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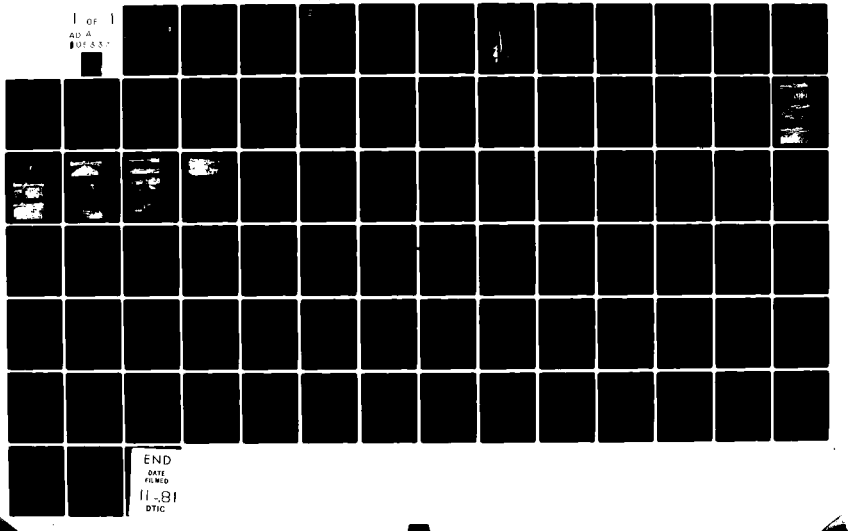

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WELLINGTON-NAPOLEON WATERSHED STRUCTURE C-21

LAFAYETTE COUNTY, MISSOURI

MO 10284

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: HOSKINS-WESTERN-SONDEREGGER, INC.

FOR: STATE OF MISSOURI

SEPTEMBER, 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

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1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A105337	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Phase I Dam Inspection Report National Dam Safety Program Wellington-Napoleon Wtrshd Structure C-21 Lafayette County, Missouri (MO 10284)	5. TYPE OF REPORT & PERIOD COVERED Final Report
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Hoskins-Western-Sonderegger, Inc.	8. CONTRACT OR GRANT NUMBER(s) DACW43-78-C-0155
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT DATE Sept 78
	13. NUMBER OF PAGES Approximately 80
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16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for release; distribution unlimited.

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National Dam Safety Program. [redacted] Wellington - Napoleon Watershed Structure C-21, (MO 10284), Missouri - Kansas City Basin, Lafayette County, Missouri. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Wellington-Napoleon Watershed Structure C-21 Dam (Mo. 10284) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Wellington-Napoleon Watershed Structure C-21 Dam:

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood.

2) Overtopping could result in dam failure.

3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED
Chief, Engineering Division — 12 APR 1979 Date

APPROVED BY: SIGNED
Colonel, CE, District Engineer — 13 APR 1979 Date

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Wellington-Napoleon Watershed Structure C-21
State Located	Missouri
County Located	Lafayette County
Stream	Tributary to Missouri River
Date of Inspection	September 15, 1978

Wellington-Napoleon Watershed Structure C-21 was inspected by an interdisciplinary team of engineers, ~~from Hoskins-Western-Sonderegger, Inc~~. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends one mile downstream of the dam. Within the first one-half mile downstream of the dam are four to five houses, a Missouri-Pacific railroad crossing and a Highway 24 crossing.

Our inspection and evaluation indicates that the spillways do not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Because of the number of houses and the railroad and highway crossings within the first one-half mile downstream of the dam the spillways should be capable of passing the probable maximum flood without overtopping the dam and possibly causing failure of the dam. The spillways will pass a 100-year flood (flood having a one percent chance of being exceeded in any one year) without overtopping the dam. The spillways will also pass 40% of the Probable Maximum Flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These analyses should be obtained in the future.

Other deficiencies visually observed by the inspection team were several rather large rodent holes in the upstream slope, seepage outcropping in both left and right abutment/embankment groins approximately eight feet above principal spillway outlet, and some erosion near the outlet end of the emergency spillway.

Several items of preventive maintenance need to be initiated by the owner. These are described in detail in the body of the report.

H. P. Hoskins

Harold P. Hoskins, P.E.
Hoskins-Western-Sonderegger, Inc.
Lincoln, Nebraska

PHOTOGRAPH NO. 1
OVERVIEW TAKEN
FROM LEFT SIDE

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WELLINGTON-NAPOLEON WATERSHED STRUCTURE C-21
ID NO. MO. 10284

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SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Wellington-Napoleon Watershed Structure C-21 be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The Wellington-Napoleon Watershed Structure C-21 is a rolled earth fill approximately 465 feet in length with maximum height of 37 feet. The dam is constructed in the Missouri River loess hills.

(2) The principal spillway is uncontrolled and consists of a reinforced concrete (R/C) riser with a 24 inch diameter R/C pipe conduit outlet.

(3) The emergency spillway is a vegetated channel cut into loess soils on the left (west) abutment. It has a bottom width of 70 feet and side slopes of 3H on 1V.

b. Location. The dam is located in the northwestern portion of Lafayette County, Missouri, as shown on Plate 2. The dam is shown on Plate 1 in the SE 1/4 of Section 19 and the SW 1/4 of Section 18, T50N, R28W. The lake formed by the dam is shown on Plate 1 in the previously mentioned 1/4 sections as well as the NW 1/4 of Section 29, T50N, R28W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the small size category.

d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph c above. Based on referenced guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends one mile downstream of the dam. Within the first one-half mile downstream of the dam are four to five houses, a Missouri-Pacific railroad crossing and a Highway 24 crossing.

e. Ownership. The dam is owned by the Wellington-Napoleon Watershed Subdistrict, 120 West 19th Street, Higginsville, MO 64037. Attention: Chester Temple, Chairman.

f. Purpose of Dam. The dam was constructed as a grade stabilization, sediment detention and flood water retarding structure.

g. Design and Construction History. The dam was constructed in 1969. The design and plans for construction were prepared by the Soil Conservation Service (SCS), Columbia, Missouri. Portions of these data are included with this report as Appendix C.

h. Normal Operating Procedure. There are no operating facilities for this dam. The lake level is controlled by rainfall, runoff, evaporation and the capacity of the spillway.

1.3 PERTINENT DATA

a. Drainage Area - 333 acres (0.52 sq. mi.)

b. Discharge at Damsite.

(1) All discharge at the damsite is through an uncontrolled reinforced concrete box drop inlet and reinforced concrete pipe principal spillway and a grassed earth channel ungated emergency spillway.

(2) Estimated maximum flood at damsite - unknown.

(3) The principal spillway capacity varies from 0 c.f.s. at elevation 758.0 feet to 56 c.f.s. at the crest of the emergency spillway (760.5 feet).

(4) The principal spillway capacity at maximum pool elevation (763.6 feet) is 60 c.f.s. Maximum pool elevation is that design value for freeboard pool level as furnished on SCS as-built plans.

(5) The emergency spillway capacity at maximum pool elevation is 1,000 c.f.s.

(6) The total spillway capacity at maximum pool elevation is 1,060 c.f.s.

c. Elevation (Feet Above M.S.L.).

(1) Top of dam - 765.0 (SCS plans) - 764.7 (survey 15 September 1978). The settled top of dam as planned by SCS is 763.6.

(2) Principal spillway crest - 758.0 (SCS plans) - 757.8 (survey 15 September 1978).

(3) Emergency spillway crest - 760.5 (SCS plans) - 760.5 (survey 15 September 1978).

(4) Streambed at center line of dam - 728±.

(5) Maximum tailwater - unknown.

d. Reservoir. Length of maximum pool - 3800 feet ±.

e. Storage (Acre-feet).

(1) Top of dam - 297±.

(2) Emergency spillway crest - 196.

(3) Principal spillway crest - 150.

f. Reservoir Surface (Acres).

(1) Top of dam - 29±.

(2) Emergency spillway crest - 20.2.

(3) Principal spillway crest - 16.5.

g. Dam.

(1) Type - Earth embankment.

(2) Length - 465 feet ±.

(3) Height - 37 feet ±.

(4) Top width - 14 feet.

(5) Side Slopes.

(a) Downstream - 2.5H on 1V.

(b) Upstream - 2.5H on 1V with 20 foot berm at principal spillway elevation.

(6) Zoning - None shown on the plans.

(7) Impervious Core - All embankment material reported to be lean clay (CL) as shown in Appendix C.

(8) Cutoff - Plans show a cutoff varying in depth from 4 to 10 feet with 12 foot bottom width and side slopes of 1H on 1V.

(9) Grout Curtain - None.

(10) Drains - None.

(11) Wave Protection - Vegetated berm.

h. Diversion and Regulation - None.

i. Spillways.

(1) Principal.

(a) Type - Standard SCS 2' x 6' x 10' R/C drop inlet and a 24-inch R/C pressure pipe.

(b) Length of weir - 12 feet (2 x 6')

(c) Crest elevation - 758.0 feet M.S.L.

(2) Emergency.

(a) Type - Standard SCS grassed earth channel.

(b) Control section - 70 foot bottom width, 3:1 side slopes, 30 feet length.

(c) Crest elevation - 760.5 feet M.S.L.

(d) Upstream channel - clear and well grassed (tall).

(e) Downstream - clear and well grassed (tall).

j. Regulating Outlets - None.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Data on the geologic investigation, hydraulic/hydrologic computations, construction plans, and the soil mechanics/soil engineering report were supplied by the Soil Conservation Service, Columbia, Missouri. This information is shown in Appendix C and Appendix D.

2.2 CONSTRUCTION

No construction data were readily available; however, it is reported that the dam was constructed with SCS engineering supervision and standard inspection and quality control procedures.

2.3 OPERATION

No information was available on the maximum loading on the dam.

All spillways are uncontrolled.

2.4 EVALUATION

a. Availability. The engineering data shown in Appendix C was readily available from the SCS, Columbia, Missouri.

b. Adequacy. The available data and reported information are considered adequate to assess the design and stability of the structure. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. The available data and analyses conform with accepted practice. Parameters for embankment strength were based upon conservative values obtained from detailed testing of similar (loess) materials used to construct similar embankments in the same watershed.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of Wellington-Napoleon Watershed Structure C-21 was made on September 15, 1978. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska making the inspection were: Rey S. Decker, Geology and Soil Mechanics; Garold Ulmer, Civil Engineer; Richard Walker and Gordon Jamison, Hydrology. Results of the inspection are summarized below. Photographs are shown in Appendix B.

b. Dam. Rough measurements of the profile along the crest of the dam and emergency spillway and cross sections of the embankment and spillway indicate that the structure was constructed according to the plans shown in Appendix C.

The dam is covered with an excellent growth of adapted grasses and legumes.

No cracks, slides or abnormal deformations were noted on the embankment or abutments.

No significant erosion was noted on the upstream face of the dam. However, several rather large rodent holes were observed on the upstream slope.

Surface materials in the dam and abutments consist of lean clays (CL).

A very wet area was noted in the west abutment/embankment groin downstream from about ℄ station 3+75. Seepage in this area was outcropping at about elevation 750 which is some 8 feet above the elevation of the principal spillway outlet conduit. Seepage was also noted in the right abutment groin at about the same elevation as on the right abutment. Seepage in both abutments seemed to be ponded in the heavy vegetative cover and appeared to be clear.

c. Project Geology. See Appendix C for geology report.

d. Appurtenant Structures.

(1) Principal Spillway. The concrete in the spillway appears to be in good condition. The lake level was 0.2 foot below the spillway crest elevation at the time of the inspection.

(2) Emergency Spillway. The emergency spillway is well vegetated with brome grass and vetch. It looked very good with no evidence of erosion in the bottom or side slopes.

Some gully headcutting was noted at the outlet end of the diversion along the west (left) side of the spillway.

d. Reservoir Area. No wave wash, excessive erosion or slides were observed along the shoreline of the reservoir.

e. Downstream Channel. The channel downstream from the emergency spillway is overgrown with trees and brush. However, spillway discharges from this dam are collected in the reservoir just downstream from this structure.

3.2 EVALUATION

None of the conditions observed indicate a need for immediate remedial action. Additional studies would be required to evaluate the affects of seepage on the stability of the structure. Erosion at the outlet of the west spillway diversion could encroach on the emergency spillway if left uncontrolled. Trees in the channel downstream from the emergency spillway should not affect the operation of the spillway. The discharges from this dam are impounded by a downstream reservoir in which high water levels will almost impinge upon the downstream toe of this structure.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The pool level is controlled by rainfall, runoff, evaporation and capacity of the uncontrolled spillways.

4.2 MAINTENANCE OF DAM

The dam is reasonably well maintained. Action should be taken to correct the minor deficiencies noted in Sections 3 and 7.2.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities at this dam.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

The inspection team is not aware of any existing warning system for this dam.

4.5 EVALUATION

The dam and appurtenances appear to be well maintained with the exception of some laxity in controlling erosion near the outlet of the emergency spillway.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. Detailed plans for the structure were furnished by the SCS. Pertinent hydraulic and hydrologic data which were taken from as-built plans furnished by the SCS are tabulated in Sections 1, 1.3 and in Appendix D as hydrologic computations. The supporting computations are attached.

b. Experience Data. The drainage area, reservoir water surface areas, and elevation-storage data were taken from the SCS as-built plans. The hydraulic computations for the spillway discharge ratings were based on data taken from the as-built plans. The hydraulic computations for the dam overtopping rating were based on data collected during the field inspection in order to reflect settled conditions.

c. Visual Observations.

(1) Principal and emergency spillways are in good condition.

(2) The emergency spillway does not appear to have ever been used.

(3) The emergency spillway and exit channel are in the left hillside at the end of the dam. Spillway use should not endanger the integrity of the dam.

d. Overtopping Potential. The spillways are too small to pass 50% of the probable maximum flood without overtopping. The spillways will pass 40% of the PMF without overtopping. The 100-year (1 percent) peak outflow discharge is approximately 37% of spillway capacity. The results of the routing through the reservoir are tabulated in regards to the following conditions.

Frequency	Peak Inflow Discharge c.f.s.	Peak Outflow Discharge c.f.s.	Maximum Pool Elevation	Freeboard Top of Dam Min. Elev. 763.4	Time Dam Overtopping Hrs.
100-Year	690	360	762.0	+1.4	-
1/2 PMF	1630	1290	764.0	-0.6	1.0
PMF	3310	3200	765.3	-1.9	3.8
0.40 PMF	1290	970	763.4	0	-

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, the PMF is the test for the adequacy of the dam and its spillways.

The St. Louis District, Corps of Engineers, in a letter dated 11 August, 1978 has estimated the damage zone as extending one mile downstream from the dam. Within the damage zone are four to five houses, one railroad crossing and one State Highway crossing.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Minor maintenance features that could affect the long time safety of the dam are discussed in Section 3.2. Additional studies are required to evaluate the affects of seepage in the downstream abutment groins upon structural stability of the dam.

Hydraulic/Hydrologic analyses presented in Section 5 indicate that the dam will be overtopped by the probable maximum flood. Under those conditions, water would flow over the top of the dam to a depth of 1.9 feet ± for about 3.8 hours.

b. Design and Construction Data. The engineering data, analyses, and plans supplied by the SCS conform with accepted practice and are considered adequate to assess the structural stability of the dam.

There is no reason to question the adequacy of construction supervision and quality control.

c. Operating Records. There are no appurtenant structures that require operational functions.

d. Post Construction Changes. The inspection party is not aware of any post construction changes.

e. Seismic Stability. This dam is located in the Zone 1 seismic probability classification area. An earthquake of this magnitude is not expected to cause structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. The probable maximum flood (PMF) will overtop the dam, however, the spillways are adequate to pass the flood resulting from 40% of the PMF without overtopping. Seepage observed at the downstream toe could affect the long-time stability of the structure. Rodent holes on the upstream slope could lead to potential of failure if left uncontrolled.

b. Adequacy of Information. The information presented in this report is considered adequate to assess the safety of the structure. Seepage analysis were not found, which is a deficiency that should be corrected in the future.

c. Urgency. There does not appear to be an immediate urgency to accomplish the remedial measures discussed in Paragraph 7.2.

d. Necessity for Phase II. Phase II investigations are not considered necessary for this dam.

e. Seismic Stability. An earthquake of the magnitude to be expected in this area should not be hazardous to this structure.

7.2 REMEDIAL MEASURES

a. Alternatives.

(1) The size of the present emergency spillway should be enlarged or a supplemental spillway constructed on the right abutment to pass the probable maximum flood without overtopping the dam.

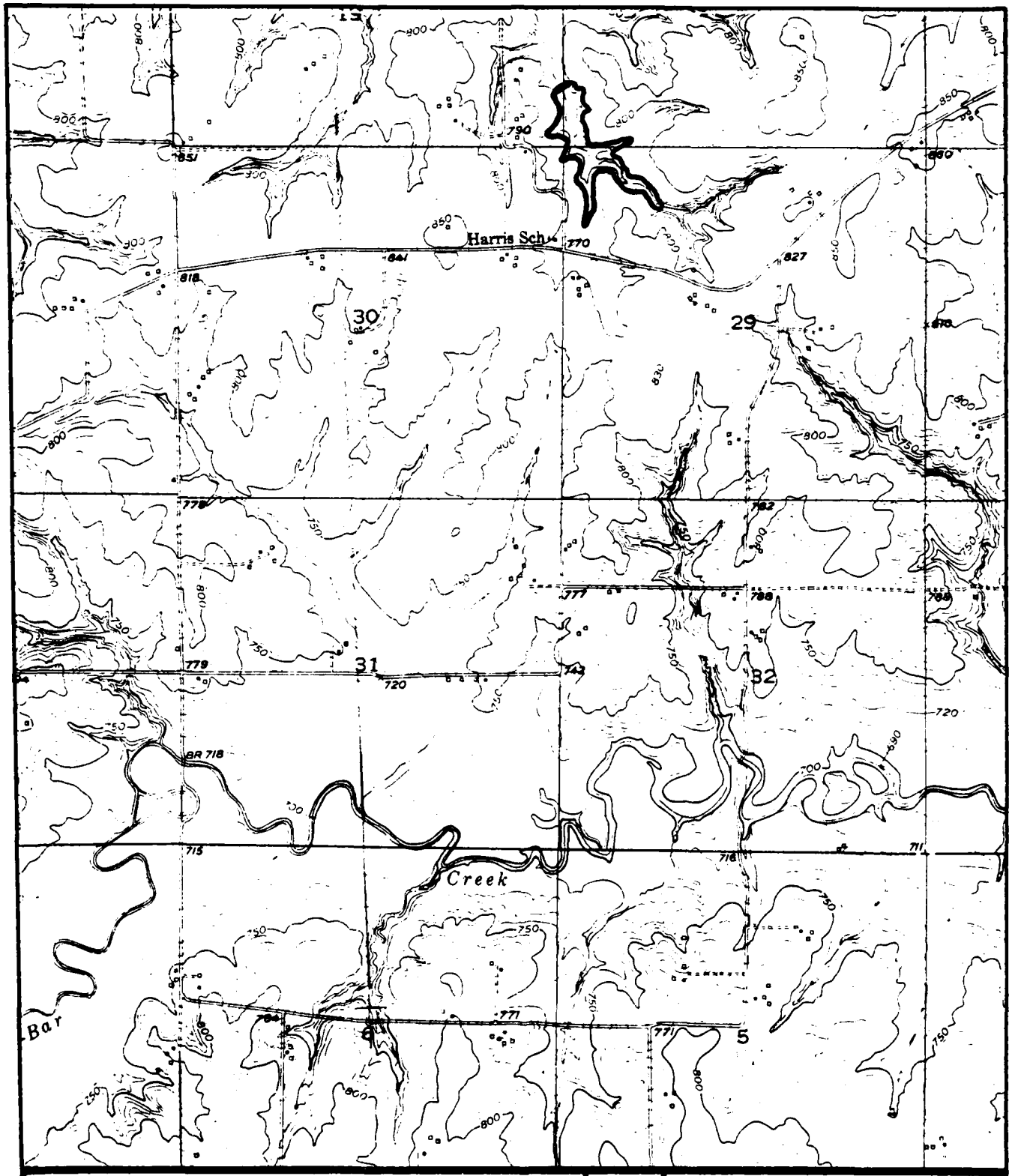
(2) Additional analyses should be made to assess the affects of seepage on the stability of the structure.

(3) The owner should engage the services of an engineer experienced in the design of dams to design an adequate spillway system and to evaluate the affects of seepage on the structural stability of the dam.

b. O & M Maintenance and Procedures.

(1) A program of regular inspection and maintenance should be initiated. The program should include measures to repair and control rodent holes and to control future tree growth (none observed at this time) on the embankment and to evaluate the progress and possible future affects of gully erosion near the outlet of the present emergency spillway. The grass on the embankment should be routinely mowed to enable early detection of rodent holes.

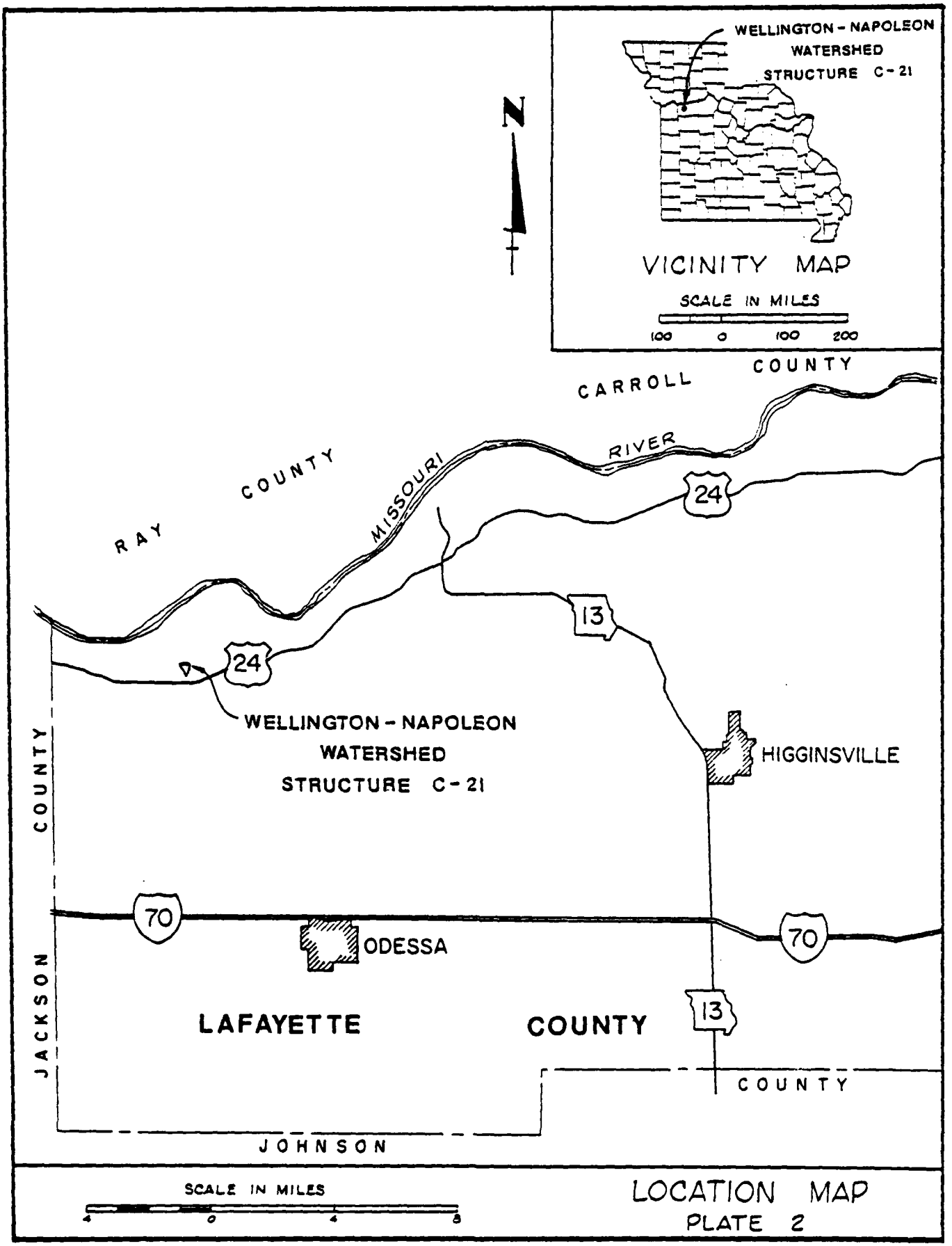
APPENDIX A
MAPS



WELLINGTON - NAPOLEON
WATERSHED
STRUCTURE C-21

VICINITY TOPOGRAPHY

PLATE 1


WELLINGTON - NAPOLEON
WATERSHED
STRUCTURE C-21
N
VICINITY MAP
SCALE IN MILES
100 0 100 200
CARROLL COUNTY
RAY COUNTY
MISSOURI RIVER
24
13
WELLINGTON - NAPOLEON
WATERSHED
STRUCTURE C-21
HIGGINSVILLE
70
ODESSA
JACKSON COUNTY
LAFAYETTE COUNTY
COUNTY
JOHNSON
SCALE IN MILES
4 0 4 8
LOCATION MAP
PLATE 2

APPENDIX B
PHOTOGRAPHS

PHOTO NO. 2
LOOKING DOWNSTREAM
IN EMERGENCY SPILLWAY

PHOTO NO. 3
LOOKING UPSTREAM IN
EMERGENCY SPILLWAY

PHOTO NO. 4
DAM AND LAKE TAKEN
FROM LEFT SIDE

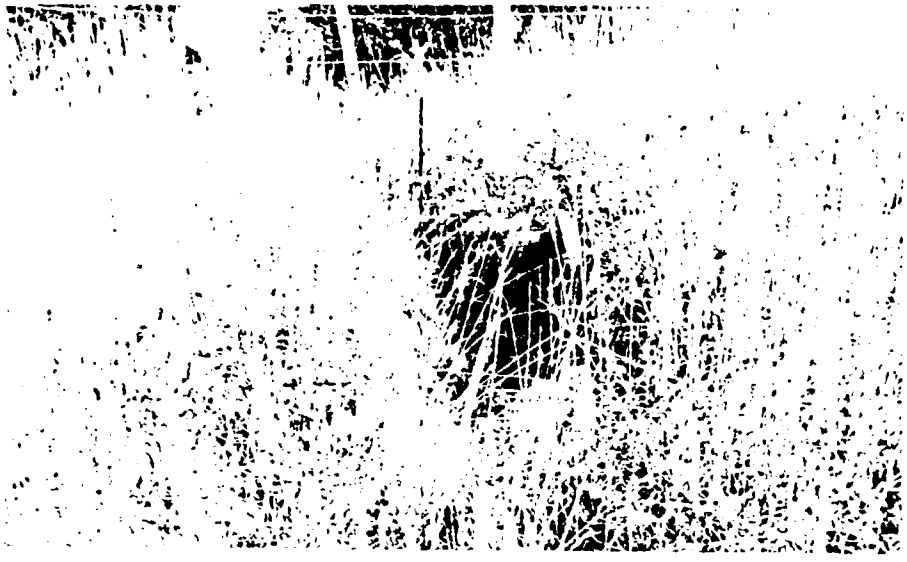


PHOTO NO. 5
GULLY EROSION
IN LEFT SIDE
EMERGENCY SPILLWAY

PHOTO NO. 6
UPSTREAM SLOPE
FROM APPROXIMATE
CENTER LINE

PHOTO NO. 7
DOWNSTREAM SLOPE
FROM APPROXIMATE
CENTER LINE

PHOTO NO. 8
CREST OF DAM
TAKEN FROM
RIGHT ABUTMENT

PHOTO NO. 9
RODENT HOLE
IN UPSTREAM SLOPE.
APPROX. STATION 3+00

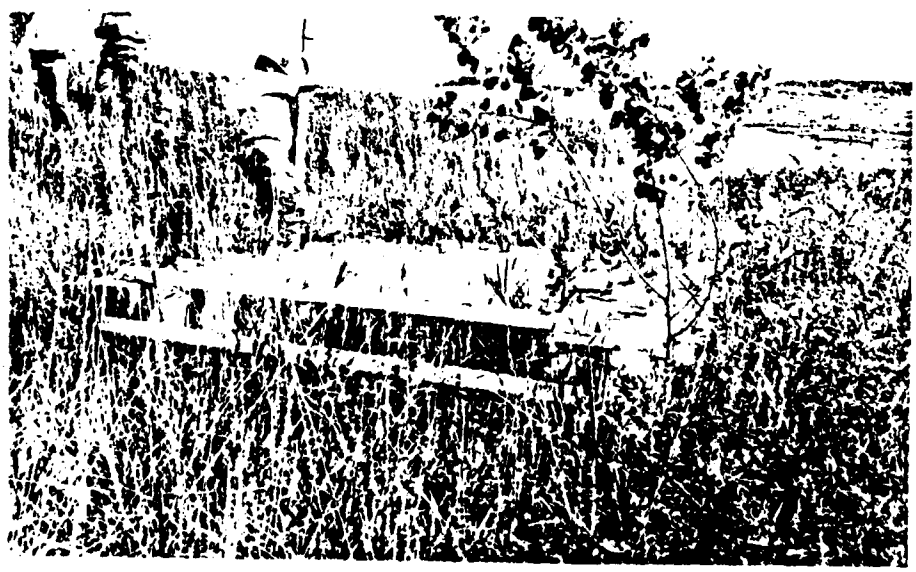


PHOTO NO. 10
PRINCIPAL SPILLWAY
RISER

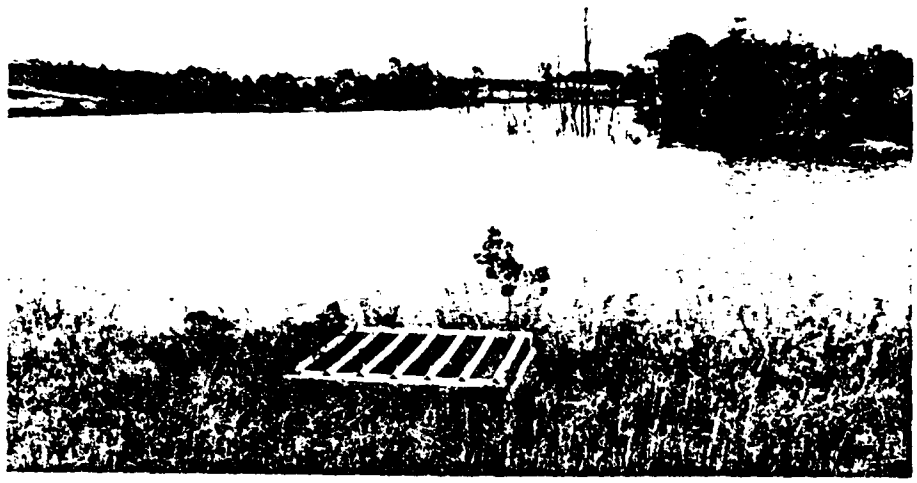


PHOTO NO. 11
LOOKING UPSTREAM
FROM CREST

PHOTO NO. 12
LOOKING DOWNSTREAM
FROM CREST

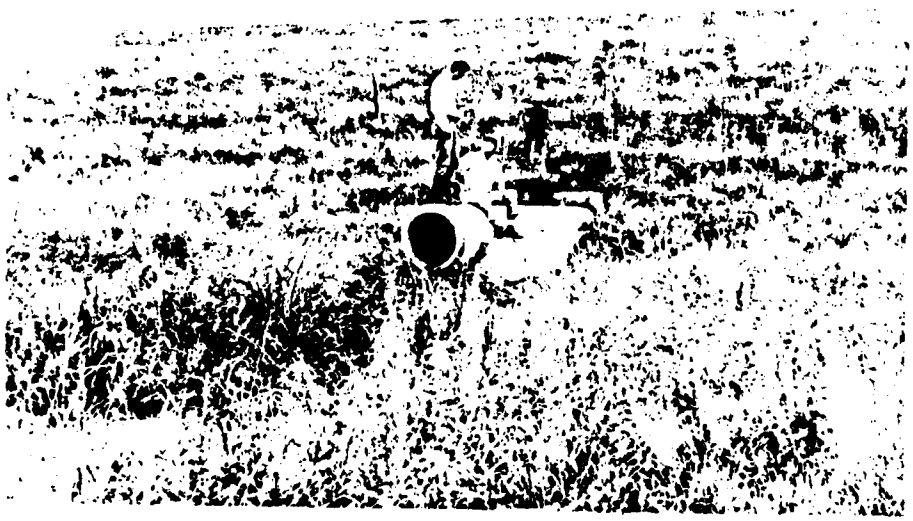
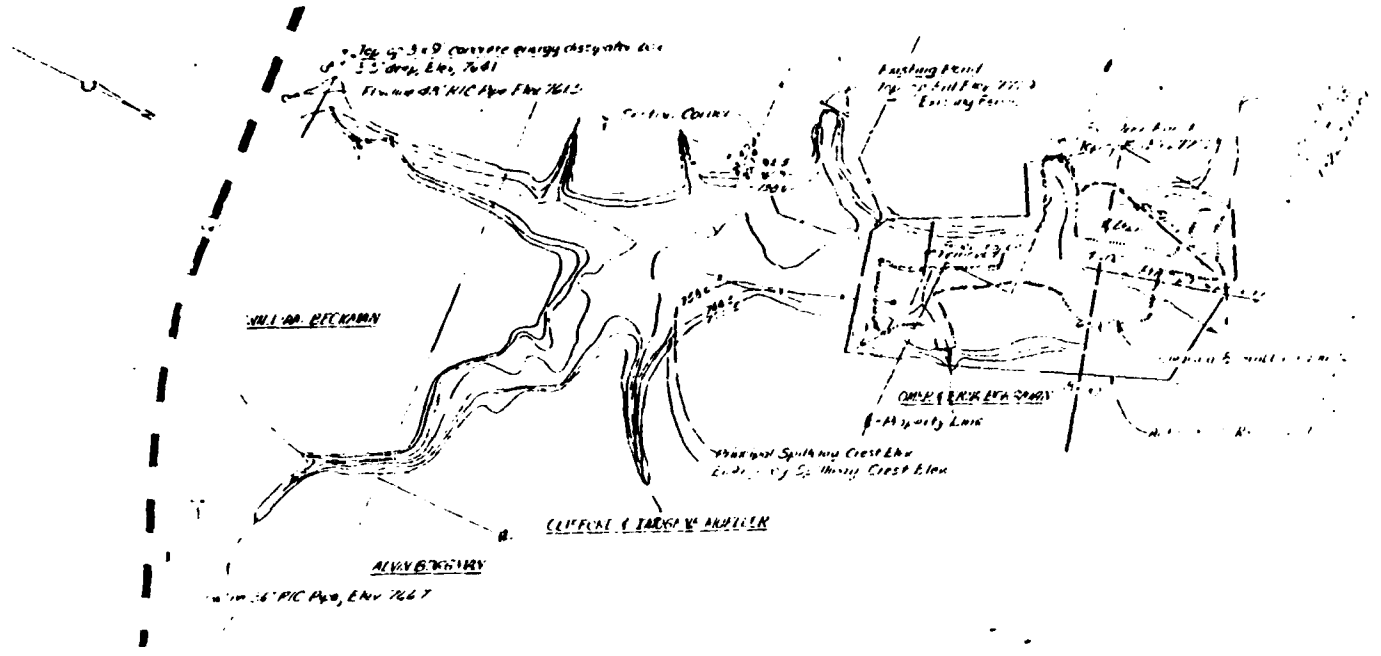


PHOTO NO. 13
OUTLET END OF
PRINCIPAL SPILLWAY

PHOTO NO. 14
UPPER END OF SEEPAGE
SPOT AT STATION 0+50±

APPENDIX C
PLANS AND REPORTS

Note: Reproductions of plans and reports included in Appendix C are the best possible from copy furnished by Soil Conservation Service. Unreadable portions on the reproduced sheets are also unreadable on sheets from which the copies were made.



AS BUILT 11-25-69

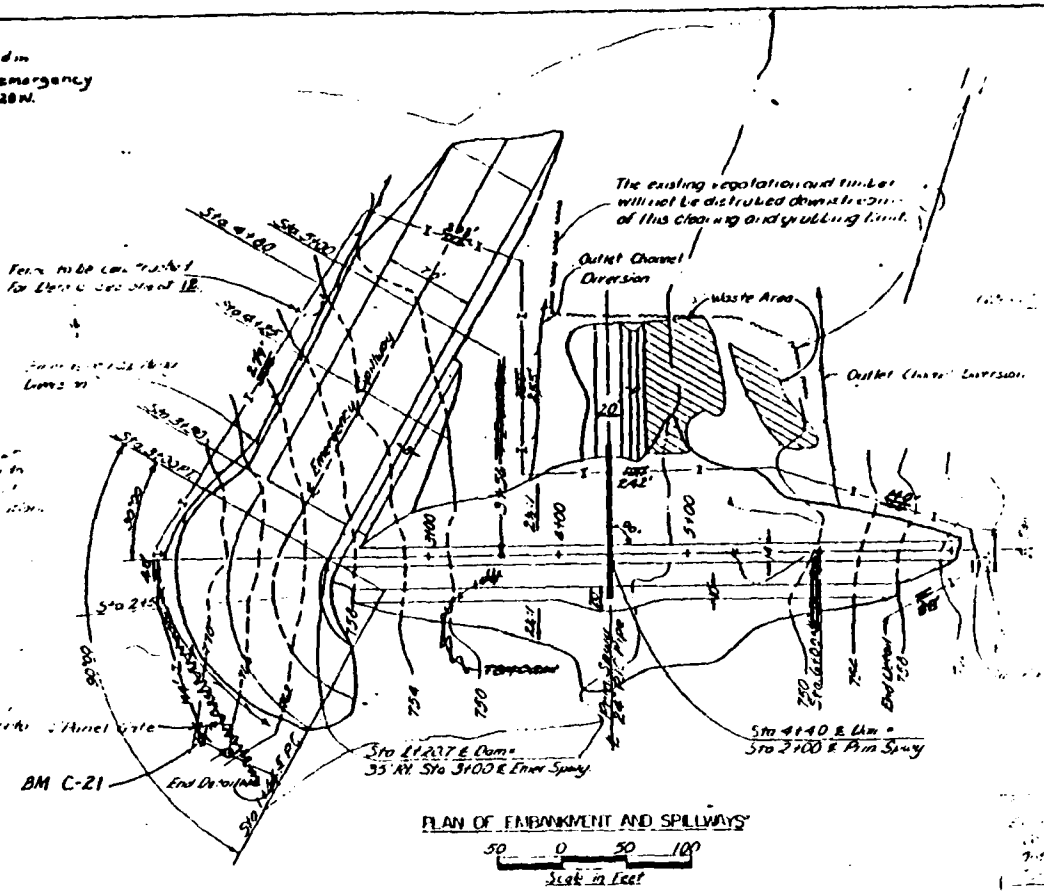
WELL-NAP

LAFAYETTE COUNTY, MISSISSIPPI

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

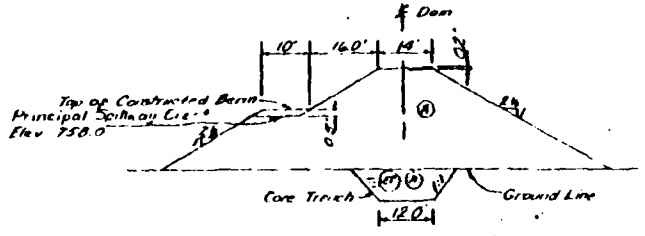
SE-25 MS

BM C-21 Elev. 760.80
Top of brass cap in concrete monument located in fence corner approx. 18' south of westgate on emergency spillway end of dam. SE¼ Sec. M, T. 50N, R. 28W.



PLAN OF EMBANKMENT AND SPILLWAYS

50 0 50 100
Scale in Feet

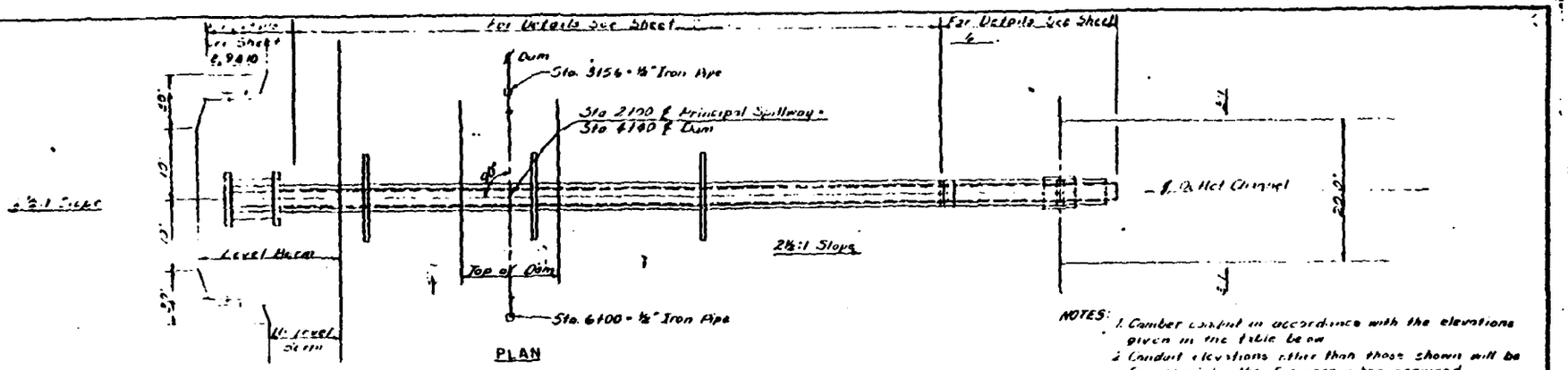


TYPICAL SECTION OF EMBANKMENT

AS BUILT 11-25-69

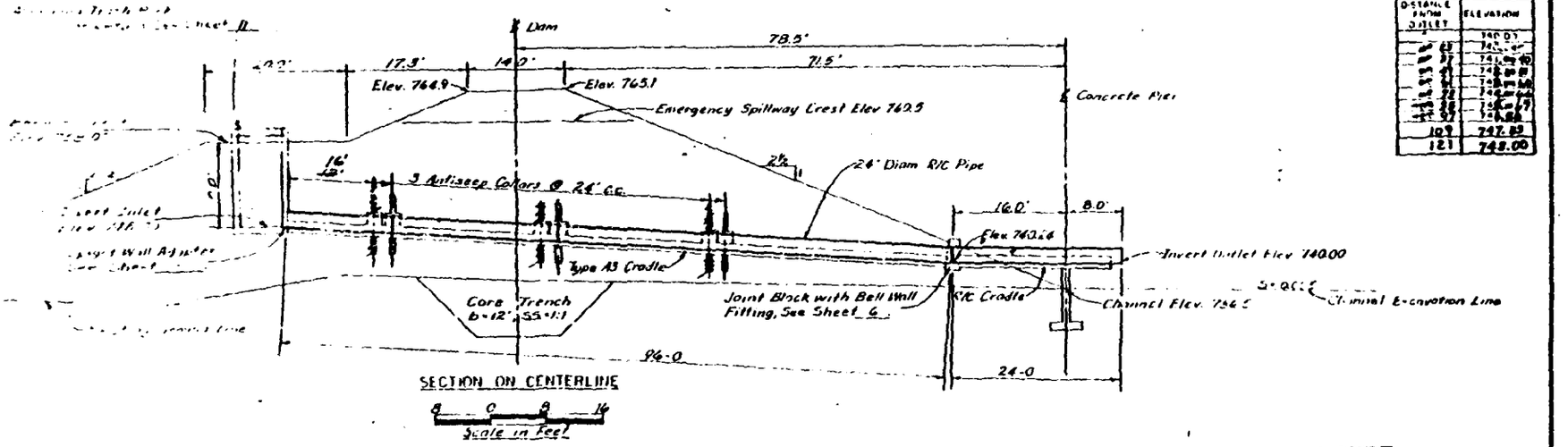
STRUCTURE C-21
[illegible] WATERSHED PL 566
LAFAYETTE COUNTY, MISSOURI

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



NOTES:
1. Camber conduit in accordance with the elevations given in the table below
2. Conduit elevations other than those shown will be furnished by the Engineer, when required
3. Antiseep collars shall not be placed closer than two (2) feet to a pipe joint

PIPE CAMBER	
DISTANCE FROM OUTLET	ELEVATION
0	740.00
13	740.00
25	740.00
37	740.00
49	740.00
61	740.00
73	740.00
85	740.00
97	740.00
109	740.00
121	740.00



QUANTITIES

Concrete - Class 3500, Plain	11.6 Cu Yds
Concrete - Class 4000, Reinforced	21.2 Cu Yds
Steel Bar Reinforcement	2275 Pounds
Pipe Conduit - Reinforced Concrete (Pressure) 24" Diam, Steel Ring Type Joint and Rubber Gasket	120 Lin Ft
Aluminum Trash Rack	Lump Sum

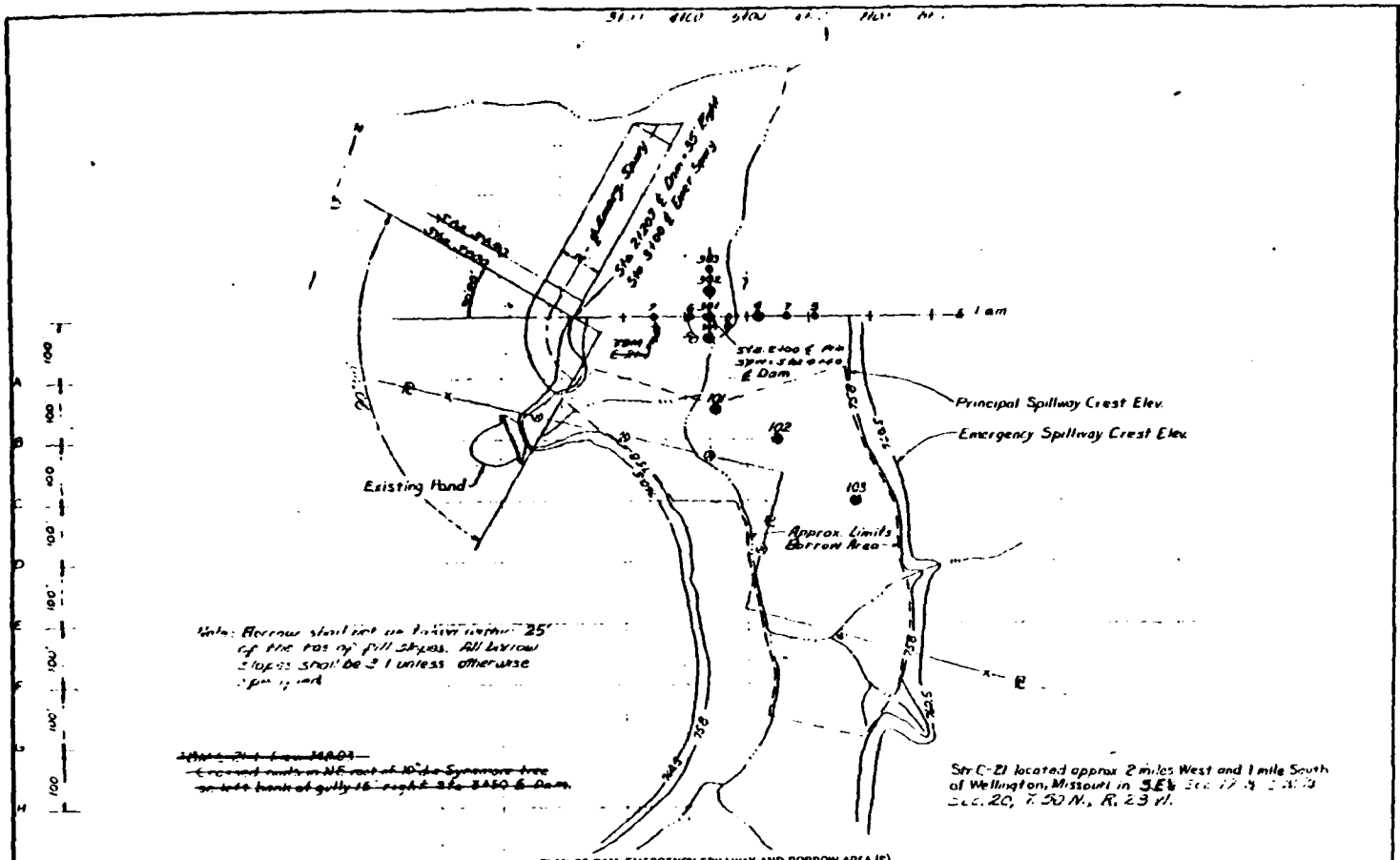
AS BUILT 11-25-69

STRUCTURE C-21

R/C DROP INLET FOR 24" DIAM. PIPE
GENERAL LAYOUT
WELLING-KINLOCH WATERSHED P.L.566
LAFAYETTE COUNTY, MISSOURI

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed		Drawn	
Traced		Checked	
Approved		Date	
Sheet No.	5 of 16	SC-25 160	



LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

CONSOLIDATED MATERIAL

ABBREVIATIONS

TEST HOLE NUMBERING SYSTEM

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

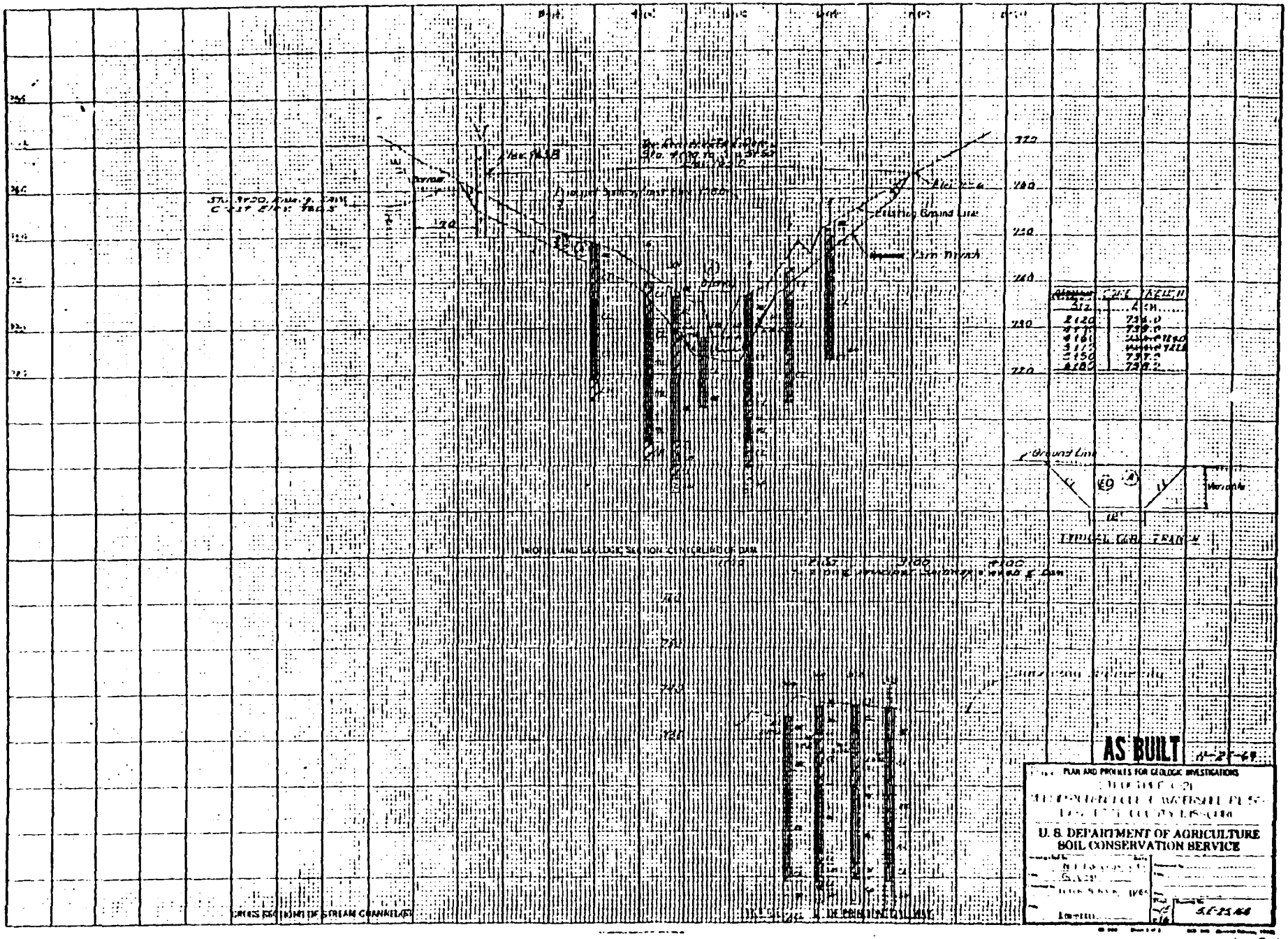
GW Well graded gravels, gravel sand mixtures
GP Poorly graded gravels
GM Silty gravels, gravel sand silt mixtures
GC Clayey gravels, gravel sand clay mixtures
SW Well graded sands, sand gravel mixtures
SP Poorly graded sands
SM Silty sand
SC Clayey sands, sand clay mixtures
ML Silts with liquid limit of 50 or less
MH Silts with liquid limit above 50
CL Clays with liquid limit of 50 or less
CH Clays with liquid limit above 50
OL Organic silts and clays with liquid limit of 50 or less
OH Organic silts and clays with liquid limit above 50

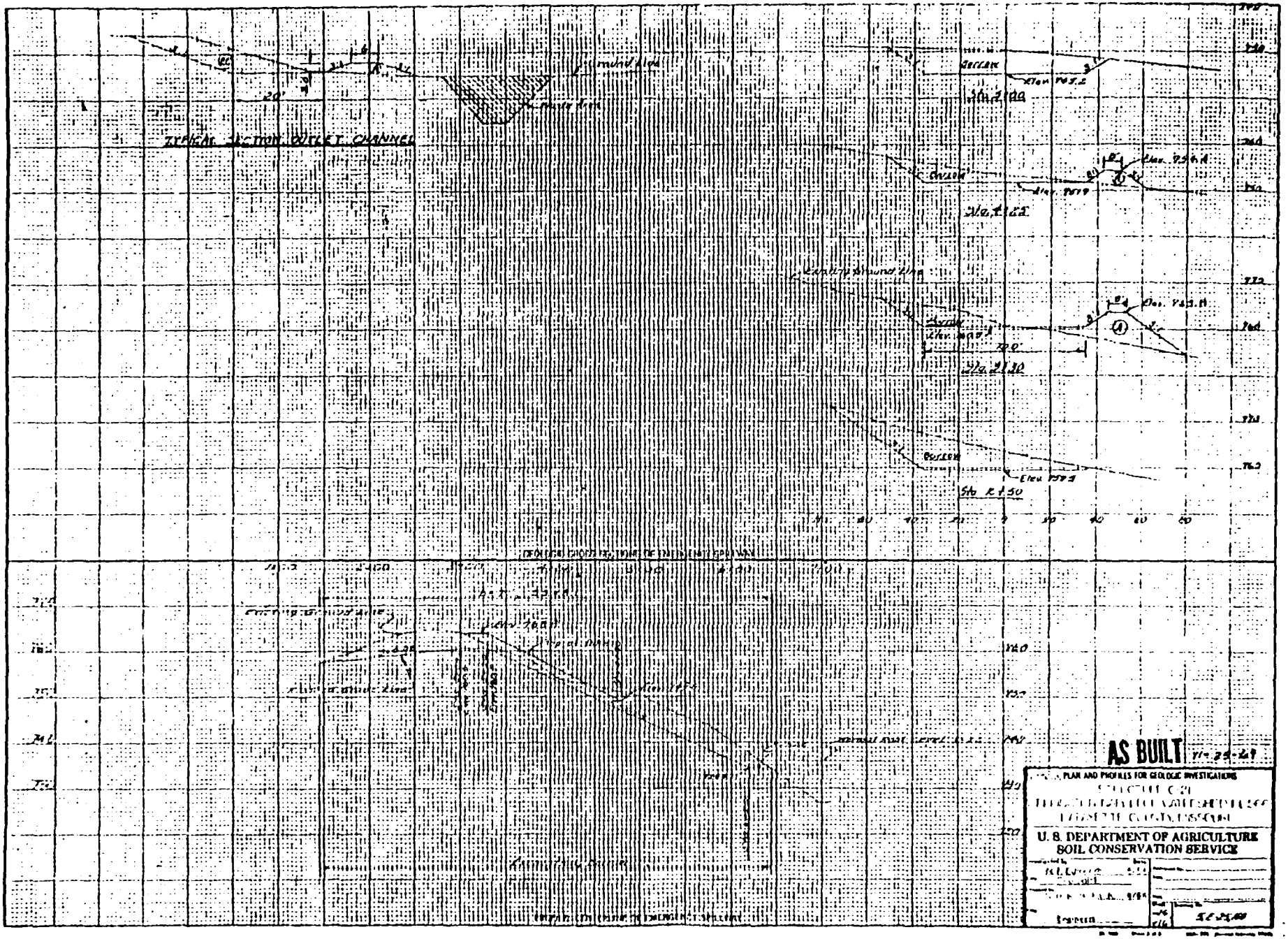
AS BUILT 11-26-69

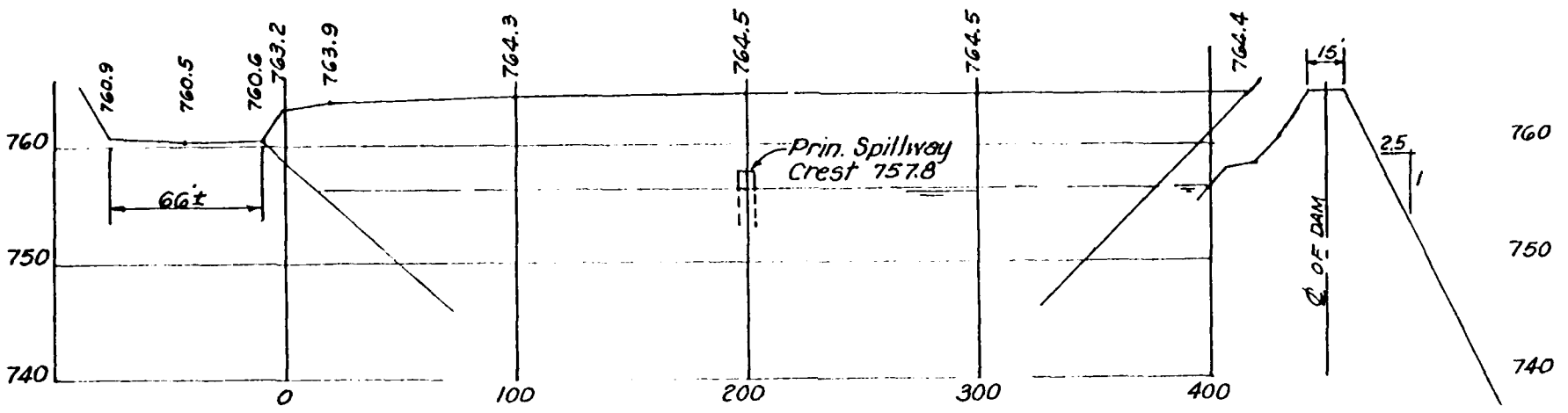
PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SE-25,160


Existing Ground Line
Dam Breach
Ground Line
TYPICAL CUT TRENCH
AS BUILT
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

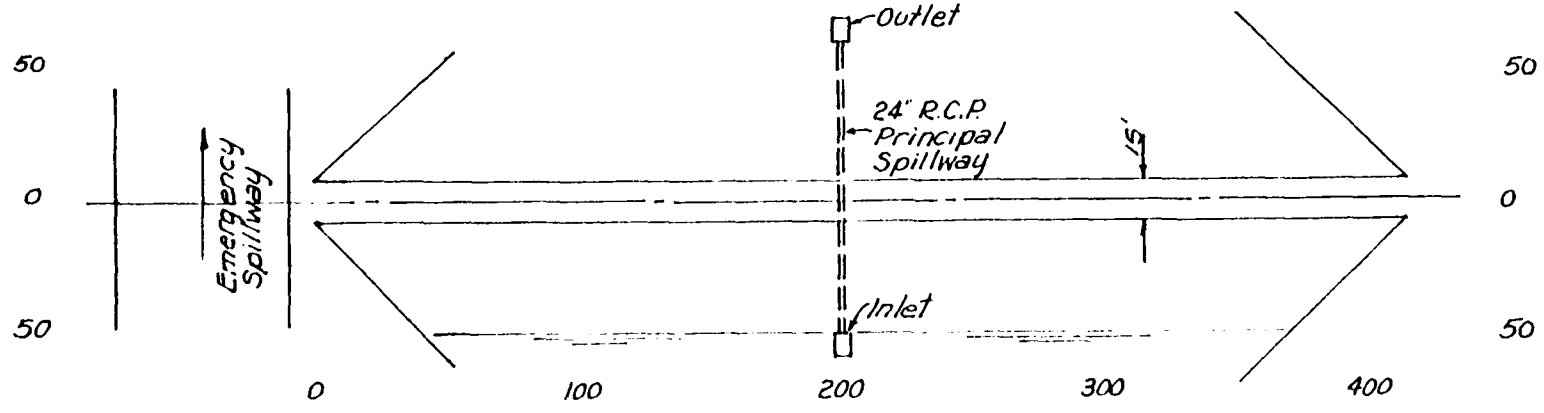

TYPICAL SECTION OUTLET CHANNEL
AS BUILT
PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



PROFILE OF DAM

CROSS SECTION
STA. 2+00

WELLINGTON - NAPOLEON
WATERSHED STRUCTURE C-21
NATIONAL DAM SAFETY PROGRAM
PHASE I



PLAN OF DAM

OPTIONAL FORM NO. 10 5010-106
MAY 1962 EDITION
GSA GEN. REG. NO. 27

UNITED STATES GOVERNMENT

Memorandum

TO : James M. Dale, State Conservation Engineer, SCS, Columbia, Missouri 65201

DATE: October 28, 1966

FROM : Roland B. Phillips, Acting Head, Soil Mechanics Laboratory, SCS, Lincoln, Nebraska 68508

SUBJECT: ENG 22-5, Missouri WP-08, Wellington-Napoleon, Site No. C-21 (Lafayette Co.)

ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 4 sheets.
2. Form SCS-127, Soil Permeability, 2 sheet.
   Form SCS-128, Consolidation Test, 5 sheets.
   Form SCS-128A, Log Time Consolidation, 3 sheets.
3. Form SCS-355A, Triaxial Shear Test, 1 sheet.
4. Form SCS-352, Compaction and Penetration Resistance, 4 sheets.
5. Form SCS-357, Summary - Slope Stability Analysis, 2 sheets.
6. Investigational Plans and Profiles.

REVIEW AND INTERPRETATION OF DATA

FOUNDATION MATERIALS

A. Classification: The site consists of Loess in the abutments that classes as CL and alluvium in the valley bottom that classes as CL and ML with some deep sands. There is a CH at about a 30 ft depth.

An area of organic silt as thick as 20 ft is noted from the channel toward the left abutment.

B. Dry Unit Weight (Blow Count): Four undisturbed core samples were submitted. Three were from the surface ML and CL alluvium and ranged in dry unit weight from 1.37 g/cc to 1.56 g/cc with blow count from 2 to 5 blows per foot. One was from the deeper organic silts and ranged from 1.07 g/cc to 1.08 g/cc but at 14 blows per foot.

All the blow counts ranged from 2 to 11 blows per foot in the alluvium, from 9 to 20 blows per foot in the organic silt and from 18 to 20 blows below those silts.

C. Consolidation: Consolidation tests were made on the CL sample 67W326 from a 10 ft to 11 ft depth and on the ML (organic silt) sample 67W328 from a 22 ft to 23 ft depth.

The CL was at an initial density of 1.47 g/cc and a consolidation potential of about .025 ft/ft is indicated under the fill at floodplain level.

The ML was at a density of 1.18 g/cc and a consolidation potential of about .020 ft/ft is indicated. The potential would be very high under a high fill. The sample may have been slightly disturbed in sampling so its potential is actually assumed as .015 ft/ft. This indicates a total foundation consolidation of 0.65 ft at ℄ Station 4+50. A maximum horizontal strain of .007 ft/ft is computed with b = 200 ft, h = 36 ft, and d = 32 ft for the 2 1/2:1 slopes and 10 ft berm as proposed.

D. Permeability: Rates were determined for the CL and the organic ML during consolidation. They are K = .024 ft/day for CL and K = .0035 ft/day for the ML. These rates were obtained by extrapolating values found after consolidation to the in-place density of the sampled materials.

Rates for the sands will be higher. The SP may correlate to the SP-SM from sites No. B-21 and C-22 for which rates of K = 10.0 ft/day were estimated.

E. Shear Strength: A consolidated, undrained triaxial shear test on the CL sample, 67W326 (301-9), yielded shear parameters of $\phi = 18°$, c = 750 psf at a test density of 1.49 g/cc. This is considered to be a limiting foundation strength.

EMBANKMENT MATERIALS

A. Classification: Borrow samples submitted all class as CL though surface materials are more silty.

B. Compacted Dry Densities: Standard Proctor compaction tests, (ASTM D-698-A) yielded maximum dry densities from 103.0 pcf to 105.0 pcf.

C. Permeability: No tests were made. Based on classification, compacted materials will have low permeability rates.

D. Shear Strength: Shear strength for the embankment CL materials is correlated to like materials from sites B-21 and C-23 with $\phi = 10°$, c = 1150 psf for the most plastic and $\phi = 17°$, c = 925 psf for the less plastic material.

E. Consolidation: No tests were made. Based on the classification of materials residual settlement within the fill should not exceed 2 1/2% of the fill height.

3 -- James M. Dale -- 10/28/66
Roland B. Phillips
Subj: ENG 22-5, Missouri WP-08, Wellington-Napoleon, Site No. C-21

SLOPE STABILITY ANALYSIS

Slopes stability was checked by a circular failure method both for a 35.3 ft embankment only and for 23 ft of foundation. The most critical case was found for failure through the foundation but a minimum upstream safety factor of 1.67 was computed for the 2 1/2:1 slope under full drawdown effects. This is a very rigorous analysis and the results indicate the 2 1/2:1 slopes are satisfactory.

SETTLEMENT STRAINS

Settlement strains should not cause high differentials if steep banks are sloped to 3:1 or flatter and no soft material is left under the fill.

CONCLUSIONS AND RECOMMENDATIONS

A. Cutoff: A shallow cutoff trench (3 ft - 6 ft) is recommended to intercept the surface ML and any surface disturbances such as root holes and animal burrows.

Backfill with CL placed at 95% of standard.

B. Principal Spillway: The pipe cradle can be set on relatively firm silty CL without over excavation. The trench should have a wide bottom and 3:1 side slopes or flatter.

Backfill at high density near the pipe but feather out away from it to fit the 95% of standard used in the fill.

Base pipe joints on a maximum horizontal strain of .007 ft/ft.

Use $\phi = 25°$ for conduit loading computations.

C. Drainage: Drainage is not needed for slope stability. It is not recommended.

D. Embankment Design: Provide a homogeneous fill of the available CL borrow placed at 95% of standard density. Control moisture at two percentage points below optimum to three above.

Use 2 1/2:1 slopes with the proposed 10 ft upstream berm at about elevation 7580.

Provide overfill of 1.4 ft from ℄ Station 4+00 to 5+50 to compensate for residual settlement of 0.65 ft in the foundation and 0.75 ft within the fill.

cc:
James M. Dale (2)
Gerald McElhiney
E. S. Alling
D. S. McVicker

Form SCS-356
3-58
7-19-66

FT 35.3'
CLASS "B" STABILIZATION, SEDIMENT DETENTION, EWR

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

LABORATORY SAMPLE NUMBER	FIELD NUMBER	LOCATION AND DESCRIPTION	DEPTH	FIELD CLASSIFICATION	MECHANICAL ANALYSES — GRAIN SIZE DISTRIBUTION EXPRESSED AS PERCENT FINER BY DRY WEIGHT: FINES 0.002 mm	0.005	0.02	0.05	#200 0.074	SANDS #140 0.105	#60 0.250	#40 0.42	#20 0.84	#10 2.0	#4 4.76	GRAVEL 3/8" 9.53	1/2" 12.7	3/4" 19.05	1" 25.4	1 1/2" 38.1	3" 76.2 mm	ATTERBERG LIMITS LL	PI	UNIFIED CLASSIFICATION	SOLUBLE SALTS %	DISPERSION %	MOISTURE-DENSITY RELATIONSHIPS: STANDARD / MODIFIED — CURVE NO	DRY DENSITY lb/cu ft	OPTIMUM MOISTURE %	UNDISTURBED SAMPLE DATA: UNIT WEIGHT	MOISTURE %	Gs	
67W		Wellington-Napoleon Site No. C-21																													
321	301-4	℄ Fill 4+40 Jar	25-26'	M	12	19	43	84	91					100								3'	E	ML	14					121	44.3		
322	301-5	℄ Fill 4+40 Jar	30-31'	M	12	21	47	92	98					100								33	3	ML	12					0.98	65!		
323	301-6	℄ Fill 4+40 Jar	35 - 35.5'	CL	13	16	30	62	77					100										(ML)	20					(1.68)	21.9		
324	301-7	℄ Fill 4+40 Jar	35.5-36'	CL	6	9	14	20	27	33	76	99	100											(SM)	20					(1.76)	17.1		
325	301-8	℄ Fill 4+40 Core	3.5 - 5'	ML	17	27	43	86	93					100								32	9	CL	-	41	size Core 3 vs 4	3 1/2" x 2"	1/4"	1.56	23.2		
																												C	1.47		
326	301-9	℄ Fill 4+40 Core	10 - 11.5'	CL	3	3	7	37	93					99								37	13	CL	5	43	3	1/8" x	12 1/4"	1.44 1.45	20.3 21.4	2.45	3.5
																												3 2	1.47 1.50		

7-19-66

MISSOURI — Wellington-Napoleon — Site No. C-21

Laboratory Sample Number 67W	Field Number	Location and Description	Depth	Field Classification	Mechanical Analysis: Grain Size Distribution Expressed as Percent Finer by Dry Weight — Fines: 0.002 mm	0.005	0.02	0.05	#200 0.074	Sands: #40 0.105	#60 0.250	#80 0.42	#20 0.84	#10 2.0	#4 4.76	Gravel: 3/8" 9.63	1/2" 12.7	3/4" 19.05	1" 25.4	1 1/2" 38	3" 76.2 mm	Atterberg Limits: LL	PI	Unified Classification	Soluble Salts %	Dispersion %	Moisture Density Relationships: Curve No.	Dry Density / lb/cu.ft.	Optimum H2O %	Undisturbed Sample Data: Dry Unit Weight	H2O %	Gs	
327	301-10	℄ Fill 4+40 Core	15 - 16.5'	CL	15	21	38	83	92					100								35	9	ML	2	48	2 7/8" x 11"			1.37 / 1.96	80.4 / 30.5		
328	301-11	℄ Fill 4+40 Core (Organic Silt)	22 - 23.5'	ML	12	20	43	82	88					100								47	8	ML	14	45	2 3/4" x 12"			1.08 / 1.07	53.3 / 51.8	2.55	Gs=2.61
329	302-3	℄ Prin. Spwy. 2+40 Jar	20-21'	ML	16	22	37	86	92					100								33	7	ML	6					(1.47)	32.2		
330	304-1	℄ Prin. Spwy. 1+65 Jar	10-11'	ML	17	23	40	81	91					100								36	12	CL	3					(1.37)	34.2		
331	304-2	℄ Prin. Spwy. 1+65 Jar (Organic on cross section)	20-21'	ML	11	19	48	86	93					100										(ML)	10					(1.02)	50.4	?	
332	4-2	℄ Fill 5+20 Jar	15-16'	CL	17	25	48	87	91					100								34	13	ML	6					1.47	30.0		

Form SCS- 350
8-58

7-19-66

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MISSOURI — LOCATION AND DESCRIPTION

LABORATORY SAMPLE NUMBER	FIELD NUMBER	LOCATION AND DESCRIPTION	DEPTH	FIELD CLASSIFICATION	MECHANICAL ANALYSIS — GRAIN SIZE DISTRIBUTION EXPRESSED AS PERCENT FINER BY DRY WEIGHT: FINES 0.002 mm	0.005	0.02	0.05	#200 0.074	SANDS #140 0.105	#60 0.250	#40 0.42	#20 0.84	#10 2.0	#4 4.76	GRAVEL 3/8" 9.51	1/2" 12.7	3/4" 19.1	1" 25.4	1 1/2" 38.1	3" 76.2 mm	ATTERBERG LIMITS LL	PI	UNIFIED CLASSIFICATION	SOLUBLE SALTS % Electrical Conductivity 1:5 Ext.	DISPERSION %	MOISTURE DENSITY RELATIONSHIPS 66 STANDARD 67 MODIFIED CURVE NO.	DRY DENSITY # PER CU FT LBS/CU FT	OPTIMUM H2O %	UNDISTURBED SAMPLE DATA DRY UNIT WEIGHT # CU FT	H2O %	Gs
67W		Wellington-Napoleon Site No. C-21																												
333	4-3	€ Fill 5+20 Jar	20-21'	CL	16	22	27	87	91					100										(ML	6					(147)	30.1	
334	4-4	€ Fill 5+20 Jar	25-26'	CL	22	26	45	83	89					100										(CL	11					(156)	26.3	
335	4-5	€ Fill 5+20 Jar	30-31'	ML	12	16	27	66	74					100								26	4	ML	20					(167)	22.8	
336	4-6	€ Fill 5+20 Jar	35-36'	CL	15	18	36	69	74					100										(ML	18					(168)	21.8	
337	101-1	Borrow A+50 4+50 L. Bag	0-5'	ML	13	18	34	83	92					100								31	10	CL			D	103.5	18.0			2.63
		Used as subgrade soil																														

Form SCS-356
3-58

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

7-19-66

LABORATORY SAMPLE NUMBER	FIELD NUMBER	LOCATION AND DESCRIPTION	DEPTH	FIELD CLASSIFICATION	MECHANICAL ANALYSES — GRAIN SIZE DISTRIBUTION EXPRESSED AS PERCENT FINER BY DRY WEIGHT: FINES 0.002 mm	0.005	0.02	#35 0.05	#200 0.074	SANDS #140 0.105	#60 0.250	#40 0.42	#20 0.84	#10 2.0	#4 4.76	GRAVEL 3/8" 9.65	1/2" 12.7	3/4" 19.05	1" 25.4	1 1/2" 38.1	3" 76.2 mm	ATTERBERG LIMITS LL	PI	UNIFIED CLASSIFICATION	SOLUBLE SALTS %	DISPERSION %	MOISTURE-DENSITY RELATIONSHIPS 60 STANDARD 61 MODIFIED CURVE NO.	DRY DENSITY # PER CU FT LBS/CU FT	OPTIMUM MOISTURE % OF DRY WEIGHT	UNDISTURBED SAMPLE DATA ✓ DRY UNIT WEIGHT # PER CU FT	MOISTURE % OF DRY WEIGHT	G_s
6TW		Wellington-Napoleon Site No. C-21																													
338	102-1	Borrow B+00 5+00 L. Bag	1-7'	CL	22	28	51	87	95					100								36	16	CL			(2)	105.0	16.5			2.63
		1250 cu. yds ex. soil 7500 " " compacted fill																													
339	103-1	Borrow C+00 6+75 L. Bag	0-4'	CL	22	28	47	86	91					100								37	18	CL			(3)	104.0	18.5			2.66
		1125 cu. yds. Compacted fill																													
340	103-2	Borrow C+00 6+75 L. Bag	4-9'	CL	22	28	51	88	94					100								40	17	CL			(4)	103.0	18.5			2.67
		1250 cu. yds. compacted fill																													
		Borrow available in area (Stockpiles) 1875 cu. yds. ex. soil 1650 cu. yds. compacted fill																													

Form SCS-128
9-64

LABORATORY NO [illegible]

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	CONSOLIDATION TEST

PROJECT and STATE			SAMPLE LOCATION
HELENA TOWNSITE #C-21 MISSOURI			FILL 4+20
FIELD SAMPLE NO. 201-3	DEPTH, 10-11.5'	GEOLOGIC ORIGIN	
TYPE OF SAMPLE UNDISTURBED	TESTED AT LINCOLN	APPROVED BY	DATE

CLASSIFICATION CL

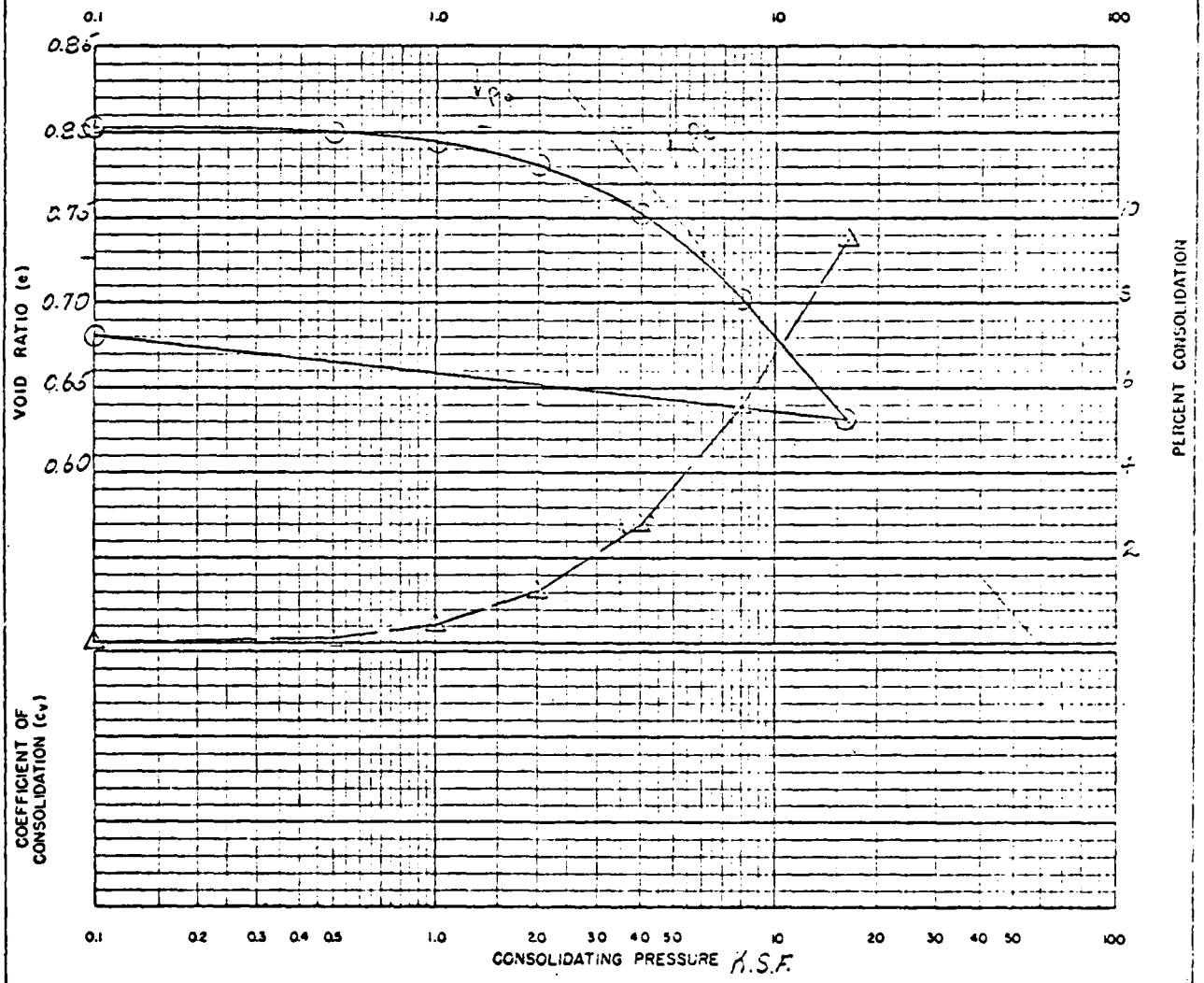
G_s 2.65 LL 37 PI 12

INITIAL DENSITY γ_d 1.47

INITIAL VOID RATIO, e_o .8028

COMPRESSION INDEX, C_c .123

TEST SPECIFICATIONS:
Saturated at Start.



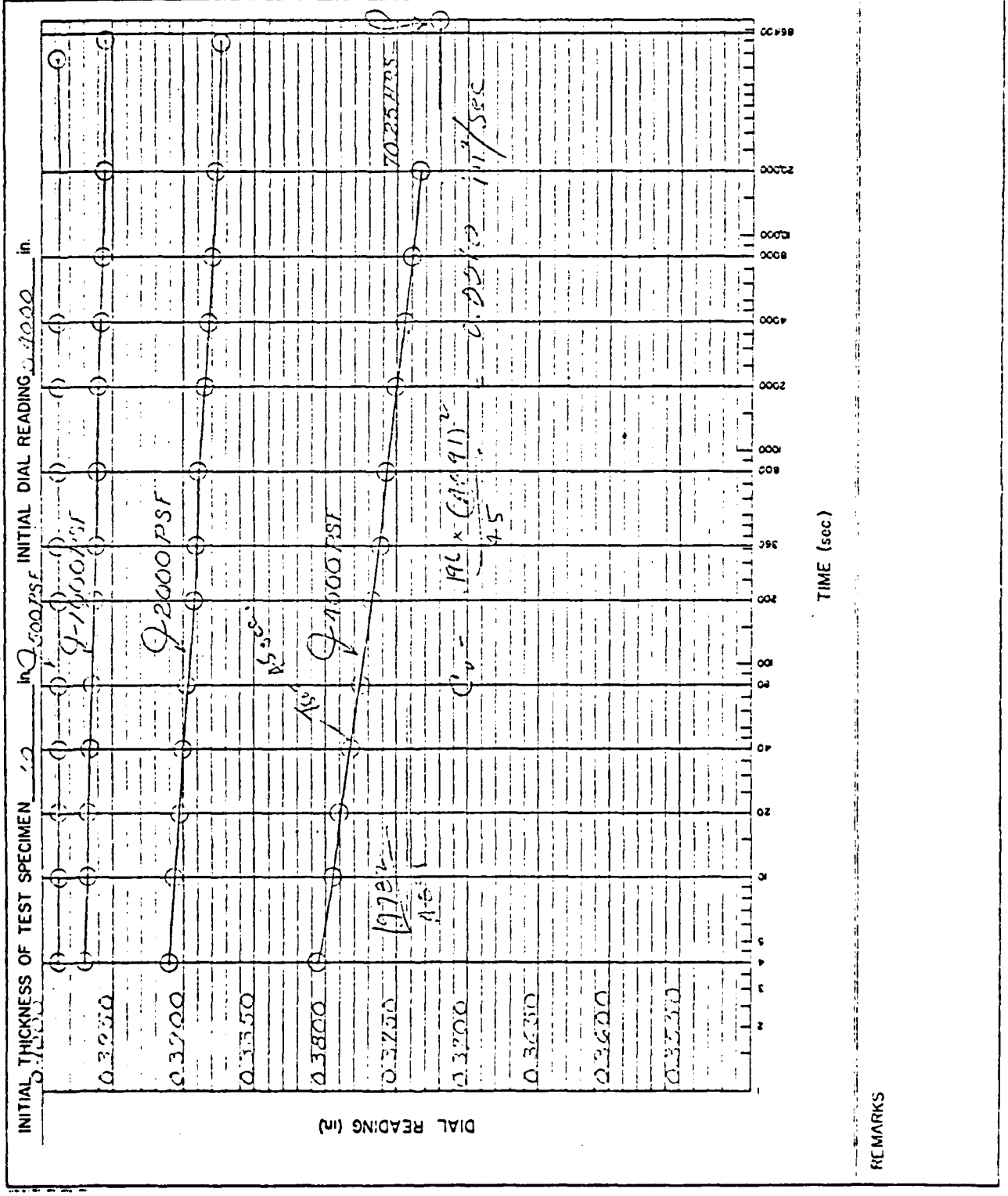
REMARKS Use C_v = 0.0010 in^2/sec.

Form SCS 129A
9-64

LABORATORY NO

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	LOG TIME CONSOLIDATION

PROJECT and STATE		SAMPLE LOCATION
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN
TYPE OF SAMPLE	TESTED AT	APPROVED BY / DATE

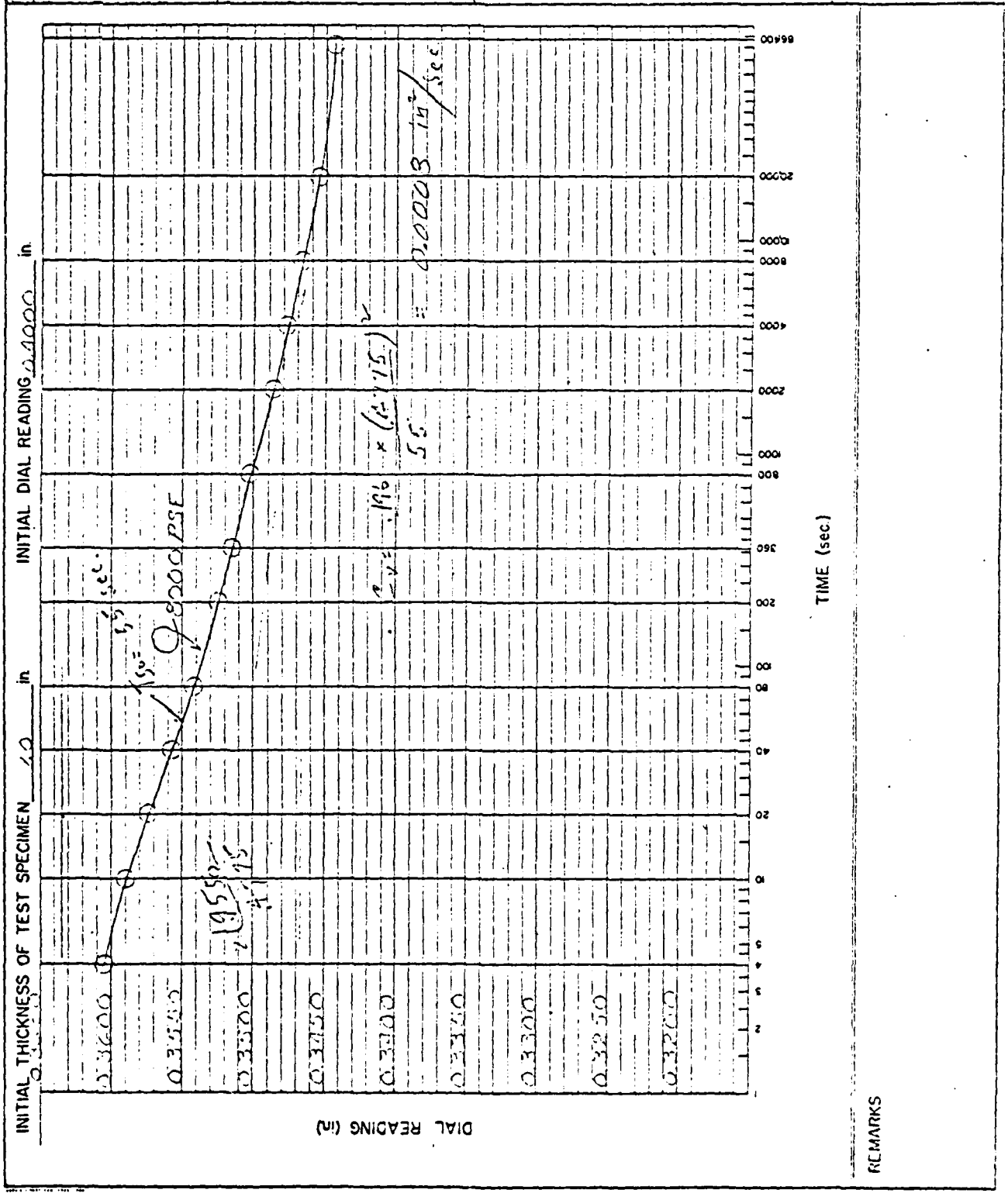


Form SCS 1286
9-58

LABORATORY NO.

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	LOG TIME CONSOLIDATION

PROJECT and STATE			SAMPLE LOCATION
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN	
TYPE OF SAMPLE	TESTED AT	APPROVED BY	DATE



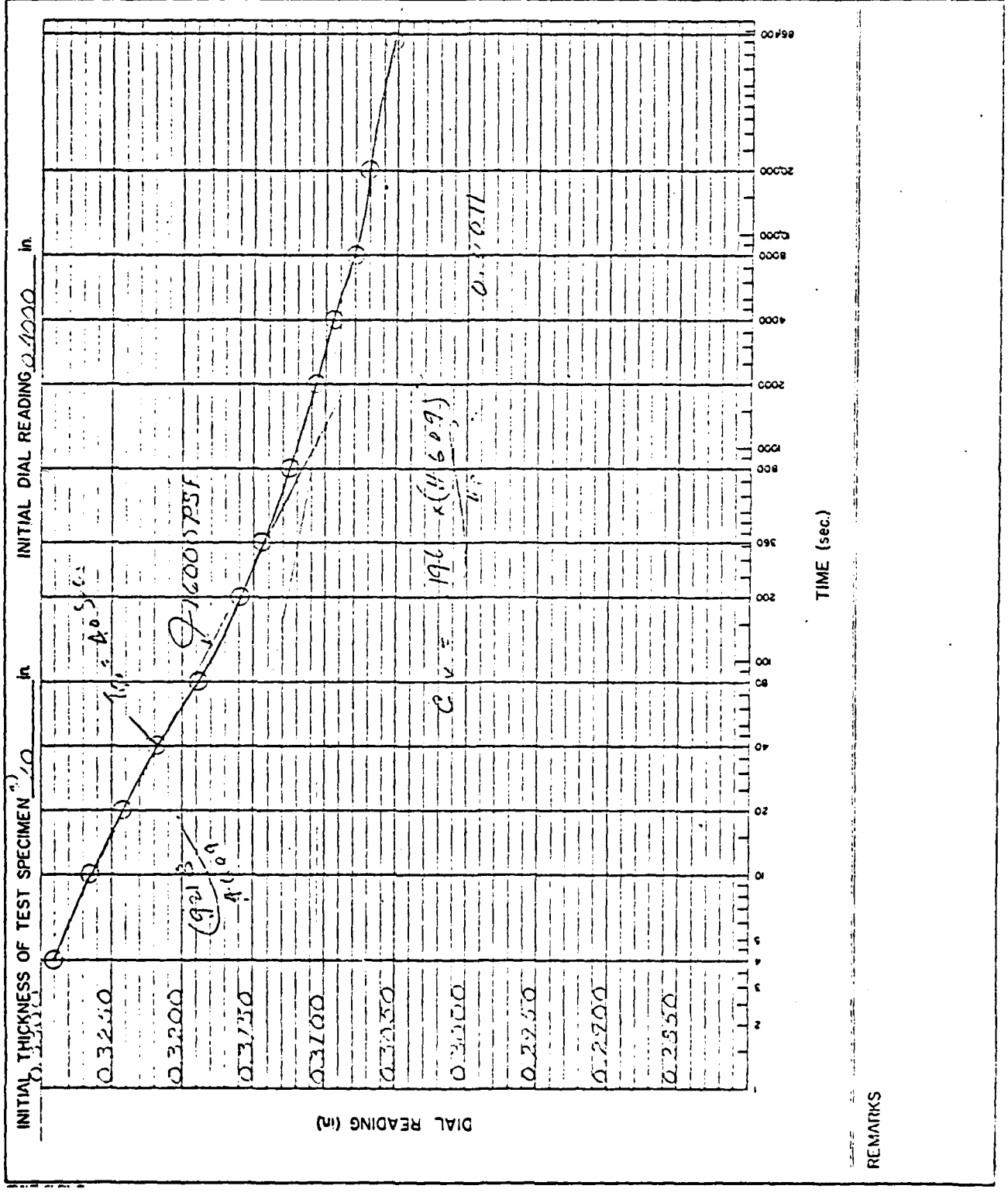
REMARKS

Form SCS-28A
9-64

LABORATORY NO.

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	LOG TIME CONSOLIDATION

PROJECT and STATE			SAMPLE LOCATION
[illegible]			[illegible]
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN	
[illegible]	[illegible]		
TYPE OF SAMPLE	TESTED AT	APPROVED BY	DATE
[illegible]	[illegible]		



REMARKS

Form SCS 127
9-63

LABORATORY NO 67W326

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	SOIL PERMEABILITY

PROJECT and STATE: WELLINGTON-NAPOLEON C-21 MISSOURI

SAMPLE LOCATION: ℄ FILL 4+40

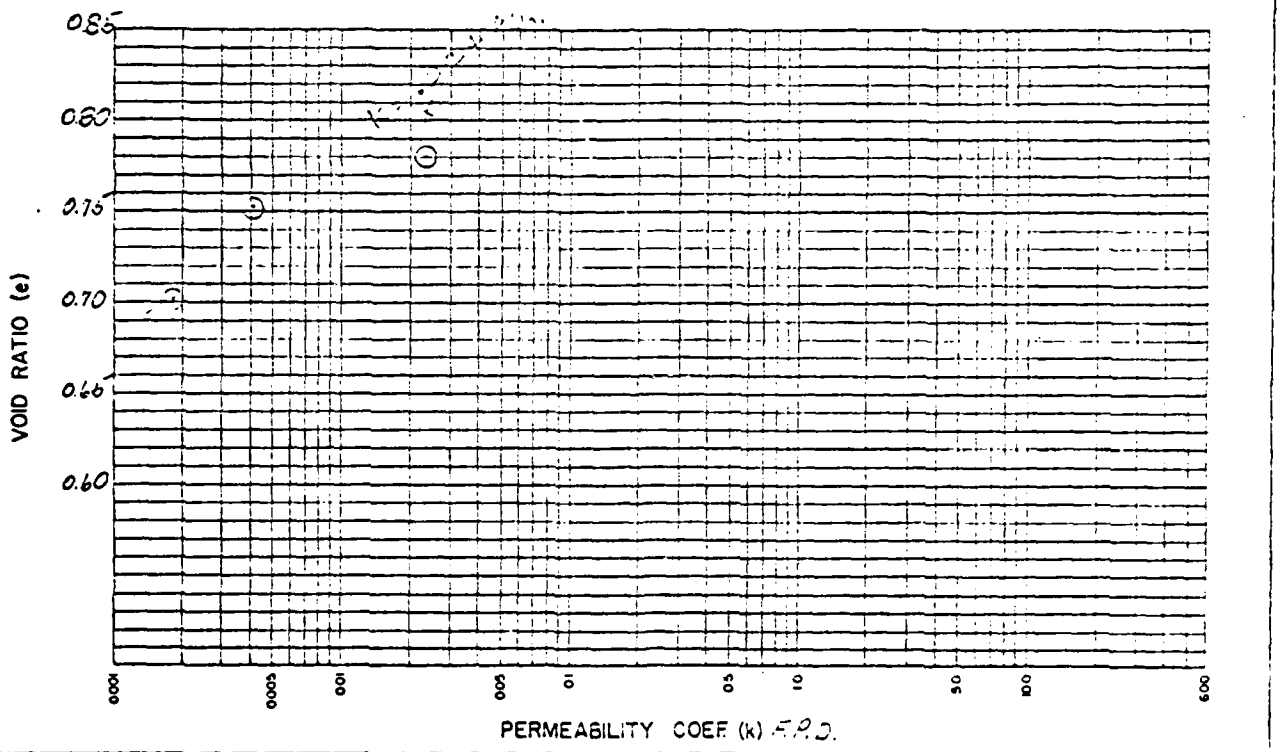
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN
301-9	10-11.5'	

TYPE OF SAMPLE	TESTED AT	APPROVED BY	DATE
UNDISTURBED	LINCOLN		

CLASSIFICATION CL LL 37 PI 12

SPECIFIC GRAVITY

TEST NO.	1	2	3	4	G_s (-)#4	2.65
INITIAL MOISTURE %					G_s (+)#4	
DRY DENSITY ☒ g/cc ☐ pcf	1.49	1.51	1.56		G_m(Bulk)(+)#4	
VOID RATIO	0.7801	0.7526	0.7026		TEST SPECIFICATIONS	
PERMEABILITY COEF. cm/sec	0.024	0.0042	0.0018		Falling Head Perm Test on the Consolidation Sample	
PERCOLATION COEF						
H/L DURING TEST						



REMARKS

Form SCS-28
9-64

LABORATORY NO 67-1[illegible]

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	CONSOLIDATION TEST

PROJECT and STATE: Wilkinson - Nicolaus C-21 Missouri

SAMPLE LOCATION: E Fill Sta 4+40

FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN
	22.0 - 23.5	

TYPE OF SAMPLE	TESTED AT	APPROVED BY	DATE
Undisturbed	SML - Lincoln		

CLASSIFICATION _____

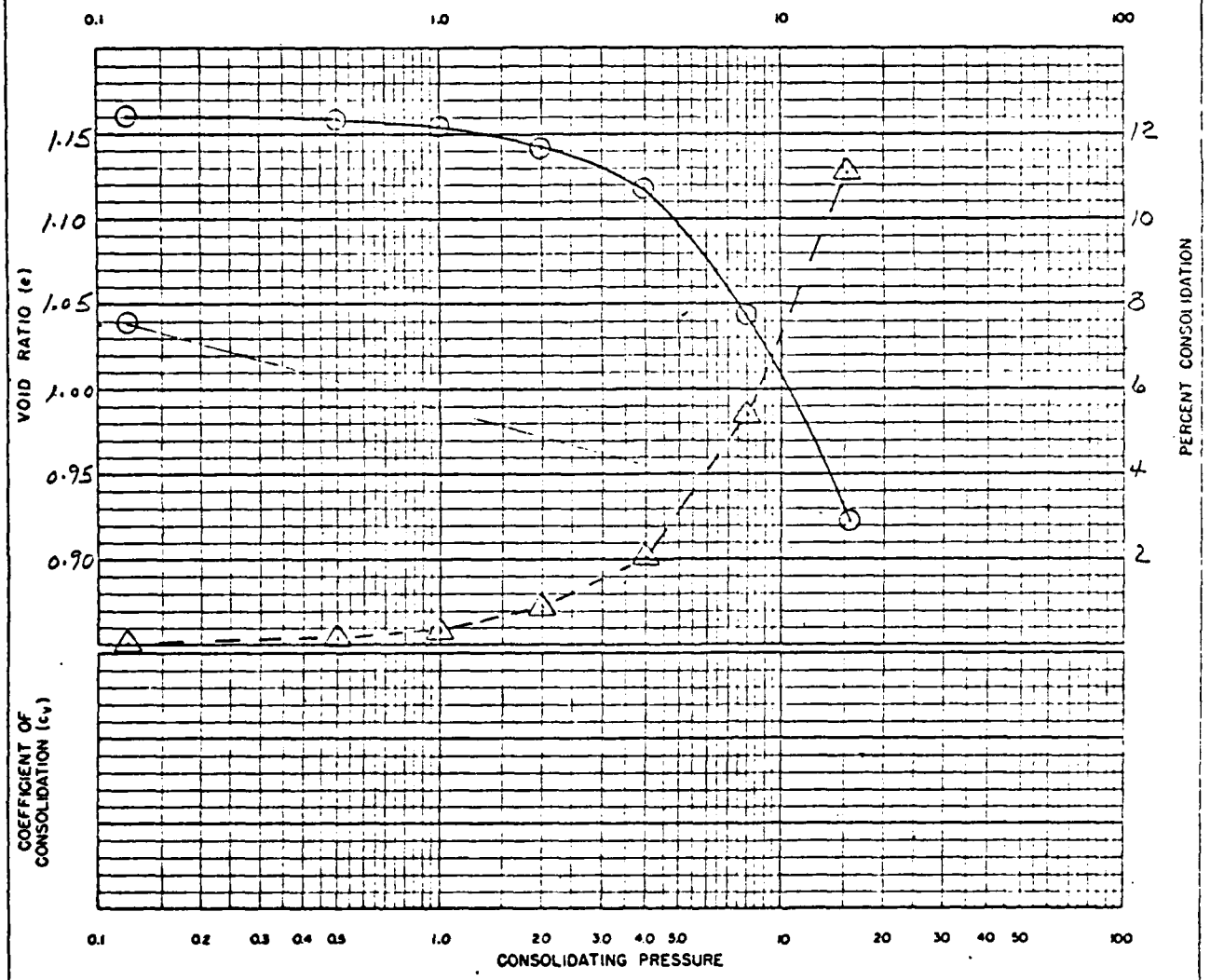
G_s 2.55 LL _____ PI _____

INITIAL DENSITY γ_d 1.18

INITIAL VOID RATIO, e_o 1.1612

COMPRESSION INDEX, C_c _____

TEST SPECIFICATIONS:



REMARKS

Form SCS-128A
9-64

LABORATORY NO 67W1328

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	LOG TIME CONSOLIDATION

PROJECT and STATE: WELLINGTON - Napoleon, C-21 Missouri

SAMPLE LOCATION:

FIELD SAMPLE NO.:

DEPTH: 22.0' - 23.5'

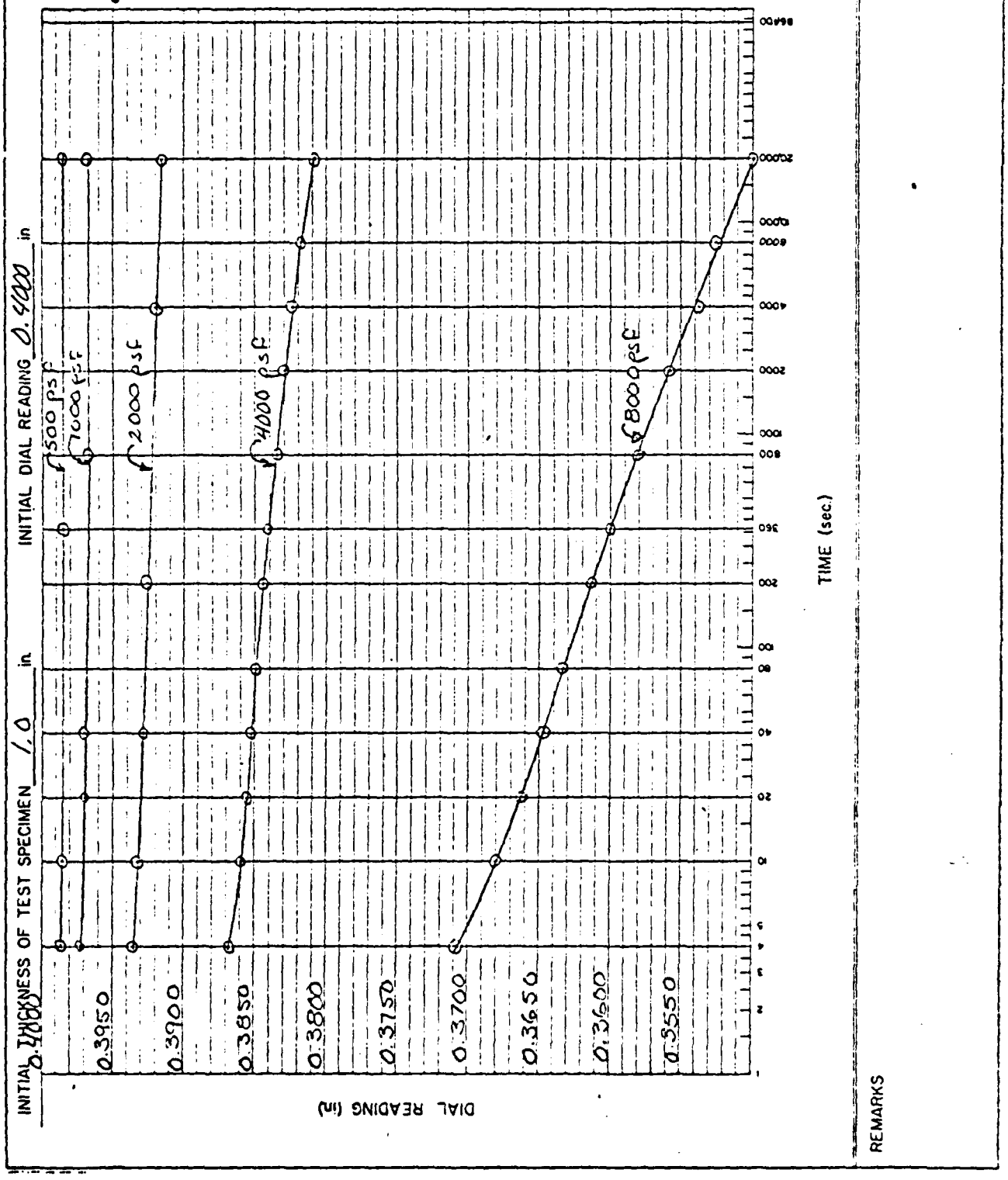
GEOLOGIC ORIGIN:

TYPE OF SAMPLE: UNDISTURBED

TESTED AT: SML - Lincoln

APPROVED BY:

DATE:

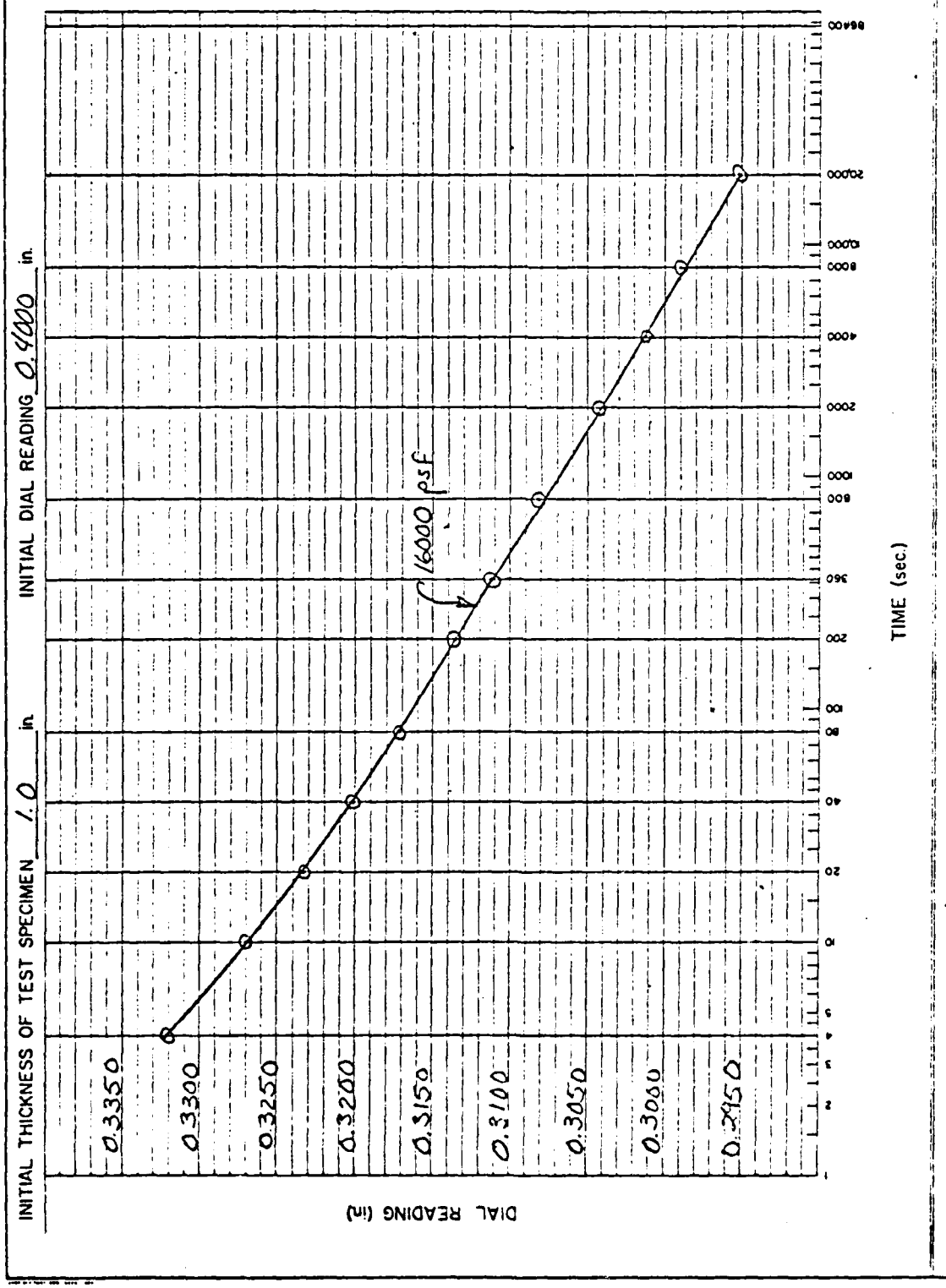


Form SCS 1268
6-64

LABORATORY NO 67W 1329

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	LOG TIME CONSOLIDATION

PROJECT and STATE		SAMPLE LOCATION	
WELLINGTON-NAPOLEON, C-21, Missouri			
FIELD SAMPLE NO.	DEPTH 22.0'-23.5'	GEOLOGIC ORIGIN	
TYPE OF SAMPLE Undisturbed	TESTED AT SML-Lincoln	APPROVED BY	DATE



Form SCS 27
9-64

LABORATORY NO 67W1322

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	SOIL PERMEABILITY

PROJECT and STATE: WELLINGTON-NAPOLEON C-21-Missouri

SAMPLE LOCATION:

FIELD SAMPLE NO:

DEPTH: 22.0'-23.5'

GEOLOGIC ORIGIN:

TYPE OF SAMPLE: UNDISTURBED

TESTED AT: SML-LINCOLN

APPROVED BY:

DATE:

CLASSIFICATION

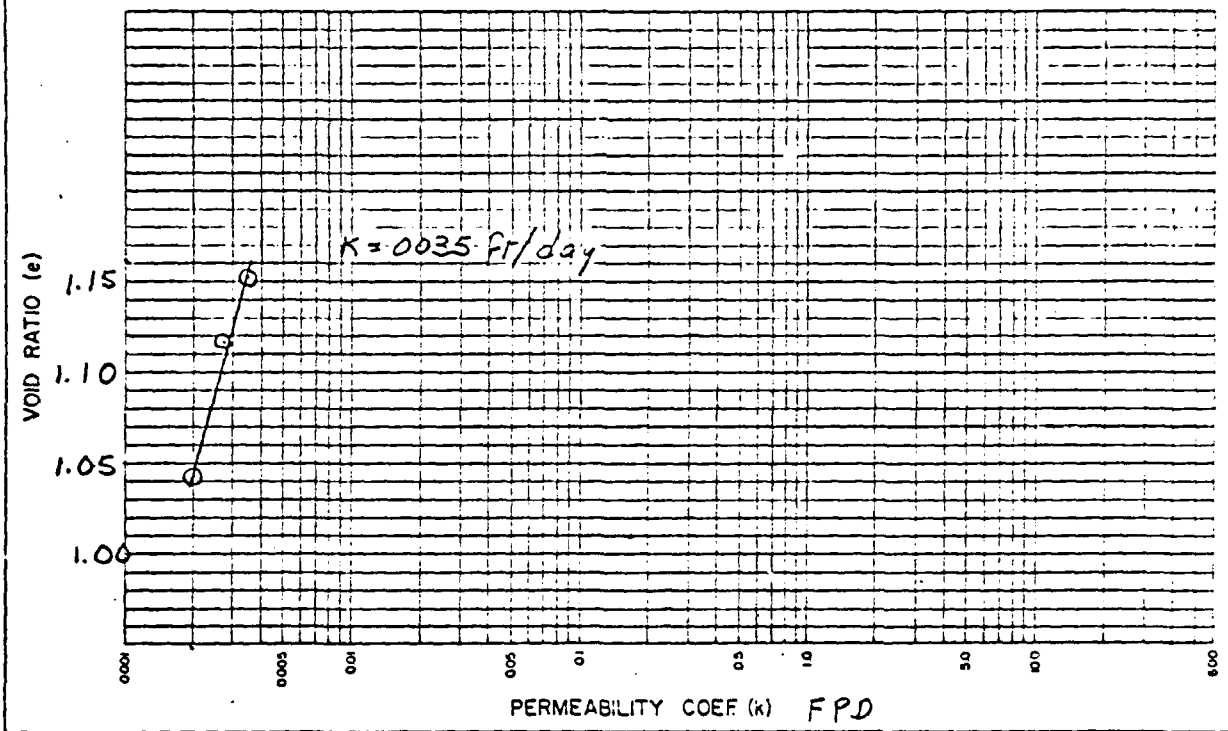
LL ___ PI ___

SPECIFIC GRAVITY

TEST NO.	1	2	3	4
INITIAL MOISTURE %				
DRY DENSITY ☐ g/cc ☐ pcf				
VOID RATIO	1.1420	1.1177	1.0441	
PERMEABILITY COEF	.0035	.0027	0020	
PERCOLATION COEF				
H/L DURING TEST				

G_s (-) #4	
G_s (+) #4	
G_m(Bulk)(+) #4	

TEST SPECIFICATIONS



REMARKS

Form SCS 355 A
Rev 6-65

LABORATORY NO [illegible]

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	TRIAXIAL SHEAR TEST

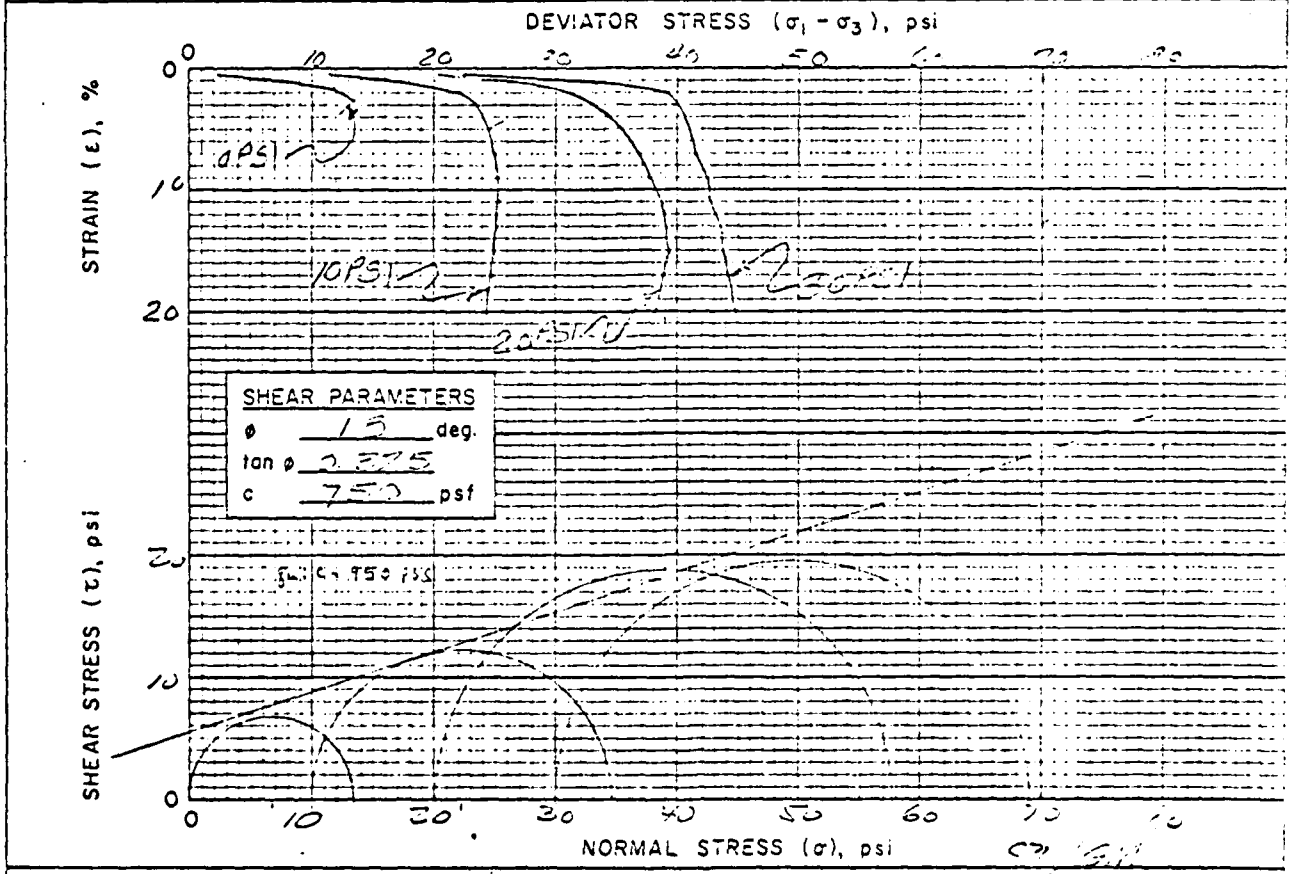
PROJECT and STATE	SAMPLE LOCATION
[illegible]	[illegible]

FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN
201-9	10.0 - 11.5'	

TYPE OF SAMPLE	TESTED AT	APPROVED BY	DATE
UNDISTURBED	[illegible]		

INDEX TEST DATA	SPECIMEN DATA	TYPE OF TEST
USCS CL ; LL 37 ; PI 13	HEIGHT 5.0 "; DIAMETER 1.4 "	
% FINER (mm): 0.002 16 ; 0.005 23 ; 0.074 (#200) 93	MATERIALS TESTED PASSED #40 SIEVE	UU ☐
G_s (-#4) 2.65 ; G_s (+#4) _____	METHOD OF PREPARATION [illegible]	CU ☑
STANDARD: γ_d MAX. _____ pcf; w_o _____ %	MOLDING MOISTURE _____ %	$\overline{CU}$ ☐
MODIFIED: γ_d MAX. _____ pcf; w_o _____ %	MOLDED AT _____ % OF γ_d MAXIMUM	CD ☐

DRY DENSITY			MOISTURE CONTENT, %			TIME OF CONSOLI-DATION (hrs.)	MINOR PRINCIPAL STRESS σ_3 (psi)	DEVIATOR STRESS $\sigma_1 - \sigma_3$ (psi)	AXIAL STRAIN AT FAILURE, ε (%)
INITIAL pcf ☐ g/cc ☐	CONSOLI-DATED pcf ☐ g/cc ☐		START OF TEST	DEG. OF SAT. AT START OF TEST	END OF TEST				
1.[illegible]			[illegible]	[illegible]			0	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



REMARKS TESTED @ NATURAL MOISTURE

Form SCS 352
Rev 5-63

LABORATORY NO. 37[illegible]

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	COMPACTION AND PENETRATION RESISTANCE

PROJECT and STATE: Wellington-Napoleon #C-21 Missouri

FIELD SAMPLE NO	LOCATION	DEPTH
101.1	Borrow 4+50 : 4+50	0.0'-5.0'

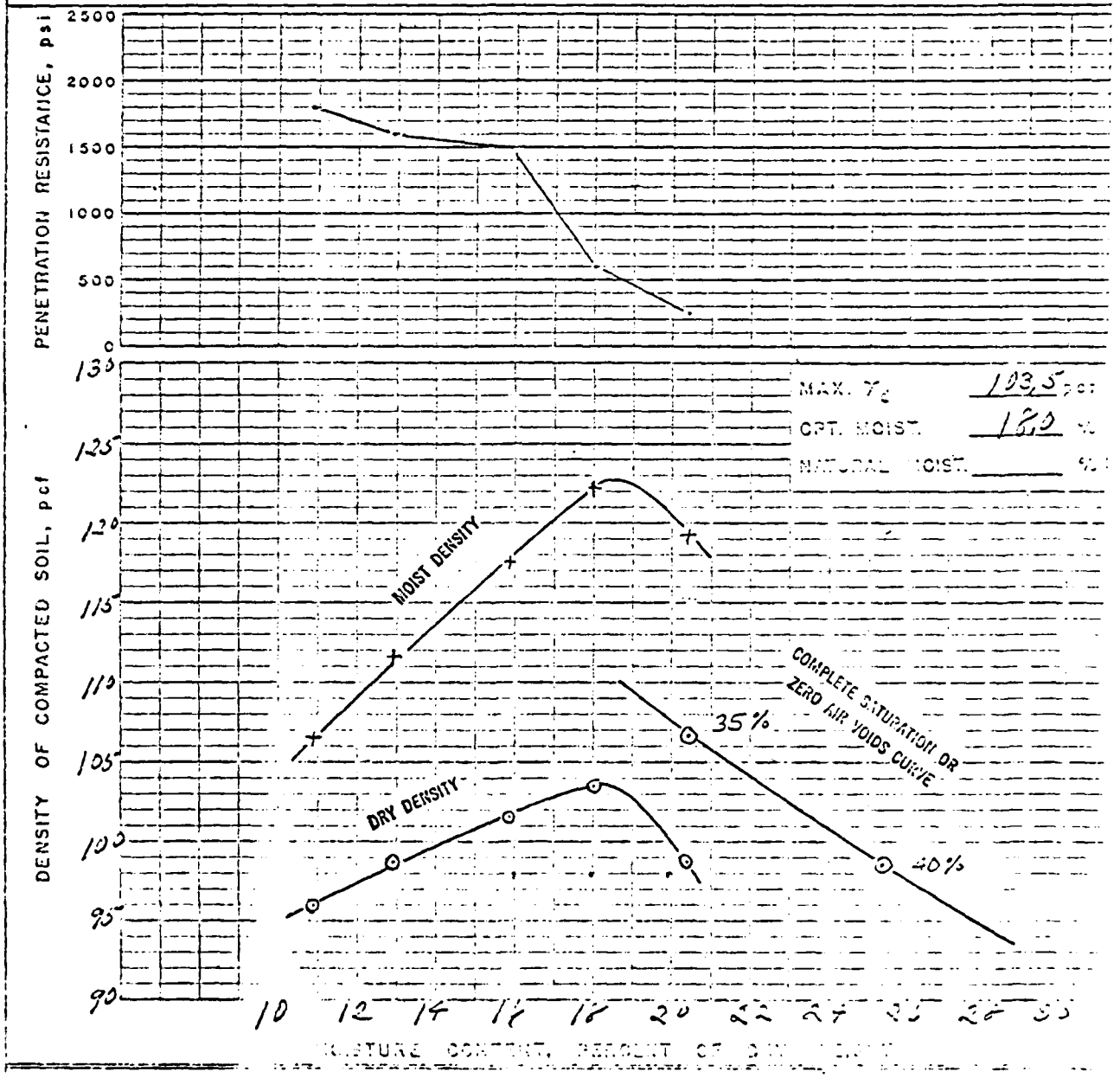
GEOLOGIC ORIGIN	TESTED AT	APPROVED BY	DATE
	SMC-LINCOLN		

CLASSIFICATION CL LL 31 PI 10 | CURVE NO. 1 OF 4

MAX. PARTICLE SIZE INCLUDED IN TEST < # 4" | STD. (ASTM D-698) ☑; METHOD A

SPECIFIC GRAVITY (G_s) { MINUS NO. 4 2.63 | MOD. (ASTM D-1557) ☐; METHOD

PLUS NO. 4 | OTHER TEST ☐ (SEE REMARKS)



REMARKS

Rev. 5-63

LABORATORY NO. [illegible]

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	COMPACTION AND PENETRATION RESISTANCE

PROJECT and STATE: Wellington-Napoleon FC-21 Missouri

FIELD SAMPLE NO.	LOCATION	DEPTH
102.1	Borrow 13+00 ; 5+00	1.0 - 7.0'

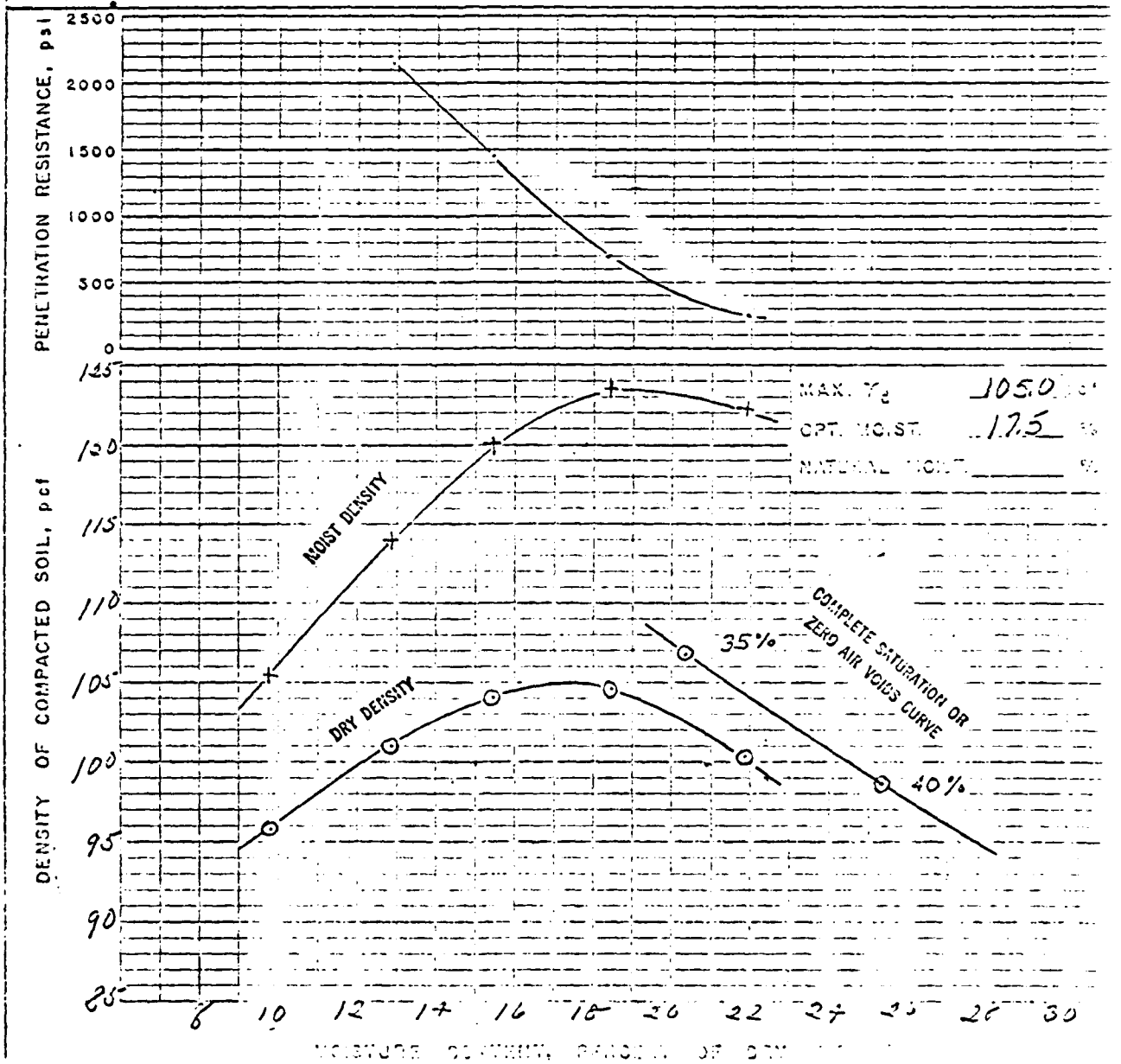
GEOLOGIC ORIGIN	TESTED AT	APPROVED BY	DATE
	SML. LINCOLN		

CLASSIFICATION CL LL 36 PI 16 CURVE NO. 2 OF 4

MAX. PARTICLE SIZE INCLUDED IN TEST < # 4" STD.(ASTM D-695) ☒; METHOD A

SPECIFIC GRAVITY (G_s) { MINUS NO. 4 2.63 / PLUS NO. 4 ____ } MOD.(ASTM D-1557) ☐; METHOD ____

OTHER TEST ☐ (SEE REMARKS)



REMARKS

Form SCS 352
Rev 5-65

LABORATORY NO. 47M-53

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	COMPACTION AND PENETRATION RESISTANCE

PROJECT and STATE: Wellington - Napoleon # C-21 Missouri

FIELD SAMPLE NO.	LOCATION	DEPTH
103.1	Borrow C+00 ; 6+75	0.0 - 4.0'

GEOLOGIC ORIGIN	TESTED AT	APPROVED BY	DATE
	SML - LINCOLN		

CLASSIFICATION CL LL 39 PI 18 CURVE NO. 3 OF 4

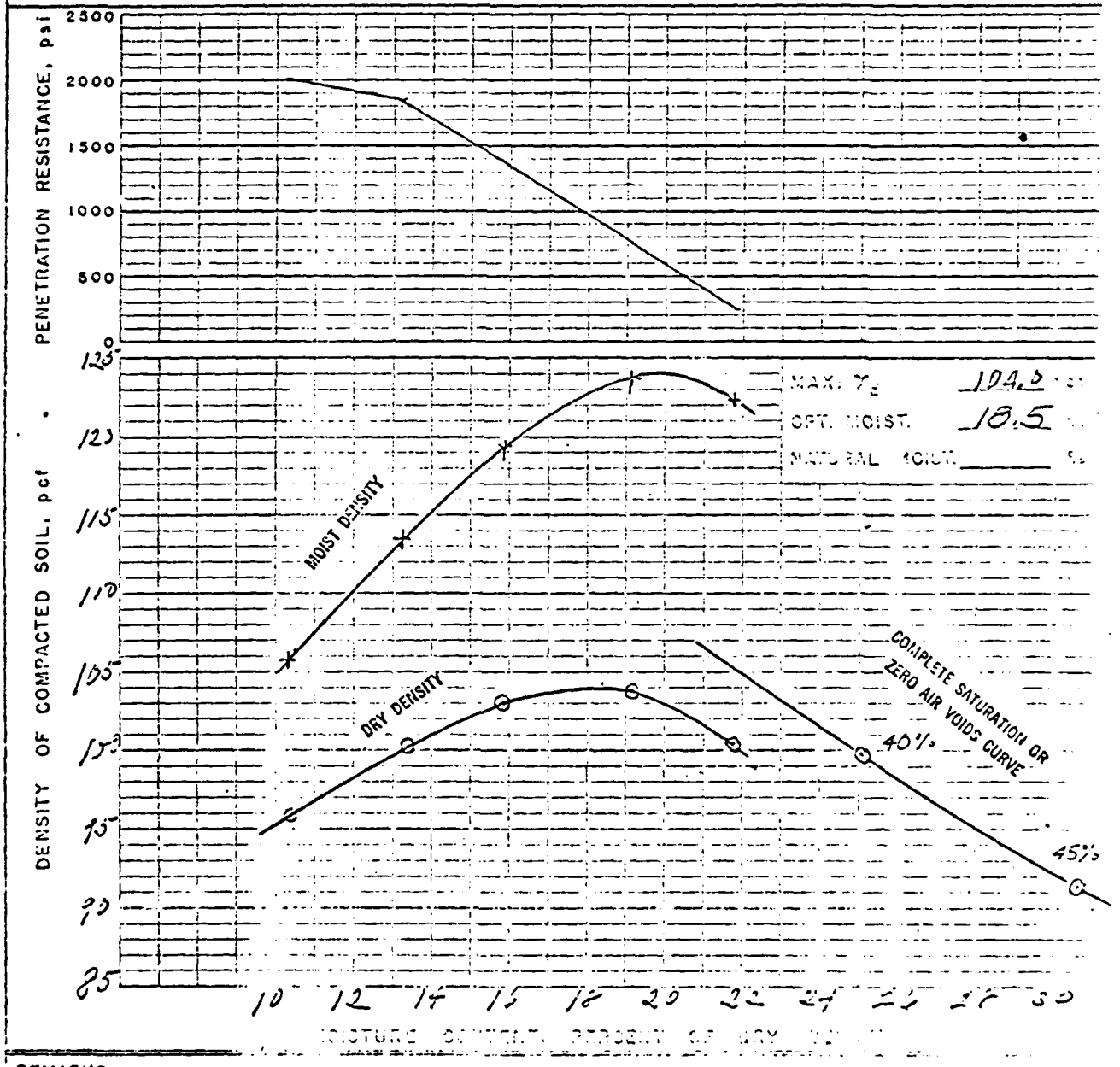
MAX. PARTICLE SIZE INCLUDED IN TEST < # 4 "

SPECIFIC GRAVITY (G_s) { MINUS NO. 4 2.66 ; PLUS NO. 4 ____

STD. (ASTM D-698) ☒; METHOD A

MOD. (ASTM D-1557) ☐; METHOD ____

OTHER TEST ☐ (SEE REMARKS)



REMARKS

Form SCS 352
Rev 5-65

LABORATORY NO. [illegible]

MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	COMPACTION AND PENETRATION RESISTANCE

PROJECT and STATE: Wellington - Napoleon # C-21 Missouri

FIELD SAMPLE NO.	LOCATION	DEPTH
103.2	Borrow C+00 ; 6+75	4.0-8.0'

GEOLOGIC ORIGIN	TESTED AT	APPROVED BY	DATE
	SML-LINCOLN		

CLASSIFICATION CL LL 40 PI 17

MAX. PARTICLE SIZE INCLUDED IN TEST < # 4"

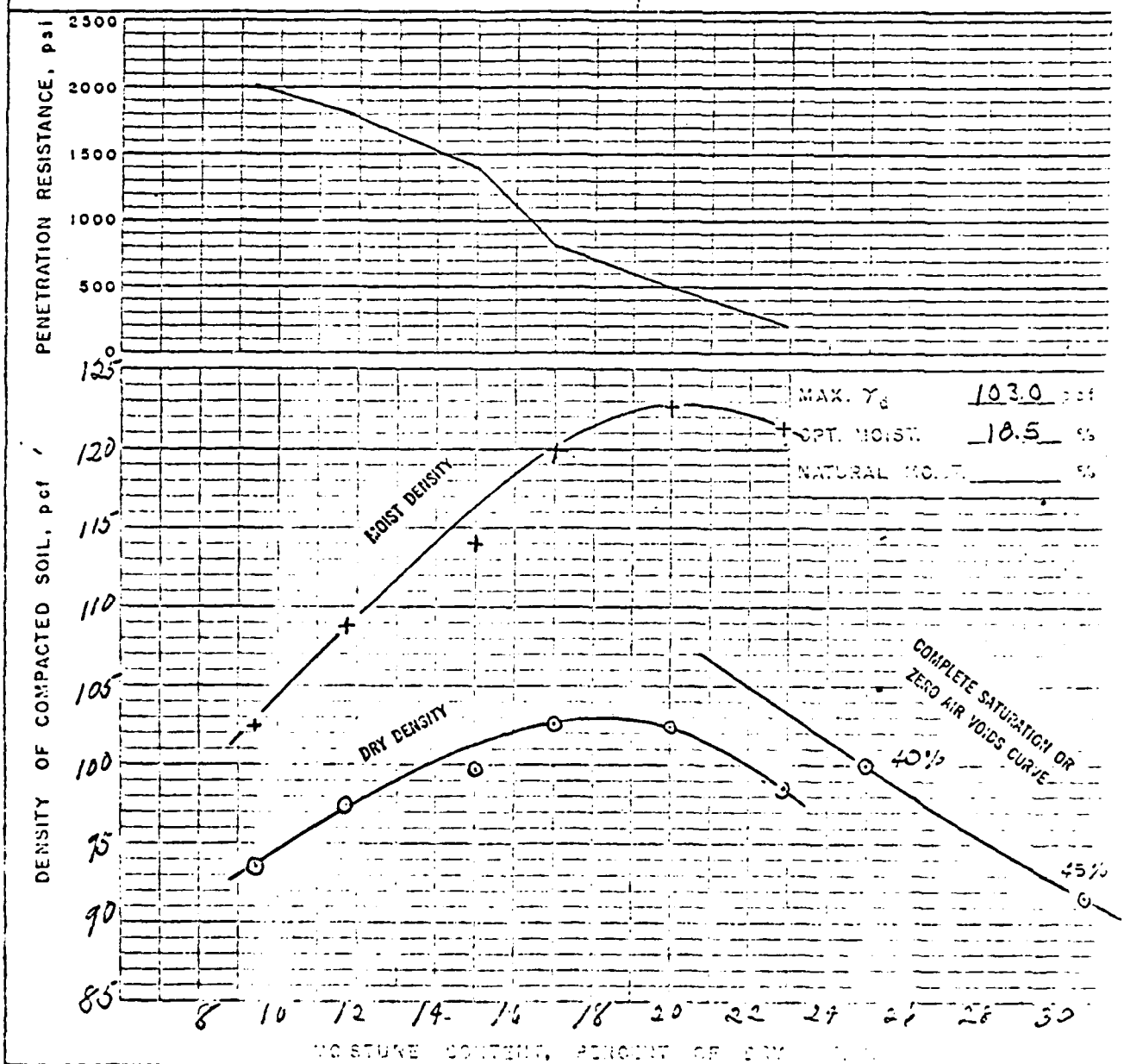
SPECIFIC GRAVITY (G_s) { MINUS NO. 4 2.67 ; PLUS NO. 4 ____

CURVE NO. 4 OF 4

STD. (ASTM D-698) ☑; METHOD A

MOD. (ASTM D-1557) ☐; METHOD ____

OTHER TEST ☐ (SEE REMARKS)



REMARKS

Form SCS 357
Rev. 6-65

MATERIALS TESTING REPORT — U.S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE

SUMMARY - SLOPE STABILITY ANALYSIS

PROJECT and STATE: WILLINGTON-WASHINGTON SITE C-21, MISSOURI

METHOD OF ANALYSIS: SWEDISH CIRCLE

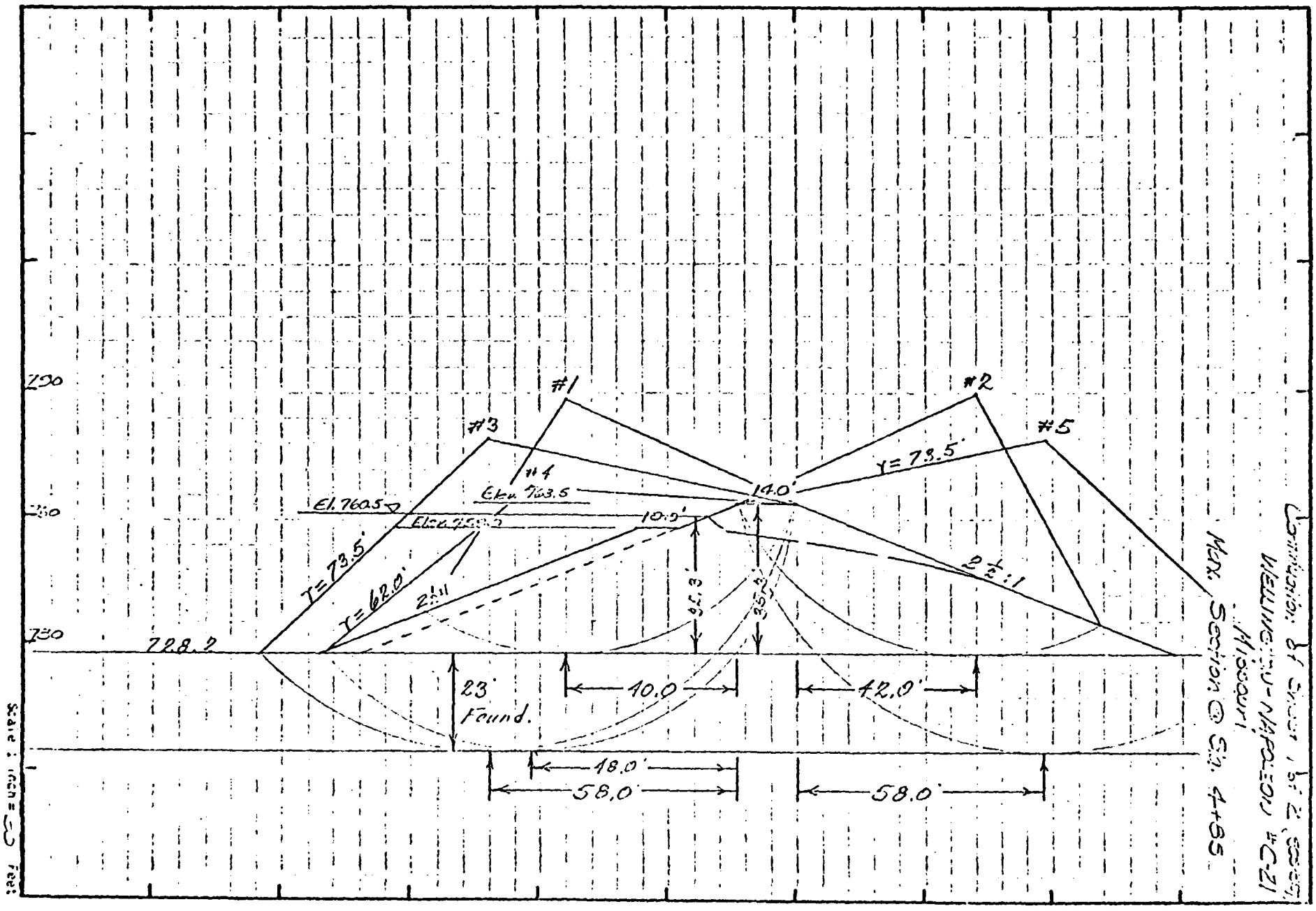
ANALYZED AT: SWL, Vicksburg

APPROVED BY:

DATE: 9-30-65

SOURCE AND USE OF MATERIALS	CLASSIFICATION	ADOPTED DESIGN DATA: γd (pcf)	γm (pcf)	γsat (pcf)	γsub (pcf)	φ (deg)	tan φ	c (psf)	REMARKS
① Found	CL	92.5		119.0	56.5	18.0	0.325	750	Sat. shear tests.
② Emb (from Site "C-23")	CL	96.8	115.0	121.5	59.0	10.0	0.176	1150	
③ Emb (from Site "B-21")	CL	99.5	117.5	123.0	60.5	17.0	0.306	925	
④									
⑤									
⑥									
⑦									
⑧									

TRIAL NO.		SLOPE	CONDITIONS	F_s
			Maximum Section @ Station 4+85	
Up	1	2½:1	Fulldrawdown - No berm - Arc cut from opp. shoulder thru Emb (110°-115°) only.	3.0
Up	11	2½:1	Same as #1 but Emb (17°-925).	2.7
Dn	2	2½:1	No drain - No berm - Arc cut from opp. shoulder thru Emb (17°-925) only.	1.4
Up	3	2½:1	Fulldrawdown - 10' berm @ elev 758.0 - Arc cut from opp. shoulder thru Emb (17.0°-925) & 23.0° Found (18.0°-750).	1.67
Up	4	2½:1	Fulldrawdown - 10' berm @ elev 758.0 - Arc cut from opp shoulder thru Emb (17.0°-925) & 23.0° Found (18.0°-750).	1.84
Dn	5	2½:1	No drain - No berm - Arc cut from opp. shoulder thru Emb (17.0°-925) & 23.0° Found (18.0°-750).	1.24


#1
#2
#3
#4
#5
El. 760.5
Elev. 763.5
Elev. 755.2
14.0'
10.0'
Y=73.5'
Y=73.5'
Y=62.0'
2:1
2:1
2:1
728.2
42.3'
35.2'
23'
Found.
10.0'
42.0'
18.0'
58.0'
58.0'
Max. Section @ Sta. 4+85
Scale: 1 inch = 10 Feet

Form SCS-378A
Sheet 1 of 3

10-59

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

GENERAL

State Missouri County Lafayette ; ___ ¼, SW ¼, Sec. 20, T 50N R 28W ; Watershed Wellington-Napoleon

Subwatershed ___ Fund class WP-03-10 (FP-2, WP-1, etc.) Site number C-21 Site group I Structure class b

Investigated by Nuel E. Edmonds, Geo. (signature and title), Equipment used Mobile B-40 (Type, size, make, model, etc.), Date 6-16-66

SITE DATA

Drainage area size .52 sq. mi., 333 acres. Type of structure DI 24" RC Purpose Stabilization, Sediment, Detention, FWR

Direction of valley trend (downstream) N Maximum height of fill 35.3 feet. Length of fill 495 feet.

Estimated volume of compacted fill required 20,500 yards

STORAGE ALLOCATION

	Volume (ac. ft.)	Surface Area (acres)	Depth at Dam (feet)
Sediment	150	~~XXX~~ 16.5	29.8
Floodwater	43.5	20.0	32.3

SURFACE GEOLOGY AND PHYSIOGRAPHY

Physiographic description Mo. River Loess Hills Topography Rolling Attitude of beds: Dip ---- Strike ----

Steepness of abutments: Left 9 percent; Right 15 percent. Width of floodplain at centerline of dam 0 feet

General geology of site: The site is located in the Missouri River loess hills in rolling to strongly rolling topography. The underlying bedrock is the Upper Desmoinesian Series of the Pennsylvanian System and is characterized as cyclic deposits predominately limestone and shale.

Form SCS-376B
Sheet 2 of 2

USDA-SCS

10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Centerline of Dam, Principal Spillway, Borrow Area

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Disturbed Small
FA 4"	6	3		4 L.Bag	
Sp.T		4			19 Jar
Tube 3"		1	4 Shelby		
Total	6	8	4	4	19

SUMMARY OF FINDINGS

(include only factual data)

The abutments are deep loess classified CL below the developed soil profile. In test hole # 2 the loess was 30 feet deep and underlain with material classified as a stiff CH. The central section of the foundation adjacent to the channel is described as alluvium or a modified loess and is underlain with sand classified SP and SW at depths of 35 to 40 feet. The thickness of the sandy material ranges from 3 to 6 feet. Lens of material classified SM occurs in test holes 5 and 301. The weakest material in the foundation is the alluvium which had a blow count of 2 from 15 to 16 feet in test hole # 301. The foundation of the principal spillway is the alluvial material which had blow counts ranging from 2 to 5. The alluvium is underlain with a stiff ML described as an organic silt. SP or SW material was found at depth in all test holes on the centerline of the principal spillway. In test hole # 304, the SP was underlain with stiff clay classified CH. The emergency spillway cuts are shallow and will be in the loess soil. The gully at the centerline is active and cutting into undisturbed material. There is sufficient borrow available within 700 feet of the centerline of the fill.

Form SCS-376C
Sheet ___ of 3
For In-Service Use Only

USDA-SCS

10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

State Missouri County Lafayette Watershed Wollington-Napoleon Subwatershed _____

Site number C-21 Site group I Structure class b Investigated by Nuel F. Edmonds, Geo. (signature and title) Date 6-16-66

INTERPRETATIONS AND CONCLUSIONS

The abutments are deep loess and present no geologic problems. The loess below the developed soil profile has sufficient clay content to be classified (low) CL. The material in the central part of the foundation , described as alluvium, between approximate centerline stations 4+00 and 5+50, is variable in texture and strength. The weakest material in test hole # 301 had a blow count of 2 and is interpreted to extend beneath the channel and to approximate centerline station 5+00. The underlying material described as stiff organic silt extends to approximately the same distance. The alluvium in test hole # 4 to the right of the channel had blow counts of 6 in the upper part and ranged from 11 to 20 in the lower part. The foundation of the principal spillway is the soft to medium alluvium which extends to a depth of about 15 feet. This is underlain with a medium ML and the organic silts. The SP and SW material occurred consistently in all test holes through the alluvium and at a relatively uniform elevation. The SP material in test hole # 304 was underlain with a stiff clay and is assumed to underlie the sand encountered in the other test holes. Undisturbed samples of the different materials were taken in test hole # 301.

The channel is active at the centerline and to a 5 foot overfall approximately 50 feet upstream and has cut to undisturbed material. Above the overfall the channel averages 2 feet deep and 30 feet wide and has approximately 3 feet of soft silt and debris in the bottom. The overfall is active and could move through the foundation area before construction time. Since emergency spillway cuts are shallow and in a loess soil, it was not necessary to drill or sample.

Borrow area 103 is a loess soil and will be the best source of material for the core. Area 102 is high bottom or terrace alluvium and classified CL. Borrow area 101 is modern alluvium classified ML and was soft and wet below 6 feet. Estimated amounts of borrow available:

Hole No.	Cu/yds Topsoil	Cu/yds Compacted Fill
101	6000	----
102	1250	7500
103	--	6000
Emergency Spillway	1250	1250
Total	8500	14,750

APPENDIX D
HYDROLOGIC COMPUTATIONS

Note: Reproductions of Sheets 1 through 3 of 3 included in Appendix D are the best possible from copy furnished by Soil Conservation Service. Unreadable portions on the reproduced sheets are also unreadable on sheets from which the copies were made.

HYDROLOGIC COMPUTATIONS

1. The Mockes dimensionless standard curvalinear unit hydrograph and the SCS TR-20 program were used to develop the inflow hydrographs (see Plate D1). The inflow hydrograph for the 100-year flood was also generated by the consultant using the TR-20 program.

   a. Six-hour, twelve-hour, and twenty-four hour 100-year rainfall for the dam location was taken from NOAA Technical Paper 40. The 24-hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis District policy and guidance for hydraulics and hydrology.

   b. Drainage area = 0.52 square mile; 333 acres (SCS).

   c. Time of concentration of runoff = 20 minutes (SCS).

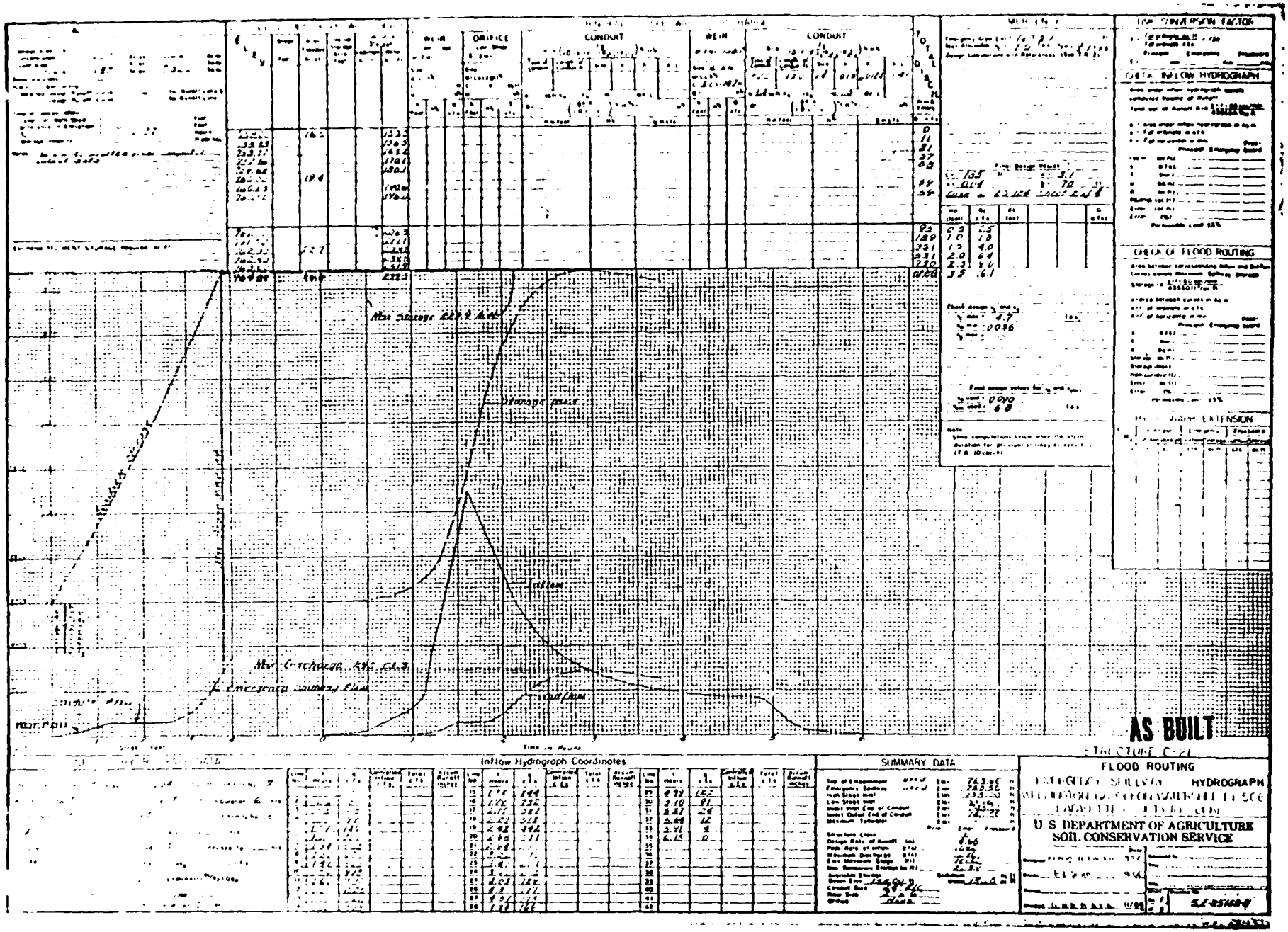
   d. The antecedent storm conditions were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMCIII). The initial pool elevation was assumed at the crest of the principal spillway.

   e. The total 24-hour storm duration losses for the 100-year storm were 1.77 inches. The total losses for the 24-hour duration 1/2 PMF storm were 1.96 inches. The total losses for the PMF storm were 2.05 inches. These data were based on use of soils group B; pasture/range and row crop weighted to produce SCS input runoff curve No. 70 from SCS AMCII converted by TR-20 to computed curve No. 85 SCS AMCIII.

   f. Average soil loss rates = 0.05 inch per hour approximately.

2. The drop inlet and conduit discharge ratings were developed using standard formulas and criteria from SCS publication design manual EWP-5 taken from Corps of Engineers publication, "Hydraulic Characteristics of Reservoir Outlet Works". The emergency spillway rating was developed using the SCS emergency spillway computer program "RESIN"; the results compared closely with data shown on the SCS as-built plans. The flows over the dam crest were based on the broad-crested weir equation $Q = CLH^{3/2}$, where H is the head on the dam crest; the coefficient C, which varies with head, was taken from the USGS publication "TWRI, Book 3, Chapter 5, Measurement of Peak Discharge at Dams by Indirect Methods" (C valued varies from 2.52 to 3.00). Sample calculations are attached.

3. Floods were routed through the reservoir using the TR-20 program to determine the capabilities of the spillways and dam embankment crest. The unit hydrograph computation duration interval is computed as 0.17TC by the TR-20 computer program. Copies of the input-output data from the TR-20 program used to develop the hydrographs for the PMF, 0.5 PMF, and 100-year flood are attached. The storm rainfall patterns, inflow hydrographs and routed outflow hydrographs are shown on Plate D1.


AS BUILT
STRUCTURE C-21
FLOOD ROUTING
EMERGENCY SPILLWAY HYDROGRAPH
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SUMMARY DATA
Inflow Hydrograph Coordinates
Time in Hours

PRINCIPAL SPILLWAY DISCHARGE

WEIR | ORIFICE | CONDUIT | WEIR | CONDUIT | TOTAL DISCH

Stage & Discharge Data See Sheet 1 of 1

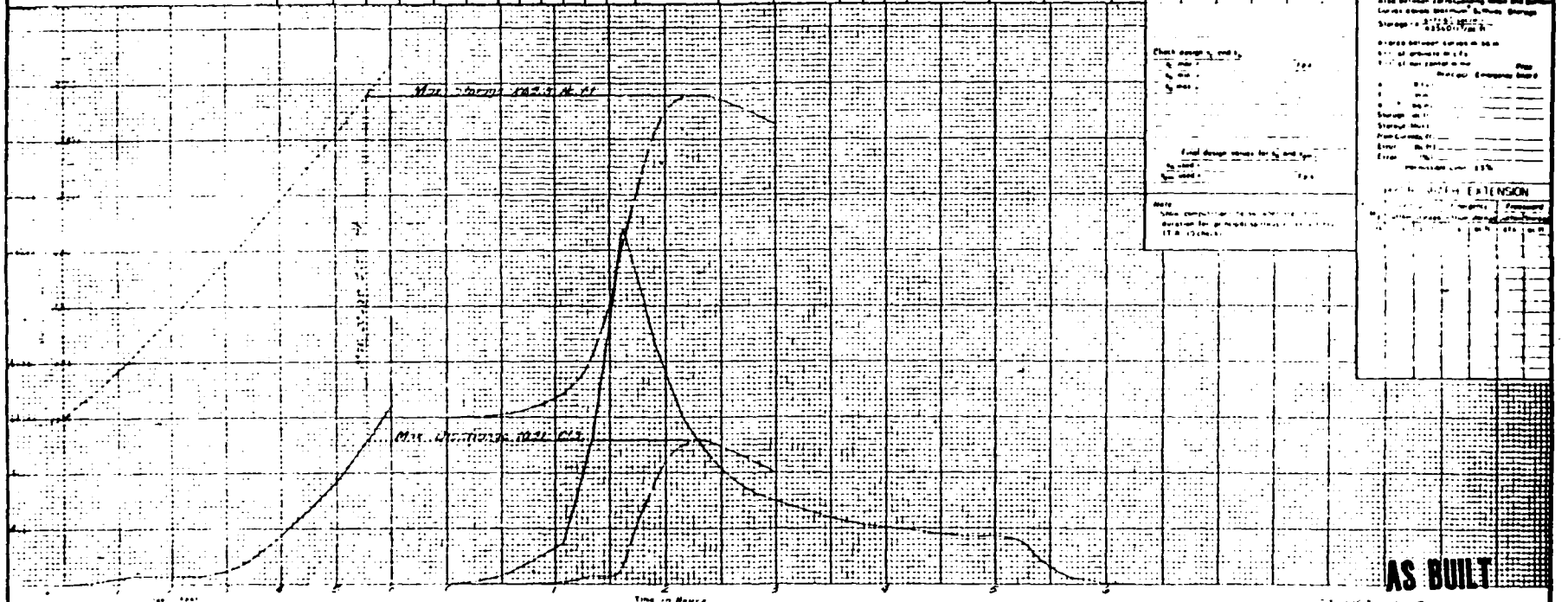
EMERGENCY

TAW CONVERSION FACTOR

CHECK OF INFLOW HYDROGRAPH

CHECK OF FLOOD ROUTING

TIME EXTENSION



AS BUILT

Inflow Hydrograph Coordinates

SUMMARY DATA

FLOOD ROUTING

FLEMING D HYDROGRAPH

LAFAYETTE COUNTY, ARK.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SC-25-ARK

STRUCTURE DATA

			C-21	STRUCTURE	SITE NUMBER		C-21
					TIME OF CONCENTRATION	HOURS	0.34
					RUNOFF CURVE NUMBER		70
		ACRES	—	INFLOW	MOISTURE CONDITION		II
		ACRES	333		STORM DISTRIBUTION CURVE		II
		ACRES	333		HYDROGRAPH FAMILY PRIN		II
	PRIN EMER FREEBOARD	CFS		HYDROGRAPH	EMER		2
	PRIN EMER FREEBOARD	CFS	450 1550 3561		T_c/T_p USED PRIN EMER FREEBOARD		1.0 1.0 2.5
	PRIN EMER FREEBOARD	CFS	450 1550 3561	DESIGN	STORM DURATION PRIN	HOURS	9
		CFS	59	DESIGN DATA	POINT RAINFALL PRIN EMER FREEBOARD	INCHES	5.65 9.55 13.31
		%	0.29		RUNOFF Q PRIN EMER FREEBOARD	INCHES	2.53 4.48 10.11
		CFS	231		STORM FREQ PRIM SPILLWAY	YEARS	50
	PRIN EMER FREEBOARD	FEET	3.50 3.82 5.96				
		AC FT	46		H_a MAX	FEET	1.32
		AC FT	150	EMERGENCY SPILLWAY DATA	Qa	CFS/FT.	9.5
		AC FT	—		Va MAX.	FT/SEC	4.7
		ACFT/SQ MI	—		Sa MIN.	FT/FT	0.036
		AC FT	—		PERMISSIBLE Va MAX.	FT/SEC.	9.1
		AC FT	—		Sa MAX.	FT/FT	—
		AC FT	—		Va MAX.	FT/SEC.	6.8
		AC FT	—				
		YEARS	—		DRAWDOWN TIME	HOURS	15
		PERCENT	—	STRUCTURE	HEIGHT X STORAGE		6530
		ACRES	16.5		CLASS		b

CHANNEL HYDRAULICS

			C-21	
			178.5 +178.5 Bottom Elev.	
		ACRES	333	
		ACRES	—	
		ACRES	333	
		CFS	59	
		CFS	—	
		CFS	59	
		FT/SEC		
		FT/SEC	2.4	
		FT/SEC		
		FEET	1.9	
		FEET		
		FEET		
		FEET	20	
		RATIO	3:1	
		FEET		
		FT/FT	0.005	

AS BUILT

THIS SHEET FOR PERTINENT DATA NOT ITEMIZED OR SHOWN ELSEWHERE ON PLANS

(Channel design based on SCS-TP61; Velocities based on "D" Retardance, Depth based on "A" Retardance.

GENERAL DESIGN DATA
STRUCTURE C-21
WELLINGTON-NAPOLEON WATERSHED PL566
LAFAYETTE COUNTY, MISSOURI
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Harvey B Randall	3/66	Approved by
Drawn	P E Smith	10/66	Title
Traced			Date
Checked	R H R & W R	11/66	Sheet 3 of 3 SE-SE-00-0-1

#10284

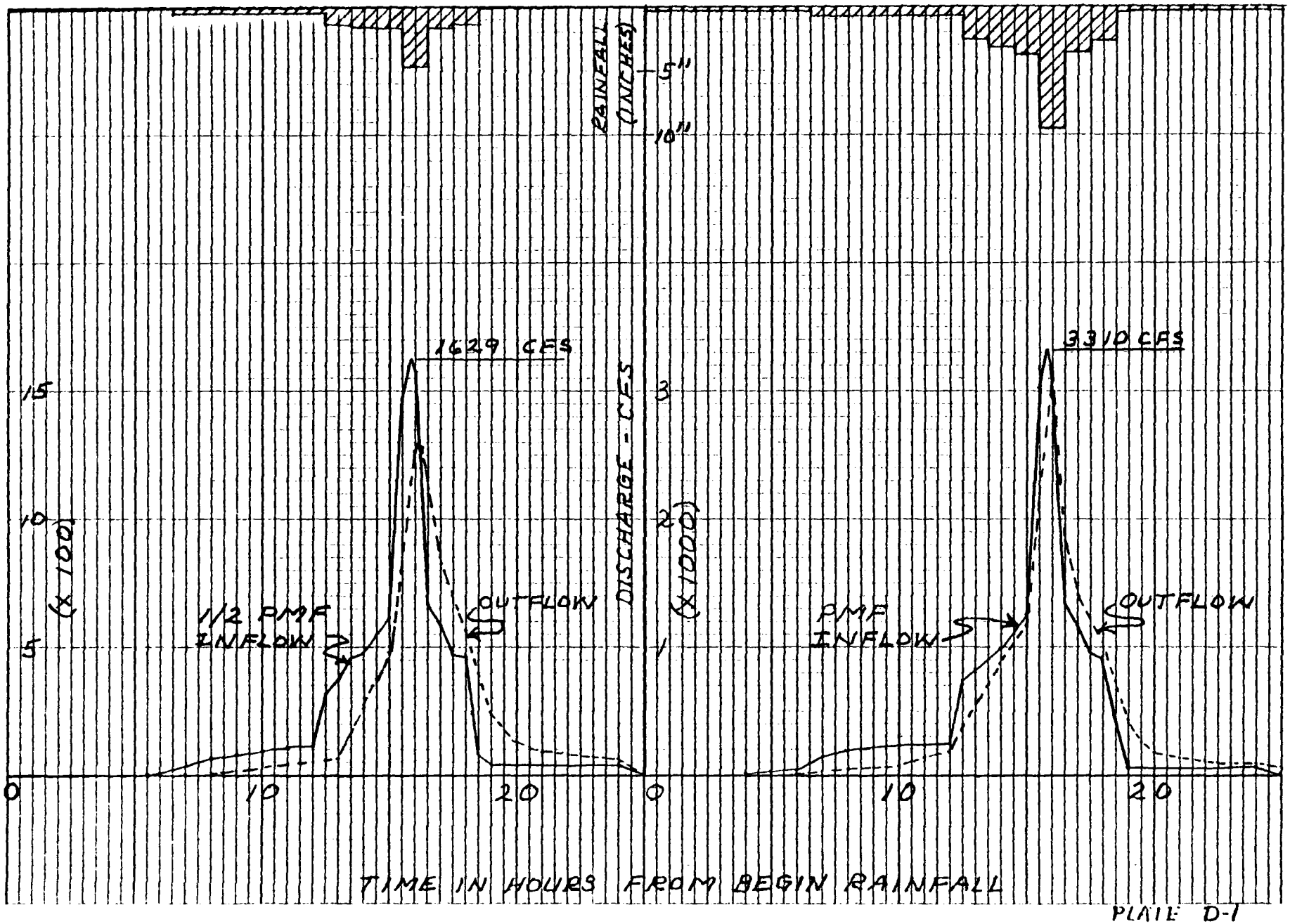


PLATE D-1

HYDROLOGY PROGRAM FOR IBM 1130 - DATED JULY, 1968

MD DAM INSP LAFAYETTE C-21 DAM (SCS) TR-20 ROUTING.

EXECUTIVE CONTROL CARD OPERATION LIST

MD DAM INSP LAFAYETTE C-21 DAM (SCS)

C TABLE VELOCITY INCREMENT = 0.200

8	0.0000	0.0800	0.1800	0.2500	0.3200
8	0.3700	0.4100	0.4500	0.4900	0.5100
8	0.5400	0.5700	0.5900	0.6100	0.6300
8	0.6500	0.6600	0.6700	0.6900	0.7000
8	0.7100	0.7200	0.7300	0.7400	0.7500
8	0.7600	0.7700	0.7700	0.7800	0.7900
8	0.7900	0.8000	0.8100	0.8100	0.8200
8	0.8200	0.8300	0.8300	0.8400	0.8400
8	0.8400	0.8500	0.8500	0.8600	0.8600
8	0.8600	0.8600	0.8700	0.8700	0.8700
8	0.8800	0.8800	0.8800	0.8900	0.8900
8	0.8900	0.8900	0.8900	0.8900	0.9000
8	0.9000	0.9000	0.9000	0.9000	0.9100
8	0.9100	0.9100	0.9100	0.9100	0.9100
8	0.9200	0.9200	0.9200	0.9200	0.9200
8	0.9200	0.9200	0.9200	0.9300	0.9300
9 ENDTBL					

STRUCTURE NO. 1

	ELEVATION	DISCHARGE	STORAGE
8	758.0001	0.0000	150.0000
9 ENDTBL			

DIMENSIONLESS HYDROGRAPH - DELTA T =484.00

8	0.0000	0.0300	0.1000	0.1900	0.3100
8	0.4700	0.6600	0.8200	0.9300	0.9900
8	1.0000	0.9900	0.9300	0.8600	0.7800
8	0.6800	0.5600	0.4600	0.3900	0.3300
8	0.2800	0.2410	0.2070	0.1740	0.1470
8	0.1260	0.1070	0.0910	0.0770	0.0660
8	0.0550	0.0470	0.0400	0.0340	0.0290
8	0.0250	0.0210	0.0180	0.0150	0.0130
8	0.0110	0.0090	0.0080	0.0070	0.0060
8	0.0050	0.0040	0.0030	0.0020	0.0010
8	0.0000	0.0000	0.0000	0.0000	0.0000
9 ENDTBL					

RAINFALL TABLE NO. 1 TIME INCREMENT = 0.50

8	0.0000	0.0080	0.0170	0.0260	0.0350
8	0.0450	0.0550	0.0650	0.0760	0.0870
8	0.0990	0.1120	0.1250	0.1400	0.1560
8	0.1740	0.1960	0.2190	0.2540	0.3030
8	0.5150	0.5830	0.6240	0.6540	0.6820
8	0.7050	0.7270	0.7460	0.7670	0.7840
8	0.8000	0.8160	0.8300	0.8440	0.8570
8	0.8700	0.8820	0.8930	0.9050	0.9160
8	0.9260	0.9360	0.9460	0.9550	0.9650
8	0.9740	0.9830	0.9920	1.0000	1.0000
9 ENDTBL					

RAINFALL TABLE NO. 2 TIME INCREMENT = 0.02

8	0.0000	0.0100	0.0200	0.0300	0.0500
8	0.0400	0.0500	0.0600	0.0700	0.0800
8	0.1000	0.1100	0.1300	0.1400	0.1700
8	0.1900	0.2200	0.2700	0.3500	0.4400
8	0.5200	0.6000	0.6300	0.6500	0.6700
8	0.7000	0.7200	0.7400	0.7600	0.7700
8	0.7900	0.8000	0.8200	0.8300	0.8400
8	0.8500	0.8700	0.8800	0.8900	0.9000
8	0.9100	0.9200	0.9300	0.9400	0.9500
8	0.9567	0.9633	0.9700	0.9800	0.9900
8	1.0000	1.0000	1.0000	1.0000	1.0000
9 ENDTBL					

RAINFALL TABLE NO. 3 TIME INCREMENT = 0.50

8	0.0000	0.0700	0.1400	0.2100	0.2800

8	0.3600	0.4400	0.5100	0.5900	0.6600
8	0.7400	0.8100	0.8900	1.2900	1.6700
8	2.0600	2.4500	2.8400	3.2300	3.6200
8	4.0200	4.4100	4.8100	5.2000	5.6000
8	6.8600	8.1300	9.6500	11.1700	13.0700
8	14.9700	19.7700	24.5800	26.3500	28.1200
8	29.5300	30.9000	31.0100	31.1300	31.2400
8	31.3600	31.4700	31.5400	31.6400	31.8000
8	31.9100	32.0200	32.1300	32.2400	32.2400
9 ENDTBL					

RAINFALL TABLE NO. 4 TIME INCREMENT = 0.50 100-Yr.

8	0.0000	0.0300	0.0600	0.0900	0.1200
8	0.1500	0.1800	0.2100	0.2400	0.2700
8	0.3000	0.3300	0.3600	0.4400	0.5200
8	0.6000	0.6800	0.7600	0.8500	0.9300
8	1.0200	1.1000	1.1900	1.2700	1.3600
8	1.6400	1.9300	2.2700	2.6100	3.0300
8	3.4600	4.5400	5.6300	6.0300	6.4300
8	6.7400	7.0600	7.1000	7.1500	7.1900
8	7.2400	7.2800	7.3300	7.3700	7.4200
8	7.4600	7.5100	7.5500	7.6000	7.6000
9 ENDTBL					

STANDARD CONTROL INSTRUCTIONS

SUBRTN	XSECTN	STRCT	HYDROGRAPHS IN1	IN2	OUT	DATA NO. 1	DATA NO. 2	DATA NO. 3	OUTPUT OPTIONS PK	H	C	V	PH	SM
RUNOFF	0	1	0	0	6	0.520	70.000	0.340	1	1	0	1	0	0
RESVOR	0	1	6	0	7	758.000	0.000	0.000	1	1	1	1	0	0
ENDATA														

END OF LISTING

ADDITIONS TO TABULAR DATA FOLLOW

STRUCTURE NO. 1

8	758.0001	0.0000	150.0000
8	758.4000	9.4000	156.0000
8	758.8000	27.0000	163.0000
8	759.2000	49.0000	170.0000
8	759.4000	54.0000	179.0000
8	760.0001	55.0000	185.0000
8	760.5001	56.0000	195.0000
8	760.7000	73.0000	198.0000
8	761.0001	99.0000	205.0000
8	761.5001	194.0000	216.0000
8	762.0001	340.0000	227.0000
8	763.0001	744.0001	252.0000
8	763.4000	960.0001	263.0000
8	764.1000	1361.0002	280.0000
8	764.5001	1668.0002	292.0000
8	764.7000	1862.0002	297.0000
8	765.0001	2319.0004	304.0000
8	765.5001	3631.0004	318.0000
8	766.0001	5209.0009	332.0000

EXECUTIVE CONTROL CARD OPERATION INCREM. MAIN TIME INCREMENT= 0.25
EXECUTIVE CONTROL CARD OPERATION COMPUT. FROM XSECTN/STRUCT 0/ 1 TO XSECTN/STRUCT 0/ 1
STARTING TIME= 0.00 RAIN DEPTH= 1.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 3 SOIL CONDITION= 3
ALTERNATE NO.= 1 STORM NO.= 1

PMF

SUBROUTINE RUNOFF STRUCTURE 1
AREA= 0.52 INPUT RUNOFF CURVE= 70.0 TIME OF CONCENTRATION= 0.34
COMPUTED CURVE NO. = 85.0

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
10.10	237.406	(RUNOFF)
11.06	244.721	(RUNOFF)
15.87	3313.734	(RUNOFF)
19.99	79.662	(RUNOFF)
23.62	73.587	(RUNOFF)

HYDROGRAPH, TZERO= 2.75 DELTA T= 0.25 DRAINAGE AREA= 0.52

TIME											
2.75	DISCHG	0.00	2.59	4.31	5.75	7.04	8.98	10.93	11.70	13.60	15.49
5.25	DISCHG	16.22	16.46	18.59	20.81	70.55	122.03	145.89	161.95	174.57	184.54
7.75	DISCHG	193.04	200.19	206.28	211.50	216.02	219.95	223.40	226.43	252.17	236.26
10.25	DISCHG	236.55	236.17	240.59	244.53	248.27	248.21	246.11	251.14	530.82	753.56
12.75	DISCHG	801.72	816.67	905.76	975.32	990.87	997.26	1147.71	1231.07	1241.69	1209.09
15.25	DISCHG	2247.64	3027.23	3172.97	3190.54	2167.62	1354.24	1210.73	1183.82	1092.03	950.77
17.75	DISCHG	932.79	926.39	488.72	146.55	84.84	80.76	78.78	74.16	77.03	79.56
20.25	DISCHG	76.72	74.12	73.65	73.57	73.56	73.56	73.56	73.56	73.57	73.57
22.75	DISCHG	73.57	73.57	73.57	73.57	73.57	73.22	59.67	6.28	1.02	0.09
25.25	DISCHG	0.00									

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 30.1946 CFS-HRS= 10145.07 ACRE-FT= 837.59

SUBROUTINE RESVOR STRUCTURE 1
SURFACE ELEVATION= 758.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
15.93	3202.562	765.35

HYDROGRAPH, TZERO= 2.75 DELTA T= 0.25 DRAINAGE AREA= 0.52

TIME											
2.75	DISCHG	0.00	0.04	0.15	0.40	0.51	0.78	1.08	1.41	1.77	2.19
2.75	ELEV	758.00	758.00	758.00	758.01	758.02	758.03	758.04	758.06	758.07	758.09
5.25	DISCHG	2.63	3.07	3.54	4.04	5.37	7.26	15.96	21.05	28.96	38.33
5.25	ELEV	758.11	758.13	758.15	758.17	758.22	758.35	758.50	758.66	758.93	759.00
7.75	DISCHG	47.79	50.48	52.22	54.00	54.55	55.06	55.41	55.76	62.47	70.68
7.75	ELEV	759.17	759.25	759.32	759.40	759.73	760.03	760.20	760.38	760.57	760.76
10.25	DISCHG	90.36	103.77	125.82	144.35	161.16	174.52	185.93	197.24	243.37	340.80
10.25	ELEV	760.90	761.02	761.14	761.24	761.52	761.39	761.45	761.51	761.67	762.00
12.75	DISCHG	465.21	563.63	640.76	732.26	819.76	879.24	950.59	1029.34	1112.43	1170.41
12.75	ELEV	762.30	762.55	762.76	762.97	763.13	763.24	763.35	763.56	763.66	763.76
15.25	DISCHG	1403.47	2079.80	3022.67	3179.17	2607.18	1484.14	1354.74	1210.52	1202.75	1163.58
15.25	ELEV	764.15	764.43	765.26	765.32	765.14	764.70	764.36	764.15	763.99	763.75

17.75	DISCHG	1085.79	1024.58	908.65	714.57	543.79	412.46	320.59	261.47	216.65	186.73
17.75	ELEV	763.61	763.51	763.30	762.92	762.50	762.17	761.93	761.75	761.57	761.46
20.25	DISCHG	168.95	153.63	140.56	129.59	120.42	112.74	106.32	100.96	97.85	96.06
20.25	ELEV	761.36	761.28	761.21	761.16	761.11	761.07	761.03	761.01	760.98	760.96
22.75	DISCHG	94.40	92.86	91.43	90.11	88.89	87.74	85.28	80.54	74.85	67.55
22.75	ELEV	760.94	760.92	760.91	760.89	760.88	760.87	760.84	760.78	760.72	760.63
25.25	DISCHG	60.08	55.95	55.83	55.72	55.60	55.49	55.37	55.26	55.14	55.03
25.25	ELEV	760.54	760.47	760.41	760.36	760.30	760.24	760.18	760.13	760.07	760.01

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 28.8619 CFS-HRS= 9685.83 ACRE-FT= 800.43

ENDCMP 1

EXECUTIVE CONTROL CARD OPERATION COMPUT. FROM XSECTN/STRUCT 0/ 1 TO XSECTN/STRUCT 0/ 1
STARTING TIME= 0.00 RAIN DEPTH= 0.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 3 SOIL CONDITION= 3
ALTERNATE NO.= 1 STORM NO.= 4

SUBROUTINE RUNOFF STRUCTURE 1
AREA= 0.52 INPUT RUNOFF CURVE= 70.0 TIME OF CONCENTRATION= 0.34
COMPUTED CURVE NO. = 85.0

0.5 PMF

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
15.88	1629.715	(RUNOFF)
19.99	39.541	(RUNOFF)
23.62	36.569	(RUNOFF)

HYDROGRAPH, TZERO= 5.50 DELTA T= 0.25 DRAINAGE AREA= 0.52

TIME											
5.50	DISCHG	0.00	1.40	2.01	9.88	22.58	32.87	41.66	49.28	55.96	61.85
8.00	DISCHG	67.06	71.71	75.87	79.60	82.97	86.01	88.78	92.52	95.82	98.92
10.50	DISCHG	97.92	100.83	103.50	103.90	104.30	106.79	109.74	234.65	337.43	363.75
13.00	DISCHG	374.82	420.09	456.42	467.28	473.38	530.53	590.38	603.65	614.48	1093.74
15.50	DISCHG	1480.11	1557.85	1571.59	1069.76	669.20	598.84	585.93	520.97	471.05	462.32
18.00	DISCHG	459.32	242.36	72.68	44.07	40.06	38.05	36.79	38.24	39.52	38.06
20.50	DISCHG	36.77	36.54	36.50	36.50	36.50	36.50	36.50	36.50	36.50	36.50
23.00	DISCHG	36.50	36.50	36.51	36.51	36.33	17.70	3.11	0.50	0.04	0.00

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 14.1623 CFS-HRS= 4752.78 ACRE-FT= 392.77

SUBROUTINE RESVOR STRUCTURE 1
SURFACE ELEVATION= 758.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
16.15	1292.359	763.98

HYDROGRAPH, TZERO= 5.50 DELTA T= 0.25 DRAINAGE AREA= 0.52

TIME											
5.50	DISCHG	0.00	0.02	0.07	0.26	0.77	1.63	2.76	4.12	5.67	7.36
5.50	ELEV	758.00	758.00	758.00	758.01	758.03	758.06	758.11	758.17	758.24	758.31
8.00	DISCHG	9.18	12.10	15.23	18.39	21.58	24.76	28.16	32.09	35.99	39.79
8.00	ELEV	758.39	758.46	758.53	758.60	758.67	758.74	758.82	758.89	758.96	759.03
10.50	DISCHG	43.42	46.93	49.25	49.87	50.49	51.12	51.77	53.15	54.54	55.53
10.50	ELEV	759.09	759.16	759.21	759.23	759.25	759.28	759.31	759.36	759.72	760.16
13.00	DISCHG	55.98	86.36	128.65	183.23	247.39	309.74	377.07	440.08	488.43	593.06
13.00	ELEV	760.49	760.85	761.15	761.44	761.68	761.89	762.09	762.24	762.36	762.62
15.50	DISCHG	800.10	1055.93	1255.31	1280.92	1119.69	933.64	818.53	731.38	664.04	607.57
15.50	ELEV	763.10	763.56	763.91	763.96	763.67	763.35	763.13	762.96	762.80	762.66
18.00	DISCHG	565.58	504.14	404.96	311.17	246.27	196.30	169.53	147.90	130.04	115.09
18.00	ELEV	762.55	762.40	762.16	761.90	761.67	761.50	761.37	761.25	761.16	761.08
20.50	DISCHG	102.37	95.66	91.29	87.24	83.49	80.02	76.80	73.82	70.10	66.39
20.50	ELEV	761.01	760.96	760.91	760.86	760.82	760.78	760.74	760.70	760.66	760.62
23.00	DISCHG	63.08	60.14	57.53	55.98	55.94	55.88	55.79	55.67	55.56	55.45
23.00	ELEV	760.58	760.54	760.51	760.49	760.47	760.44	760.39	760.33	760.28	760.22
25.50	DISCHG	55.33	55.22	55.10	54.99	54.80	54.61	54.42	54.24	54.05	54.55
25.50	ELEV	760.16	760.11	760.05	759.99	759.88	759.76	759.65	759.54	759.43	759.38
28.00	DISCHG	52.94	52.34	51.74	51.15	50.56	49.99	49.42	48.21	45.17	42.33
28.00	ELEV	759.35	759.33	759.30	759.28	759.26	759.23	759.21	759.18	759.13	759.07

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 13.5221 CFS-HRS= 4547.91 ACRE-FT= 375.01

ENDCMP 1

EXECUTIVE CONTROL CARD OPERATION COMPUT. FROM XSECTN/STRUCT 0/ 1 TO XSECTN/STRUCT 0/ 1
STARTING TIME= 0.00 RAIN DEPTH= 1.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 4 SOIL CONDITION= 3
ALTERNATE NO.= 1 STORM NO.= 1

SUBROUTINE RUNOFF STRUCTURE 1
AREA= 0.52 INPUT RUNOFF CURVE= 70.0 TIME OF CONCENTRATION= 0.54
COMPUTED CURVE NO. = 85.0

100-yr.

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
10.10	27.193	(RUNOFF)
11.06	31.320	(RUNOFF)
15.89	693.325	(RUNOFF)
17.87	214.532	(RUNOFF)
18.89	32.064	(RUNOFF)
19.99	31.594	(RUNOFF)
20.99	31.605	(RUNOFF)
21.99	31.619	(RUNOFF)
22.99	31.648	(RUNOFF)
23.90	32.828	(RUNOFF)

HYDROGRAPH, TZERO= 6.25 DELTA T= 0.25 DRAINAGE AREA= 0.52

TIME											
6.25	DISCHG	0.00	2.60	4.72	6.76	8.69	10.50	12.20	13.80	15.32	16.75
8.75	DISCHG	19.33	21.75	22.03	22.21	24.66	26.99	26.74	26.48	28.91	31.21
11.25	DISCHG	30.54	29.96	32.39	34.89	76.03	111.94	145.60	134.17	152.43	167.82
13.75	DISCHG	174.76	179.83	206.31	228.56	239.09	240.37	447.57	613.77	656.96	671.84
16.25	DISCHG	460.15	288.77	259.14	254.13	225.05	202.22	202.66	203.75	112.62	40.99
18.75	DISCHG	31.45	31.78	28.70	26.27	29.09	31.57	28.74	26.29	29.12	31.58
21.25	DISCHG	28.77	26.29	29.14	31.60	28.80	26.30	29.17	31.63	28.81	26.35
23.75	DISCHG	29.19	31.54	15.54	2.74	0.44	0.04	0.00			

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 5.8254 CFS-HRS= 1954.98 ACRE-FT= 161.56

SUBROUTINE RESVOR STRUCTURE 1
SURFACE ELEVATION= 758.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
16.42	359.663	762.04

HYDROGRAPH, TZERO= 6.25 DELTA T= 0.25 DRAINAGE AREA= 0.52

TIME											
6.25	DISCHG	0.00	0.04	0.15	0.33	0.57	0.85	1.19	1.56	1.98	2.42
6.25	ELEV	758.00	758.00	758.00	758.01	758.02	758.03	758.05	758.06	758.08	758.10
8.75	DISCHG	2.92	3.48	4.07	4.64	5.24	5.90	6.57	7.21	7.86	8.57
8.75	ELEV	758.12	758.14	758.17	758.19	758.22	758.25	758.27	758.30	758.33	758.36
11.25	DISCHG	9.28	10.27	11.33	12.46	14.63	18.65	23.72	29.61	36.76	44.52
11.25	ELEV	758.39	758.41	758.44	758.46	758.51	758.61	758.72	758.84	758.97	759.11
13.75	DISCHG	49.63	51.09	52.71	54.17	54.79	55.26	55.87	92.13	172.76	281.30
13.75	ELEV	759.22	759.28	759.34	759.50	759.87	760.13	760.43	760.92	761.58	761.79
16.25	DISCHG	351.82	358.29	335.06	316.16	297.69	277.47	259.38	245.78	224.65	190.60
16.25	ELEV	762.02	762.04	761.98	761.91	761.85	761.78	761.72	761.67	761.60	761.48
18.75	DISCHG	165.31	143.41	124.87	108.91	97.47	92.50	87.20	83.43	79.31	75.69
18.75	ELEV	761.34	761.23	761.13	761.05	760.98	760.92	760.87	760.82	760.77	760.73
21.25	DISCHG	72.00	67.08	62.73	59.15	55.99	55.94	55.88	55.82	55.77	55.71
21.25	ELEV	760.68	760.63	760.57	760.53	760.49	760.47	760.44	760.41	760.38	760.35
23.75	DISCHG	55.66	55.60	55.54	55.44	55.33	55.22	55.10	54.99	54.80	54.61
23.75	ELEV	760.33	760.30	760.27	760.22	760.16	760.11	760.05	759.99	759.88	759.76
26.25	DISCHG	54.42	54.23	54.05	53.55	52.94	52.33	51.74	51.15	50.56	49.98
26.25	ELEV	759.65	759.54	759.43	759.38	759.35	759.33	759.30	759.28	759.26	759.23
28.75	DISCHG	49.41	48.20	45.17	42.33	39.66	37.17	34.83	32.64	30.59	28.66
28.75	ELEV	759.21	759.18	759.13	759.07	759.03	758.98	758.94	758.90	758.86	758.83

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 5.3354 CFS-HRS= 1790.53 ACRE-FT= 147.96

ENDCMP 1

7 OF 12

END OF JOB TR20 663

BATCH JOB

HOSKINS-WESTERN-SONDEREGGER

COMPUTED BY SEV DATE 10-10-83 SHEET NO. 1 OF 3

CHECKED BY _____ DATE _____ JOB NUMBER 83.3005

CALCULATIONS FOR PROJECT Mo Dam Eros

Principal Spillway Drop Inlet

Eating - Weir SCS-C21 #10234

See sheet 8 of 16 SCS Plans $Q = CLH^{3/2}$

L = Length of weir = 6' x 2 = 12 ft

C = 3.1 SCS standard for this type

L x C = 12 x 3.1 = 37.2

Elev.	H	Q	
758.0	—	0	Crest elev. on plans
758.2	.2	3.3	
758.4	.4	9.4	
758.6	.6	17	
758.8	.8	27	
759.0	1.0	37	
759.2	1.2	49	
759.4	1.4	62	
759.6	1.6	75	
759.8	1.8	90	
760.0	2.0	105	

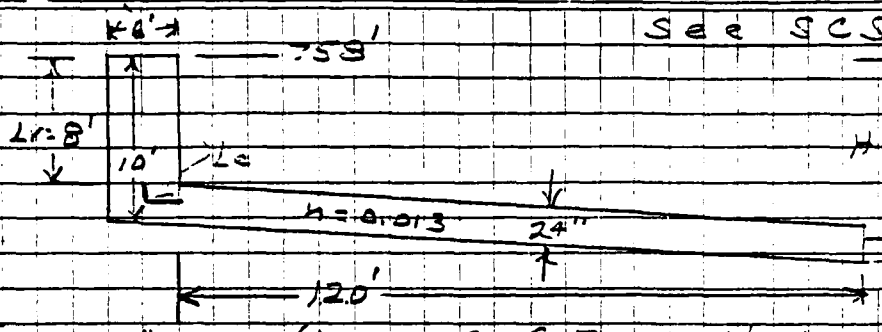
OSKINS-WESTERN-SONDEREGGER

COMPUTED BY GGV DATE 10/3/75 SHEET NO. 2 OF 3
CHECKED BY _____ DATE _____ JOB NUMBER 75305
PROJECT _____

CALCULATIONS FOR

P.S. Drop Inlet Rating - Conduit SCS-21 #10284

See SCS Plans



From Appendix D-C of Engr. Hydr. Chart of Reser. Outlet works

General Equation $Q = A\sqrt{\frac{2gh}{1+\Sigma K}}$

where $1+\Sigma K = 1+K_o+K_b+\left[\left(\frac{2A_c}{A_r+A_e}\right)^2 L_r + \left(\frac{2A_c}{A_e+A_c}\right)^2 L_e + L_c\right] K_e$

A_c = Area of conduit = $\pi r^2 = \pi(1.0)^2 = 3.14$ sq ft
A_r = Area of riser = w x b = 2 x 6 = 12 sq ft
A_e = A_r
$L_r = 8'$ $L_c = 120'$ $L_e = \frac{6}{2} + \frac{3}{2} = 3+1 = 4$

From Engr. H.B. Sec. 5

$K_o = 0.5$ K_b (90°) $= 1.0$ $K_e = .0124$

$1+\Sigma K = 1.0+0.5+1.0+\left[\left(\frac{2\times3.14}{12+12}\right)^2 \times 8 + \left(\frac{2\times3.14}{12+3.14}\right)^2 \times 4 + 120\right] .0124$

$= 2.5 + \left[.548 + .638 + 120\right] .0124$

$= 2.5 + \left[121.236\right] .0124$

$= 2.5 + 1.503 = 4.0$

$Q_c = A_c\sqrt{\frac{2g}{1+\Sigma K}}\sqrt{h}$

$= 3.14\sqrt{\frac{64.32}{4.0}}\sqrt{h}$

$= 12.59\sqrt{h}$

HOSKINS-WESTERN-SONDEREGGER

CALCULATIONS FOR

COMPUTED BY GGJ DATE 10/01/73 SHEET NO. 3 OF 3

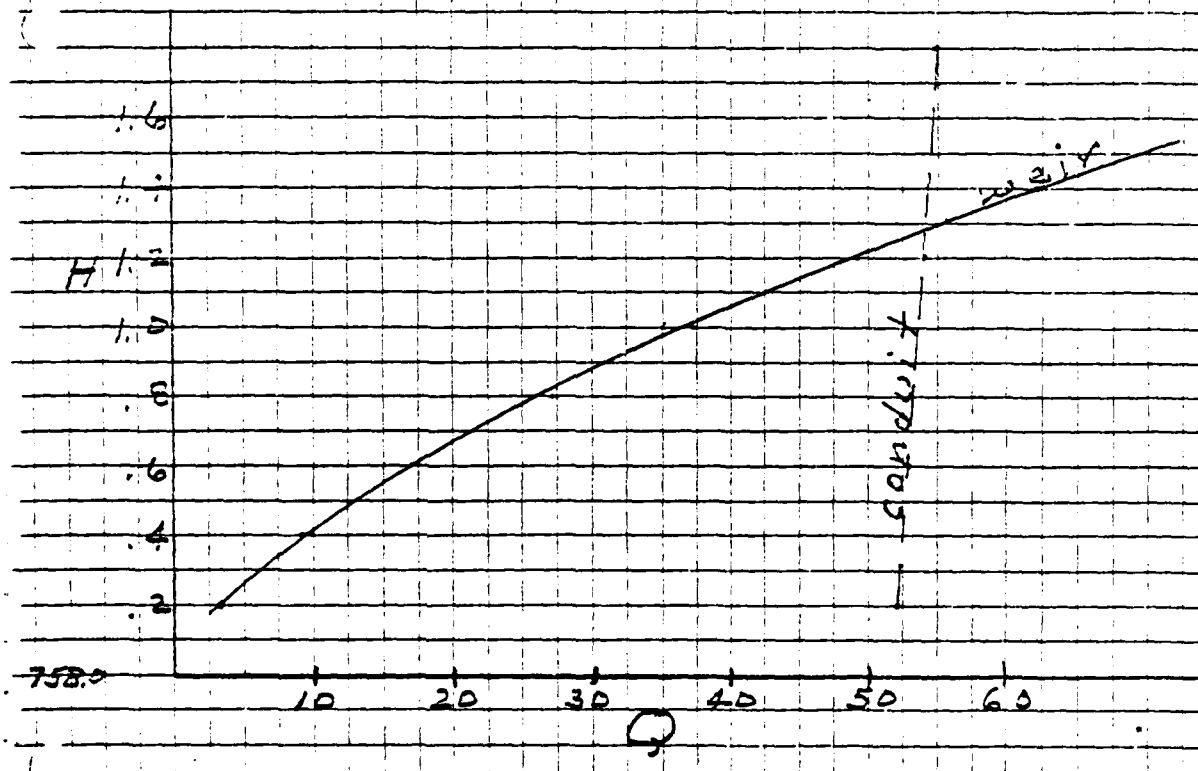
CHECKED BY _____ DATE _____ JOB NUMBER 73300

PROJECT _____

C Conduit Rating Cont'd. SCS-21 = 1029

$Q_c = 12.59\sqrt{h}$

Elev	h (+17.0')	Q
758.0	—	0 Crest Elev.
.2	.2	52
.4	.4	52
.6	.6	53
.8	.8	53
759.0	1.0	53
.2	1.2	54
.4	1.4	54
.6	1.6	54
.8	1.8	55
760.0	2.0	55



HK JKINS-WESTERN-SONDEREGGER

CALCULATIONS FOR

COMPUTED BY ESJ DATE 10-11-78 SHEET NO. 3 OF 3
CHECKED BY _____ DATE _____ JOB NUMBER 3300
PROJECT Mo Dam Emb

Flow over Dam Embank LaFayette Co - C-21

See Turk, Bk 3, Chap 4-5 Q = 26 cfs

Sta	Dist	Ground El	Top of Dam El	H20 ft	Velocity fps	Manning n	D	Q
0		765.5	763.4	2.1				
	20				1.75	<.15	2.96	137
0+20			764.1	1.4				
	80				1.20		2.87	302
1+00			764.5	1.0				
	100				.9		2.80	239
2+00			764.7	.8				
	100				.8		2.78	199
3+00			764.7	.8				
	100				.85		2.79	219
4+00			764.6	.9				
	65				.90		2.80	155
4+65			764.6	.9				
	13				.45		2.67	10
4+78		765.5	765.5	0				
								1261
0		766.0	763.4	2.6				
	20				2.25	<.15	3.00	202
0+20			764.1	1.9				
	80				1.7		2.95	523
1+00			764.5	1.5				
	100				1.4		2.91	482
2+00			764.7	1.3				
	100				1.3		2.89	428
3+00			764.7	1.3				
	100				1.35		2.90	455
4+00			764.6	1.4				
	65				1.4		2.91	313
4+65			764.6	1.4				
	21				.7		2.74	34
4+86		766.0	766.0	0				
								2437

OSKINS-WESTERN-SONDEREGGER

CALCULATIONS FOR

COMPUTED BY SS DATE 3-14-7 SHEET NO. ____ OF ____

CHECKED BY ____ DATE ____ JOB NUMBER 78/3097

PROJECT ____

Total Rating LaFayette-C-21

Elev	H	Weir	Cond.	Em. S.	Embank	Total
758.0	0	0	0	0		0
.2	.2	3.3				
.4	.4	9.4		9.4		9.4
.6	.6	17				
.8	.8	27		27		27
759.0	1.0	37				
.2	1.2	49	~~54~~	49		49
.4	1.4	~~62~~	54	54		54
.6	1.6		54			
.8	1.8		55			
760.0	2.0		55	55		55
760.5	2.5		56	56		56
760.7	2.7		56	73		73
761.0	3.0		56	99		99
761.5	3.5		57	194		194
762	4.0		58	340		340
763	5.0		59	744		744
763.4	0.8 Crest		60	960		960
~~763.6~~	~~5.6~~		~~60~~			
764.1	6.1		61	1350	11	1361
764.5	6.5		61	1614	54	1668
764.7	6.7		61	1760	122	1882
765.0	7.0		62	1979	340	2319
765.5	7.5		62	2370	1261	3631
766.0	8.0		63	2772	2437	5209
766.5	8.5		64			
767.0	9.0		64			
768.0	10.		65			

X Includes P.S. Flow (From Comp. Run)


DAT
FILM