KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 1937-2

Memorandum to the District Engineer
Inspection of Failure of Wyandotte County Dam

by

Irving Crosby

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KGS
OF
37-2

Marshall Creek Dam, Kansas.

W. O. Crosby ?
more likely Irving Crosby
(W.O.C.'s son) c
1905, Sq.

September 21, 1937.

MEMORANDUM TO THE DISTRICT ENGINEER

Subject: Inspection of failure of Wyandotte County Dam.

1. Subsequent to the failure of the Wyandotte County Dam, an inspection was made of the structure on September 20, 1937 pursuant to your instructions and at the request of Mr. LeRoy Arnold, County Engineer of Wyandotte County, Kansas, by Captain Jos. J. Twitty, Corps of Engineers, Mr. G. A. Hathaway, Principal Engineer of the Division Engineer's Office, and Mr. D. H. McCoskey, Engineer. The inspection began at 10:30 a.m. and lasted about an hour. There are submitted herewith six photographs showing the extent of the failure, together with an aerial photograph obtained from the T.W.A., and a plan and cross-section of the dam.

2. The entire central portion of the dam, from Station 4+00 to Station 11+00 on the center line moved out downstream. There was no perceptible movement of the upstream shell of the dam. The failure occurred at 9:20 p.m. Sunday, September 19, 1937. There has been no report of any casualties or injuries due to the failure.

3. The Missouri Pacific Railroad tracks which parallel the dam approximately 180 feet below the downstream toe, were apparently not disturbed.

4. The earth work on the center line of the dam was at approximately elevation 830 at the time of the failure. There was little water in the reservoir above the dam, the water surface elevation being at approximately elevation 765. The geological cross-sections on the center line of the dam shows a layer of soft blue clay from Station 4+00 to Station 10+00. This clay is located roughly between elevations 730 and 750, being approximately 100 feet below the projected top elevation of the dam (elevation 838).

5. The location of the sliding plane on which the failure took place is a matter of conjecture at present. It would appear that the failure occurred just downstream from the line of the sheet piling cut-off wall, which extends through the center of the dam. It is probably that the weight of rock and earth on the downstream half of the dam overloaded the soft blue clay stratum and caused this material to flow. The entire downstream portion of the dam apparently slid toward the railroad tracks. The material forming the downstream part of the dam from the center line to below the berm at elevation 806 suffered a vertical displacement. The point at which the displacement changed from a downward and lateral movement to an upheaval could not be determined without surveys.

6. No definite plans had been made by any agency for securing the essential engineering information on the extent and character of the sliding,

the plane of failure, and possible remedial measures. If it is desired to make a separate departmental report, it would appear that the County or Works Progress Administration should make surveys or request the District Engineer to outline them. It is believed however, that if the work which the County or the Works Progress Administration lays out is not sufficient in scope to determine accurately the conditions which caused the failure and the proper provisions which should have been made to obtain a stable structure, an additional investigation should be made by this office as a criterion for the design of dams on similar material.

7. The science of soil mechanics is still in somewhat of a developmental stage. The results of shear and consolidation analysis on foundation materials are applicable only to the materials where the samples were taken. Due to the lack of homogeneousness in soils, a liberal factor of safety should be applied to the results of laboratory analysis. The failure of this dam should supply an excellent comparison of actual foundation failure with predictions based on the results of laboratory analysis. It is recommended that the following information be obtained:

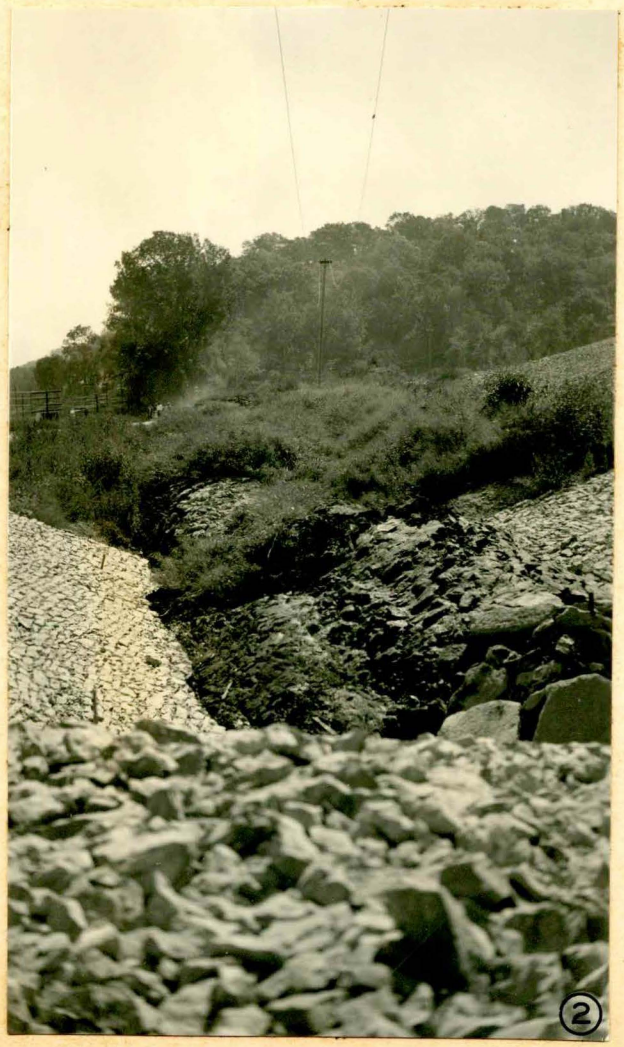
a. A detailed topographic survey (scale 1" - 50 feet) of the entire downstream section of the dam.

b. Core and auger borings with drive samples of material supplemented by shaft and trench excavation to determine the character of material and the location of the sliding plane.

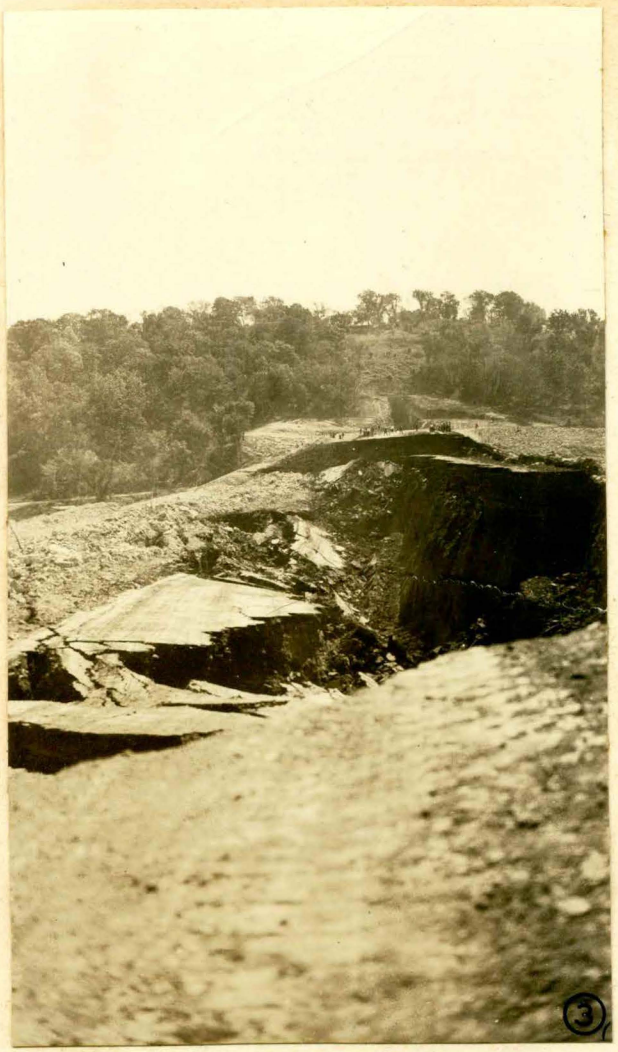
c. A thorough analysis of all material and a report thereon.

8. No remedial measures or future construction plans should be made until the above investigations have been completed. It should be noted however, that a hazard exists in the structure as it now stands. The spillway crest is about at the level of the intact portion of the dam, but it would pass no appreciable quantity of water without the dam being overtopped. The standing portion of the dam would probably store a considerable quantity of water before further failure occurred. A rain similar to that over the Marais des Cygnes Basin in November 1928 occurring above the Marshall Creek Reservoir area would probably be stored and released suddenly with disastrous results to the railroad and the bottom lands. It is believed that a trench should be excavated through the dam in the immediate future to relieve this hazard.

Taken from the Missouri Pacific Railroad embankment showing the downstream face of the dam and the material pushed out on the old creek bank by the slide.



Taken from near the head wall of the spillway outlet, looking down along the spillway outlet channel, showing the earth pushed up by the slide.

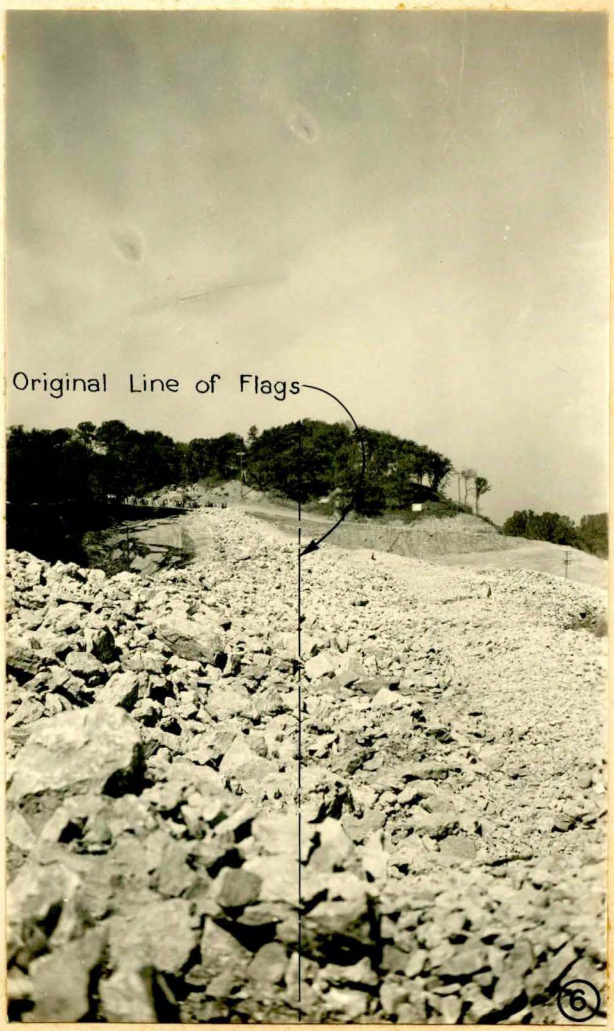


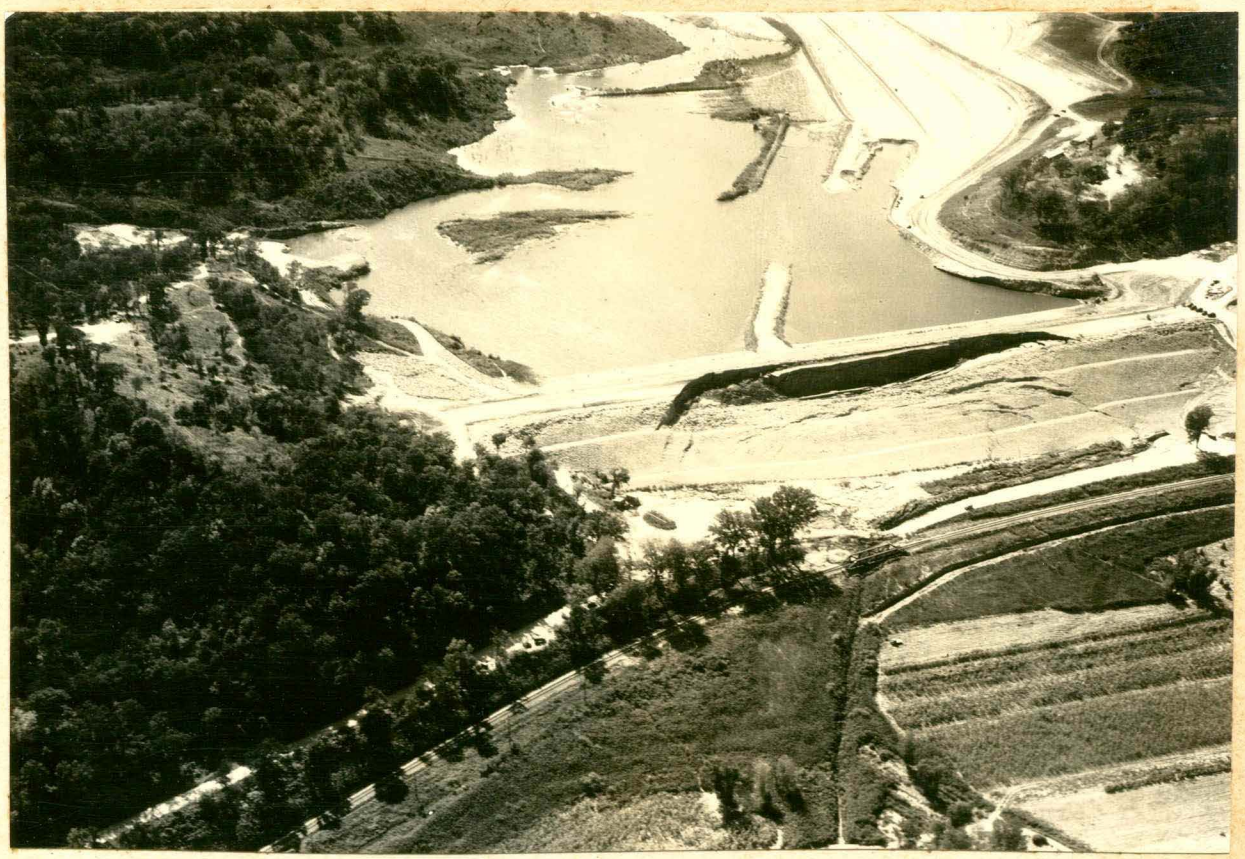
Looking east along the center line of the dam from Station 11, showing the depth of the fissure left by the movement of the down-stream section of the dam.

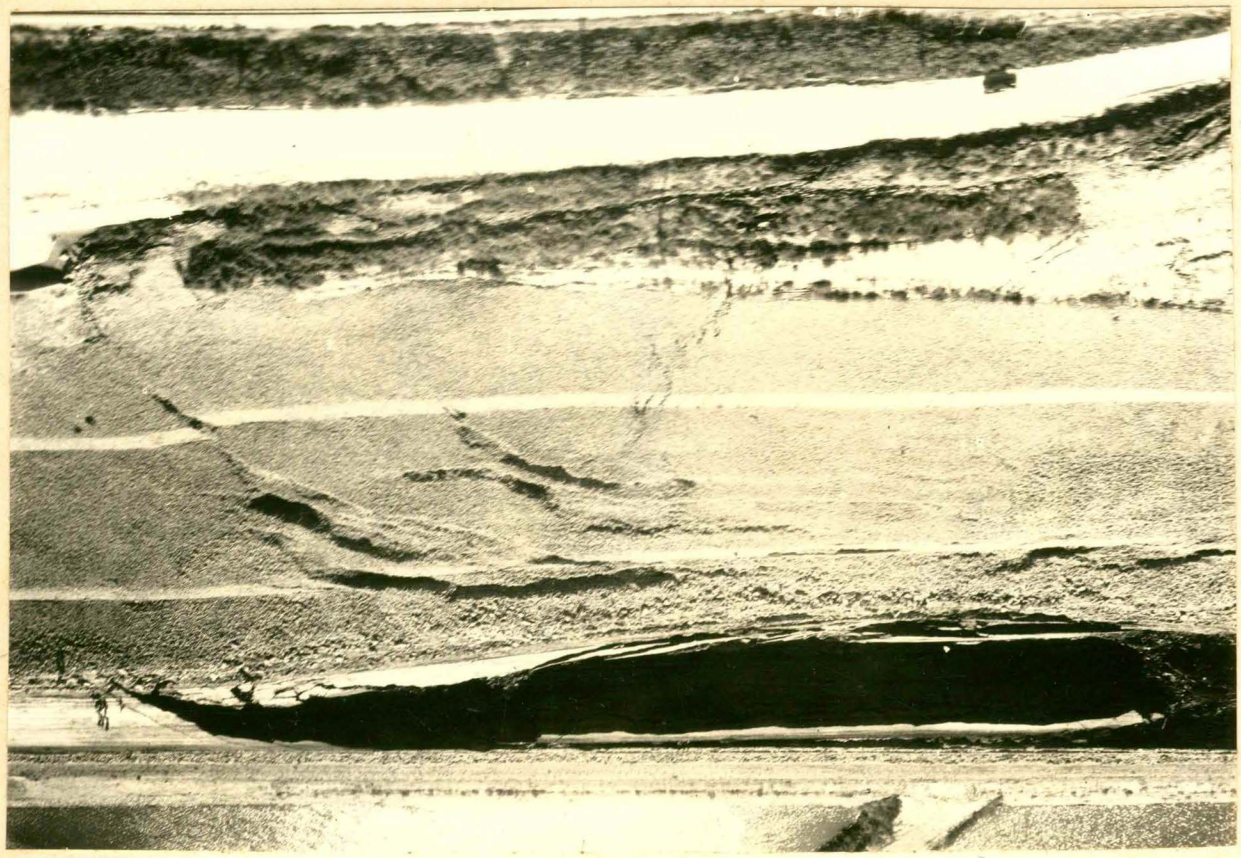
Taken from below the crest of the dam, looking west showing the fissure left by the slide.

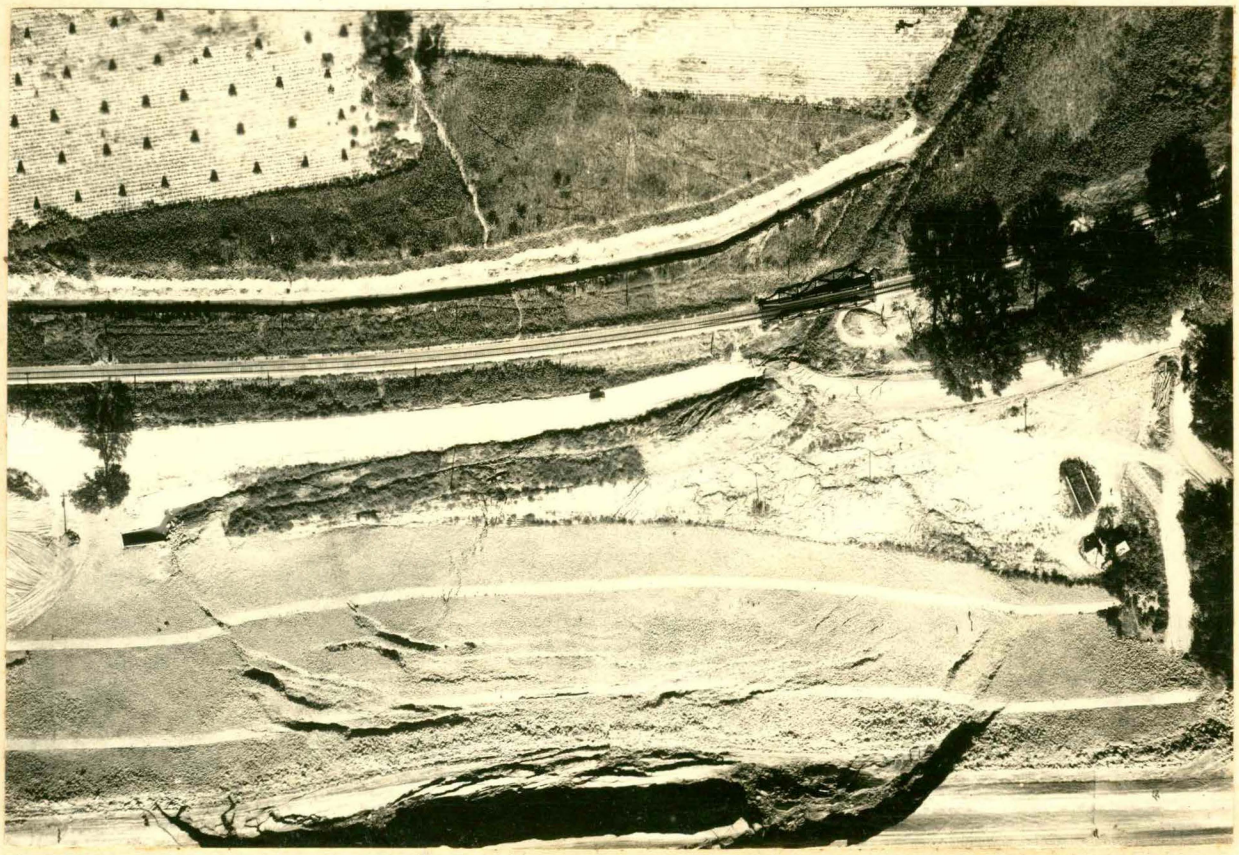
Taken from approximately station 4 on center line looking west, showing the cleavage between the upstream face and a portion of the crest of the dam.

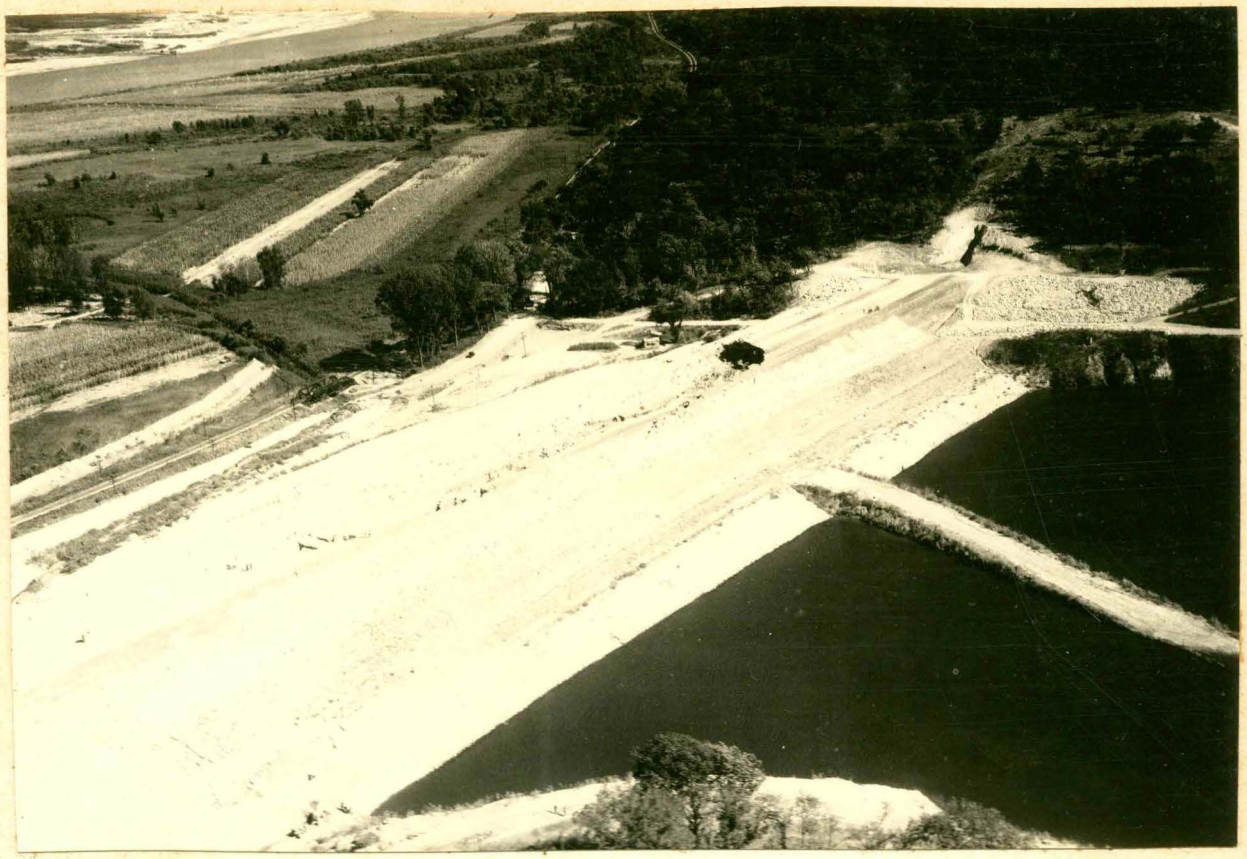
Looking west along the line of the first berm below the top of the dam, showing the lateral displacement of the berm flags which were, previous to the failure, on the line indicated in ink on the photograph.

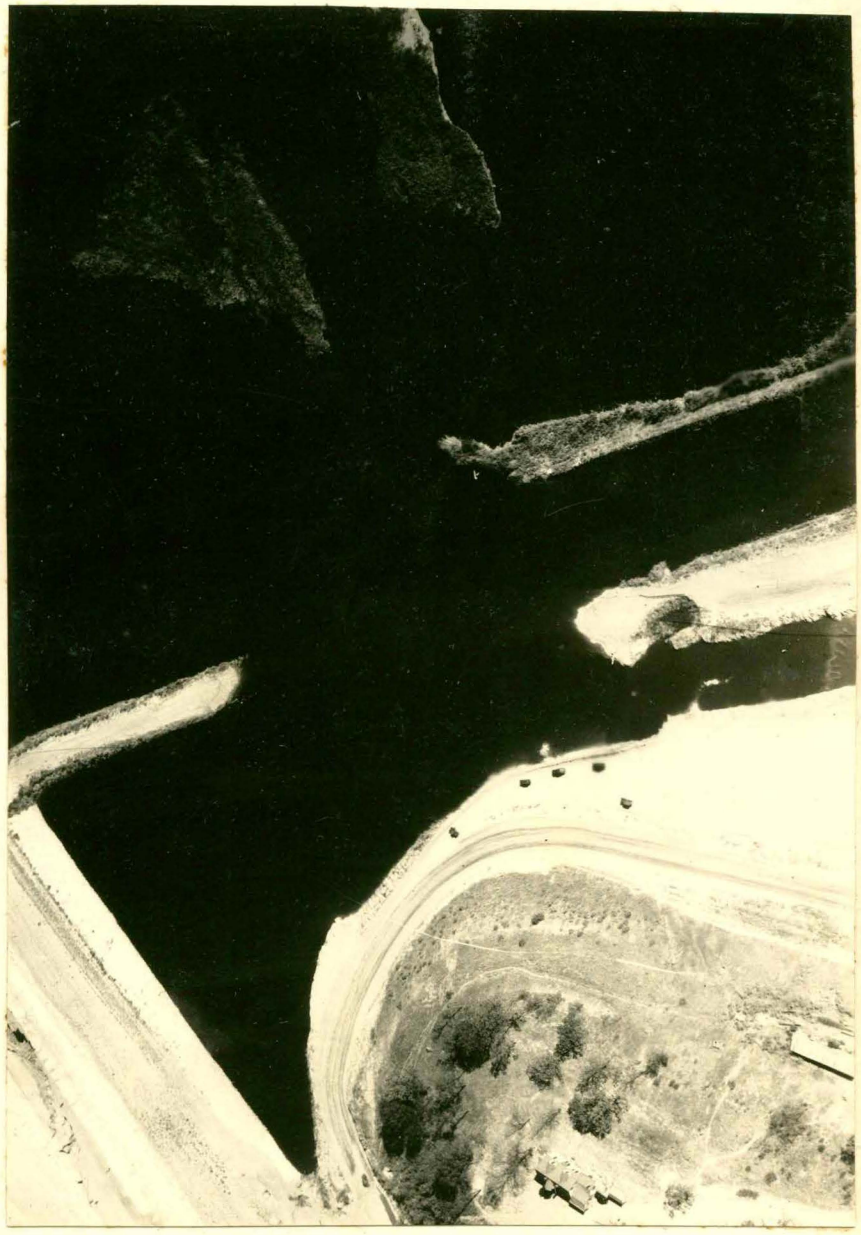




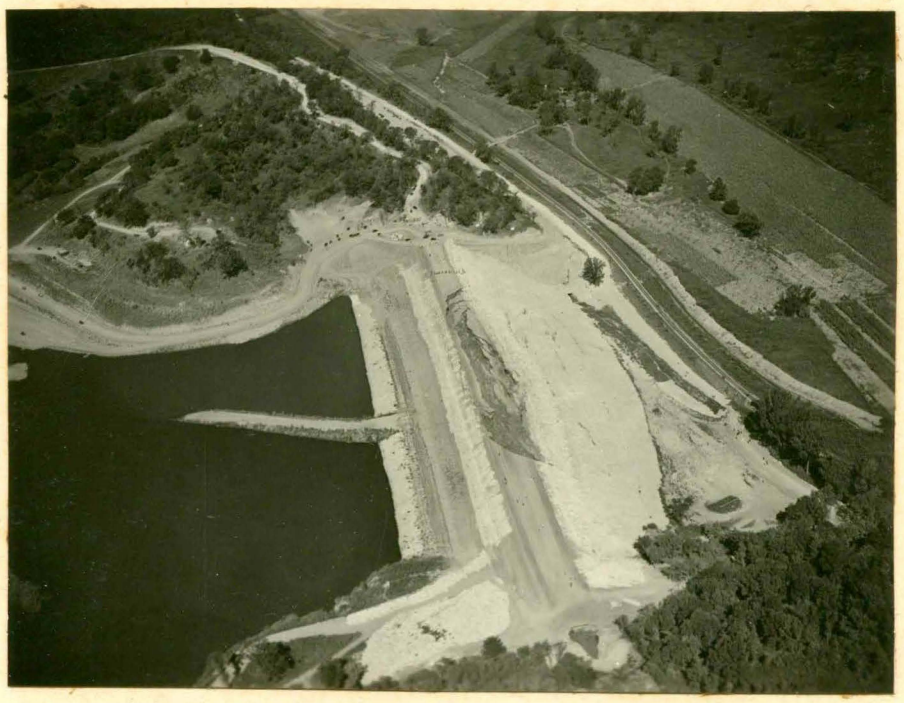




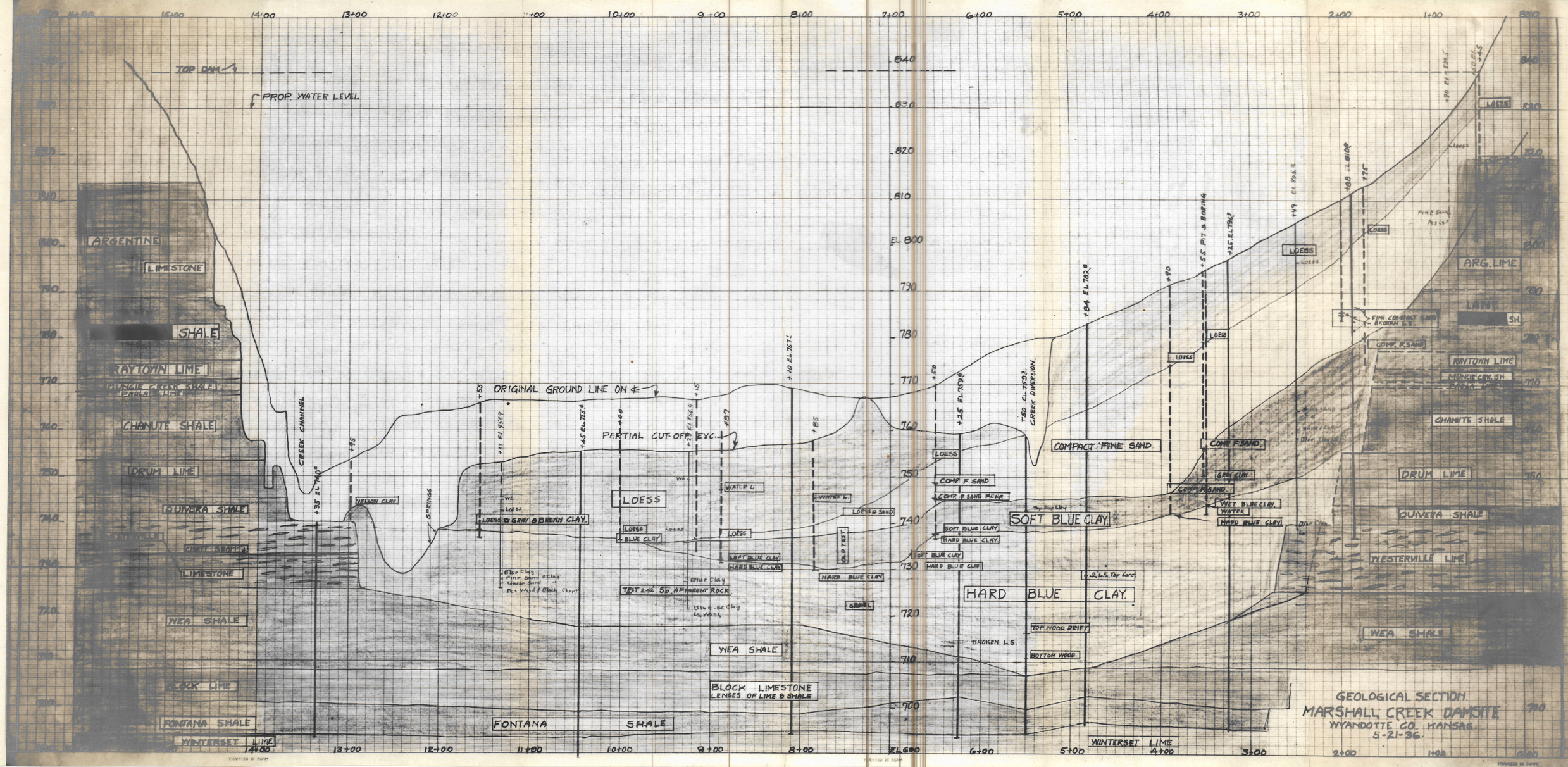




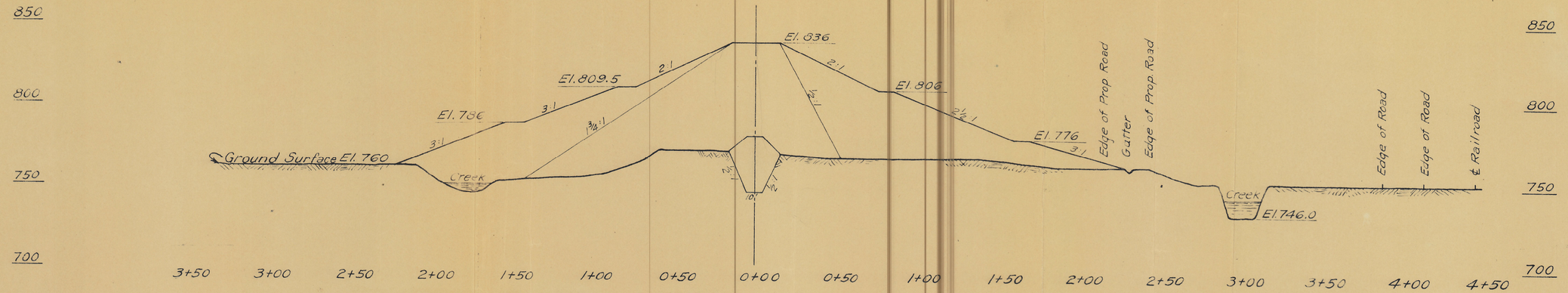
September 20, 1937



September 20, 1937



GEOLOGICAL SECTION
MARSHALL CREEK DAMSITE
WYANDOTTE CO. KANSAS
5-21-36.



WYANDOTTE COUNTY DAM
Section at Station 8+50
Scale 1"= 50'

U.S. — B.M. E.F. Elev. 754.9

Mo. Pac. Br. #64

R-100'

R-150'

Sta. 5+03.6 Back

Sta. 5+43.8 Ahead

Sta. 6+43.8 End of Paving

El. 746.7

Pave slope on curve this side

Slope Canal Banks 2½:1

Sta. 3+62.5

Paved Gutter

1% Slope

BERM ELEVATION 776'

BERM ELEVATION 806

Loose Rock & Earth Rolled in 18" Layers

Impervious Materials Rolled in 8" Layers

Sta. 7+00.3

Sta. 0+70.0

Trench Clay, Sand & Gravel

CREST of DAM 836

R-100'
L 13°30'

Sta. 7+02.3

Sta. 7+02.1

BERM ELEVATION 809.5

Sta. 0+00

BERM ELEVATION 786

Sta. 7+01.9

Impervious Materials Rolled in 8" Layers

Loose Rock & Earth Rolled in 18" Layers

Sta. 7+02.9

B.M. cut Spike in North Face of 10" Elm about 24' South of Sta. 6+00 El. 858.11

MARSHALL CREEK DAM
WYANDOTTE COUNTY KANS
PLAN OF DAM
AND
LOCATION OF SPILLWAY ETC

SHEET No. 3 OF 10

Revised January 25-1936