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4285

Denver, Colorado

August 15, 1949

Memorandum

To: Mr. Courtlandt Eaton

From: E. W. Lane

Subject: Review of Report on Improvement of Levee System near Yuma, Arizona.

1. The following are the important conclusions from our review of the Report on Improvement of Levee System near Yuma, Arizona--Preliminary Survey--July 1949, prepared by the Office of River Control of Region No. 3.

2. The levee grade adopted for the main river levees conforms to the results of the studies made by the International Boundary Commission, under the direction of Mr. J. F. Friedkin. We have checked these studies.

3. The location of the levee proposed by the Office of River Control on both banks of the Colorado River for some distance above Yuma differs from that assumed in the computations which the International Boundary Commission made. The proposed line for the relocation of the levee on the right bank of the river, south and east of Haughtelin Lake, as shown on the Location Map (Page 39) and map of the Overflow Area (Page 44) is roughly one-half mile nearer the river than the line used in computing the levee grade. The proposed location of the South Gila Levee, from Yuma to the mouth of the Gila River, as shown on the same maps, is from zero to one-third mile closer to the river than the line used in the computations of the Boundary Commission. The construction of the levee on these lines will materially reduce the flow area for floods and therefore raise the water level in the river, probably making the proposed levee grade inadequate. To use the proposed grade, it will probably be necessary to use the location assumed in the Boundary Commission computations.

4. At the time that the computations were made, the proposed relocation of the levee line was not completed in the field, and no data were furnished us by the Office of River Control on its location. Mr. Friedkin had discussed this location with Mr. Vetter, and we assumed that the line used by Mr. Friedkin conformed to that which Mr. Vetter expected to propose.

5. It is possible that a detailed study will show that the location assumed by the Boundary Commission is more economical than that proposed by the Office of River Control. Since the Boundary Commission location is nearer the old river than the Office of River Control location, the land along the former line is probably higher than along the latter line, with the result that the levee on the former line would be lower and therefore less expensive. The difference in cost might be greater than the benefit of protecting the land between the two levee lines.

Memo result of Computations

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6. There is a small discrepancy in the discharges used by the two agencies for the various floods. The report of the Office of River Control, on Page 15, for Plan "A" gives 45,000 second-feet as the discharge above the Gila and 265,000 second-feet coming down the Gila, making a total of 310,000 second-feet below the Gila. The discharges used by the International Boundary Commission in computing their profile were 50,000 second-feet above the Gila and 310,000 second-feet below. For Plan "B" the Office of River Control Report on Page 16 gives a flow of 103,500 second-feet above the mouth of the Gila and 36,500 second-feet coming down the Gila, making 140,000 second-feet below the Gila. However, the computations sent by the Office of River Control for the flow line on the Gila used a 40,000 second-foot discharge for this stream. The International Boundary Commission used 100,000 second-feet above the Gila and 40,000 second-feet coming down the Gila. Thus, for Plan "A", the levee grade computed by the International Boundary Commission and adopted by the Office of River Control is slightly higher than necessary above the mouth of the Gila for the 45,000 second-foot discharge assumed by the Office of River Control since this grade was computed for 50,000 second-feet. However, for Plan B, the levee grade computed by the International Boundary Commission and adopted by the Office of River Control is slightly too low for the 103,500 second-foot discharge assumed by the Office of River Control, since the grade was computed for 100,000 second-feet discharge.

7. It is my belief that, in view of the uncertainties of the hydraulic roughness of the Colorado River and the overbank areas, a freeboard of no less than three feet should be used on these levees. This opinion is shared by Mr. Nalder and Mr. Vetter.

8. I am not prepared to pass on the sufficiency of the levees along the Gila River, as I was not aware that it would be called to my attention at the time that I was at Yuma, and therefore I did not study the hydraulic roughness of the region through which this channel passes.

9. We have checked over the computations made on the Gila River channel by the Office of River Control, and have the following comments:

a. In computing the flow line of Plan "A" for the 265,000 second-foot flood, the areas for the downstream three cross-sections are larger than our planimetering of them indicates. If our measurements are correct, this would cause the computed levee grade to be somewhat higher than necessary.

b. In the computations for the flow line of Plan "B" (for the 40,000 second-foot flood), the cross-sectional area and hydraulic radius used for Section 4 appears to be too great, giving too large a discharge. This would cause the computed levee grade to be too low.

c. Time was not available to compute the flow lines based on our planimeter measurements.

d. The use of the value of Manning's "n" of 0.025 for the entire width of the excavated channel seems questionable. Much of the area on the 40:1 slope will be no lower than much of the overflow area and there seems to be no reason why vegetation will not grow on it and give as high a roughness as on the overflow area.

e. With the assumption of n = 0.025 for the entire excavated width, the velocities at the narrow sections would be so large (17.1 ft. per second or greater) that the velocity head charges could not be ignored. The velocities based on the mean of the cross-sections at the end of the reaches are not excessive, but the velocities at the end of some of the reaches would be much higher.

f. Would there be enough flow down the bottom of the excavated channel to prevent the growth of vegetation in the channel bottom, which would cause a value of "n" of greater than 0.025.