface information, CHA was unable to perform a preliminary stability analyses for dikes. Our recommendation that subsurface investigations and stability analyses be performed for these ponds is discussed in Section 4.6.

3.4 Foundation Conditions

CHA has been provided with geotechnical subsurface information for Pond 3A and Pond 10 at the JM Stuart site. Bowser Morner and URS Greiner Woodward Clyde performed the respective investigations for the Pond 3A and Pond 10 sites. The subsurface conditions encountered in the foundation soils at these two structures are discussed in the two sections that follow.

3.4.1 Foundation Conditions – Pond 3A

A total of 47 soil borings were drilled to investigate the subsurface conditions at Pond 3A, 32 of which were advanced along the proposed dike centerline. Nine (9) of the borings were drilled in the northern 2/3 of the basin area and 6 borings were drilled along the proposed toe of the southern dike. Figure 12 depicts the general locations of the soil borings, which were organized into groups labeled A through E, apparently to delineate the differing existing conditions and areas where the borings were advanced.

The E and D borings were drilled in the northern 2/3 of the basin noted on the plans as “original ground” and generally encountered medium stiff to very stiff cohesive alluvium to depths ranging from approximately 7 feet to 19.5 feet, underlain by loose to dense sand to sandy gravel. Topsoil thicknesses ranged from 0.5 feet to 1.5 feet in these borings and isolated areas of granular fill from 2.5 feet to 6.5 feet deep was also encountered. Coal was noted at the surface of one boring advanced near the Coal Storage Area that existed at the time the borings were drilled.

Three C borings were drilled in the Coal Storage Area along the centerline of the proposed dike and encountered approximately 16 to 31 feet of fill above very stiff to hard cohesive alluvium and deeper dense sand. The fill varied in composition and included loose to medium dense coal, medium dense sand and gravel, and mixtures of fly ash, coal, and silty clay. Of particular interest is approximately 28.5 feet of fly ash encountered below about 2.5 feet of surficial fill in one of the borings in this area. Field penetration tests in this material produced N-values ranging from 5 to 12 blows per foot, indicating a very loose to medium dense condition.

The A and B borings were drilled along the centerline of the proposed south dike and southern third of the proposed east dike, and at the toe of the proposed south dike. These borings were in the general location of an existing ash basin. This area is shown in Drawing 300-12-1020B (1976), which depicts how Pond 3A lies above this older ash basin. Fill, comprising silty sand and gravel to silty clay and sand, was encountered to depths ranging from 0.5 to 16.0 feet. Field tests (N-values) in this fill varied widely from 2 to 70 blows per foot, reflecting very loose or soft, to very dense or hard conditions. Fly ash was encountered below this upper fill, ranging from 0.5 feet to 29.5 feet in thickness. An average N-value equal to 6 blows per foot was noted in this material, indicating loose conditions, though in several locations below an apparent water table the average was lower with weight of hammer values being recorded. In the B borings, additional fill, generally very stiff to hard silty clay used to construct the existing dike, was encountered below the fly ash. Natural soils below the fly ash and old dike fill were stiff to hard cohesive alluvium similar to the surficial soils encountered in other portions of the proposed basin.

In addition to the soil borings, DP&L provided record drawings related to construction of the ash ponds at the site. Drawings 300-12-1020B (1976) and 300-12-1020C (1977) show plan and sections for Ash Ponds 3A and 8. Section A-A, which applies to the eastern and southern dikes, indicates that the dikes are to be constructed above an existing 2-foot-thick clay cover. Other sections indicate that the dikes are to be constructed above existing grade. An approximately 3-

foot-thick and 40-foot-wide sand drainage blanket is indicated at the base of the downstream slope.

Clearing and grading specifications address vegetation, rubbish, deleterious material, "structures scheduled for demolition" removal and disposal, formation of fill areas, subgrade preparation, and compaction requirements (90% of the maximum modified Proctor dry density). These specifications and drawing do not, however, indicate if the existing dikes were scheduled for demolition, or if the ash was considered deleterious and subsequently stripped or excavated from beneath the dikes,. Given that the available stability analyses for Pond 3A include the impounded ash below the dike section, it is highly likely that the impounded ash was allowed to remain in place. Additional comments related to this foundation condition and liquefaction potential appear in Section 4 of this document.

3.4.2 Foundation Conditions – Ponds 5, 6, and 7/7A

CHA was not provided with geotechnical subsurface information for Ponds 5, 6, and 7/7A. However, several record drawings related to construction of the ash ponds at the site were made available. The information provided is described below in chronological order as it relates to the aforementioned ponds.

Drawings 300-12-1020, -1022, and -1023 (1966) are related to construction of the Station, an ash pond west of the plant, and a coal storage area and ash disposal area east of the plant. The cross section on the 1966 drawings implies that the Station buildings are supported on pile foundations. The notes on the 1966 drawings provide the following information regarding construction of the dikes:

- The area shall be stripped of "all fences, timber, stumps, structures, or other obstructions, and striped of topsoil, unsuitable or excessively wet earth, vegetation, stubble, surface trash, and perishable matter of all sorts."
- Embankment fill material shall be excavated from the borrow areas on the site.

APPENDIX 3.2
Excerpt from:
Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station
By Bowser-Morner, Dated 30 January 1975
Section II, Section VII Pt. 2

BOWSER-MORNER Testing Laboratories, Inc.
Founded 1911
CORPORATE ADDRESS • 420 Davis Ave. • P.O. Box 51 • Dayton, Ohio 45401 • 513/253-8805

February 19, 1975

Dayton Power and Light Company
Cincinnati Gas and Electric Company
Columbus and Southern Ohio Electric Company
25 North Main Street
Dayton, Ohio 45401

Attention: Mr. Jack Puterbaugh

Re: Addendum #1 to Report #788533, Dated January 30, 1975: Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station, Aberdeen, Ohio

Gentlemen:

The purpose of this letter is to outline the specific details of the construction at the above-referenced project. The option which will be utilized is Option I discussed in our report (please refer to BOWSER-MORNER Testing Laboratories report number 788533, dated January 30, 1975). The particular option chosen is for the dikes to be constructed to elevation 558 feet with no provisions made for extending the height of the dikes 3 feet at some future date. The top width of the dikes will be 12 feet at elevation 558 feet. The pit itself will be excavated to elevation 530 feet. The quantities of material required for the construction of the dikes with this procedure are as follows:

Material	Yardage Required
Clay	353,069
Sand	23,414
TOTAL	376,483

The following quantities will be excavated from the pit at a bottom elevation of 530 feet:

Material	Yardage Excavated
Topsoil	77,407
Good Clay	358,915
Poor Clay	81,329
Sand	44,178
TOTAL	561,829

The total yardage figure represents the total excavation from the borrow pit. It is felt, as stated in the above-referenced report, that a shrinkage factor of 15% should be utilized with these values. The following quantities of material are, therefore, available once compaction has been accomplished:

Material	Yardage Available
Good Clay	312,000
Poor Clay	70,721
Sand	38,416

The overruns of material excavated over what will be used in the dikes themselves are, therefore:

Material	Yardage Overrun
Topsoil	77,407
Good Clay	0
Poor Clay	34,100 (uncompacted)
Sand	17,252 (uncompacted)

A total of 27,500 cubic yards will be required for sealing off the sand in the bottom of the borrow pit. With 29,652 yards of poor clay available there will be approximately a 2,000 yard overrun on the poor clay material. There will also be an overrun of 17,252 yards of sand which in our understanding will be left in the bottom of the pit and not removed. Only that amount of sand necessary for the construction of the sand filter will be excavated.

The topsoil and portions of the poor clay which are left over will be utilized to fill pit number 6 to form an impervious blanket in the bottom of the pit, and whatever topsoil is left will be used to face the outside of the dikes in order to promote vegetation growth.

All other recommendations are contained in the above-referenced report. If there are any questions or if we can be of further service, please contact us.

Very truly yours,

BOWSER-MORNER Testing Laboratories, Inc.

David C. Cowherd

DCC:ss
6-Addressee
3-File

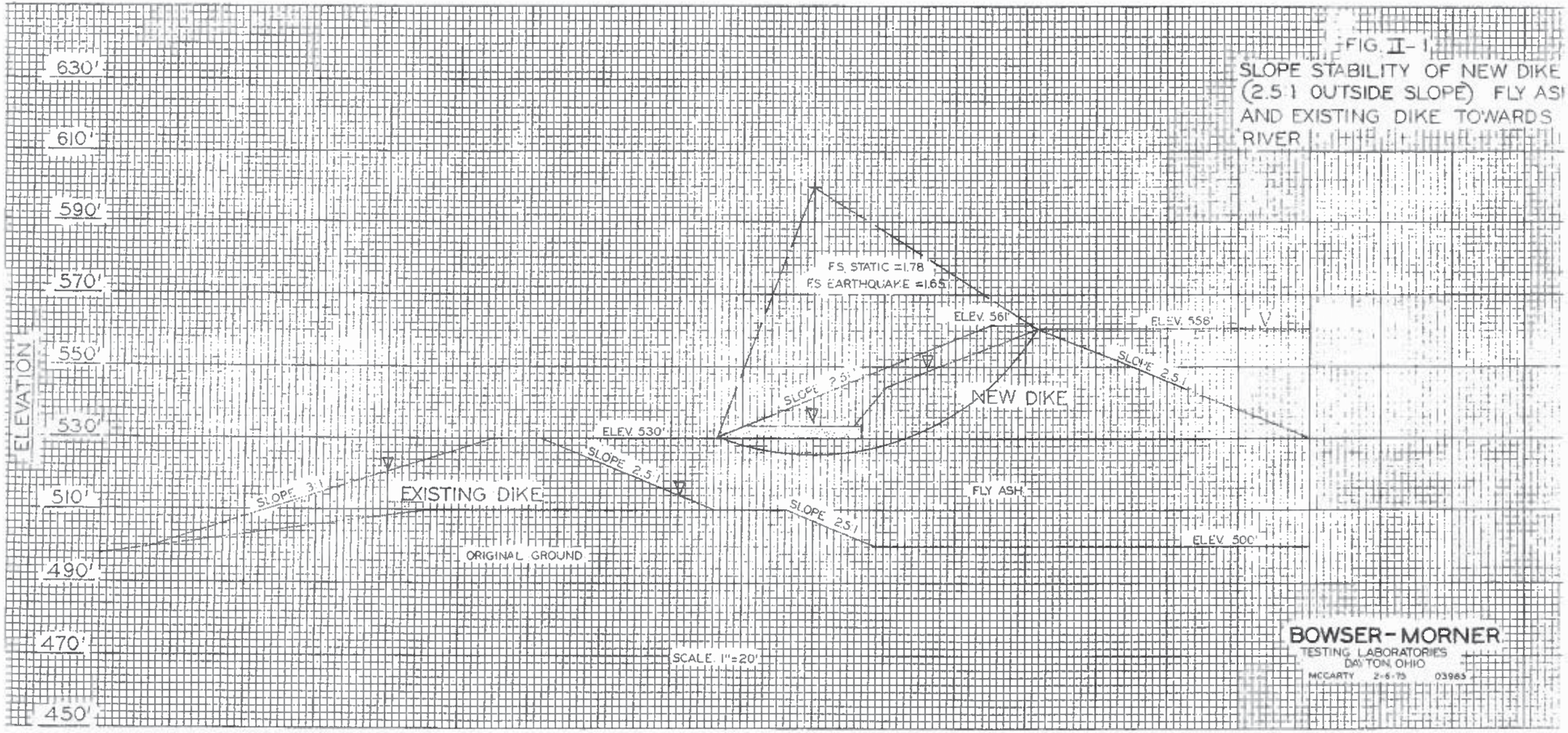
David C. Cowherd, M.S., P.E.
Chief Soils Engineer
Construction Materials Div.

BOWSER-MORNER
Testing Laboratories, Inc.

SECTION II

SLOPE STABILITY ANALYSES

FIG. II-1
SLOPE STABILITY OF NEW DIKE (2.5:1 OUTSIDE SLOPE) FLY ASH AND EXISTING DIKE TOWARDS RIVER



BOWSER-MORNER
TESTING LABORATORIES
DAYTON, OHIO
MCCARTY 2-6-75 03983

FIG II-2

SLOPE STABILITY OF NEW DIKE (2.5:1 OUTSIDE SLOPE) TOWARD RIVER

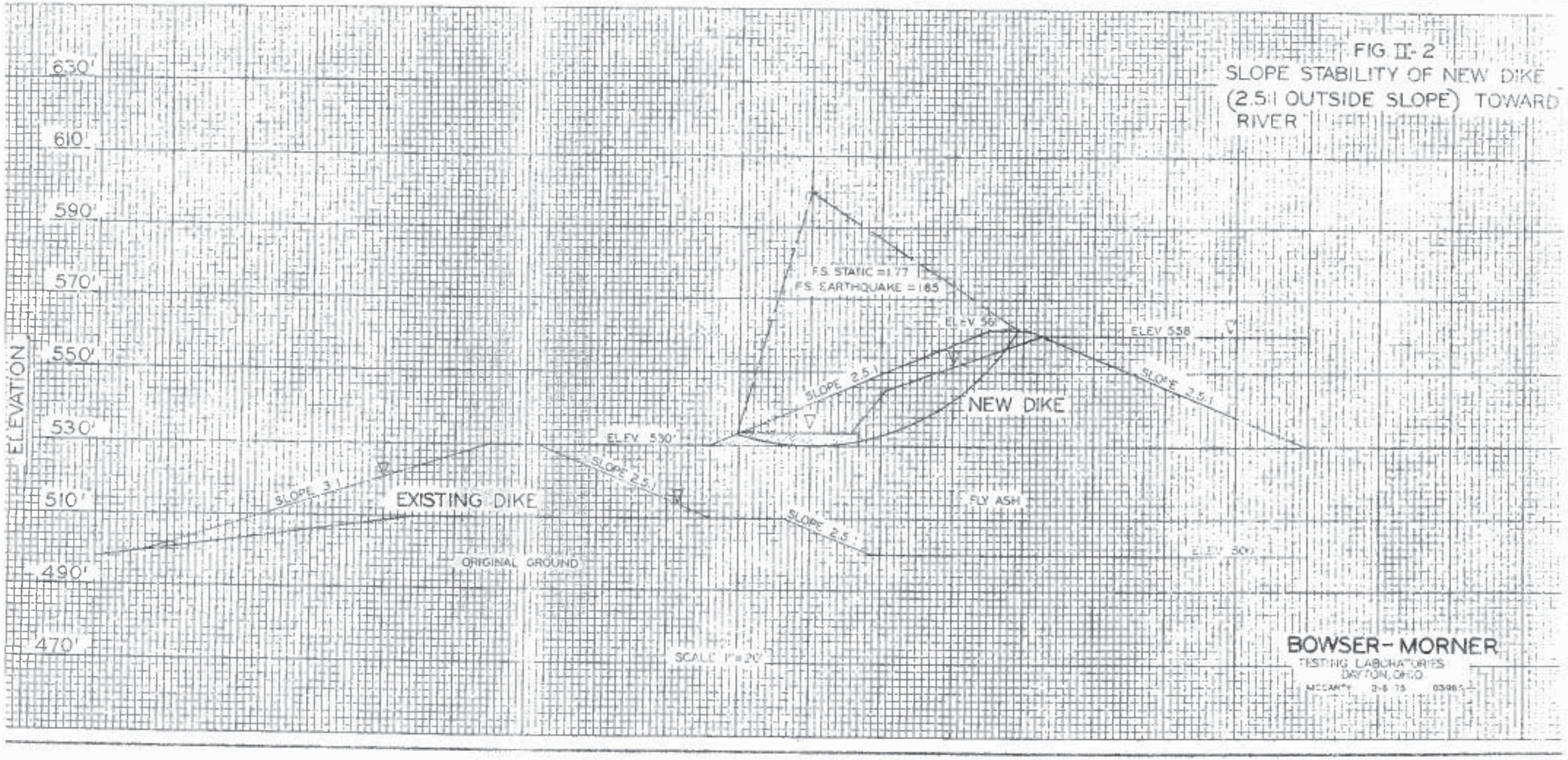


FIG. II-3

SLOPE STABILITY OF NEW DIKE TOWARD INTERIOR OF PIT UNDER RAPID DRAWDOWN CONDITION

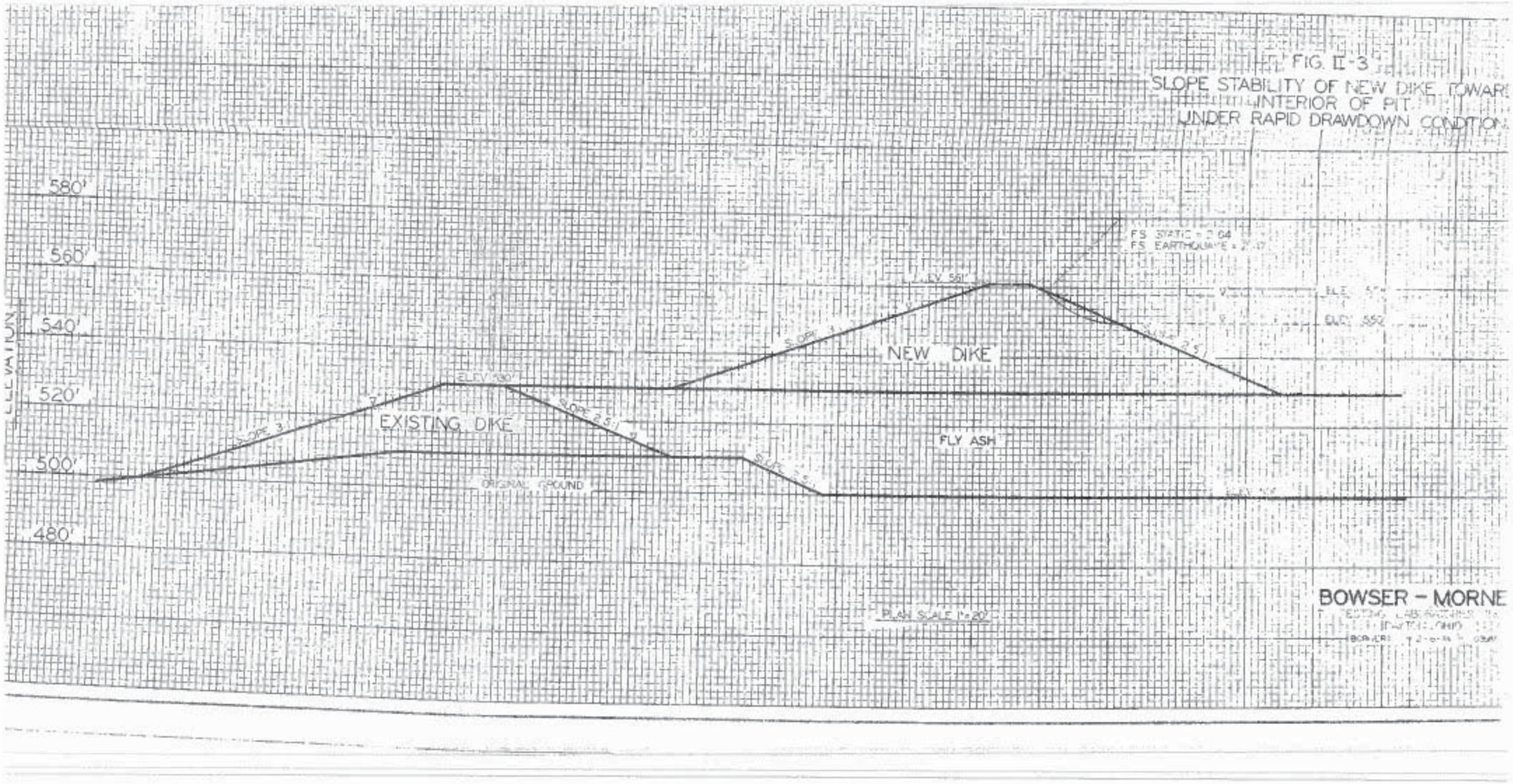
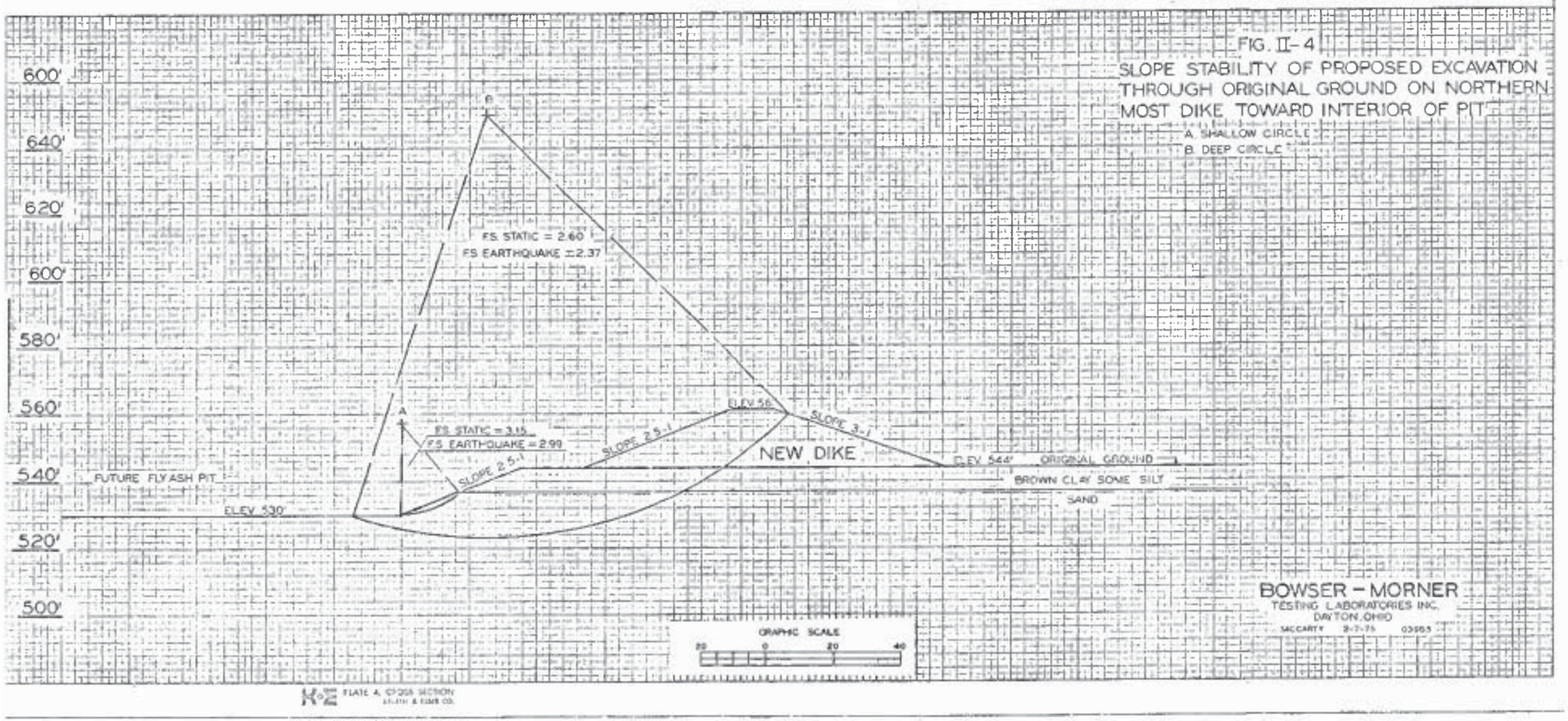


FIG. II-4

SLOPE STABILITY OF PROPOSED EXCAVATION THROUGH ORIGINAL GROUND ON NORTHERN MOST DIKE TOWARD INTERIOR OF PIT

A. SHALLOW CIRCLE

B. DEEP CIRCLE



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TESTING LABORATORIES INC.
DAYTON, OHIO
MCCARTY 3-3-75 03865

PLATE A CROSS SECTION

FIG II-5

SLOPE STABILITY OF NEW DIKE (3:1 OUTSIDE SLOPE),
FLY ASH AND EXISTING DIKE TOWARD RIVER

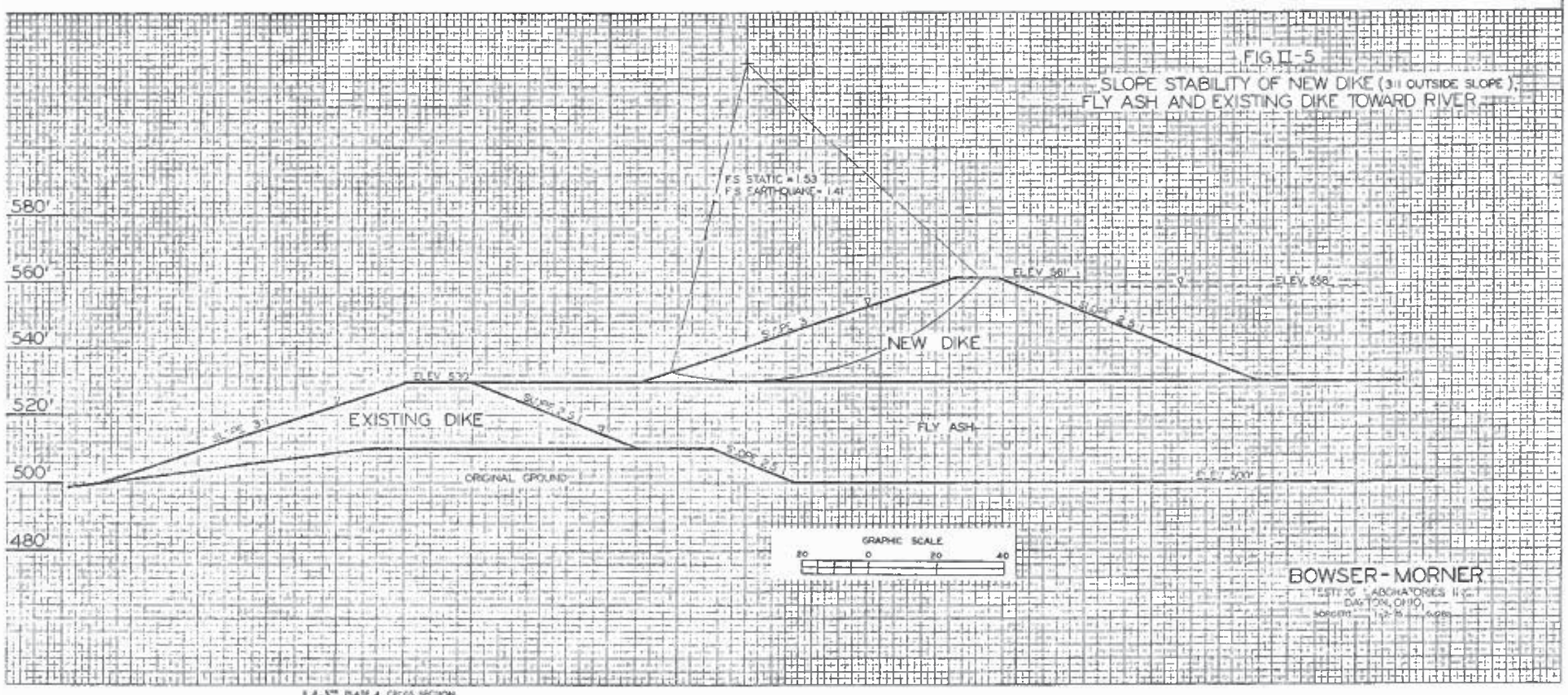
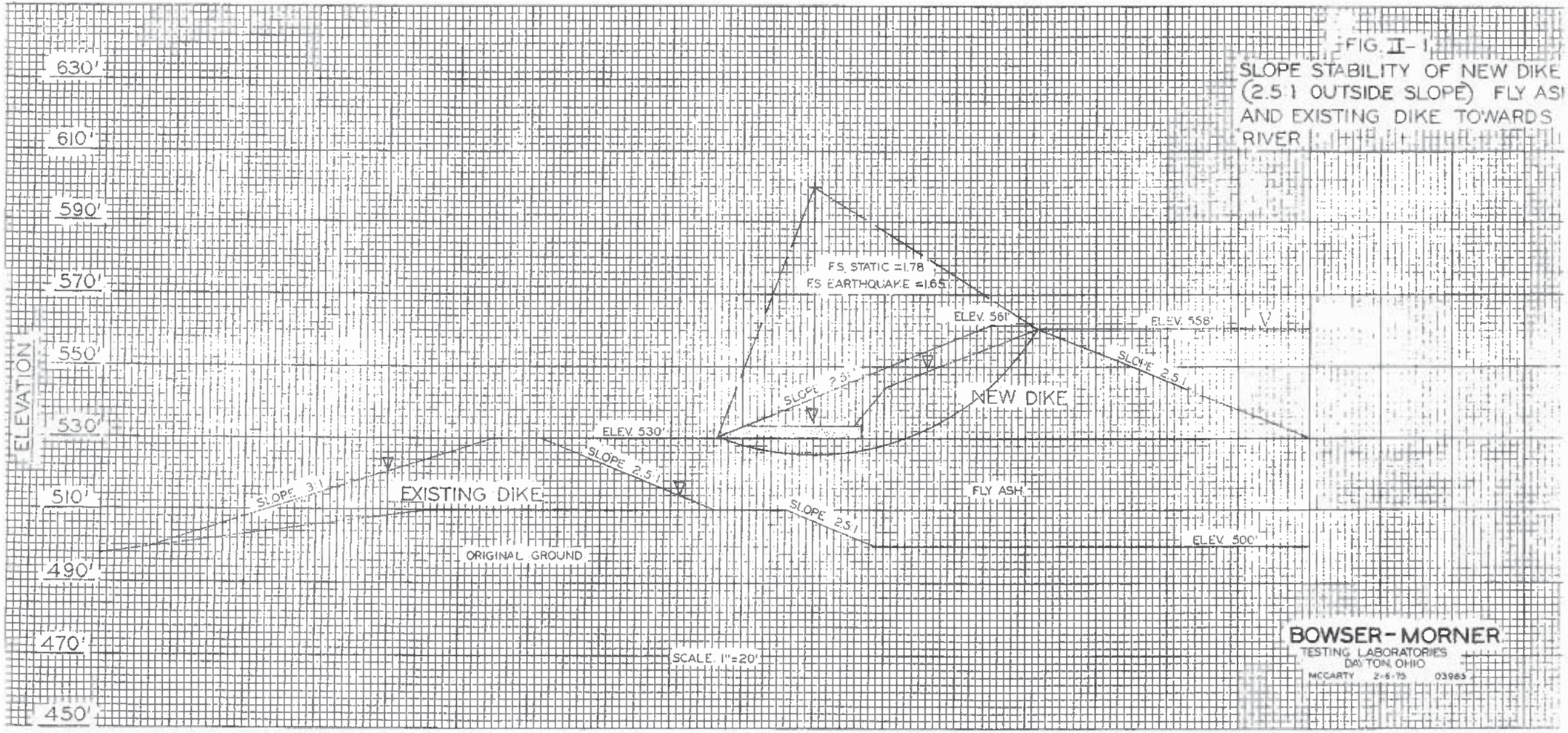


PLATE 4, CROSS SECTION
SMITH & KEEP CO.

FIG. II-1
SLOPE STABILITY OF NEW DIKE (2.5:1 OUTSIDE SLOPE) FLY ASH AND EXISTING DIKE TOWARDS RIVER



BOWSER-MORNER
TESTING LABORATORIES
DAYTON, OHIO
MCCARTY 2-6-75 03983

FIG II-5

SLOPE STABILITY OF NEW DIKE (3:1 OUTSIDE SLOPE),
FLY ASH AND EXISTING DIKE TOWARD RIVER

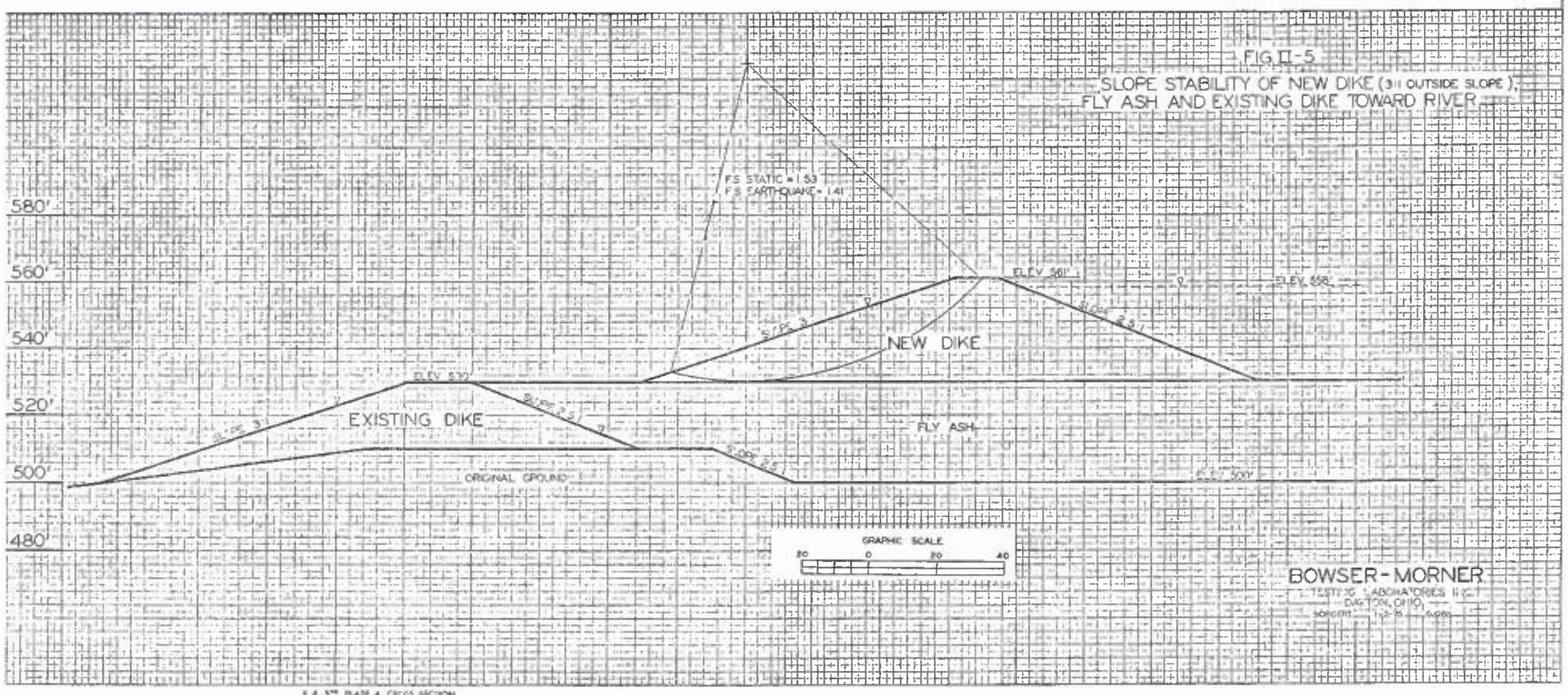
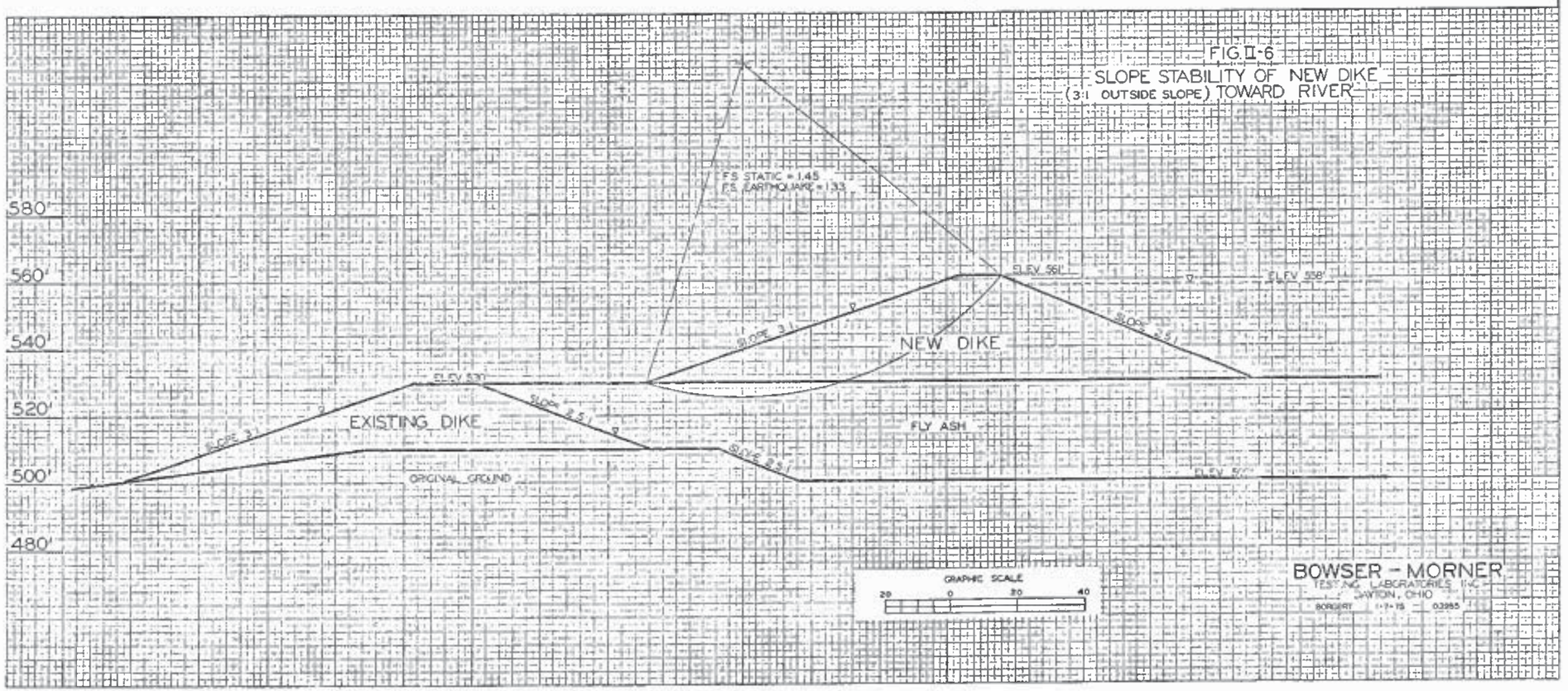


PLATE 4, CROSS SECTION
SMITH & KEEP CO.

FIG. II-6

SLOPE STABILITY OF NEW DIKE
(3:1 OUTSIDE SLOPE) TOWARD RIVER

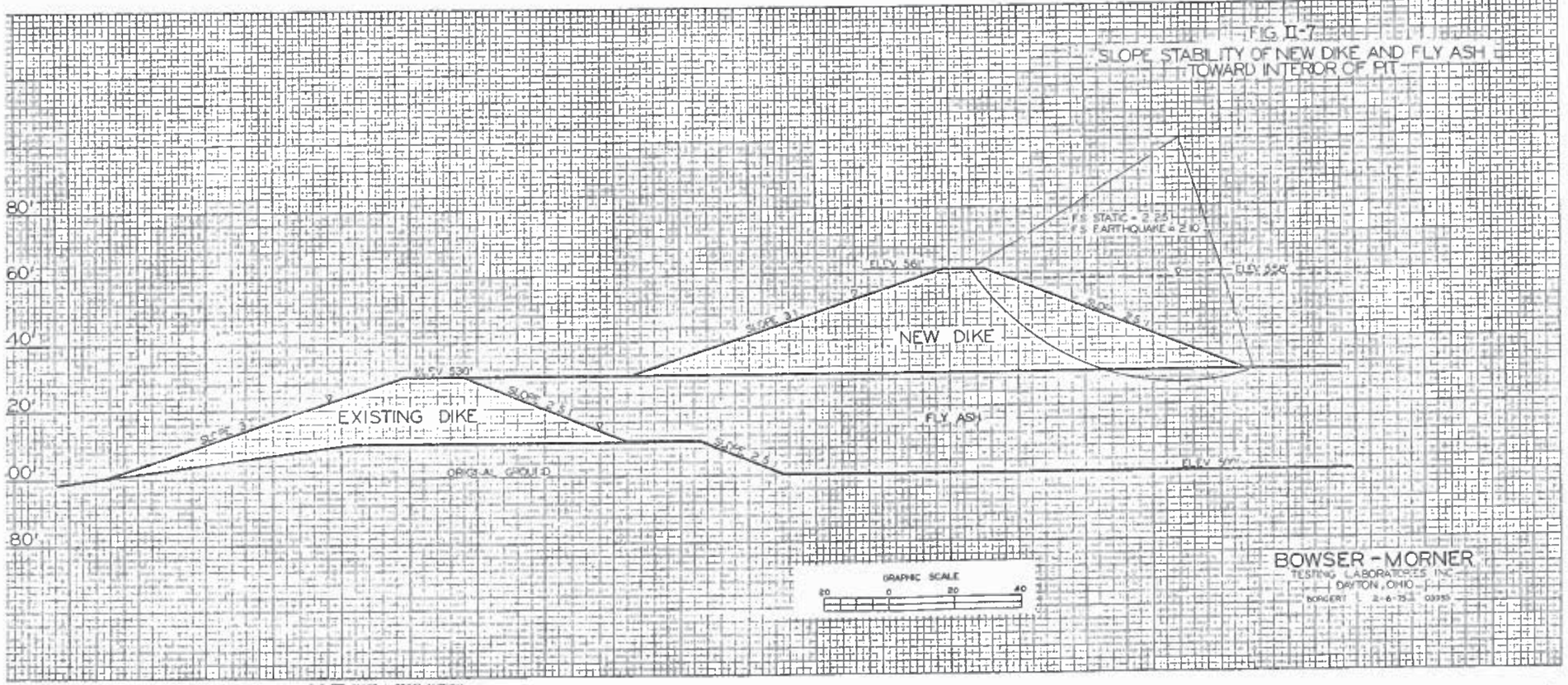


BOWSER – MORNER
TESTING LABORATORIES, INC.
DAYTON, OHIO
BORG/RT 1-7-75 03985

K-E PLATE 4, CROSS SECTION
KEUFFEL & ESSER CO.
46 7004 IMPERIAL™

FIG. II-7

SLOPE STABILITY OF NEW DIKE AND FLY ASH TOWARD INTERIOR OF PIT

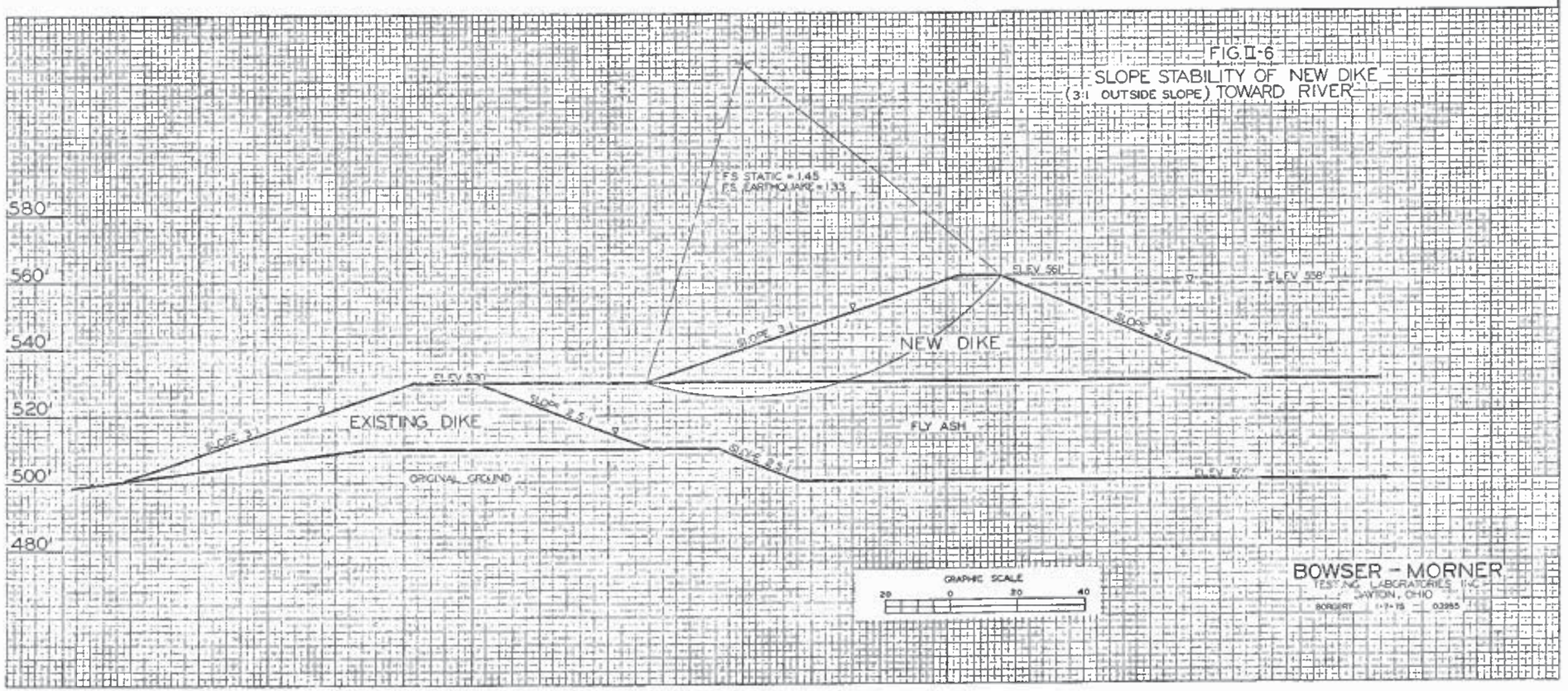


K&E PLATE 4, CROSS SECTION
Keuffel & Esser Co.

46 7008 IMPERIAL

FIG. II-6

SLOPE STABILITY OF NEW DIKE
(3:1 OUTSIDE SLOPE) TOWARD RIVER

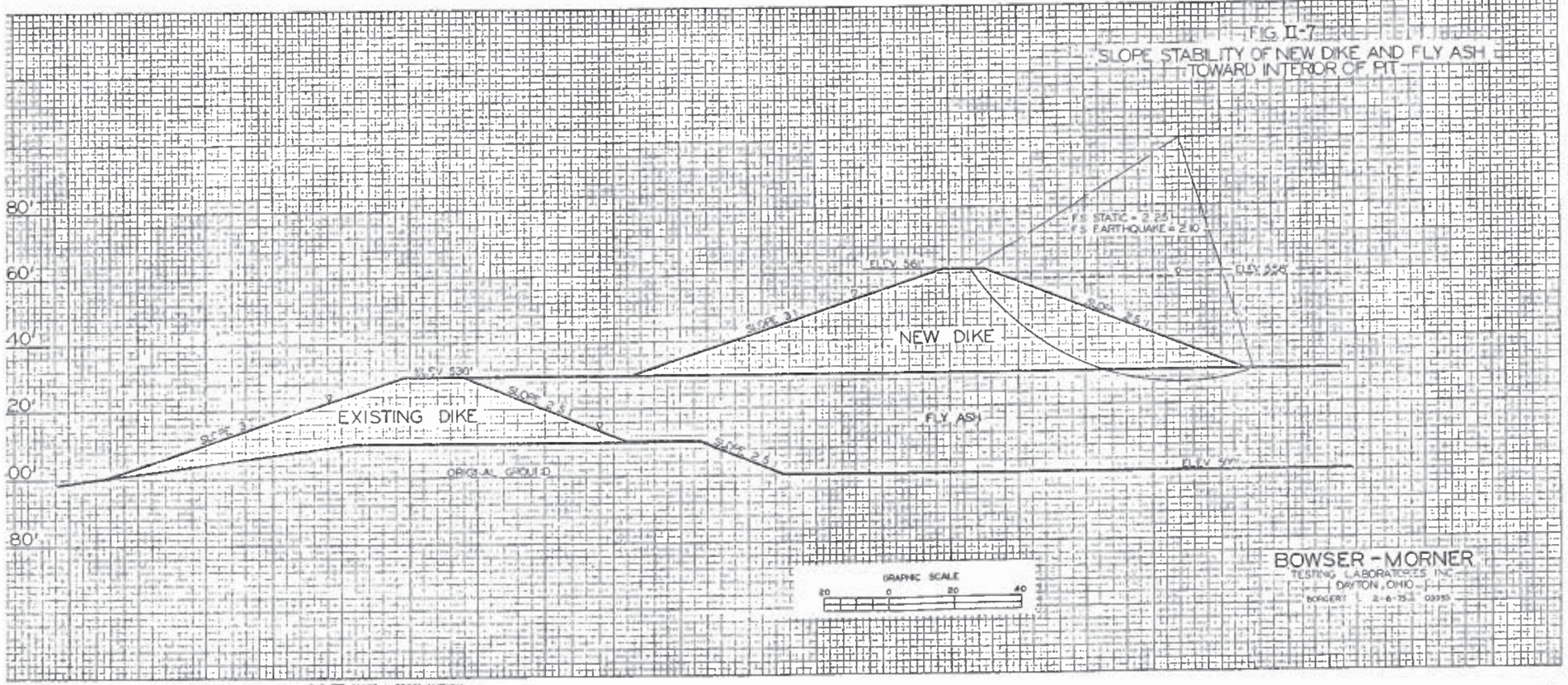


BOWSER – MORNER
TESTING LABORATORIES, INC.
DAYTON, OHIO
BORG/RT 1-7-75 03985

K-E PLATE 4, CROSS SECTION
KEUFFEL & ESSER CO.
46 7004 IMPERIAL™

FIG. II-7

SLOPE STABILITY OF NEW DIKE AND FLY ASH TOWARD INTERIOR OF PIT



K&E PLATE 4, CROSS SECTION
Keuffel & Esser Co.

46 7008 IMPERIAL

EXISTING DISCHARGE CANAL

NORTH-SOUTH BASE LINE

EAST-WEST BASE LINE

ORIGINAL GROUND

AVE. ELEV. 530.0'

COAL STORAGE AREA

ASH DISPOSAL AREA

TOE AT 530.0'

SLOPE 2.5-1

N

LEGEND

NEW CONSTRUCTION

EXISTING CONSTRUCTION

PLAN SCALE 1"=200'

OHIO FLOW RIVER

545'

535'

525'

515'

NOTE: SOIL STRATA ARE INTERPOLATED BETWEEN BORINGS

LEGEND

FILL (SOIL AND/OR GRAY FLY ASH) AND/OR TOPSOIL

CLAY WITH VARYING AMOUNTS OF SILT, SAND, AND GRAVEL

SAND AND/OR SAND AND GRAVEL WITH VARYING AMOUNTS OF SILT AND CLAY

EXISTING DIKE

COAL

BLOWS PER FOOT

INITIAL GROUNDWATER DEPTH

COMPLETION GROUNDWATER DEPTH

GROUNDWATER DEPTH AFTER 24 HRS

NEW CONSTRUCTION

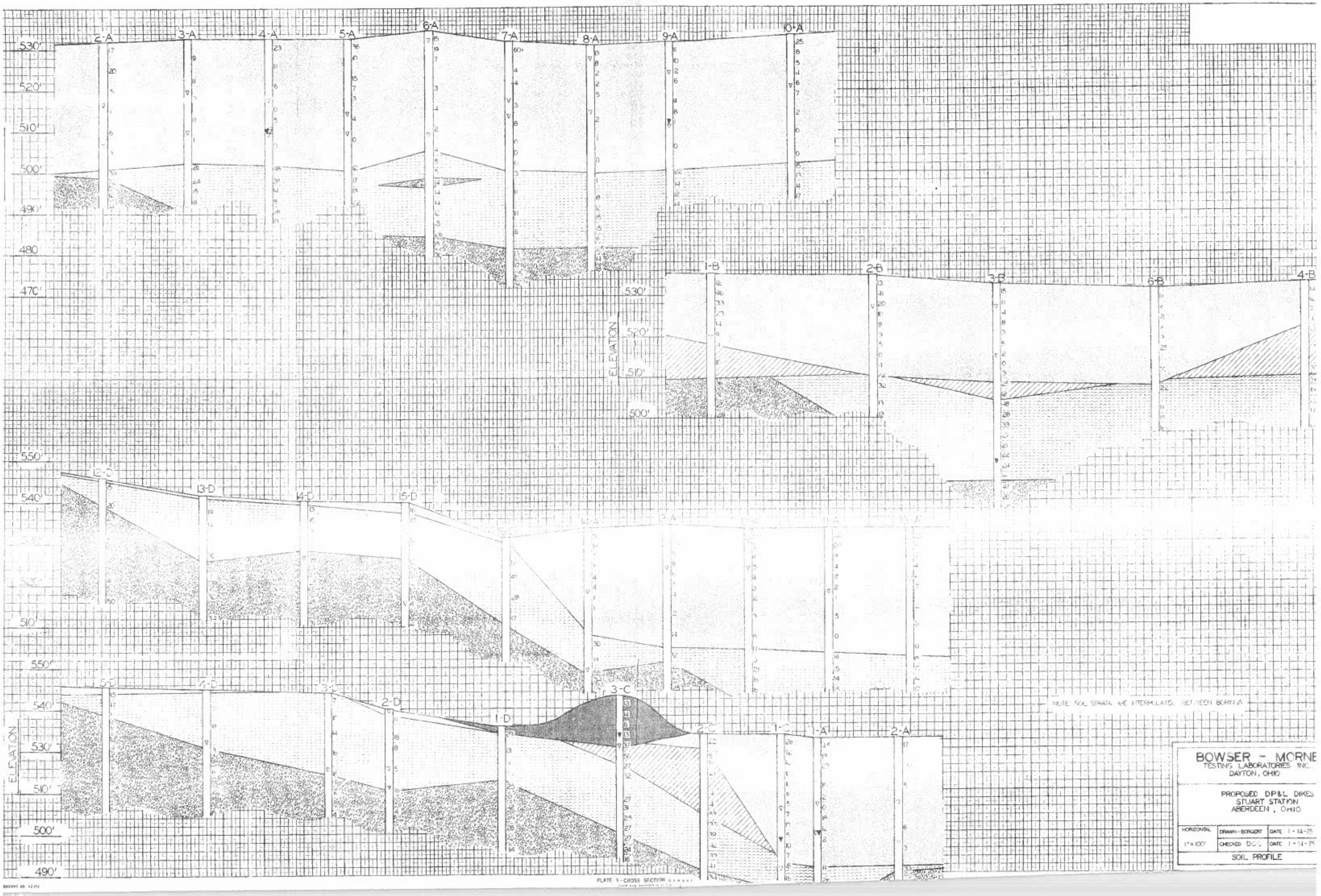
EXISTING CONSTRUCTION

BOWSER - MORNE
TESTING LABORATORIES IN
DAYTON, OHIO

PROPOSED DP&L DIKE
STUART STATION
ABERDEEN, OHIO

HORIZONTAL SCALE	DRAWN	DATE
1"=100'	CHECKED DLC	DATE 1-31-75

SOIL PROFILE



BOWSER - MORNE
TESTING LABORATORIES INC.
DAYTON, OHIO

PROPOSED DP&L DIKES
STUART STATION
ABERDEEN, OHIO

HORIZONTAL	DRAWN - BORGERT	DATE 1-14-75
1" = 100'	CHECKED DCS	DATE 1-14-75

SOIL PROFILE

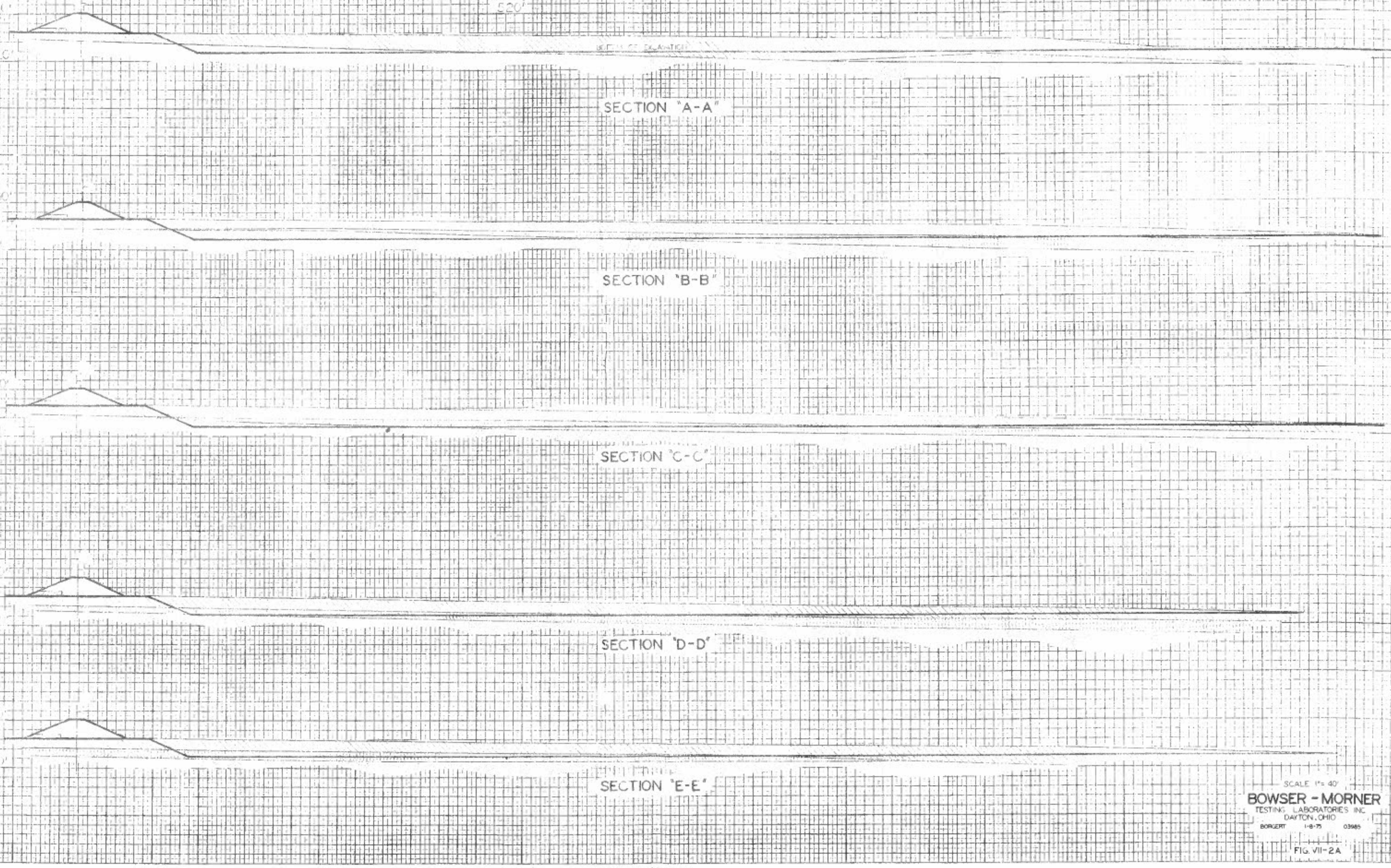
PLATE 3 - CROSS SECTION

OPTION I
2.5:1 SIDE SLOPE
WITH SAND DRAIN

LEGEND
- CLAY
- CLAY AND SAND
- SAND

SCALE 1"=20'

CROSS - SECTIONS OF PIT
FIG. VII-2A



SCALE 1"= 40'

BOWSER - MORNER
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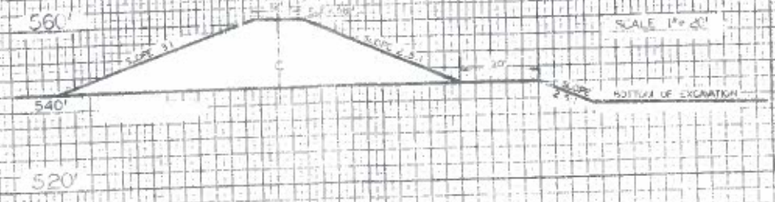
DAYTON, OHIO
BORGERT 1-8-75 03985

FIG. VII-2A

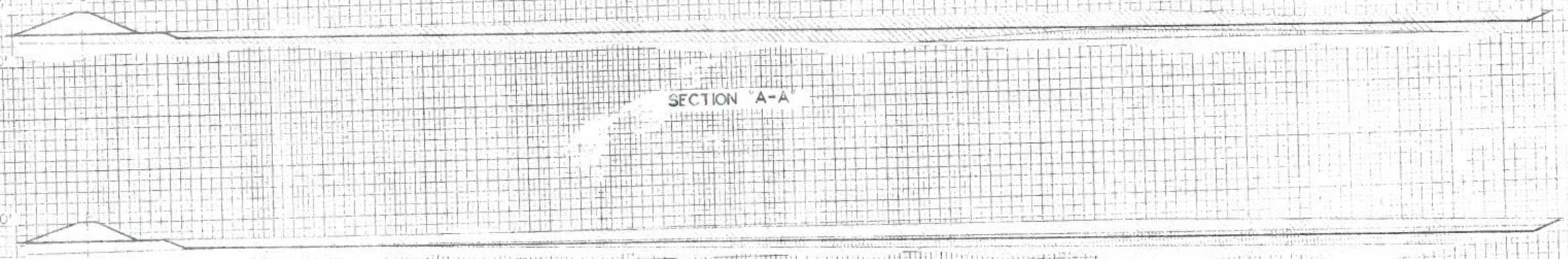
PLATE 3-CROSS SECTION

2.5:1 INTERIOR SLOPE
3:1 EXTERIOR SLOPE
WITHOUT SAND DRAIN

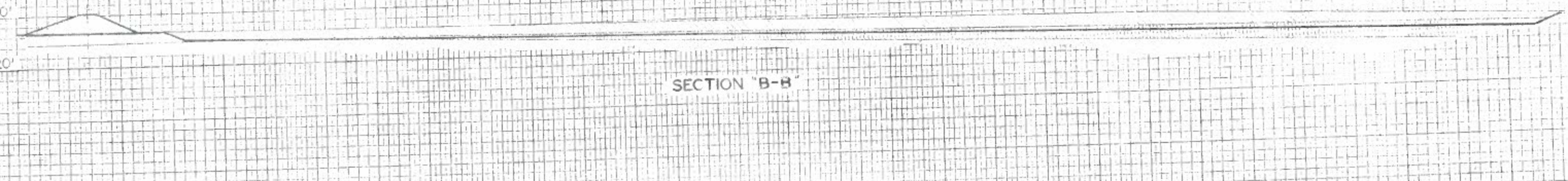
LEGEND
- CLAY
- CLAY AND SAND
- SAND



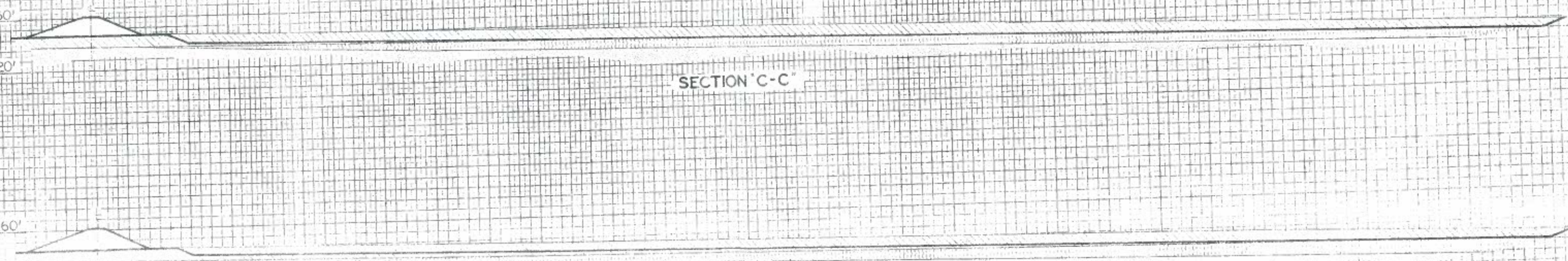
CROSS - SECTIONS OF PIT
FIG. VII-28



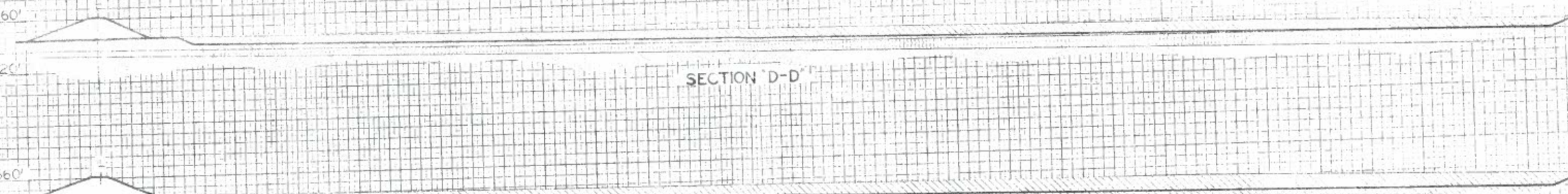
SECTION "A-A"



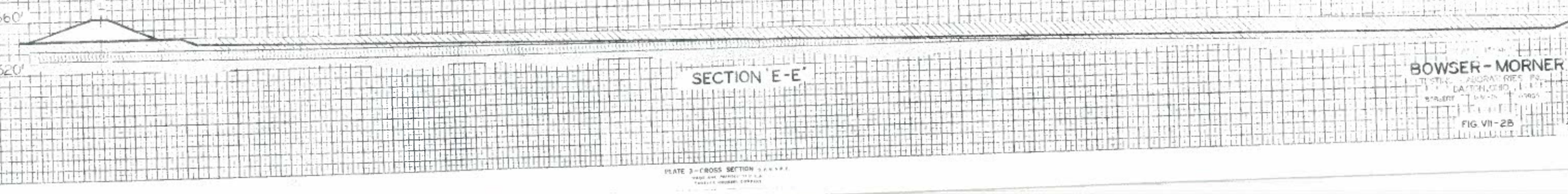
SECTION "B-B"



SECTION 'C-C"



SECTION 'D-D"



SECTION 'E-E"

BOWSER - MORNER
TESTING LABORATORIES INC.
DAYTON, OHIO

FIG. VII-28

PLATE 3 - CROSS SECTION

APPENDIX 3.3
Excerpt from:
Ponds 3A, 5, 6 & 7 Slope Stability Investigation
By BBC&M Engineering, Inc., Dated May 2010
Pages 14-15

safety of 1.04 for shallow sloughing with a failure depth less than 1 foot. As noted in the Phase 1 investigation report, shallow sloughs have been observed within the seepage areas, which support the factor of safety near unity. While shallow sloughing failures of this magnitude in general are not critical to the overall stability of the dam, it is important that these areas be repaired to minimize the potential for progressive failures.
Preliminary stability analysis were performed with the seepage model incorporating a 3 foot thick inverted filter on the outboard slope. As the phreatic surface was prevented from exiting the slope, adequate factors of safety were computed for shallow sloughing failures. Increased factors of safety were also computed for deep-seated failures as the inverted filter provided additional resistance forces to the failure surfaces. Table 7 summarizes the lowest factors of safety computed during the slope stability analysis of Pond 5.

Table 76: Stability Analysis Summary - Pond 5

Analysis Case	*Minimum Computed Factor of Safety*			
	Outboard Slope	*Inboard Slope*	*Upper Granular Zone: Outboard Slope*	*Inverted Filter Design*
Static (Steady State Seepage)	2.13	3.52	1.57	1.82
Pseudostatic	1.69	2.70	1.54	N/A

Pond 3A Stability Evaluation

As part of the dike raising investigation and design of Pond 3A, Bowser-Morner performed steady state and seismic stability for the proposed inboard and out board slopes, and a rapid drawdown analysis of the proposed inboard slope. These analyses examined three cross-sections encompassing the varying subsurface geometry while evaluating two scenarios: a 2.5H:1V outboard slope angle with a blanket drain and 3 H:1V outboard slope angle with no blanket drain. The first scenario was ultimately selected and constructed. The strength parameters used for slope stability analysis performed by Bowser-Morner for the Pond 3A dike raising are shown in Table 7.

Table 7: Strength Values used by Bowser-Morner for Pond 3A Dike Raising Stability Analysis:

Material Description	*Strength*		*Reference*
	ϕ'	c' (psf)	
New Dike	31.5°	173	Remolded CU Test (BM, 1975)
Existing Dike	30.5°	490	UU Test (BM, 1975)
Fly Ash	35°	0	CU & UU Tests (BM, 1975)
Brown Clay, Some Silt	0°	1550	Unknown
Sand	28°	0	Unknown
New Blanket Drain	33°	0	Unknown

As part of the scope of this investigation, BBCM performed three borings extending through the crest of Pond 3A (New Dike layer). In general, the embankment fill consisted of silty clay soil consistent with the soils investigated by Bowser-Morner for construction of the embankments. Following the slope stability investigation of Ponds 5, 6 and 7, BBCM peer reviewed the stability analyses performed by Bowser-Morner as part of their original design effort. Overall, these analyses appear to be reasonable with respect to the standard of care at the time that this work was performed. However, when comparing strength values of the New Dike and Existing Dike layers with the strength values established by BBCM, the effective cohesion values used by Bowser-Morner appear somewhat aggressive. It should be noted that although a design effective cohesion value of 490 psf was used for the Existing Dike layer, no critical slip surfaces passed through this material in the analysis performed by Bowser-Morner.

In regard to the Fly Ash foundation layer, an effective friction angle of 35^{o} was used by Bowswer-Morner. It is unknown if the fly ash was originally placed in a controlled manner or the foundation was improved prior to the fill placement. Typical strength values assumed for sluiced fly ash in recent studies have ranged from approximately 30 to 32 degrees. However, 3 CU triaxial tests were performed by Bowser-Morner on the fly ash material resulting in effective friction angles ranging from 35.0 to 35.6 degrees support the design value used. Having said this, and as previously discussed, Bowser-Morner did not assess the potential for the fly ash to liquefy under seismic or rapid drawdown excitation, consistent with the standard of care at the time that the work was carried out.

Overall, the strength values used do not appear unreasonable, and were selected based on the results of triaxial shear strength testing. The minimum factors of safety computed by Bowser-Morner were 1.77 for static analysis, 1.65 for seismic, and 2.64 for rapid drawdown, well above US Army Corps of Engineers recommendations. Most importantly, the embankments have shown no signs of instability such as shallow sloughing or seepage emanating from the slope which supports the reported values.

In order to satisfy requirements imposed by the USEPA for fly ash ponds constructed in the manner as Pond 3A, a seismic analysis, including determining the liquefaction susceptibility of the fly ash and underlying foundation layers must be performed. Although many borings performed for the dike raising extended into the fly ash material generating sufficient SPT data, additional information in the form of Cone Penetrometer Testing (CPT) and/or shear wave velocity must be performed in conjunction with soil borings extending to the bedrock surface to properly conduct the liquefaction analysis.

CONCLUSIONS

As part of this report, BBCM examined the stability of the embankment slopes of Ponds 5, 6 and 7 under steady-state seepage, seismic, and rapid drawdown loading conditions using the results from 12 soil borings and site reconnaissance. The analyses suggest that at the four cross-sections examined, the embankments exhibit adequate factors of safety relative to typical US Army Corps of Engineers (COE) requirements.

APPENDIX 4.1
Excerpt from:
Ponds 3A, 5, 6 & 7 Slope Stability Investigation
By BBC&M Engineering, Inc., Dated May 2010
Pages 14-15

safety of 1.04 for shallow sloughing with a failure depth less than 1 foot. As noted in the Phase 1 investigation report, shallow sloughs have been observed within the seepage areas, which support the factor of safety near unity. While shallow sloughing failures of this magnitude in general are not critical to the overall stability of the dam, it is important that these areas be repaired to minimize the potential for progressive failures.
Preliminary stability analysis were performed with the seepage model incorporating a 3 foot thick inverted filter on the outboard slope. As the phreatic surface was prevented from exiting the slope, adequate factors of safety were computed for shallow sloughing failures. Increased factors of safety were also computed for deep-seated failures as the inverted filter provided additional resistance forces to the failure surfaces. Table 7 summarizes the lowest factors of safety computed during the slope stability analysis of Pond 5.

Table 76: Stability Analysis Summary - Pond 5

Analysis Case	*Minimum Computed Factor of Safety*			
	Outboard Slope	*Inboard Slope*	*Upper Granular Zone: Outboard Slope*	*Inverted Filter Design*
Static (Steady State Seepage)	2.13	3.52	1.57	1.82
Pseudostatic	1.69	2.70	1.54	N/A

Pond 3A Stability Evaluation

As part of the dike raising investigation and design of Pond 3A, Bowser-Morner performed steady state and seismic stability for the proposed inboard and out board slopes, and a rapid drawdown analysis of the proposed inboard slope. These analyses examined three cross-sections encompassing the varying subsurface geometry while evaluating two scenarios: a 2.5H:1V outboard slope angle with a blanket drain and 3 H:1V outboard slope angle with no blanket drain. The first scenario was ultimately selected and constructed. The strength parameters used for slope stability analysis performed by Bowser-Morner for the Pond 3A dike raising are shown in Table 7.

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Fly Ash	35°	0	CU & UU Tests (BM, 1975)
Brown Clay, Some Silt	0°	1550	Unknown
Sand	28°	0	Unknown
New Blanket Drain	33°	0	Unknown

As part of the scope of this investigation, BBCM performed three borings extending through the crest of Pond 3A (New Dike layer). In general, the embankment fill consisted of silty clay soil consistent with the soils investigated by Bowser-Morner for construction of the embankments. Following the slope stability investigation of Ponds 5, 6 and 7, BBCM peer reviewed the stability analyses performed by Bowser-Morner as part of their original design effort. Overall, these analyses appear to be reasonable with respect to the standard of care at the time that this work was performed. However, when comparing strength values of the New Dike and Existing Dike layers with the strength values established by BBCM, the effective cohesion values used by Bowser-Morner appear somewhat aggressive. It should be noted that although a design effective cohesion value of 490 psf was used for the Existing Dike layer, no critical slip surfaces passed through this material in the analysis performed by Bowser-Morner.

In regard to the Fly Ash foundation layer, an effective friction angle of 35^{o} was used by Bowswer-Morner. It is unknown if the fly ash was originally placed in a controlled manner or the foundation was improved prior to the fill placement. Typical strength values assumed for sluiced fly ash in recent studies have ranged from approximately 30 to 32 degrees. However, 3 CU triaxial tests were performed by Bowser-Morner on the fly ash material resulting in effective friction angles ranging from 35.0 to 35.6 degrees support the design value used. Having said this, and as previously discussed, Bowser-Morner did not assess the potential for the fly ash to liquefy under seismic or rapid drawdown excitation, consistent with the standard of care at the time that the work was carried out.

Overall, the strength values used do not appear unreasonable, and were selected based on the results of triaxial shear strength testing. The minimum factors of safety computed by Bowser-Morner were 1.77 for static analysis, 1.65 for seismic, and 2.64 for rapid drawdown, well above US Army Corps of Engineers recommendations. Most importantly, the embankments have shown no signs of instability such as shallow sloughing or seepage emanating from the slope which supports the reported values.

In order to satisfy requirements imposed by the USEPA for fly ash ponds constructed in the manner as Pond 3A, a seismic analysis, including determining the liquefaction susceptibility of the fly ash and underlying foundation layers must be performed. Although many borings performed for the dike raising extended into the fly ash material generating sufficient SPT data, additional information in the form of Cone Penetrometer Testing (CPT) and/or shear wave velocity must be performed in conjunction with soil borings extending to the bedrock surface to properly conduct the liquefaction analysis.

CONCLUSIONS

As part of this report, BBCM examined the stability of the embankment slopes of Ponds 5, 6 and 7 under steady-state seepage, seismic, and rapid drawdown loading conditions using the results from 12 soil borings and site reconnaissance. The analyses suggest that at the four cross-sections examined, the embankments exhibit adequate factors of safety relative to typical US Army Corps of Engineers (COE) requirements.

APPENDIX 4.2
Excerpt from:
Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station
By Bowser-Morner, Dated 30 January 1975
Pages I-13 – I-20, Section VI

BOWSER-MORNER Testing Laboratories, Inc.
Founded 1911
CORPORATE ADDRESS • 420 Davis Ave. • P.O. Box 51 • Dayton, Ohio 45401 • 513/253-8805

February 19, 1975

Dayton Power and Light Company
Cincinnati Gas and Electric Company
Columbus and Southern Ohio Electric Company
25 North Main Street
Dayton, Ohio 45401

Attention: Mr. Jack Puterbaugh

Re: Addendum #1 to Report #788533, Dated January 30, 1975: Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station, Aberdeen, Ohio

Gentlemen:

The purpose of this letter is to outline the specific details of the construction at the above-referenced project. The option which will be utilized is Option I discussed in our report (please refer to BOWSER-MORNER Testing Laboratories report number 788533, dated January 30, 1975). The particular option chosen is for the dikes to be constructed to elevation 558 feet with no provisions made for extending the height of the dikes 3 feet at some future date. The top width of the dikes will be 12 feet at elevation 558 feet. The pit itself will be excavated to elevation 530 feet. The quantities of material required for the construction of the dikes with this procedure are as follows:

Material	Yardage Required
Clay	353,069
Sand	23,414
TOTAL	376,483

The following quantities will be excavated from the pit at a bottom elevation of 530 feet:

Material	Yardage Excavated
Topsoil	77,407
Good Clay	358,915
Poor Clay	81,329
Sand	44,178
TOTAL	561,829

The total yardage figure represents the total excavation from the borrow pit. It is felt, as stated in the above-referenced report, that a shrinkage factor of 15% should be utilized with these values. The following quantities of material are, therefore, available once compaction has been accomplished:

Material	Yardage Available
Good Clay	312,000
Poor Clay	70,721
Sand	38,416

The overruns of material excavated over what will be used in the dikes themselves are, therefore:

Material	Yardage Overrun
Topsoil	77,407
Good Clay	0
Poor Clay	34,100 (uncompacted)
Sand	17,252 (uncompacted)

A total of 27,500 cubic yards will be required for sealing off the sand in the bottom of the borrow pit. With 29,652 yards of poor clay available there will be approximately a 2,000 yard overrun on the poor clay material. There will also be an overrun of 17,252 yards of sand which in our understanding will be left in the bottom of the pit and not removed. Only that amount of sand necessary for the construction of the sand filter will be excavated.

The topsoil and portions of the poor clay which are left over will be utilized to fill pit number 6 to form an impervious blanket in the bottom of the pit, and whatever topsoil is left will be used to face the outside of the dikes in order to promote vegetation growth.

All other recommendations are contained in the above-referenced report. If there are any questions or if we can be of further service, please contact us.

Very truly yours,

BOWSER-MORNER Testing Laboratories, Inc.

David C. Cowherd

DCC:ss
6-Addressee
3-File

David C. Cowherd, M.S., P.E.
Chief Soils Engineer
Construction Materials Div.

BOWSER-MORNER
Testing Laboratories, Inc.

Soil Investigation and Design for Proposed Fly Ash Dikes James M. Stuart Electric Generating Station Aberdeen, Ohio

Dayton Power and Light Company
Cincinnati Gas and Electric Company
Columbus and Southern Ohio Electric Company
25 North Main Street
Dayton, Ohio 45401

Laboratory Report No. 788533

January 30, 1975

BOWSER-MORNER
Testing Laboratories, Inc.

530.0 and 545.0 feet giving a total height of the dikes varying between 16 and 31 feet at the final crest elevation of 561.0 feet. The dikes are to be 12 feet wide at the top to provide access to vehicles. The borrow area is to be excavated to elevation 530.0 feet to provide for storage of ash. The pit volume is to be filled to the 2/3 point with fly ash, with the top 1/3 of the volume of the pit being used for storage of water. This condition is to exist for about 35 years. Each of the various aspects related to the dikes will be discussed separately below.

I. Foundation Treatment

A. Fly Ash and Old Dike Areas

The dikes are situated such that the largest portion of the east-west part of the dike nearest the river will be situated in the fly ash area with approximately 30% of the lateral width overlying the fill in the old dike. This will present different compressibilities beneath the new dike. The various materials (the fly ash above and below water and the existing dikes) were tested to determine the strength and compressibility characteristics. It was found that the total settlement of the dike in this particular area could be expected to be a maximum of 6 inches due to the consolidation of the fly ash, existing dike, and original soil material. The situation of the new dike superimposed on the old dike is such that a problem will not be created with differential settlement between that portion above the old dike and that portion on the fly ash. The settlement of the portion of the new dike above the old dike will vary between about 4.5 inches and 6 inches. The shear strength of the fly ash was also determined and found to be adequate to hold the new dike

without shearing. It is recommended that the clay cover over the fly ash in the area in which the dike specifically will be placed be left in place and that this area be proof-rolled to insure that all soft areas have been removed before placement of the new dike. Any vegetation existing on the present dike which would be under the new dike should be removed before new fill is placed.

B. Coal Storage Area

The area of the coal storage currently has coal existing in thicknesses up to 30 feet. Before any work is done on the dike in this area all coal should be stripped down to the clay fill material. The area beneath the coal should then be proof-rolled to remove any soft areas before the new dike is constructed. The fill beneath the coal pile was found to be relatively compressible and the amount of settlement to be expected beneath the dike in this particular area is approximately 4 inches. The moisture content at which the dike will be constructed is sufficient to give flexibility to the dike so that the differential settlement between the area of dike over the coal fill and that over the fly ash will not create a major problem.

C. Original Soil Areas

For the most part, the original soil was found to be overlain by topsoil which should be undercut and removed from the entire limits of the dike area. In addition, some areas in the original soil were found to be filled with as much as 8 feet of sand fill which is quite loose. It is recommended that this existing fill material be undercut

and removed before construction on the dikes begins. The area beneath new dikes should be undercut to the brown clay soil in all original soil areas. Once all of this material has been removed to the outer limits of the dikes the surface of original soil should be proof-rolled and all soft areas undercut at this time. Settlement of the dikes in the original soil areas will vary between 1 and 3 inches from the lowest portion of the dikes at the northern part of the site to the highest portion of the dikes at the southern part of the site.

All areas beneath the proposed dikes which contain sand fill should have the sand removed before any construction begins except for that portion of the outside of the dikes which is no more than 25% of the base width of the dikes. In these areas the sand fill can be left in place to act as a sand drain. It should, however, be brought up to 90% of the maximum Modified Proctor dry unit weight before additional fill is added.

II. Embankments

The slopes of the embankments as herein recommended have been designed in accordance with the National Dam Safety Act recorded in the Federal Register dated August 8, 1974. In the consideration of slope stability this particular area is in a zone 1 or low risk earthquake area. In accordance with the above publication an earthquake force equal to 0.025 times the weight of the driving force has been added to the total driving force for slope stability. This was done by taking 0.025 times each slice weight and considering this as a horizontal force applied at the centroid of the slice. Both inside and outside slopes have been designed

for short term and also long term considerations once the fly ash is in place. These slope stability analyses are shown in Section II of this report. For specific questions relating to a particular analysis, please refer to that section.

In addition to these considerations, the amount of material available for construction of the dikes has been evaluated. There are basically two designs that are feasible depending on the method chosen for excavating the pit. The first would be a homogeneous clay dike with a sand drainage blanket, while the second would be a completely homogeneous clay dike without a sand drainage blanket. Each of these options will be discussed in detail below. The outside slopes will be above the maximum flood level for the Ohio River, therefore, there is no need to take into account rapid drawdown on these slopes. The design incorporating sand drains will permit the use of some of the sand which will be excavated in order to achieve the necessary pit area if the option of cutting the entire area of the pit to elevation 530.0 feet is used. This procedure will be discussed more fully below. Typical sections of the proposed dikes are shown in Figures VII-1A and VII-1B.

The top of the dikes at present will be at elevation 558.0 feet, however, the slope stabilities were calculated for a dike at elevation 561.0 feet. The height will vary between a minimum of about 16 feet and a maximum of about 31 feet on the Ohio River side of the dikes.

A. Option I

Option I consists of constructing homogeneous clay dikes with a sand filter as shown in Figure VII-1A. The following procedures should

be used for the construction of the dikes for this option. It is recommended if a sand drain is used that the sand drain be 3 feet thick and extend inward toward the center line of the dikes a total of 25% of the base width of the dikes. The crest width should be 27 feet if the dikes are constructed to elevation 558.0 feet with the option to extend the crest to 561.0 feet. This will allow space for raising the dikes an additional 3 feet at some date in the future.

If the elevation of the dikes is to be 558 feet and the option of raising the dikes an additional 3 feet is not considered, a total of 376,483 cubic yards of soil are needed for the construction of the dikes. The additional yardage required to provide for a 3 foot rise in height at some date in the future is 84,500 cubic yards, and is due to providing a 27 foot top width at 558 feet instead of a 12 foot top width. The yardage required for raising the final 3 feet at some time in the future will then be approximately 16,076 cubic yards. If the option of a sand filter is used and the dikes are constructed to a crest elevation of only 558.0 feet with a top width of 27 feet to provide for raising to elevation 561.0 feet at some date in the future, a total of 460,983 cubic yards of material will be required. This breaks down into 437,569 cubic yards of clay fill and 23,414 cubic yards of sand fill. These yardage figures include the yardage required to replace one foot of topsoil and all existing fill which must be stripped from beneath the dikes in the original soil area as recommended under the foundation treatment section of this report. This amounts to 13,301 cubic yards of topsoil and fill to be removed and replaced beneath the dike area proper. These figures do, therefore, represent the total yardage required for construction

of the dikes once the area has been stripped of topsoil.

The first option would include excavating the pit down to elevation 530.0 feet to provide for ash storage. The bottom of the pit would be level at elevation 530.0 feet. The borings made in the interior of the pit indicate that four basic types of soil will be encountered in the excavation. The first is topsoil, the second is a "good" clay, the third, a clay and sand which will be difficult to compact, and the fourth, a sand. Cross sections through the pit have been drawn and are shown in Figure VII-2A in Section VII of this report. These cross sections show the relative positions of the various types of soil in reference to the dikes and the bottom elevation of the pit at 530.0 feet. The following quantities of materials have been calculated as excavation from the borrow area:

Material	Quantity (cubic yards)
Topsoil	77,407
"Good" Clay	358,915
Clay and Sand	81,329
Sand	44,178

The above yardage of topsoil includes that portion of topsoil already outlined above as being under the dikes, and is a total value including stripping from outside of dike to outside of dike. The topsoil varies in thickness between 0.5 feet and 1.5 feet, and an average of 1.0 feet has been used in the above calculations. It is our opinion that these estimates are high enough to include all stripping of unsuitable fill from beneath the dikes. It is felt that a "shrinkage" factor of about 15% should be used with the above yardage figures. The total yardage

available for construction will, therefore, be as follows:

Material	Quantity (cubic yards)
"Good" Clay	312,000
Clay and Sand	70,721
Sand	38,416
"Good" Clay from Diversion Ditch	5,000

From the above table it can be seen that the total amount of "good" clay and clay and sand available for construction of the dikes is 387,721 cubic yards or approximately 50,000 cubic yards short of the required yardage. This additional yardage could be obtained at the south end of the new pit near the "old" pit. There is sufficient clay in this area to provide the necessary 50,000 cubic yards. It can also be seen from the table that the sand excavated is adequate for the requirements of the sand filter with about 15,000 cubic yards left over. With this option it will be necessary to utilize the clay and sand for construction of the dikes. The clay and sand will be more difficult to compact and will require more effort, therefore, it is recommended that an effort be made to mix the two materials to achieve a more workable mix. It should be noted that in many locations the "good" clay is present to deeper depths and it might be advantageous to extend the excavation deeper in these areas, both from the standpoint of better clay for use in the dikes and in more storage for ash.

The excavation for the fly ash pit should be constructed in the following manner. A berm 20 feet in width between the inside toe of the dike and the top of the slope for the pit should be constructed.

This design is shown in both the cross sections in Figures VII-2A and VII-2B and in detail in Figure VII-3. The excavation should then be made on a 2 1/2 to 1 slope to the bottom elevation of 530.0 feet. A slope stability analysis of this situation was performed and is shown in Figure II-4. The factor of safety against failure of a 2 1/2 to 1 slope in original soils is 2.37. Some areas of wet sand and trapped water will be encountered throughout the excavation for the pit, however, the general groundwater table will not be encountered and groundwater should not be a major problem. Some problems will be encountered with the loose sand being unstable under wheel loads of pans, particularly near the northwestern corner of the proposed pit. It should be anticipated that some pushing of pans in this area will be required. Once the excavation has been made to elevation 530.0 feet, approximately 25% of the bottom area of the pit will be sand and the remainder will be clay. It is our recommendation that the following procedure be utilized for the bottom of the pit. The bottom of the pit where sand is exposed should be lined with 18 inches of relatively impermeable material. The topsoil excavated for the construction of the pit could be used for this procedure. The total yardage required for this procedure would be about 27,500 cubic yards. There will, therefore, be sufficient topsoil to line the bottom of the pit. It appears that this is the most economical method of facing the bottom as it permits the use of some of the excavated topsoil. This blanket should be compacted to 85% of the maximum Modified Proctor dry unit weight.

SECTION VI

SPECIFICATIONS

CLEARING & GRADING SPECIFICATIONS

BOWSER-MORNER TESTING LABORATORIES, INC.

I. General Conditions:

The Contractor shall furnish all labor, materials and equipment, and perform all work and services necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction and grading as shown on the plans and as described therein.

This work shall consist of all clearing and grading, removal of existing structures unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes and specifications.

This work is to be accomplished under the constant and continuous supervision of the Owner or his designated representative.

In these specifications the terms "approved" and "as directed" shall refer to directions to the Contractor from the Owner or his designated representative.

II. Subsurface Conditions:

Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work. Borings and/or soil investigations shall have been made at the construction site by the Owner. Results of these borings and investigations will be made available by the Owner to the Contractor upon

his request, but the Owner is not responsible for any interpretations or conclusions with respect thereto made by the Contractor on the basis of such information, and the Owner further has no responsibility for the accuracy of the borings and the soil investigations.

III. Site Preparation:

Within the specified areas, all trees, brush, stumps, logs, tree roots and structures scheduled for demolition shall be removed and disposed of.

All cut and fill areas shall be properly stripped. Topsoil will be removed to its full depth and stockpiled for use in finish grading or as a stabilizing fill. Any rubbish, organic and other objectionable soils, and other deleterious material, shall be disposed of as directed by the Owner or his designated representative if on site disposal is provided. In no case shall such objectionable material be allowed in or under the embankment proper unless specifically authorized in writing.

Prior to the addition of fill, the original ground shall be compacted to job specifications as outlined below. Special notice shall be given to the proposed fill area at this time. If wet spots, spongy conditions, or groundwater seepage is found, corrective measures must be taken before the placement of fill.

IV. Formation of Fill Areas:

Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross section. The depth of lift may be increased if the Contractor can demonstrate his ability to compact a larger lift.

All material entering the fill shall be free of organic matter such as leaves, grass, roots and other objectionable material.

The operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather or other unsatisfactory conditions. The Contractor shall keep the work areas graded to provide drainage at all times.

The fill material shall be of the proper moisture content before compaction efforts are started. Wetting or drying of the material and manipulation to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. The moisture content of the fill material should be between optimum moisture and four (4) percentage points higher than optimum unless otherwise authorized. Sprinkling shall be done with equipment that will satisfactorily distribute the water over the disced area.

Compaction operations shall be continued until the fill is compacted to not less than 90% of the maximum density as determined in accordance with ASTM-D1557-70 (Modified). Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. If directed, original slopes shall be continuously, vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal and the back of the bench is vertical. As many benches as are necessary to bring the site to final grade shall be constructed.

Filling operations shall begin on the lowest bench, with the fill being placed in horizontal eight (8) inch loose lifts unless otherwise authorized. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper drainage shall be maintained at all times during benching and filling of the benches to insure that all water is drained away from the fill area.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the areas or in the rock toe. Stones or fragmentary rock larger than twelve (12) inches in their greatest dimensions will not be allowed in the fill unless specifically authorized in writing. Rock fill shall be brought up in layers as specified or as directed.

Frozen material shall not be placed in the fill nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all fills made under the contract and shall replace any portion which, in the opinion of the Owner or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damaged by inclement weather shall be repaired at the Contractor's expense.

V. Slope Ratio and Storm Water Runoff:

Slopes shall be as designated on the prints and report in both cut and fill, and storm water shall not be drained over the slopes.

VI. Grading:

The Contractor shall furnish, operate and maintain such equipment as is necessary to construct uniform layers and control smoothness of grade for maximum compaction and drainage.

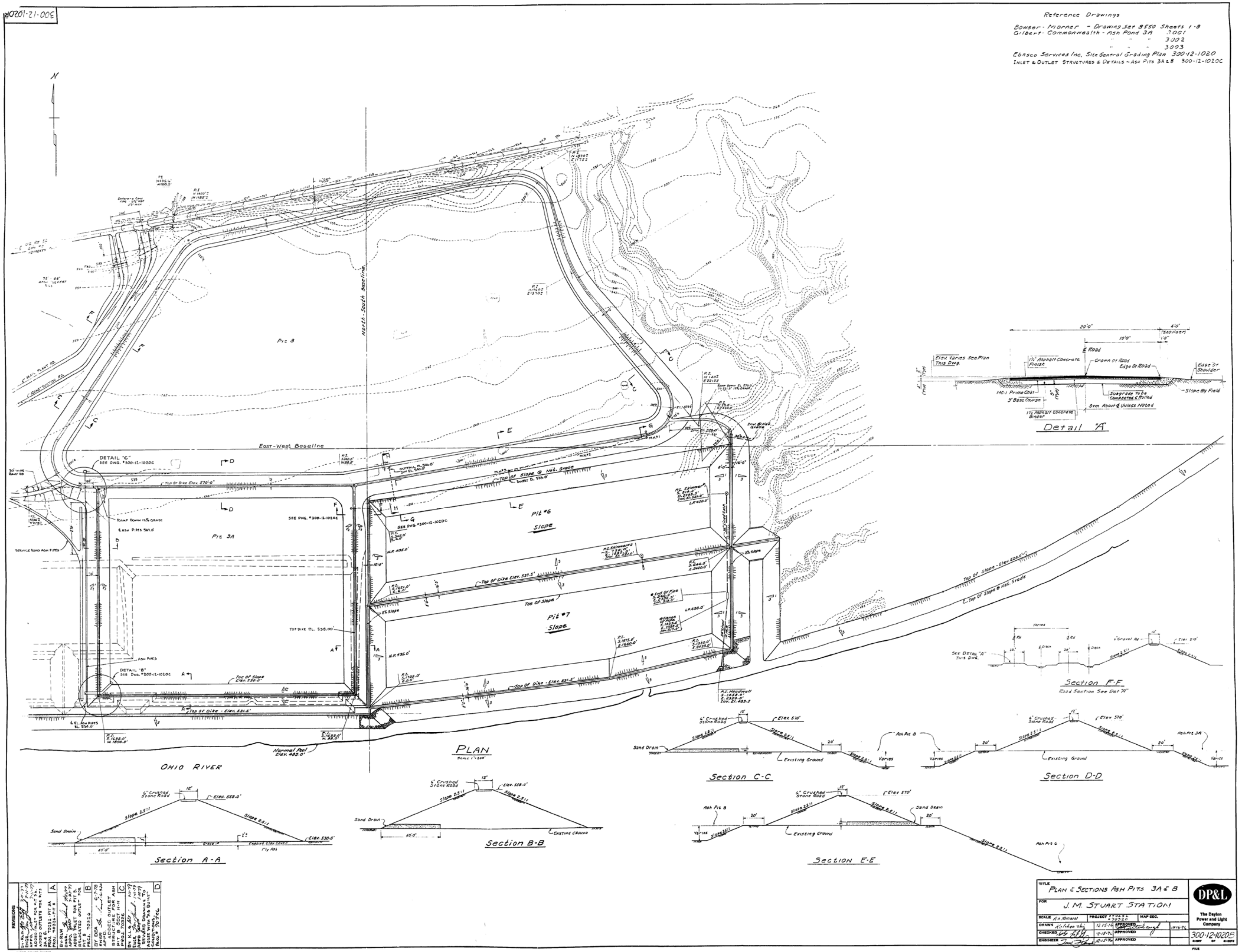
VII. Compacting:

The compaction equipment shall be approved equipment of such design, weight and quantity to obtain the required density in accordance with these specifications.

VIII. Testing and Inspection Services:

Testing and inspection services will be provided by the Owner.

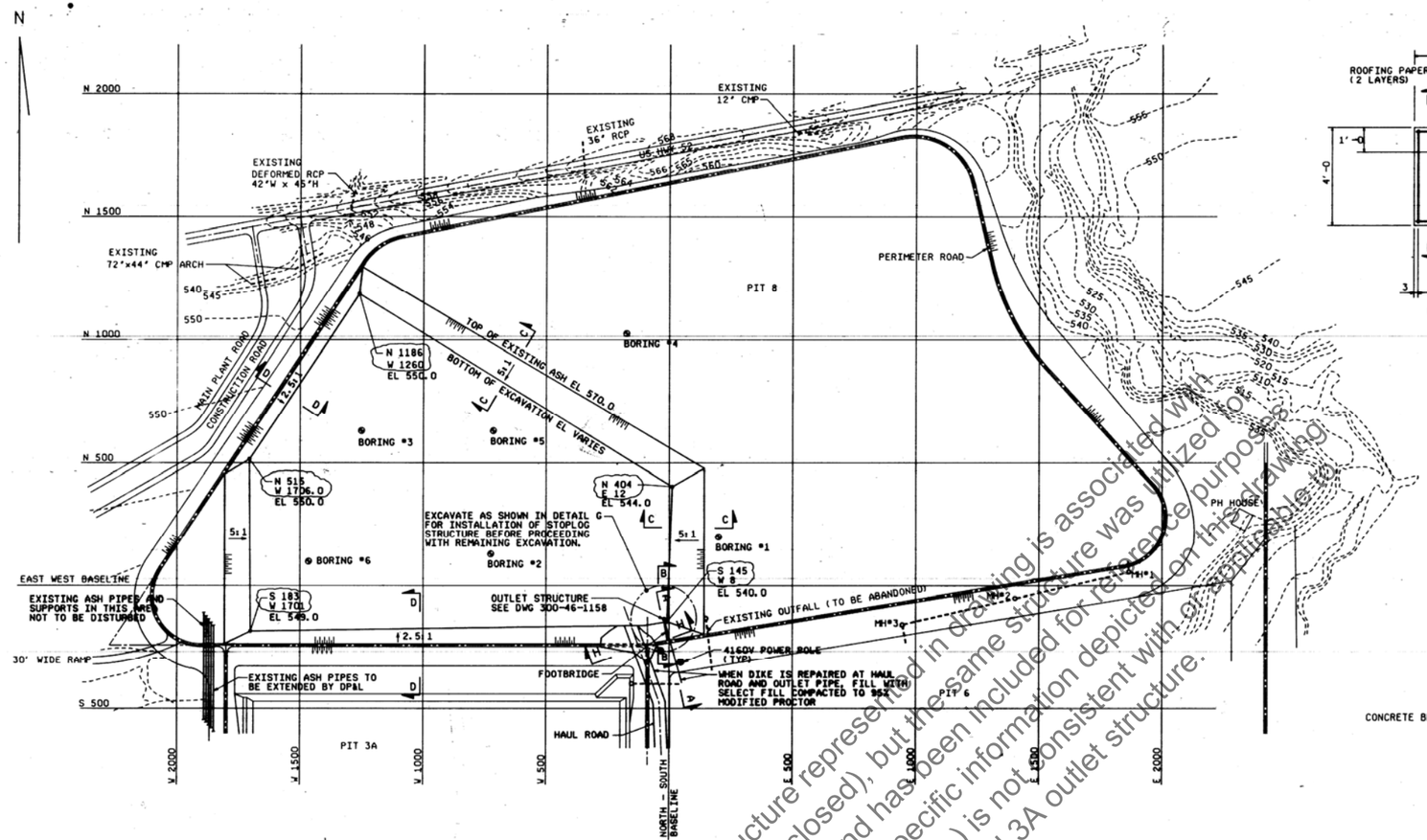
APPENDIX 5
Design Drawings
By DP&L

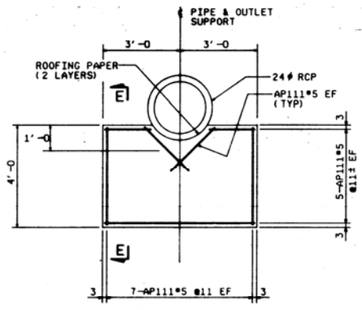

300-12-1020B
N
Pit 8
Pit 3A
Pit #6
Slope
Pit #7
Slope
East-West Baseline
North-South Baseline
DETAIL "C"
DETAIL "B"
OHIO RIVER
Normal Pool Elev. 485.0'
PLAN
Detail "A"
Section F-F
Road Section See Det "A"
Section A-A
Section B-B
Section C-C
Section D-D
Section E-E
Reference Drawings
Bowser-Morner - Drawing Set 8550 Sheets 1-8
Gilbert-Commonwealth - Ash Pond 3A 3001
" " " 3002
" " " 3003
Ebasco Services Inc. Site General Grading Plan 300-12-1020
INLET & OUTLET STRUCTURES & DETAILS ~ ASH PITS 3A & B 300-12-1020C
REVISIONS
TITLE PLAN & SECTIONS ASH PITS 3A & B
FOR J. M. STUART STATION
SCALE AS SHOWN
PROJECT #70656 #70320
MAP SEC.
DRAWN Kolthoff 12-15-76
CHECKED 12-15-76
ENGINEER 12-15-76
APPROVED 12-16-76
APPROVED
APPROVED
DP&L
The Dayton Power and Light Company
300-12-1020B
SHEET OF SHEETS
FILE

300-46-1157

PLAN – ASH POND NO. 8 EXCAVATION – STAGES I AND II

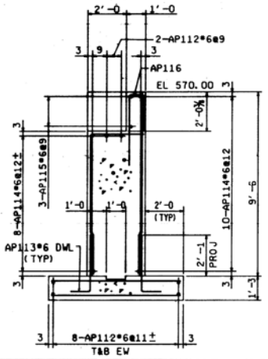
1=200'



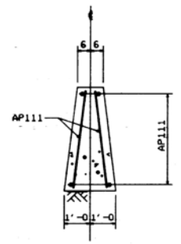


OUTLET SUPPORT

½ =1'-0

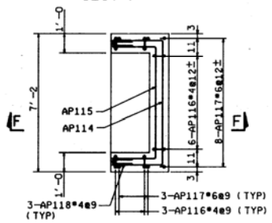


SECT F

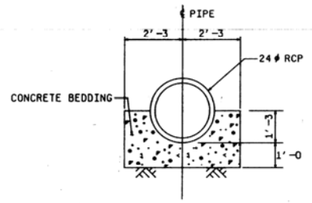


SECT E

½ =1'-0

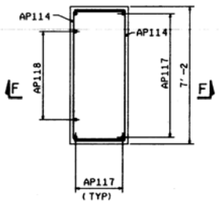


PLAN @ EL 570.00

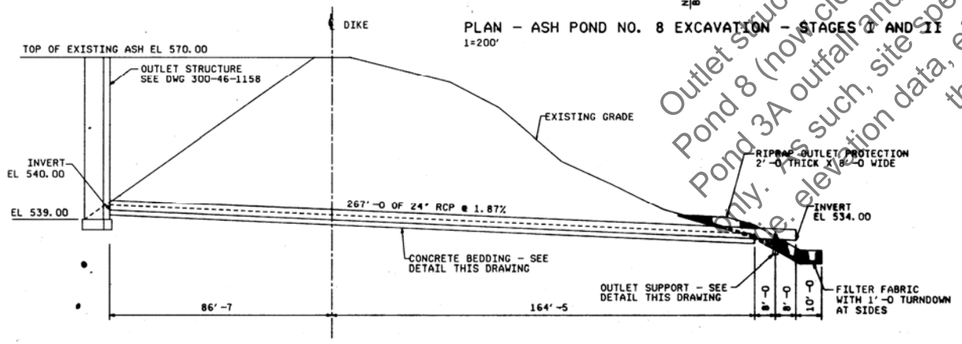


CONCRETE BEDDING

½ =1'-0

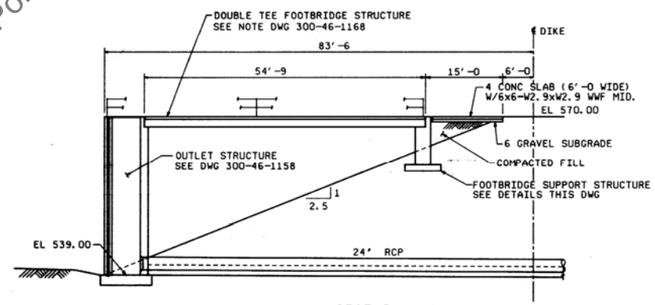


PLAN @ EL 568.00



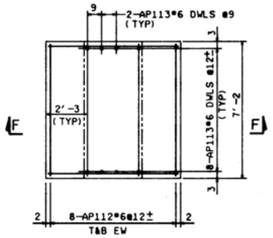
SECTION A

1=20' HORIZ
1=10' VERT



SECT B

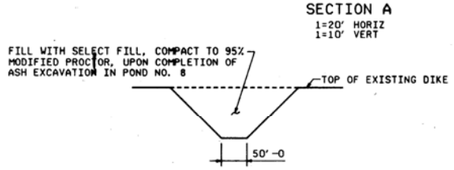
1=10'



PLAN – FOOTING

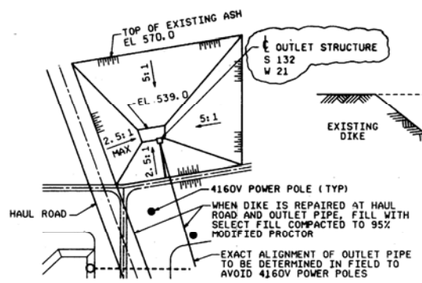
FOOTBRIDGE SUPPORT STRUCTURE

⅜ =1'-0



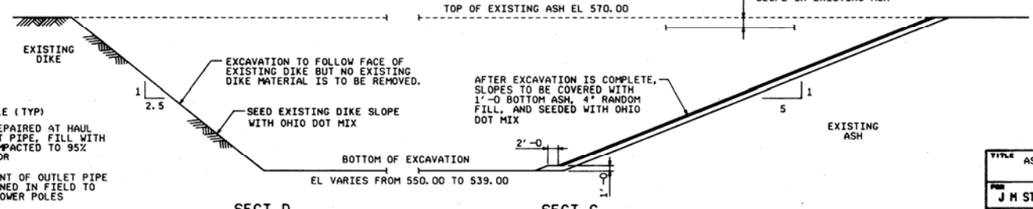
SECTION H

NTS



DETAIL G

1=100'



SECT D

1=20 HORIZ
1=10 VERT

SECT C

1=20 HORIZ
1=10 VERT

NOTES

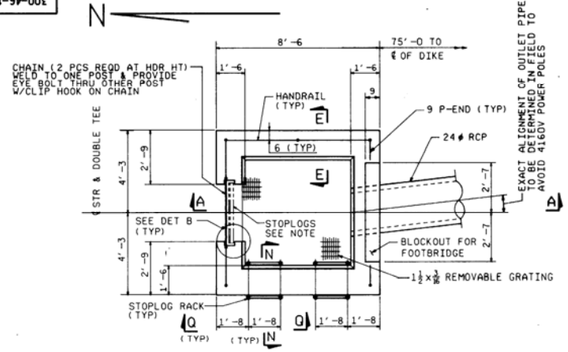
FOR NOTES, LEGEND AND REFERENCE DRAWINGS SEE DWG 300-46-1168

REVISIONS				
1	REVISED PLAN	BM	6/4/09	

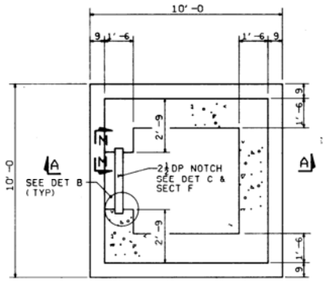
EBASCO SERVICES INCORPORATED

TITLE	ASH DISPOSAL PROJECT-WO NO SHEET 1
PSD	J M STUART ELECTRIC GENERATING STATION
SCALE	AS NOTED
PROJECT	
MAP SEC.	
DRAWN	D. MORRIS
APPROVED	KAK 1-16-09
CHECKED	CAM 1-14-09
APPROVED	
SUPERVISOR	
APPROVED	
DP&L	The Dayton Power and Light Company
300-46-1157	

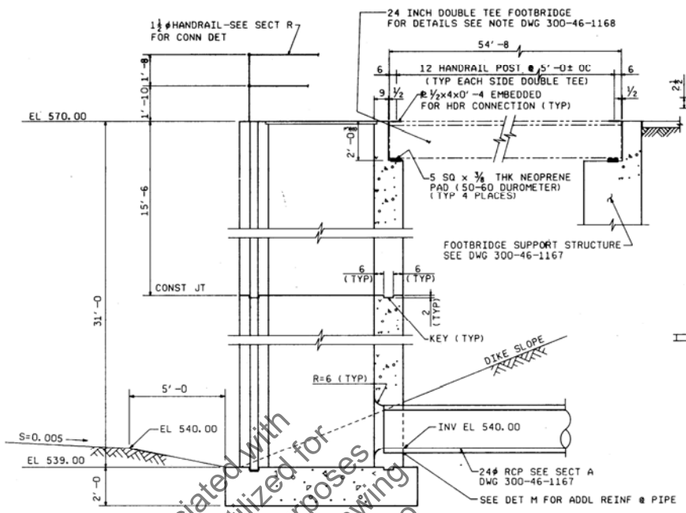
300-46-1158



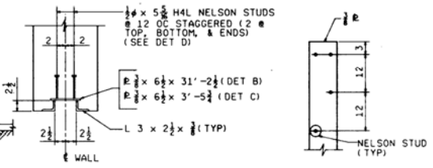
OUTLET STRUCTURE
PLAN @ EL 570.00 - MAS



OUTLET STRUCTURE
PLAN @ EL 539.00 - MAS

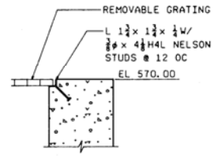


SECT A

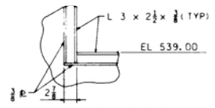


DET B AS SHOWN & NOTED
DET C AS SHOWN & NOTED
1=1'-0

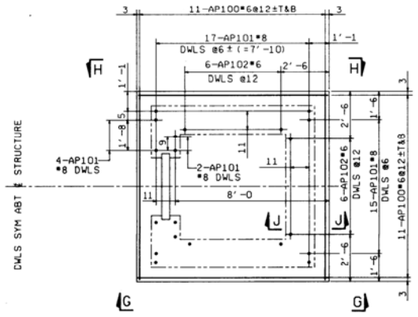
DET D
NTS



SECT E
1=1'-0

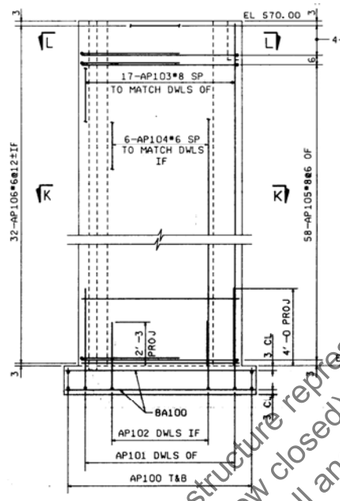


SECT F
1=1'-0

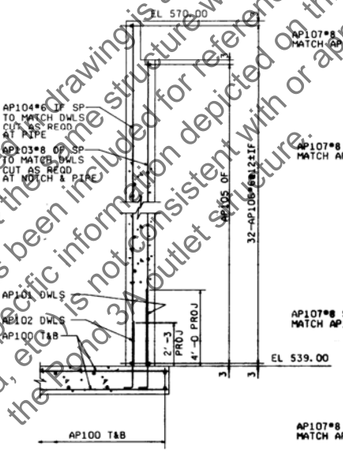


OUTLET STRUCTURE
PLAN @ EL 539.00 - REINF

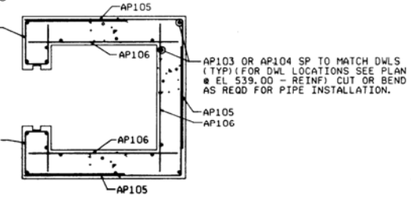
NOTE: CUT, SHIFT OR BEND DWLS AS REQUIRED FOR INSTALLATION OF 24ϕ RCP.



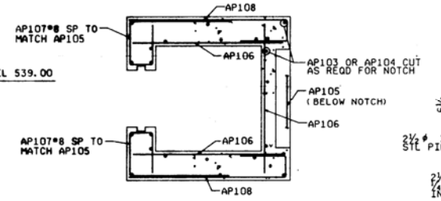
ELEV G AS SHOWN
ELEV H OPP HAND



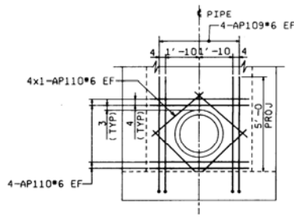
SECT J



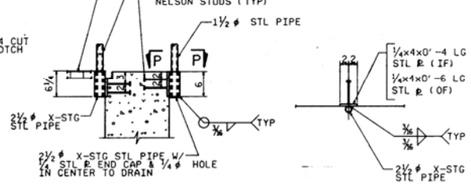
SECT K



SECT L

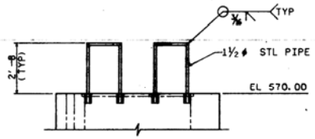


DET M

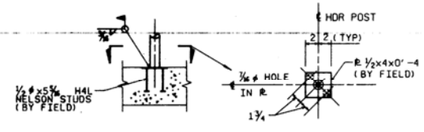


SECT N
1=1'-0

SECT P
1=1'-0



SECT Q



SECT R

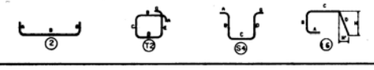
BAR BENDING SCHEDULE

MARK	QTY	SIZE	LGTH	TYPE	A	B	C	D	E	F	F'	G	H	H'	J	K	L	REMARKS
AP100	44	*6	9'-8	STR														
AP101	61	*8	7'-1	2	1'-4	5'-9												
AP102	22	*6	5'-0	2	1'-0	4'-0												
AP103	61	*8	30'-10	STR														
AP104	22	*6	30'-10	STR														
AP105	116	*8	14'-5	2	6'-3	8'-2												
AP106	96	*6	8'-0	STR														
AP107	116	*8	9'-9	16	2'-4	1'-1	2'-4	4'-0					4'-0	0				
AP108	8	*8	11'-10	2	8'-2	1'-4	2'-4											
AP109	8	*6	7'-9	2	1'-0	6'-9												
AP110	16	*6	5'-0	STR														
AP111	LF	*5	125	STR														CUT TO SUIT IN FIELD
AP112	34	*6	6'-10	STR														
AP113	20	*6	4'-0	2	1'-0	3'-0												
AP114	18	*6	12'-2	2	2'-8	6'-10	2'-8											
AP115	3	*6	10'-10	2	2'-0	6'-10	2'-0											
AP116	12	*4	5'-8	S4	3'-0	0'-8	3'-0											
AP117	26	*6	9'-4	STR														
AP118	6	*6	10'-0	2	2'-8	7'-4												
AP119	6	*4	2'-8	S4	1'-0	0'-8	1'-0											

BAR SIZE	WEIGHT (LB)
*3	
*4	160
*5	1,745
*6	4,395
*7	
*8	13,915
*9	
*10	
*11	
*14	
*18	
TOTAL WEIGHT	18,600

NOTES

REINFORCING BAR TYPES



NOTES
FOR NOTES, LEGEND AND REFERENCE DRAWINGS SEE DWG 300-46-1168

GEORGIA REGISTERED No. 9945 PROFESSIONAL ENGINEER KEITH A. KESSLER

E. A. KESSLER

EBASCO SERVICES INCORPORATED

TITLE ASH DISPOSAL PROJECT-WO NO SHEET 2
FOR J M STUART ELECTRIC GENERATING STATION
SCALE 3/4=1'-0 UN | PROJECT | SHOP DWG
DRAWN D. MORRIS | APPROVED | DPST The Dayton Power and Light Company
CHECKED 6.491 | CONSTR
REVISIONS | APPROVED
300-46-1158

APPENDIX 6.1
Excerpt from:
Assessment of Dam Safety Coal Combustion Surface Impoundments (Task 3)
Final Report
By CHA, Dated 26 March 2010
Pages 4, 5, 32

An aerial photograph of the region indicating the location of the JM Stuart Station and identifying schools, hospitals, or other critical infrastructure located within approximately five miles down gradient of the ash ponds is provided as Figure 3 – Critical Infrastructure Map.

1.3.1 Pond 3A

According to the 1976 drawing provided by DP&L, we understand that the southern portion of Pond 3A was constructed above the former ash disposal area. Figures 4A and 4B show the plan view and selected sections from the 1976 drawing. The ODNR Dam Inventory Sheet (DIS) reports that the dikes were designed by DP&L with Bowser-Morner. Construction was reportedly completed in 1978. This impoundment receives fly ash from the plant.

Pond 3A is entirely bounded by earth dikes with a total length of approximately 4,400 ft and a maximum height of approximately 28 feet. The width of the dike crests are 12 feet. The crest of the north dike (which also functions as a portion of the southern dike and buttress for the former Pond 8 and current Landfill 11) is at El. 570. The crest of the east and west dikes slopes downward from El. 570 at the north end to abut the southern dike El. 558.0 at the south end, and remains at that elevation along the south dike crest. The upstream and downstream embankments have slopes of 2.5 horizontal to 1 vertical (2.5H:1V). A 40 ft wide by 3 ft high sand drain is shown below the downstream toe. Section A-A, shown herein on Figure 4B, indicates that a portion of the embankment was constructed over an existing clay cover placed above an ash disposal basin functioning as the foundation for the southern dike. A 20-foot wide bench is indicated in Section D-D, shown herein on Figure 4B, along the northern dike. The drawing indicates that this bench is the transition between the cut and fill portions of the slope.

Fly ash and water enters Pond 3A through the sluice piping on the southwestern corner of the pond. The surface area of the pond is approximately 50 acres and the maximum operating pond elevation, based upon an ODNR regulated minimum 5-foot operating freeboard is at 553 feet. The Ohio DIS indicates that the elevation at the top of the concrete spillway structure is at

El. 554, roughly equal to the maximum weir plate elevation of 553.5 DP&L has indicated in correspondences available after the site visit was completed. According to DP&L, the water level in Pond 3A does not reach the maximum possible pool elevation because fly ash sluicing is rotated among three ponds. Water entering the intake structure is discharged into a channel at the northwestern corner of Pond 6, where it conveys water into Pond 6. At the time of CHA's site visit, ash was not being actively sluiced into the pond and the water level in the pond was significantly below the spillway invert to accommodate ash excavation for landfilling. Due to the way the pond was constructed, free water that presently collects in the base of the inactive basin has to pumped up to the outlet structure to reach the invert elevation at 547.0, approximately 15 to 18 feet above the basin floor.

1.3.2 Pond 5

It appears that the 1968 drawing provided by DP&L is a grading plan for Pond 5A. Figures 5A and 5B show the plan view and selected sections from the 1968 drawing. The ODNR Dam Inventory sheet reports that the dikes were designed by DP&L. DP&L reported to the EPA that pond was commissioned circa 1975. This impoundment receives bottom ash, cooling tower and FGD blow-down, and miscellaneous plant waste water.

Pond 5 is entirely bounded by earth dikes with a total length of approximately 4,200 feet and a maximum height of approximately 41 feet. The width of the dike crests are 22 feet. A discrepancy was noted between the top of dike elevation shown on the 1968 drawing (El. 532.0) and the crest elevation reported on the Ohio Dam Inventory Sheet (El. 529). The upstream side of the embankment slopes at 2.2H:1V and downstream side of the embankment has a slope of 3H:1V as shown on Sections A-A, B-B, and D-D included herein in Figure 5B.

Material enters Pond 5 through a series of pipes and interior channels along the east side of the pond. An interior dike has been constructed to facilitate ash and waste settling in the eastern third of the pond, forming an ash delta and processing area and creating an open pond in the

sluice line gradually deflects toward the west dike and eventually is supported on a bench excavated into the dike slope at the southern portion of the pond, closer to the south dike. The sluice line turns to the east at the south dike and is supported in a bench along the entire south dike length.

2.4.2 Pond 3A Outlet Structure

The Pond 3A outlet structure is located near the northeast corner of the pond. It is similar to the outlet structure in Pond 10 in that it is a rectangular concrete riser that functions with concrete stop logs to control the operating pool level. The low level invert of this riser appears to be above the pond bottom, which prevents the structure from completely dewatering the pond and allows surface water to collect in the pond bottom. At the time of the site assessment, there was some water observed in the structure from water pumped out of the pond to facilitate dredging activities because the water level was far below the structure invert (Photo 52).

2.5 Visual Observations – Pond 6

CHA performed visual observations of the Pond 6 embankment and outlet structures. Selected pictures are shown in Photos 53 through 72.

2.5.1 Pond 6 - Embankments and Crest

Pond 6 appears to be impounded by constructed dikes along its eastern and southern sides, a partially incised wall at its western extremity where the ash processing occurs and, a mostly if not completely, incised northern wall. In general, the dikes of the Pond 6 do not show signs of changes in their horizontal alignments from the proposed alignments.

The western wall is generally obscured, does not impound water, and the crest of the portion that is visible functions as a facility haul road. Outlet pipe from the Pond 3A outfall convey water

APPENDIX 6.2
Dam Inventory Sheet from:
Dam Safety Inspection Report – J.M. Stuart Station Ash Pond 3A
By Ohio Department of Natural Resources, Dated 27 June 2013

Dam Inventory Sheet

Name: JM STUART STATION ASH POND NO. 3A
Reservoir:
File No: 8535-012
National #: OH03183
Permit No.:
Class (Ht-Vol): II (III - II)

Owner Information

Owner: Dayton Power & Light Company
Address: US Route 52, POB 468
City: Aberdeen **State:** OH **Zip:** 45101
Contact: Craig Spangler
Owner Type: Utility
Multi-Dams: Yes: 8, Class I:1
Parcel No.:
Phone No.: 937/549-2641

Location Information

County: Adams
Township: Sprigg
Stream: Ohio River - Off Stream
Latitude Deg.: 38 **Min.:** 38 **Sec.:** 02
Longitude Deg.: 83 **Min.:** 41 **Sec.:** 00
Nearest Affected Community: Maysville, Ky
Community's Distance from Dam (miles): 3.2
USGS Quad.: Maysville East, Ky-oh
USGS Basin No.: 05090201

Design/Construction Information

Designed By: Dayton Power And Light Co. With Bowser-morner
Constructed By: Ucon Construction Company
Completed: 1978 **Plan Available:** YES **At:** DSWR
Failure/Incident/Breach:

Structure Information

Purpose: Waste Retention
Type of Impound.: Upground
Type of Structure: Earthfill
Drainage Area (sq. miles): 0.09 **or (acres):** 55

Embankment Data

Length (ft): 6140
Height (ft): 25.6
Top Width (ft): 12
Upstream Slope: 2.5H:1V
Downstream Slope: 2.5H:1V
Volume of Fill (cub. yds.):

Spillway Outlet Works Data

Lake Drain: SEE PRINCIPAL SPILLWAY
Principal: 30" CONC PIPE IN BOTTOM OF CONC STRUCTURE WITH 36" STOPLOGS
Emergency: NONE
Maximum Spillway Discharge (cfs): **Design Flood:** 0.50 **Flood Capacity:** 0.50

Dam Reservoir Data	Elevation (ft-MSL)*	Area (acres)	Storage (acre-feet)
Top of Dam:	555.6	52.7	1257
Emergency Spillway:			
Principal Spillway:	526.86	50.7	1161
Streambed:	530		
Foundation:			

*Elevations are not necessarily related to a USGS benchmark

Inspection Information

Inspection History: 6/27/2013 JRH
10/28/2009 JRH
Phase I:
Other Visits:
Inspection Year: A

ZJMS

Operation Information/Remarks

Emergency Action Plan: Not Approved **Format:** No Plan **OMI:** No
Last Entry: 4/15/2014

APPENDIX 7.1
Excerpt from:
Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station
By Bowser-Morner, Dated 30 January 1975
Pages I-13 – I-20, Section VI

BOWSER-MORNER Testing Laboratories, Inc.
Founded 1911
CORPORATE ADDRESS • 420 Davis Ave. • P.O. Box 51 • Dayton, Ohio 45401 • 513/253-8805

February 19, 1975

Dayton Power and Light Company
Cincinnati Gas and Electric Company
Columbus and Southern Ohio Electric Company
25 North Main Street
Dayton, Ohio 45401

Attention: Mr. Jack Puterbaugh

Re: Addendum #1 to Report #788533, Dated January 30, 1975: Soil Investigation and Design for Proposed Fly Ash Dikes, James M. Stuart Electric Generating Station, Aberdeen, Ohio

Gentlemen:

The purpose of this letter is to outline the specific details of the construction at the above-referenced project. The option which will be utilized is Option I discussed in our report (please refer to BOWSER-MORNER Testing Laboratories report number 788533, dated January 30, 1975). The particular option chosen is for the dikes to be constructed to elevation 558 feet with no provisions made for extending the height of the dikes 3 feet at some future date. The top width of the dikes will be 12 feet at elevation 558 feet. The pit itself will be excavated to elevation 530 feet. The quantities of material required for the construction of the dikes with this procedure are as follows:

Material	Yardage Required
Clay	353,069
Sand	23,414
TOTAL	376,483

The following quantities will be excavated from the pit at a bottom elevation of 530 feet:

Material	Yardage Excavated
Topsoil	77,407
Good Clay	358,915
Poor Clay	81,329
Sand	44,178
TOTAL	561,829

The total yardage figure represents the total excavation from the borrow pit. It is felt, as stated in the above-referenced report, that a shrinkage factor of 15% should be utilized with these values. The following quantities of material are, therefore, available once compaction has been accomplished:

Material	Yardage Available
Good Clay	312,000
Poor Clay	70,721
Sand	38,416

The overruns of material excavated over what will be used in the dikes themselves are, therefore:

Material	Yardage Overrun
Topsoil	77,407
Good Clay	0
Poor Clay	34,100 (uncompacted)
Sand	17,252 (uncompacted)

A total of 27,500 cubic yards will be required for sealing off the sand in the bottom of the borrow pit. With 29,652 yards of poor clay available there will be approximately a 2,000 yard overrun on the poor clay material. There will also be an overrun of 17,252 yards of sand which in our understanding will be left in the bottom of the pit and not removed. Only that amount of sand necessary for the construction of the sand filter will be excavated.

The topsoil and portions of the poor clay which are left over will be utilized to fill pit number 6 to form an impervious blanket in the bottom of the pit, and whatever topsoil is left will be used to face the outside of the dikes in order to promote vegetation growth.

All other recommendations are contained in the above-referenced report. If there are any questions or if we can be of further service, please contact us.

Very truly yours,

BOWSER-MORNER Testing Laboratories, Inc.

David C. Cowherd

DCC:ss
6-Addressee
3-File

David C. Cowherd, M.S., P.E.
Chief Soils Engineer
Construction Materials Div.

BOWSER-MORNER
Testing Laboratories, Inc.

Soil Investigation and Design for Proposed Fly Ash Dikes James M. Stuart Electric Generating Station Aberdeen, Ohio

Dayton Power and Light Company
Cincinnati Gas and Electric Company
Columbus and Southern Ohio Electric Company
25 North Main Street
Dayton, Ohio 45401

Laboratory Report No. 788533

January 30, 1975

BOWSER-MORNER
Testing Laboratories, Inc.

530.0 and 545.0 feet giving a total height of the dikes varying between 16 and 31 feet at the final crest elevation of 561.0 feet. The dikes are to be 12 feet wide at the top to provide access to vehicles. The borrow area is to be excavated to elevation 530.0 feet to provide for storage of ash. The pit volume is to be filled to the 2/3 point with fly ash, with the top 1/3 of the volume of the pit being used for storage of water. This condition is to exist for about 35 years. Each of the various aspects related to the dikes will be discussed separately below.

I. Foundation Treatment

A. Fly Ash and Old Dike Areas

The dikes are situated such that the largest portion of the east-west part of the dike nearest the river will be situated in the fly ash area with approximately 30% of the lateral width overlying the fill in the old dike. This will present different compressibilities beneath the new dike. The various materials (the fly ash above and below water and the existing dikes) were tested to determine the strength and compressibility characteristics. It was found that the total settlement of the dike in this particular area could be expected to be a maximum of 6 inches due to the consolidation of the fly ash, existing dike, and original soil material. The situation of the new dike superimposed on the old dike is such that a problem will not be created with differential settlement between that portion above the old dike and that portion on the fly ash. The settlement of the portion of the new dike above the old dike will vary between about 4.5 inches and 6 inches. The shear strength of the fly ash was also determined and found to be adequate to hold the new dike

without shearing. It is recommended that the clay cover over the fly ash in the area in which the dike specifically will be placed be left in place and that this area be proof-rolled to insure that all soft areas have been removed before placement of the new dike. Any vegetation existing on the present dike which would be under the new dike should be removed before new fill is placed.

B. Coal Storage Area

The area of the coal storage currently has coal existing in thicknesses up to 30 feet. Before any work is done on the dike in this area all coal should be stripped down to the clay fill material. The area beneath the coal should then be proof-rolled to remove any soft areas before the new dike is constructed. The fill beneath the coal pile was found to be relatively compressible and the amount of settlement to be expected beneath the dike in this particular area is approximately 4 inches. The moisture content at which the dike will be constructed is sufficient to give flexibility to the dike so that the differential settlement between the area of dike over the coal fill and that over the fly ash will not create a major problem.

C. Original Soil Areas

For the most part, the original soil was found to be overlain by topsoil which should be undercut and removed from the entire limits of the dike area. In addition, some areas in the original soil were found to be filled with as much as 8 feet of sand fill which is quite loose. It is recommended that this existing fill material be undercut

and removed before construction on the dikes begins. The area beneath new dikes should be undercut to the brown clay soil in all original soil areas. Once all of this material has been removed to the outer limits of the dikes the surface of original soil should be proof-rolled and all soft areas undercut at this time. Settlement of the dikes in the original soil areas will vary between 1 and 3 inches from the lowest portion of the dikes at the northern part of the site to the highest portion of the dikes at the southern part of the site.

All areas beneath the proposed dikes which contain sand fill should have the sand removed before any construction begins except for that portion of the outside of the dikes which is no more than 25% of the base width of the dikes. In these areas the sand fill can be left in place to act as a sand drain. It should, however, be brought up to 90% of the maximum Modified Proctor dry unit weight before additional fill is added.

II. Embankments

The slopes of the embankments as herein recommended have been designed in accordance with the National Dam Safety Act recorded in the Federal Register dated August 8, 1974. In the consideration of slope stability this particular area is in a zone 1 or low risk earthquake area. In accordance with the above publication an earthquake force equal to 0.025 times the weight of the driving force has been added to the total driving force for slope stability. This was done by taking 0.025 times each slice weight and considering this as a horizontal force applied at the centroid of the slice. Both inside and outside slopes have been designed

for short term and also long term considerations once the fly ash is in place. These slope stability analyses are shown in Section II of this report. For specific questions relating to a particular analysis, please refer to that section.

In addition to these considerations, the amount of material available for construction of the dikes has been evaluated. There are basically two designs that are feasible depending on the method chosen for excavating the pit. The first would be a homogeneous clay dike with a sand drainage blanket, while the second would be a completely homogeneous clay dike without a sand drainage blanket. Each of these options will be discussed in detail below. The outside slopes will be above the maximum flood level for the Ohio River, therefore, there is no need to take into account rapid drawdown on these slopes. The design incorporating sand drains will permit the use of some of the sand which will be excavated in order to achieve the necessary pit area if the option of cutting the entire area of the pit to elevation 530.0 feet is used. This procedure will be discussed more fully below. Typical sections of the proposed dikes are shown in Figures VII-1A and VII-1B.

The top of the dikes at present will be at elevation 558.0 feet, however, the slope stabilities were calculated for a dike at elevation 561.0 feet. The height will vary between a minimum of about 16 feet and a maximum of about 31 feet on the Ohio River side of the dikes.

A. Option I

Option I consists of constructing homogeneous clay dikes with a sand filter as shown in Figure VII-1A. The following procedures should

be used for the construction of the dikes for this option. It is recommended if a sand drain is used that the sand drain be 3 feet thick and extend inward toward the center line of the dikes a total of 25% of the base width of the dikes. The crest width should be 27 feet if the dikes are constructed to elevation 558.0 feet with the option to extend the crest to 561.0 feet. This will allow space for raising the dikes an additional 3 feet at some date in the future.

If the elevation of the dikes is to be 558 feet and the option of raising the dikes an additional 3 feet is not considered, a total of 376,483 cubic yards of soil are needed for the construction of the dikes. The additional yardage required to provide for a 3 foot rise in height at some date in the future is 84,500 cubic yards, and is due to providing a 27 foot top width at 558 feet instead of a 12 foot top width. The yardage required for raising the final 3 feet at some time in the future will then be approximately 16,076 cubic yards. If the option of a sand filter is used and the dikes are constructed to a crest elevation of only 558.0 feet with a top width of 27 feet to provide for raising to elevation 561.0 feet at some date in the future, a total of 460,983 cubic yards of material will be required. This breaks down into 437,569 cubic yards of clay fill and 23,414 cubic yards of sand fill. These yardage figures include the yardage required to replace one foot of topsoil and all existing fill which must be stripped from beneath the dikes in the original soil area as recommended under the foundation treatment section of this report. This amounts to 13,301 cubic yards of topsoil and fill to be removed and replaced beneath the dike area proper. These figures do, therefore, represent the total yardage required for construction

of the dikes once the area has been stripped of topsoil.

The first option would include excavating the pit down to elevation 530.0 feet to provide for ash storage. The bottom of the pit would be level at elevation 530.0 feet. The borings made in the interior of the pit indicate that four basic types of soil will be encountered in the excavation. The first is topsoil, the second is a "good" clay, the third, a clay and sand which will be difficult to compact, and the fourth, a sand. Cross sections through the pit have been drawn and are shown in Figure VII-2A in Section VII of this report. These cross sections show the relative positions of the various types of soil in reference to the dikes and the bottom elevation of the pit at 530.0 feet. The following quantities of materials have been calculated as excavation from the borrow area:

Material	Quantity (cubic yards)
Topsoil	77,407
"Good" Clay	358,915
Clay and Sand	81,329
Sand	44,178

The above yardage of topsoil includes that portion of topsoil already outlined above as being under the dikes, and is a total value including stripping from outside of dike to outside of dike. The topsoil varies in thickness between 0.5 feet and 1.5 feet, and an average of 1.0 feet has been used in the above calculations. It is our opinion that these estimates are high enough to include all stripping of unsuitable fill from beneath the dikes. It is felt that a "shrinkage" factor of about 15% should be used with the above yardage figures. The total yardage

available for construction will, therefore, be as follows:

Material	Quantity (cubic yards)
"Good" Clay	312,000
Clay and Sand	70,721
Sand	38,416
"Good" Clay from Diversion Ditch	5,000

From the above table it can be seen that the total amount of "good" clay and clay and sand available for construction of the dikes is 387,721 cubic yards or approximately 50,000 cubic yards short of the required yardage. This additional yardage could be obtained at the south end of the new pit near the "old" pit. There is sufficient clay in this area to provide the necessary 50,000 cubic yards. It can also be seen from the table that the sand excavated is adequate for the requirements of the sand filter with about 15,000 cubic yards left over. With this option it will be necessary to utilize the clay and sand for construction of the dikes. The clay and sand will be more difficult to compact and will require more effort, therefore, it is recommended that an effort be made to mix the two materials to achieve a more workable mix. It should be noted that in many locations the "good" clay is present to deeper depths and it might be advantageous to extend the excavation deeper in these areas, both from the standpoint of better clay for use in the dikes and in more storage for ash.

The excavation for the fly ash pit should be constructed in the following manner. A berm 20 feet in width between the inside toe of the dike and the top of the slope for the pit should be constructed.

This design is shown in both the cross sections in Figures VII-2A and VII-2B and in detail in Figure VII-3. The excavation should then be made on a 2 1/2 to 1 slope to the bottom elevation of 530.0 feet. A slope stability analysis of this situation was performed and is shown in Figure II-4. The factor of safety against failure of a 2 1/2 to 1 slope in original soils is 2.37. Some areas of wet sand and trapped water will be encountered throughout the excavation for the pit, however, the general groundwater table will not be encountered and groundwater should not be a major problem. Some problems will be encountered with the loose sand being unstable under wheel loads of pans, particularly near the northwestern corner of the proposed pit. It should be anticipated that some pushing of pans in this area will be required. Once the excavation has been made to elevation 530.0 feet, approximately 25% of the bottom area of the pit will be sand and the remainder will be clay. It is our recommendation that the following procedure be utilized for the bottom of the pit. The bottom of the pit where sand is exposed should be lined with 18 inches of relatively impermeable material. The topsoil excavated for the construction of the pit could be used for this procedure. The total yardage required for this procedure would be about 27,500 cubic yards. There will, therefore, be sufficient topsoil to line the bottom of the pit. It appears that this is the most economical method of facing the bottom as it permits the use of some of the excavated topsoil. This blanket should be compacted to 85% of the maximum Modified Proctor dry unit weight.

SECTION VI

SPECIFICATIONS

CLEARING & GRADING SPECIFICATIONS

BOWSER-MORNER TESTING LABORATORIES, INC.

I. General Conditions:

The Contractor shall furnish all labor, materials and equipment, and perform all work and services necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction and grading as shown on the plans and as described therein.

This work shall consist of all clearing and grading, removal of existing structures unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes and specifications.

This work is to be accomplished under the constant and continuous supervision of the Owner or his designated representative.

In these specifications the terms "approved" and "as directed" shall refer to directions to the Contractor from the Owner or his designated representative.

II. Subsurface Conditions:

Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work. Borings and/or soil investigations shall have been made at the construction site by the Owner. Results of these borings and investigations will be made available by the Owner to the Contractor upon

his request, but the Owner is not responsible for any interpretations or conclusions with respect thereto made by the Contractor on the basis of such information, and the Owner further has no responsibility for the accuracy of the borings and the soil investigations.

III. Site Preparation:

Within the specified areas, all trees, brush, stumps, logs, tree roots and structures scheduled for demolition shall be removed and disposed of.

All cut and fill areas shall be properly stripped. Topsoil will be removed to its full depth and stockpiled for use in finish grading or as a stabilizing fill. Any rubbish, organic and other objectionable soils, and other deleterious material, shall be disposed of as directed by the Owner or his designated representative if on site disposal is provided. In no case shall such objectionable material be allowed in or under the embankment proper unless specifically authorized in writing.

Prior to the addition of fill, the original ground shall be compacted to job specifications as outlined below. Special notice shall be given to the proposed fill area at this time. If wet spots, spongy conditions, or groundwater seepage is found, corrective measures must be taken before the placement of fill.

IV. Formation of Fill Areas:

Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross section. The depth of lift may be increased if the Contractor can demonstrate his ability to compact a larger lift.

All material entering the fill shall be free of organic matter such as leaves, grass, roots and other objectionable material.

The operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather or other unsatisfactory conditions. The Contractor shall keep the work areas graded to provide drainage at all times.

The fill material shall be of the proper moisture content before compaction efforts are started. Wetting or drying of the material and manipulation to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. The moisture content of the fill material should be between optimum moisture and four (4) percentage points higher than optimum unless otherwise authorized. Sprinkling shall be done with equipment that will satisfactorily distribute the water over the disced area.

Compaction operations shall be continued until the fill is compacted to not less than 90% of the maximum density as determined in accordance with ASTM-D1557-70 (Modified). Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. If directed, original slopes shall be continuously, vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal and the back of the bench is vertical. As many benches as are necessary to bring the site to final grade shall be constructed.

Filling operations shall begin on the lowest bench, with the fill being placed in horizontal eight (8) inch loose lifts unless otherwise authorized. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper drainage shall be maintained at all times during benching and filling of the benches to insure that all water is drained away from the fill area.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the areas or in the rock toe. Stones or fragmentary rock larger than twelve (12) inches in their greatest dimensions will not be allowed in the fill unless specifically authorized in writing. Rock fill shall be brought up in layers as specified or as directed.

Frozen material shall not be placed in the fill nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all fills made under the contract and shall replace any portion which, in the opinion of the Owner or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damaged by inclement weather shall be repaired at the Contractor's expense.

V. Slope Ratio and Storm Water Runoff:

Slopes shall be as designated on the prints and report in both cut and fill, and storm water shall not be drained over the slopes.

VI. Grading:

The Contractor shall furnish, operate and maintain such equipment as is necessary to construct uniform layers and control smoothness of grade for maximum compaction and drainage.

VII. Compacting:

The compaction equipment shall be approved equipment of such design, weight and quantity to obtain the required density in accordance with these specifications.

VIII. Testing and Inspection Services:

Testing and inspection services will be provided by the Owner.

APPENDIX 7.2
Excerpt from:
Operation Maintenance and Inspection Manual Ash Impoundment Dike Stuart Electric Generating Station
By DP&L, Dated 8 April 2014
Pages 1-3, 8-10, Appendix C

OPERATION MAINTENANCE AND INSPECTION MANUAL

ASH IMPOUNDMENT DIKE

STUART ELECTRIC GENERATING STATION

ODNR FILE No.

POND 3A	POND 5	POND 6	POND 7	POND 10
8535-012	8535-003	8535-013	8535-002	8535-011

SPRIGG TOWNSHIP, ADAMS COUNTY
CLASS 2

OWNER:
DAYTON POWER & LIGHT COMPANY
745 U.S. ROUTE 52
MANCHESTER, OH 45144

(937) 549-2641 TEL
(937) 549-4281 FAX

PREPARED BY:

The Dayton Power & Light Company

Revised
April 8, 2014

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1.2 GENERAL ARRANGEMENT 2
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3.1 SAFE RATE DRAWDOWN PLAN 9
4.0 INSPECTION 9
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Figure 1.1 Location Map
Figure 1.2 Facility Map

LIST OF APPENDICES

Appendix A References
Appendix B Arrangement Drawings
Appendix C **Inspection Forms**
Form 1 Rainfall Monitoring
Form 2 Monthly & Biannual Monitoring
Form 3 Dam Maintenance Record

Master document located in:

G:\Central Services\Equipment - System Owners\Ponds-Landfills\Stuart\OM&I Manual Stuart RA.doc

1.0 DESCRIPTION OF FACILITY

1.1 LOCATION

DP&L has 5 impoundments located at the J.M. Stuart Station in Sprigg Township, Adams County, Ohio as shown on Figure 1.1, Location Map and Figure 1.2, Facility Map. The purpose of this manual is to increase the safety of the impoundments by defining the procedures for operating, maintaining and inspecting the dams on a regular basis. The facility's characteristics are shown in Section 1.2's tables. The Operation, Maintenance & Inspection Manual (OM&I Manual) was prepared as required by OAC 1501:21-15-06.

Figure 1.1, Location Map

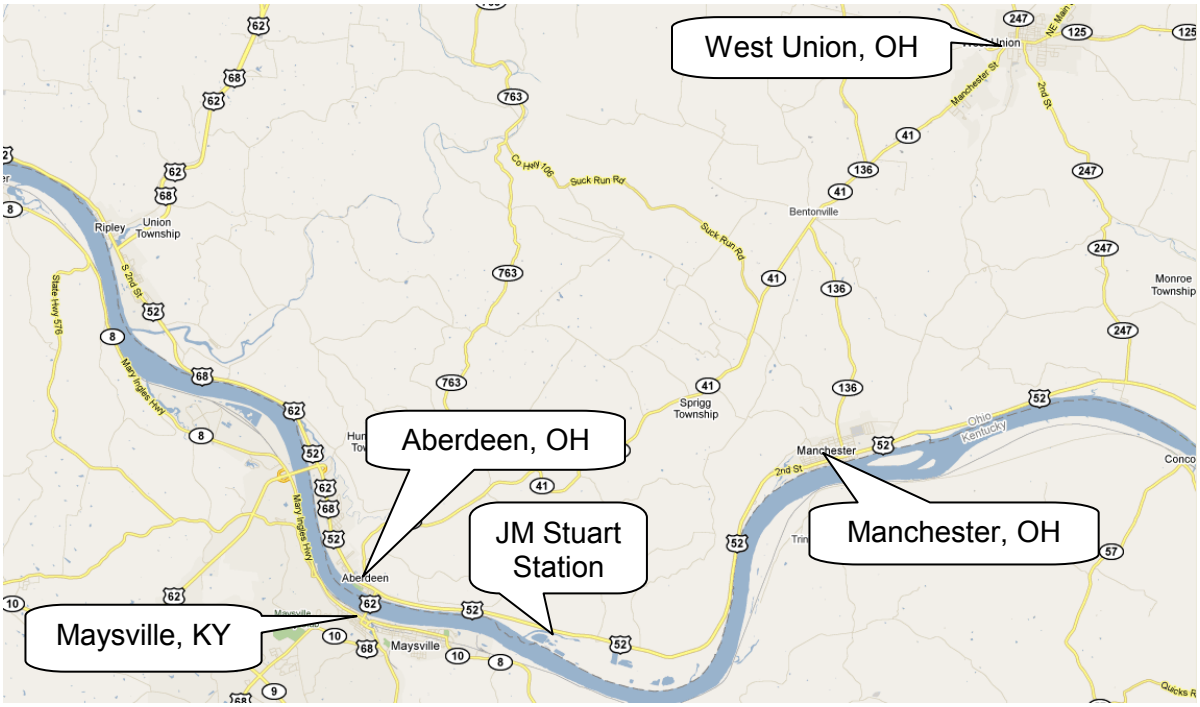
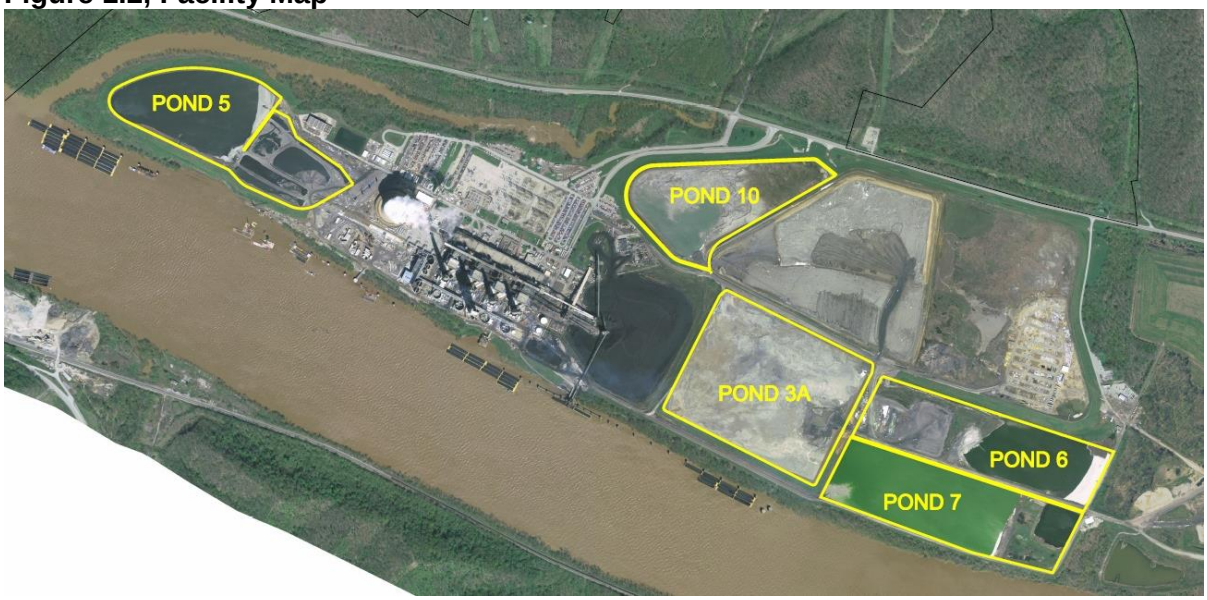


Figure 1.2, Facility Map



1.2 GENERAL ARRANGEMENT

Ponds 3A, 7 and 10 are primary fly ash settling ponds. They receive ash sluiced from the fly ash collection system from the plant. Pond 6 receives water from plant sumps and ash sluice water from the above mentioned ponds. Under normal operation only one of the three ash sluice ponds will discharge water at any given time. Pond 5 is divided into two sections. The east section contains primary settling lagoons for bottom ash and other plant area drainage sumps.

In 2012 a survey of the crest of the ponds was performed. The elevations in this document have been revised to reflect these elevations which are now referenced to the NAVD 1983.

1.2.1 Ash Pond 3A – ODNR File No. 8535-012

Ash pond 3A is an upland reservoir that was constructed in c1978 under ODNR Permit No. 77-97. A portion of this pond is constructed over the previously closed and abandoned Pond 3 which was capped with 2' of cohesive material. In 2010-11 a new liner was installed in the bottom consisting of 2 ft of 10^{-7} clay. The dam is constructed with a solid clay core. This pond is used for settling wet sluiced fly ash produced from the combustion of coal in the station generating units. The pond has an area of 52.7 acres at the crest, is 26 ft deep and has a volume of 1,257 acre-ft (427 million gal.) to the crest. This pond is periodically drained and the settled fly ash excavated which is then sent to a dry ash landfill.

A sand curtain drain was installed along the toe of the south dam to alleviate water in the pond 3 below this structure as indicated in drawing 300-46-1109.

The inlets for this pond are 5 HDPE pipes entering the pond typically in the southwest corner. Sluice lines are moved as the pond fills with solids. The Maximum Operating Level of this pond is 3 ft below the crest. The outlet is a concrete structure with removable stop logs to control the level and facilitate dewatering the pond for cleaning. Effluent is conveyed from this structure to pond 6 through a 30" reinforced concrete pipe.

During the normal excavation process the dam on the east side is breeched to facilitate ash hauling. Repair of the breech at the end of the excavation cycle shall be monitored and by a qualified technician under the supervision of a Professional Engineer.

Table 1.1 – Pond 3A Properties

Item	Description
IDENTIFICATION	
ODNR File Number	8535-012 / 77-97
LOCATION	
State	Ohio
County	Adams
Township	Sprigg
Stream	Ohio River
USGS Quadrangle Map	Maysville east, KY-Ohio
Community Distance from Dam	4 miles, Aberdeen, Ohio / Maysville, KY
DESIGN/CONSTRUCTION INFORMATION	
Original Designer	Bowser Mourner
Date Completed	1978
Contractor	Ucon Construction Co.
Purpose of Dam	Industrial
Type of Impoundment	Up ground
Type of Structure	Earth fill

Area at Crest	52.7 acres
Entire Length of Dam	4,496ft
Bottom of Pond [1, 2]	El 531 ft.
Maximum Height	24.6 ft
Top Berm Width	10.0 ft
Top of Dam	El 555.6 ft
Maximum Operating Level	El 552.6 ft
Freeboard	3.0 ft
Upstream Slope [1, 2]	2.5H:1V
Downstream Slope [1, 2]	2.5H:1V
INLETS	
Fly Ash System	Starting in the southwest corner HDPE pipes are moved as needed to manage filling of the pond.
OUTLETS	
Outlet structure	Northeast corner, Latitude = 38° 38' 4.6" N; Longitude = 83° 40' 48.2 W Concrete structure with stop logs to adjust water level discharging through a 24" RCP into Pond 6
Emergency Spillway	None.

1.2.2 Pond 5 – ODNR File No. 8535-003

Pond 5 is an upland reservoir that was constructed in c1970. Inverted filters were added in 2010 at 5 seepage locations. This pond receives influent from plant processes including area drains, bottom ash sluicing, and FGD blow down. These influents are routed into settling bays in the eastern portion of the pond which discharge into the remaining portion of the pond. The pond has an area of 39 acres at the crest, is 40ft deep and has a volume of 1,110 acre-ft to the crest including the permanently filled portion of the pond. This pond is vital to the operation of the plant and cannot be drained without shutting the station down. The Maximum Operating Level of this pond is 5 ft below the crest. The outlet is constructed of driven sheet piling and is routed via a 4ft diameter corrugated metal pipe to the waste water treatment building. In this building effluent is filtered in rapid sand filters with a walnut shell filter media. There is also an emergency overflow weir (elevation 723.82') in this building which will bypass the filters if the level is up to 5½ ft below the crest.

Table 1.2 – Pond 5 Properties

Item	Description
IDENTIFICATION	
ODNR File Number	8535-003
LOCATION	
State	Ohio
County	Adams
Township	Sprigg
Stream	Ohio River
USGS Quadrangle Map	Maysville east, KY-Ohio
Community Distance from Dam	4 miles, Aberdeen, Ohio / Maysville, KY
DESIGN/CONSTRUCTION INFORMATION	
Original Designer	Ebasco Services, Inc, Atlanta, GA
Date Completed	1968
Contractor	
Purpose of Dam	Industrial

2.0 OPERATION

Specific procedures for operation of mechanical equipment are as follows:

Table 2.1		
Frequency (Min.)	**Personnel**	**Maintenance Item**
Continuously	Owner's Representative	Monitor water levels and operation of filter system
		Monitor water levels
Semiannually	Owner's Representative	Exercise pond 6 weir gates to ensure operability.
		Exercise pond 10 sluice gate. Sluice gate shall otherwise be locked in the open position.

3.0 MAINTENANCE

Table 3.1 lists the type and frequency of the maintenance activities to be performed at the dam.

Table 3.1

Frequency (Min.)	Personnel	Maintenance Item
Semi Annually	Owner's Representative	All broadleaf vegetation on the dam shall be sprayed with a broadleaf herbicide or cut and treated to prevent re-growth. This includes trees, shrubs and all other woody plants.
		Lubricate and inspect pond 6 weir gates.
		Lubricate and test operate Pond 10 discharge vlave
As Needed	Owner's Representative	• Repair erosion and re-establish proper vegetative cover. Reseeding of bare or eroded areas should be performed immediately to allow re-vegetation. The seed mixture shall meet the species requirement of ODOT 659.09 class 2 or class 3B. All alternates must be approved by ODNR. • Mow the grass to maintain a height of less than 12". • Make repairs to all structures and elements as required. • All rodent damage shall be repaired immediately by filling the burrows or holes utilizing the mud packing method. (*To backfill a burrow, place a length of metal stove pipe or PVC in a vertical position over the entrance to the burrow and fill with slurry clay and cement. After the burrow is filled, the pipe should be removed and dry earth tamped into the burrow entrance and the vegetation re-established.)* • Maintain a permanent record of all maintenance actions. Maintenance records may be maintained on Form 3 or maintained in an electronic maintenance management system.

3.1 SAFE DRAWDOWN RATE PLAN

The following section includes the method to be used for drawing the impoundment down under emergency conditions. Drawdown should be limited to 12" per week for normal operation and 6" per day for emergencies. Excessive drawdown can cause sloughing or slides of the upstream face of the dam.

For 3A and 10 the level should be lowered by removing stop logs to maintain the safe drawdown rate. Once the bottom of the outlet structure is reached, portable pumps shall be used to lower the level further. The water level in pond 7 must be lowered with portable pumps. Ponds 5 and 6 are critical to plant operation and cannot be lowered beyond the normal operating range without shutting the plant down. If an emergency necessitates that this be done the ponds will have to be drained with portable pumps. When possible pumps used for drawdown should be discharged into other ponds or the pond normal outfall.

4.0 INSPECTION

DP&L shall perform three types of inspections. Two periodic inspections include monthly and biannual. The third type is monitoring as needed during and after heavy rainfall events. Table 3.1 lists the type and frequency of the inspection activities to be performed at the dam. Inspection forms are included under Appendix A. DP&L's operations representative or operations contractor may complete the monthly inspections. The biannual (every 6 months) inspections should be completed by a person qualified Dam Safety and may be performed

by DP&L personnel or a Registered Professional Engineer. Inspections shall be documented on the forms provided with this manual.

Table 4.1

Frequency	Personnel	Inspection Item	Form No. or Reference
As Needed (After heavy rainfall event such as 2" in a 24 hour period)	Owner's Representative (Operations Shift Supervisor)	Monitor the rainfall at NOAA, National Weather Service or KYmesonet weather station in Mason County,	Form No. 1 www.nws.noaa.gov www.kymesonet.org
		Flow though overflow pipe	
		Water level of the impoundment	
Monthly *(Visual Observation)*	Owner's Representative (Plant Operations)	Seepage and/or wet areas	Form No. 2
		Flow through spillway or outlet pipe	
		Water level of the impoundment	
		Slides and cracks	
		Rodent activity along the waterline	
		Vandalism	
Biannually *(Visual Observation)*	Owner's Representative or consultant PE or other qualification. (Central Services)	Slope protection	Form No. 2
		Condition of earthen dam	
		Outfall discharge to plunge pool area	
		Condition of vertical riser and culvert *(visual)*	
		Pond drain and valve *(operational)*	
		Review dam maintenance records	
Periodic 5 years *(Visual Observation)*	ODNR/Division of Soil & Water Resources/Dam Safety Engineering Program	Engineer's Safety Inspection Checklist	Form provided by ODNR

5.0 RESPONSIBILITIES

Plant Manager

The Plant Manager is responsible for implementation of this manual. The Plant Manager or designee shall also be responsible for the annual review and revision of this manual.

Plant Commodities Manager

The Plant Commodities Manager or designee is responsible for the maintenance of the facility and record keeping of all maintenance activities.

Material Handling Shift Supervisor

The Shift Supervisors are responsible for the routine monthly inspections included those after a significant rainfall and monthly and adherence to operational practices. Supervisors are also responsible for periodic operation of drain valves. The shift supervisor may designate others to perform these suties

Central Services Engineer

The Central Services Engineer is responsible for conducting the semi-annual inspections and coordinating with ODNR for compliance of deficiencies and 5-year inspections.

6.0 APPENDICIES

APPENDIX A

Reference Drawings used in this manual.

APPENDIX B

Future Arrangement Drawings

APPENDIX C

Inspection forms.

APPENDIX C

INSPECTION FORMS

FORM 1

RAINFALL MONITORING

This form should record all inspections triggered by significant rainfall events (greater than 2” in a 24 hour period) in the area. The National Weather Service (NOAA) web site is useful for monitoring these events. Note any significant decrease of freeboard or obstructions to flow in the outlet structures.

POST RAINFALL EVENT MONITORING FORM				
DATE (M/D/Y)	PERSONNEL NAME	RAINFALL (in)	ESTIMATED FREEBOARD (ft)	COMMENTS

FORM 2

Stuart Station Pond _____
Dam Inspection Report
ODNR File No. _____

MONTHLY/SEMIANNUAL INSPECTION FORM

Where appropriate, indicate conditions below as "**none**" or "**acceptable**" if no further action is required. Check "**repair**", "**monitor**", or "**investigate**" if further action is required. Obvious problems will require repair. Monitoring will be recommended if there is potential for a problem to occur in the future. Investigation is necessary if the reason that the problem is occurring is not obvious. More than one box may be checked if necessary. The locations of any observed conditions can be noted on photographs.

CONDITIONS AT THE TIME OF INSPECTION			
DATE		INSPECTED BY:	

AREA	ITEM	OBSERVATIONS	ACTION		
			REPAIR	MONITOR	INVESTIGATE
DAM EMBANKMENT					
BOTTOM ASH UPSTREAM SLOPE	VEGETATION/TREES/ BRUSH				
	RODENT BURROWS				
	RIPRAP				
	BREACHING/SLIDES/ CRACKS				
	UNDERMINING/ EROSION				
	OTHER				
FLY ASH UPSTREAM SLOPE	VEGETATION/TREES/ BRUSH				
	RODENT BURROWS				
	RIPRAP				
	BREACHING/SLIDES/ CRACKS				
	UNDERMINING/ EROSION				
	OTHER				
CREST	RUTS/EROSION				
	CRACKS/ SETTLEMENT				
	OTHER				

DOWNSTREAM SLOPE	VEGETATION/TREES/ BRUSH				
	RODENT BURROWS				
	SLOUGHS/SLIDES/ CRACKS				
	SEEPAGE/WETNESS				
	OTHER				
TOE	CRACKS/SLUMPS				
	SEEPAGE/WETNESS				
	OTHER				
INFLUENT/EFFLUENT STRUCTURES					
INLET STRUCTURE	OBSTRUCTIONS				
	DETERIORIATION				
	ACCESS/GRATING				
	OTHER				
OUTLET STRUCTURE	OBSTRUCTIONS				
	DETERIORIATION/ SEEPAGE				
	UNDERMINING				
	ACCESS/GRATING				
	OTHER				

FORM 3

Stuart Station Pond _____ Dam Maintenance Report ODNR File No. _____		
DAM MAINTENANCE RECORD FORM		
This form may be used to record all maintenance tasks performed including preventative maintenance, corrective maintenance and emergency maintenance.		
DATE	WORK ORDER NO.	ACTION

Alternate spreadsheet used in lieu of this form. A mowing log is kept separately.

APPENDIX 7.3
Excerpt from:
Assessment of Dam Safety Coal Combustion Surface Impoundment (Task 3) Final Report
By CHA, Dated 26 March 2010
Pages 106-110

above approximately 1 to 12 feet of fine grained, generally cohesive alluvial deposits comprising medium stiff to hard clay, silty clay and silt. Granular alluvial deposits comprising silty and clayey sand to poorly graded and well graded sand with gravel at lower elevations was evident below the cohesive soils. This granular deposit was divided into an upper and lower zone. Very loose to medium dense conditions were apparent in the upper zone noted to between 9 and 25 feet below grade, and loose to very dense conditions in the deeper, cleaner sand with gravel noted to more than 100 feet below grade. Under seismic load conditions, the very loose to loose sand and silty sand soils in evident in the upper zone closest to the dike foundation may be susceptible to liquefaction behavior during which they lose shear strength and flow like a viscous liquid. Additional discussion regarding liquefaction appears in Section 4 of this report.

A generalized cross section of Pond 10 and its associated dikes (Figure 13C) indicates that the dikes are founded above the cohesive alluvium and the basin bottom is in the upper granular alluvium comprising silty to clayey sand. Available specifications indicate that the dike foundation was to be "stripped to the depths required to remove vegetative matter, roots, and other perishable, loose, or objectionable material". This directive would likely address the topsoil and miscellaneous fill materials encountered in the surficial zone in the foundation area. Furthermore, the foundation soils were to be proof rolled to delineate soft or yielding subgrade. Any poor subgrade conditions exposed in the field was to be excavated and replaced with the appropriate compacted material for the foundation location.

3.5 Operations & Maintenance

DP&L provided CHA with a copy of the Operations, Maintenance, and Inspection Manual (OMI) and a copy of the Emergency Action Plan (EAP), both dated May 15, 2000. A copy of Addendum No.1 to the OMI dated December 20. 2001 was also included with the DP&L submittal. These items address Pond 10, the most recent impoundment commissioned at the site. Tasks required under the OMI are supposed to be performed by J.M. Stuart plant personnel and address the following:

- Operation of Reservoir – Discharge fly ash/water slurry into the pond at a location away from the outlet structure and allow ash to settle/decant. Add stop logs as ash levels rise to prevent ash flow through outlet structure.
    - Initial filling of Ash Pond 10
    - Installation of stop logs

- Dike Inspections – Outlines field inspection schedule and highlights critical items.
    - Inspection procedures and general inspection recommendations
    - Featured inspection items – Addendum No.1 adds discharge pipe, sand toe drain, and abutment areas with Pond 8W (now Landfill 11) dike to list
    - Repair Order/Work Performed Items

- Maintenance Items – Identifies appurtenant structures needed for effective operation and important dam safety concepts. A Dike Inspection Checklist along with a dike inspection plan and site operation schematic are included as a part of this OMI.
    - Concrete/Steel Structures and associated mechanisms
    - Skimmer, Walkway, and Safety Barriers
    - Crest and Access Roads
    - Vegetation and Rodent Control
    - Debris/Obstructions in Outlet Structure
    - Erosion
    - Seepage
    - Cracks/slides/slumps and gross deformations

- Emergency Procedures – Emergent or critical problems beyond routine maintenance. Separates them into two categories
    - Non-Failure or Potential Failure
    - Imminent or Failure has Occurred

Based upon conversations during our site visit, we understand that Plant personnel make visual observations on a daily basis during the course of their work on-site. However, a formal documented inspection procedure is not in place.

The Emergency Action Plan (EAP) for Pond 10 includes the following items:

- Communication Flow Charts for the type of emergency situation.
  - Non-Failure/Potential Failure – Flow Chart II
  - Failure Imminent/Failure Occurred – Flow Chart III
  - Flow Chart I is a general communication flow chart.

- Emergency Criteria to establish the level of deficiency and determine if a company or public notification is warranted.
  - Minor, Non-Emergency – Typically a maintenance issue
  - Serious Deficiency - Non-Failure/Potential Failure, requires immediate repair and company alert
  - Emergent Deficiency – Failure Imminent/Failure Occurred, requires public alert

- Personnel Responsibilities – Delegates specific responsibilities during an emergency situation
  - Notification Responsibility – critical communication with required personnel and agencies.
  - Evacuation Responsibility –if US 52 is threatened
  - Security, Follow-up, and Duration Responsibility
  - EAP Coordinator – EAP revision, training, etc.

In addition to the items listed above, the EAP for Pond 10 also included an inundation map showing the extent of an ash flow from the pond should a breach occur, site specific concerns associated with U.S. 52, and the EAP approval from the Adams County Emergency Action Agency.

3.6 Inspections

3.6.1 State Inspections

Ohio Revised Code Section 1521.062 states that the owners of dams must monitor, maintain, and operate their dams safely. The owner is to maintain a safe structure and appurtenances through inspection, maintenance, and operation. For Engineering Repairs and Investigations, the dam owner must retain the services of a professional engineer to address the plans, specification, investigative reports, and other supporting documentation. The owner is required to complete the items within five (5) years. Owner repairs may be performed by the dam owner or by a hired contractor.

Representatives of the ODNR Dam Safety Program inspected Ash Pond 10 structures on June 12, 2008 and their observations were summarized in a Dam Safety Inspection Report. The report included required remedial measures based on observation made during the inspection, calculations performed, and requirements of the Ohio Administrative Code. The Dam Safety Inspection Report identified the following required remedial measures:

- Remove trees growing in the rip-rap at the toe of the northeast embankment.
- Establish a regular mowing routine to permit inspection of the upstream slope.
- Keep detailed records of quarterly inspections by site personnel using the checklists included in the Operations, Maintenance, & Inspection Manual.

Representatives of the ODNR Dam Safety Program accompanied CHA and site representatives during CHA's site assessment on October 27, 2009 and October 28, 2009. Subsequently, ODNR issued a letter to DP&L on November 5, 2009 indicating that a Professional Engineer must be engaged to investigate observed seepage and corresponding stability of the dike at Ash Pond 5. ODNR indicated that the investigation must be completed within six months of the date of their letter.

3.6.2 Inspections by Engineering Consultants

DP&L's letter to the USEPA responding to the request for information indicates that Civil & Environmental Consultants performed an assessment of Ash Ponds 3A, 5, 6, 7, 7A, and 10 in 2009 and that no significant issues were identified at the time of the inspection. CHA has not been provided with a copy of the inspection report.