

TECHNICAL MEMORANDUM NO. 57-2

Model Study for Channel Improvement
of the
Savannah River
(Miles 188.0 to 178.5)

June 15, 1933.

U. S. Waterways Experiment Station,
Vicksburg, Mississippi.

June 15, 1935.

TECHNICAL MEMORANDUM NO. 57-2

Subject: Model Study for Channel Improvement of the Savannah River between Miles 188.0 and 178.5.

To: The District Engineer, U. S. Engineer Office, Savannah, Georgia (Through the President, Mississippi River Commission).

Introduction

1. Technical Memorandum No. 57-1, issued from this Station on January 23, 1935, presented the results of model experiments (Tests Nos. 1 to 12) pertaining to proposed regulating works on the Savannah River between Miles 188.0 and 178.5. The regulating works tested were located at Miles 187.0, 186.0, 185.3, 185.0, 183.8, 182.0, 181.8, 181.3, and 181.1. It is understood that, subsequent to the issue of Technical Memorandum No. 57-1, specifications have been drawn up for the construction in the river of impermeable dikes at Miles 187.0, 186.0, 185.3, and 185.0, similar to those tested in the model (Test No. 10).

2. This memorandum (Technical Memorandum No. 57-2) includes the results of Tests Nos. 13 to 16, which were made as a continuation of the original model study, especial attention being concentrated upon the development and effects of the cut-off at Bailey's Neck. The authority for the model study, a description of the model, and the general method of procedure are given on Sheet 1 of the folio accompanying this report.

Tests and Results

3. The following table is an index to the sheets in the accompanying

folio:

Test No.	Description	Results	
		General Data	Hydrographic Maps
---	General Data	Sheet 1	---
---	River Survey (1933)	---	Sheet 2
13	Study of Proposed Dikes and Cut-off	Sheet 3	Sheets 4-6
14	Study of Proposed Dikes and Cut-off	Sheet 7	Sheets 8-11
15	Study of Proposed Dikes and Cut-off	Sheet 12	Sheets 13-16
---	River Survey (1933 and 1935)	---	Sheet 17
16	Study of Cut-off and Proposed Dikes	Sheet 18	Sheets 19-22

Upon the general data sheet for each test there are presented the purpose, initial conditions, test procedure, results, and discussion of that test. The hydrographic maps depict the condition of the movable bed during, and at the end of the respective tests.

Summary

4. The results of the model tests included in this memorandum indicated the following:

(a) The location, alignment, and lengths of the proposed dike systems as studied in Tests Nos. 13 to 16 (Bailey's Neck Cut-off in effect) at Miles 187.0, 186.0, 185.5, and 185.0, were identical with those tested in Test No. 10 (Bailey's Neck Cut-off not effected - see Technical Memorandum No. 57-1). The resulting bed conditions, upstream from Half Guinea Bar, were not quite as satisfactory as those obtained during Test No. 10. The differences were small, however, and the same general tendencies prevailed in both cases, indicating that if Bailey's

Neck Cut-off influenced bed conditions in that area at all, the effect was slight.

(b) The results of Test No. 13 indicated shoaling tendencies in the vicinity of the proposed dike system on the Georgia bank at Mile 183.8. In Tests Nos. 14, 15, and 16, two additional dikes on the opposite bank at Mile 184.0 were installed, and satisfactory depths were effected. Although this area is subjected to a slight lowering of the water surface by the cut-off at Bailey's Point, it is not exactly known why shoaling, such as was obtained in Test No. 13, should occur at this point. Therefore, although the additional dikes were simulated in the model to obtain satisfactory conditions in this crossing, it is recommended that the initial construction in the prototype should include only the four dikes on the Georgia bank. Then, if at a later date these dikes prove to be insufficient, the two dikes on the opposite bank could be added, or as an alternative, the initial system could be extended upstream and the length of the individual dikes increased.

(c) The results of Test No. 13 indicated the necessity of regulating works at Miles 182.1-181.5. The dike systems at Miles 182.0 and 181.7 as studied in Tests Nos. 15 and 16 proved to be adequate to effect a satisfactory channel in that vicinity.

(d) Bailey's Neck Cut-off in each instance caused a fill at Mile 181.4, a deep scour just downstream from the cut-off channel (Mile 180.2), and shoaling at Miles 180.0 and 179.0. The shoaling at Mile 180.0 was eliminated by the installation of a single dike on the South Carolina bank (Run No. 7 of Test No. 16). No system of dikes was tested at Mile 179.0, but it is thought possible that some regulating works might be required in the river at that point. This construction should

be deferred until the cut-off has reached a more stable condition.

(e) Better flow alignment was attained in the model when the position of Bailey's Neck Cut-off was in a more northerly position, as in Test No. 15. The alignment based upon recent developments in the river (Test No. 16) was found to be more abrupt than that of Test No. 15, but was deemed satisfactory.

(f) When Bailey's Neck Cut-off was fully developed, as in Tests Nos. 14-16, the cut-off channel carried 100 per cent of the flow at the low stages, and 80 per cent, or more, of the flow at the high stages, depending upon the position of the cut-off. At times the flow around Bailey's Point was reversed in direction.


(g) Bailey's Neck Cut-off caused a lowering of the water surface as far upstream as Bradford Point, and raising, in some cases, of the water surface elevations downstream (see Plate 1). The amount of these changes varied with the alignment of the cut-off and regulating works tested. It is to be kept in mind that any lowering of the water surface would decrease the channel depth below the 4000-second-foot reference plane by a corresponding amount. It is also desired to point out that in a movable bed model the determination of exact water surface elevations is precluded by the constantly changing character of the bed and the riffle formations. Consequently, the model gage readings must be interpreted in this light.

(h) The Georgia bank just below the mouth of the cut-off was subjected to a severe attack by the currents at that point. The south bank of the cut-off also received considerable attack during the early runs of Tests Nos. 13 to 15, but by the end of these tests this attack was not appreciable. On the other hand, the results of Test No. 16, in which pile clusters were simulated along the south bank of the cut, indicated

that scouring tendencies along that bank did not exist at any time during the test - in fact a slight fill was attained in this area by the end of the test.


5. Several factors which should be considered in analyzing the results of this model study were pointed out in the Summary of Technical Memorandum No. 57-1. A point which should also be kept in mind in comparing the results of Test No. 16 with those of Tests Nos. 13, 14, and 15 is that the old training wall on the South Carolina bank at the upstream end of Bailey's Neck Cut-off was simulated in Test No. 16 whereas this was not done in Tests Nos. 13-15. The results of Test No. 7 (Technical Memorandum No. 57-1), which was the verification test of the model study, indicated that on the whole the model was conservative in regard to effected depths, since in many instances the river survey of October-November, 1903, indicated much better channel conditions than those obtained in Test No. 7.

Submitted:



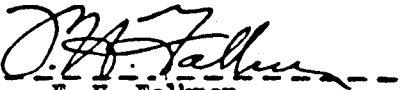
R. B. Cochrane,
Junior Engineer,
Leader, Experiment Group No. 1

Recommended:

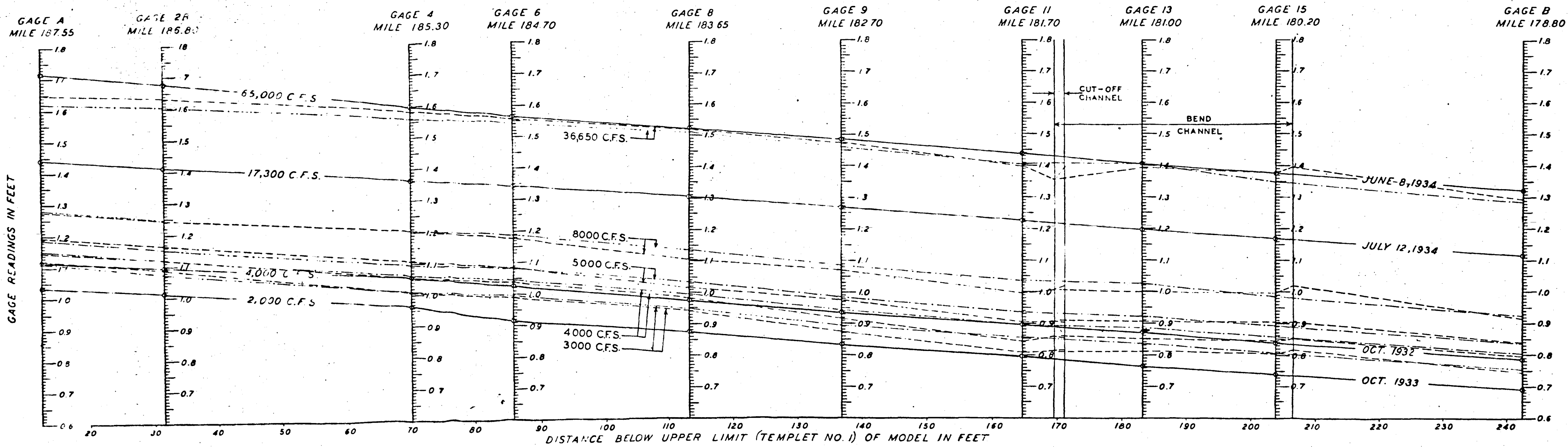


I. H. Patty,
Associate Engineer,
Chief, Experiment Section

Approved:



F. H. Falkner,
1st Lieut., Corps of Engrs.,
Director, U. S. Waterways
Experiment Station.



LEGEND

- Actual profile in river
- - - Profile in model (Test No. 10, Run No. 7) - Cut-off not effected
- - - Profile in model (Test No. 16, Run No. 7) - Cut-off effected

**SAVANNAH RIVER
WATER SURFACE PROFILES**