

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION



FLOOD PROFILE STUDY, MORGAN CREEK,
LINN COUNTY, IOWA

By

Harlan H. Schwob, Hydraulic Engineer
United States Geological Survey

Prepared in cooperation with the

CITY OF CEDAR RAPIDS

Open-file Report

Iowa City, Iowa
May 1970

U.S. GEOLOGICAL SURVEY
P.O. BOX 1230
IOWA CITY, IA 52244

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CONTENTS

	Page
Introduction.....	1
Description of area.....	1
Study criteria.....	3
Presentation of results.....	4
Appendix.....	14

ILLUSTRATIONS

Plate 1. Map of Morgan Creek basin in Linn County showing index of plates 2 to 6.....	2
2. Map of Morgan Creek, station 0 to 72, showing water- way limits used in computations.....	5
3. Map of Morgan Creek, station 71 to 142, showing waterway limits used in computations.....	6
4. Map of Morgan Creek, station 140 to 214, showing waterway limits used in computations.....	7
5. Map of Morgan Creek, station 213 to 287, showing waterway limits used in computations.....	8
6. Map of Morgan Creek, station 286 to 351, showing waterway limits used in computations.....	9
7. Flood profiles, station 16 to 90, on Morgan Creek.....	10
8. Flood profiles, station 90 to 180, on Morgan Creek.....	11
9. Flood profiles, station 180 to 270, on Morgan Creek.....	12
10. Flood profiles, station 270 to 352, on Morgan Creek.....	13

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by

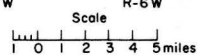
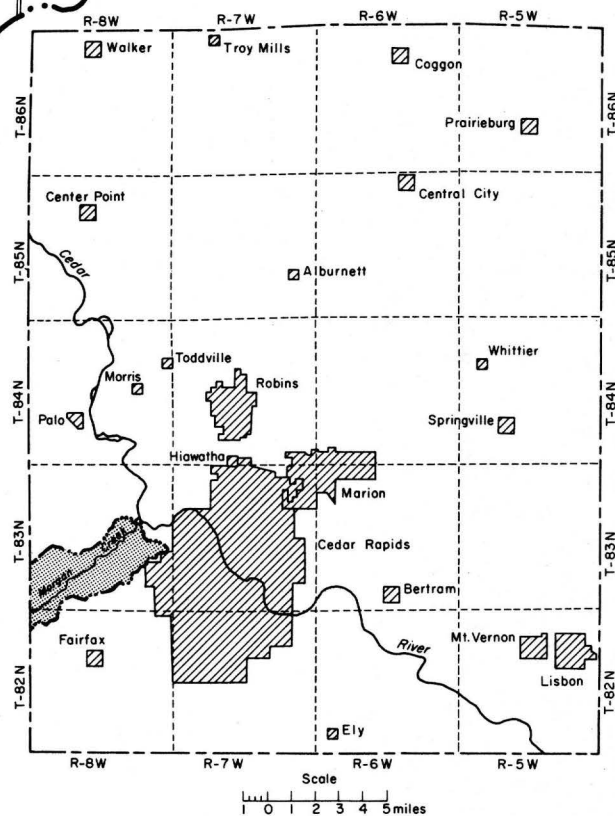
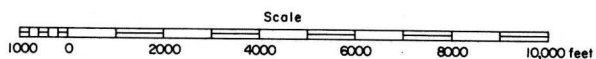
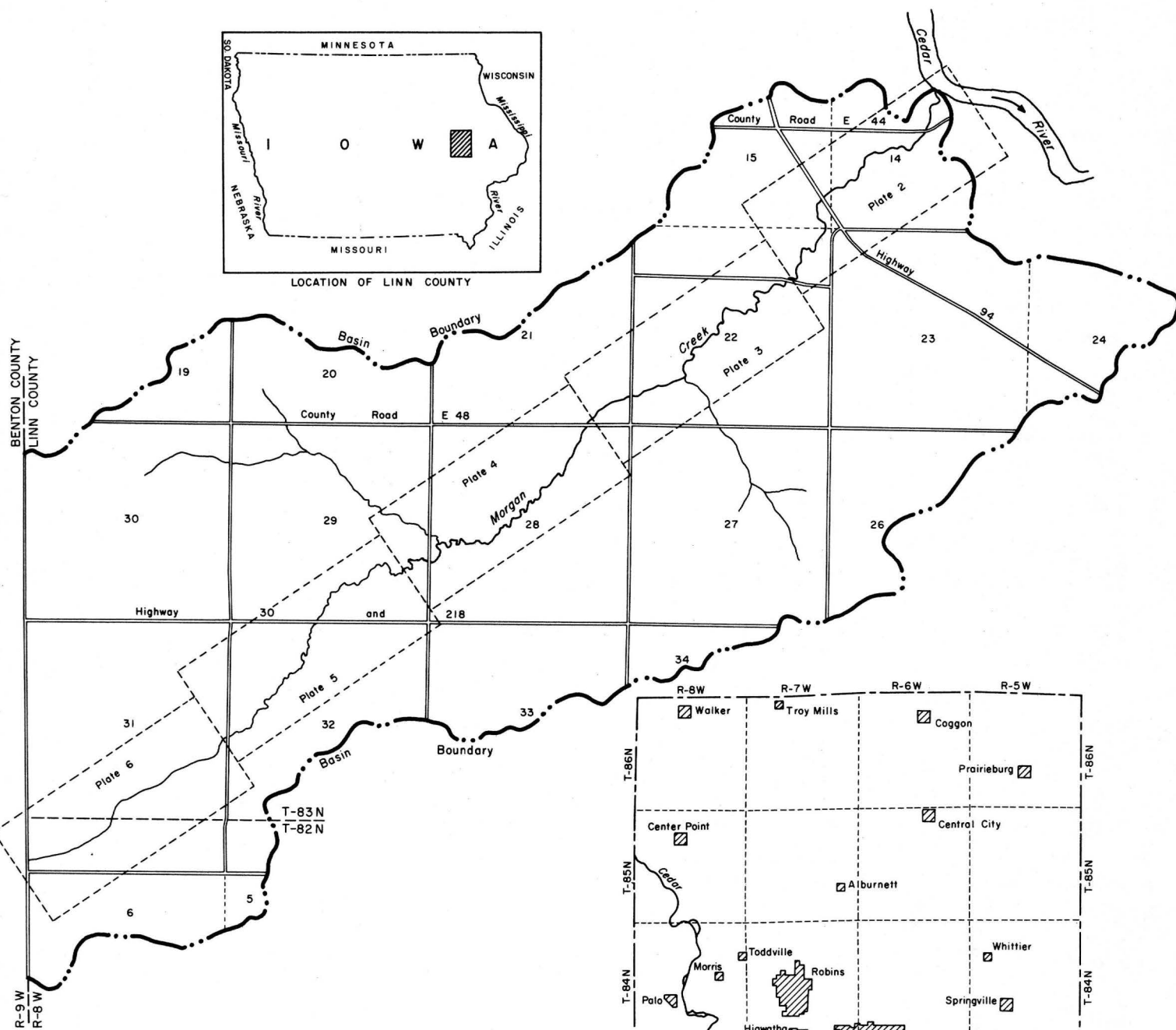
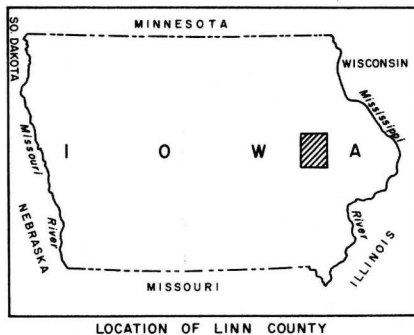
Harlan H. Schwob

INTRODUCTION

The purpose of this report is to present the results of a study made for a 35,000-foot reach of Morgan Creek. The report shows profiles computed for a large flood under existing conditions and for a smaller flood for two assumed conditions of encroachment. Flood-plain management can benefit from this type of information during future expansion of the urban area. This report is the result of a cooperative agreement between the City of Cedar Rapids and the U.S. Geological Survey that provides for the collection and analysis of flood data in, and near, the City of Cedar Rapids.

DESCRIPTION OF THE AREA

Morgan Creek is a small right-bank tributary of the Cedar River near the northwestern part of Cedar Rapids (pl. 1). The area drained at the mouth is 18.9 square miles--approximately two-thirds of which is in Linn County and the remainder, 6.71 square miles, is in Benton County. The land in the basin is gently rolling and is now virtually all used for agricultural purposes. In the 35,000-foot reach of the flood plain covered by this report, nine bridges, including the county-line bridge, span the creek.



LOCATION OF MORGAN CREEK BASIN AND CITIES AND TOWNS IN LINN COUNTY

Plate 1. Map of Morgan Creek basin in Linn County showing index of plates 2 to 6.

STUDY CRITERIA

City and State practice requires that a large flood discharge be used to define the inundation elevation of the natural flood plain. For Morgan Creek this discharge varied from 7,000 cfs (cubic feet per second) at the county line to 12,000 cfs near the mouth. Changes in discharge were made in steps of 1,000 or 2,000 cfs at the mouths of selected tributaries. Five steps were used in the reach covered by this report. For the downstream reach affected by backwater from the Cedar River, local and State officials selected the elevation of the Corps of Engineers' standard project flood at the mouth of Morgan Creek, 744.0 feet (Corps of Engineers, 1967)^{1/}, as the inundation elevation.

City and State practice also provides for the use of a smaller flood discharge to evaluate the effect of restriction of the waterway. For Morgan Creek, this discharge varies from 6,000 cfs at the county line to 10,000 cfs at the mouth, stepped in the same way as the larger flood. Floodways restricted to 200 and 300 feet in width were assumed to be caused by encroachments that blocked the flow landward from them.

Except near the mouth, the elevations computed for the smaller flood with encroachments can be used as guides to set minimum building elevations on the flood plain of the creek. The corresponding elevation for the reach affected by the Cedar River floodwater is the elevation of the Corps of Engineers' intermediate regional flood at the mouth of Morgan Creek, 740.0 feet (Corps of Engineers, 1967).

These criteria are founded on floods that are extremely rare. However, discharges exceeding those used have occurred on similar-sized drainage basins

^{1/} Corps of Engineers, U.S. Army, 1967, Flood-plain information, Cedar River, Linn County, Iowa: Corps of Engineers report prepared for Iowa Natural Resources Council, 39 p., 22 pl.

in the State. Schwob (in Dougal, 1969, p. 33)^{2/} shows that floods having ratios to mean annual flood of 17 and 20 have occurred on drainage basins equal in size to those at the county line and at the mouth of Morgan Creek, respectively. The larger flood (7,000 - 12,000 cfs) used in this study has a ratio to mean annual flood of about 14. The 50-year flood, equivalent to flows of 1,650 and 2,700 cfs at the county line and at the mouth, has a ratio of 3.1 to the mean annual flood (Schwob, 1966)^{3/}.

PRESENTATION OF RESULTS

Standard methods of step-backwater computation were used to define water-surface profiles for the larger flood discharge that defines the inundation level. Similar computations were used to define the profiles for the smaller flood in the two restricted waterways.

Plate 1 shows the coverage of the five map sheets (pl. 2-6) with respect to features such as roads and land lines. Plates 2-6 show the reference line used for measurement of distance on the profiles and the limits (for computation purposes) of the restricted waterways with respect to the reference line and the low-water channel. The profiles are contained on plates 7-10. Appendix 1 contains descriptions and elevations of temporary bench marks set during surveys for the report.

^{2/} Dougal, Merwin D. ed., 1969, Flood plain management, Iowa's experience: Iowa State University Press, 270 p.

^{3/} Schwob, Harlan H., 1966, Magnitude and frequency of Iowa floods: Iowa Highway Research Board Bull. 28, pt. 1, 47 p., 2 pl., 16 fgs.

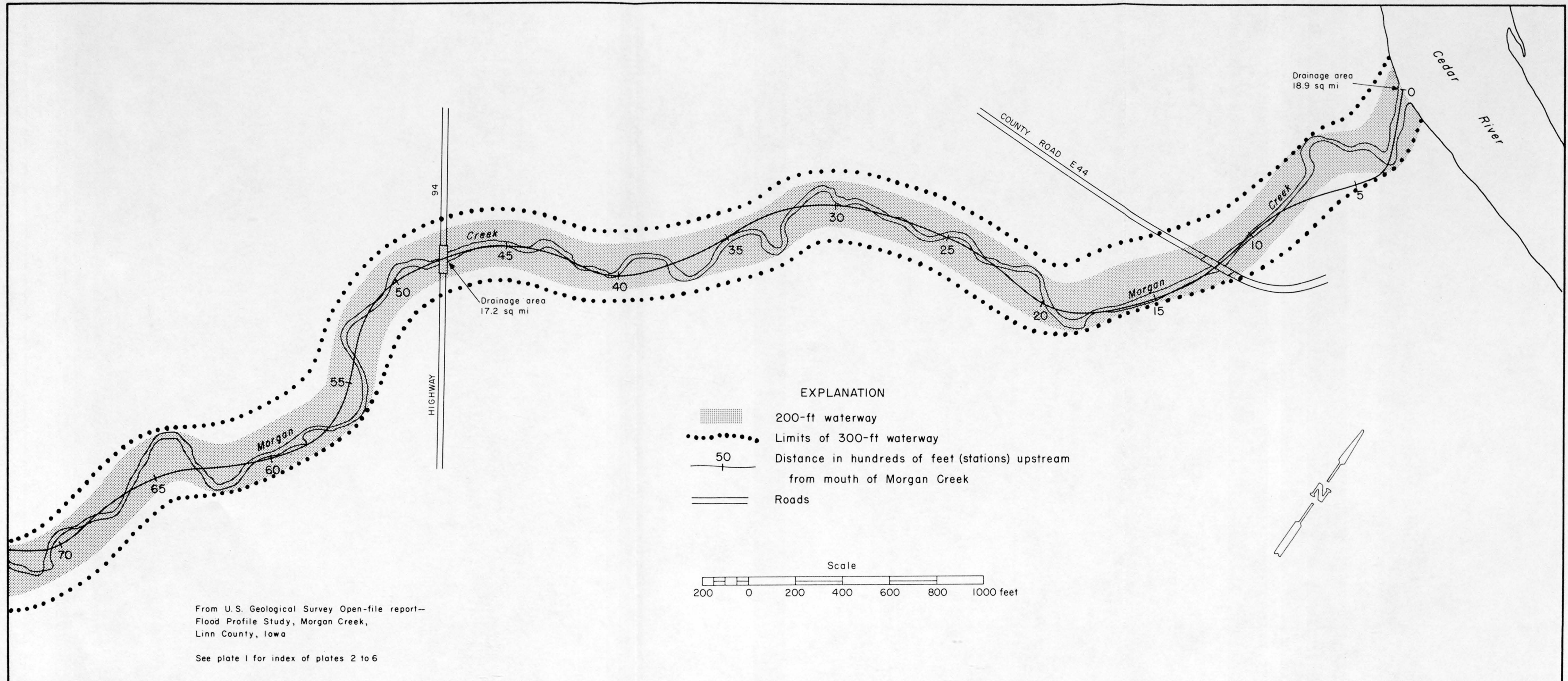


Plate 2. Map of Morgan Creek, station 0 to 72, showing waterway limits used in computations.

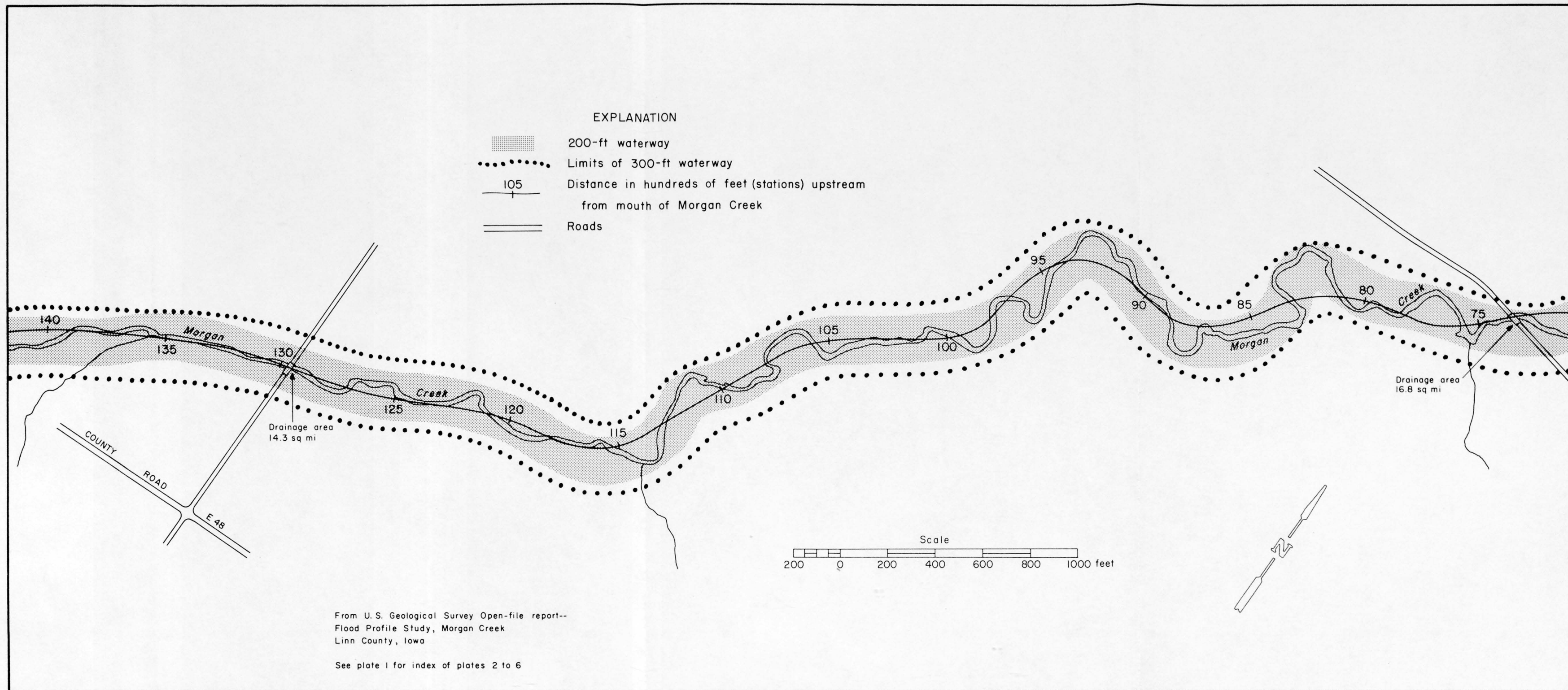


Plate 3. Map of Morgan Creek, station 71 to 142, showing waterway limits used in computations.

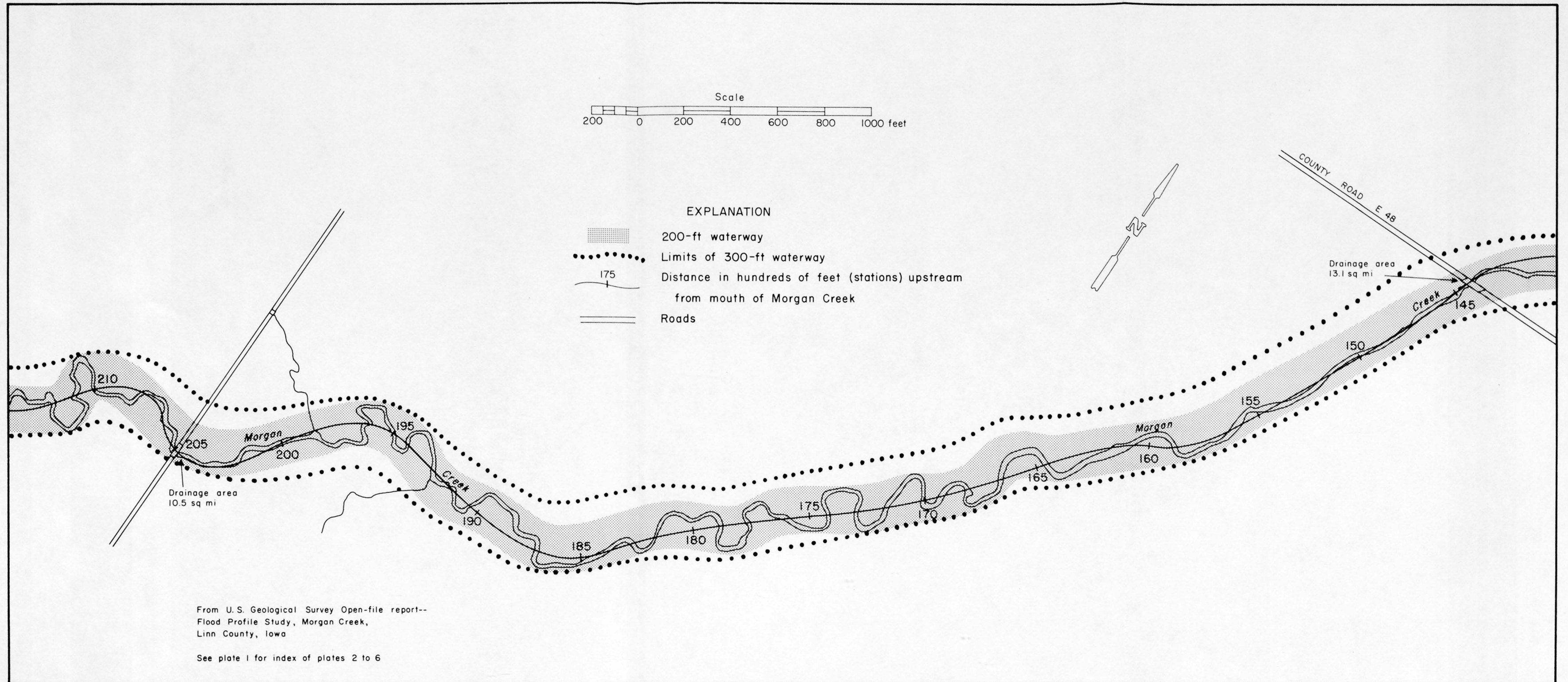


Plate 4. Map of Morgan Creek, station 140 to 214, showing waterway limits used in computations.

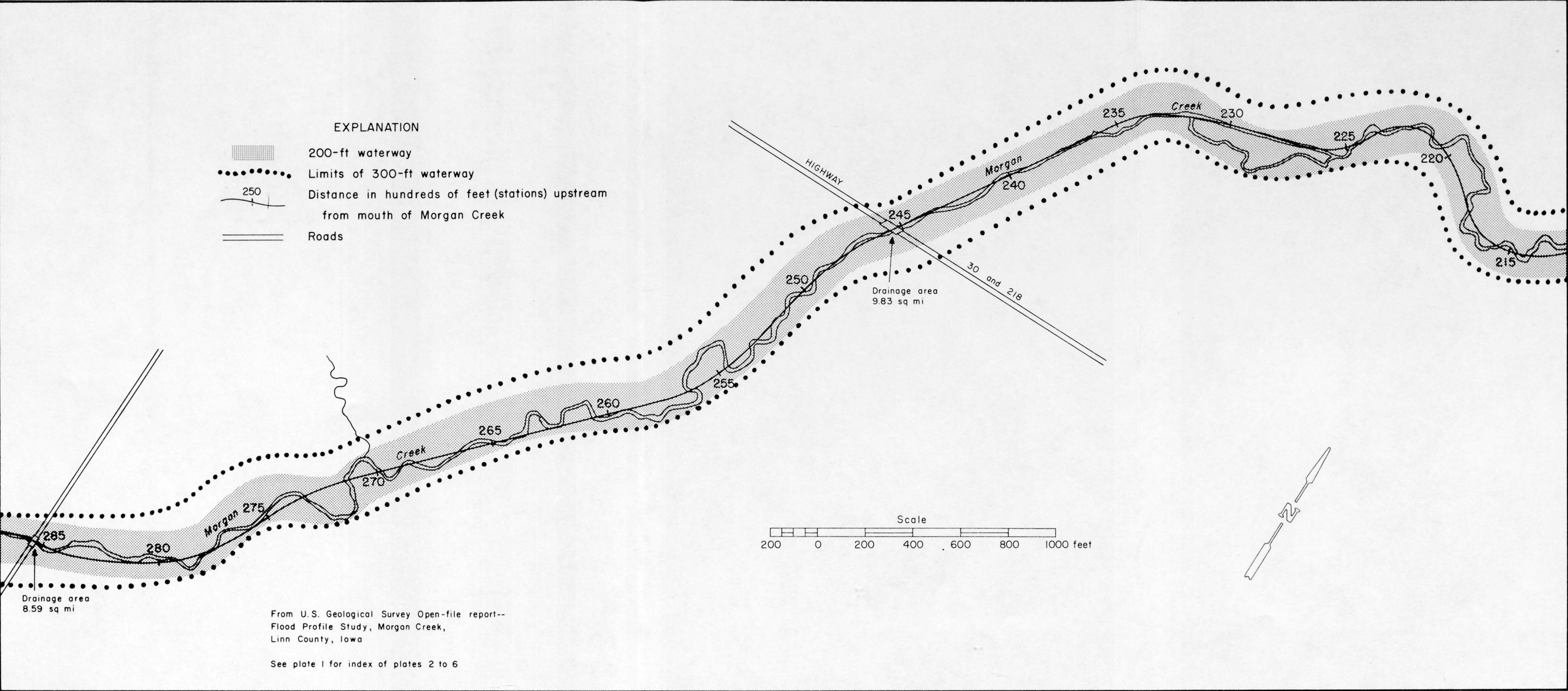


Plate 5. Map of Morgan Creek, station 213 to 287, showing waterway limits used in computations.

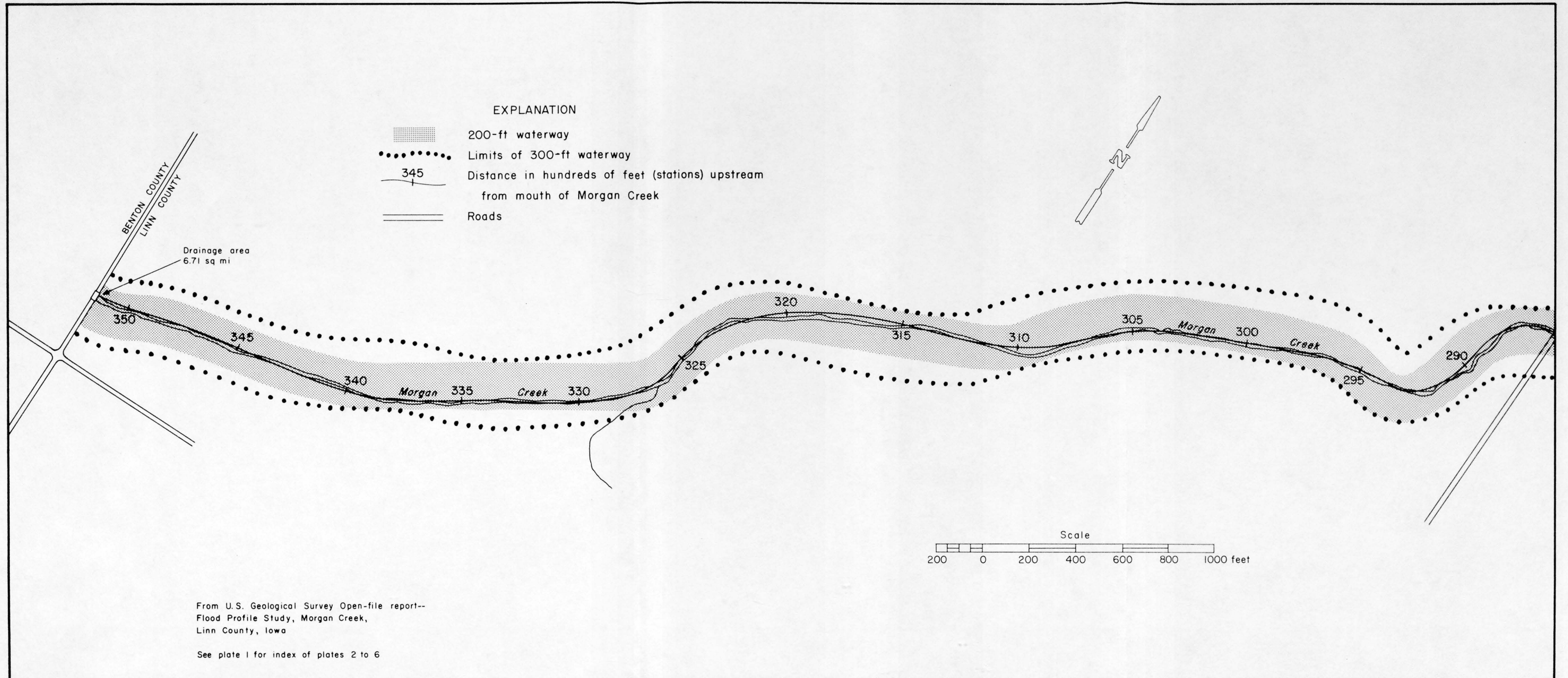


Plate 6. Map of Morgan Creek, station 286 to 351, showing waterway limits used in computations.

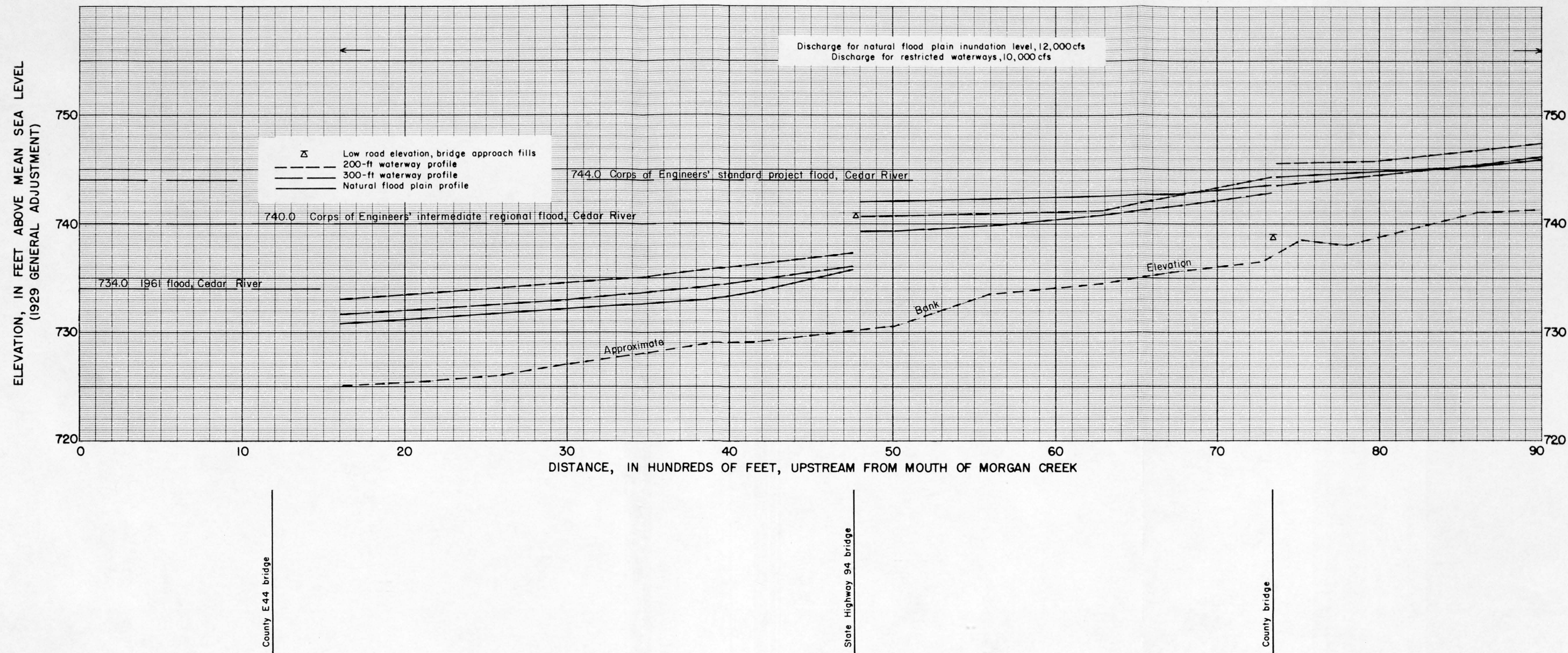


Plate 7. Flood profiles, station 16 to 90, on Morgan Creek.

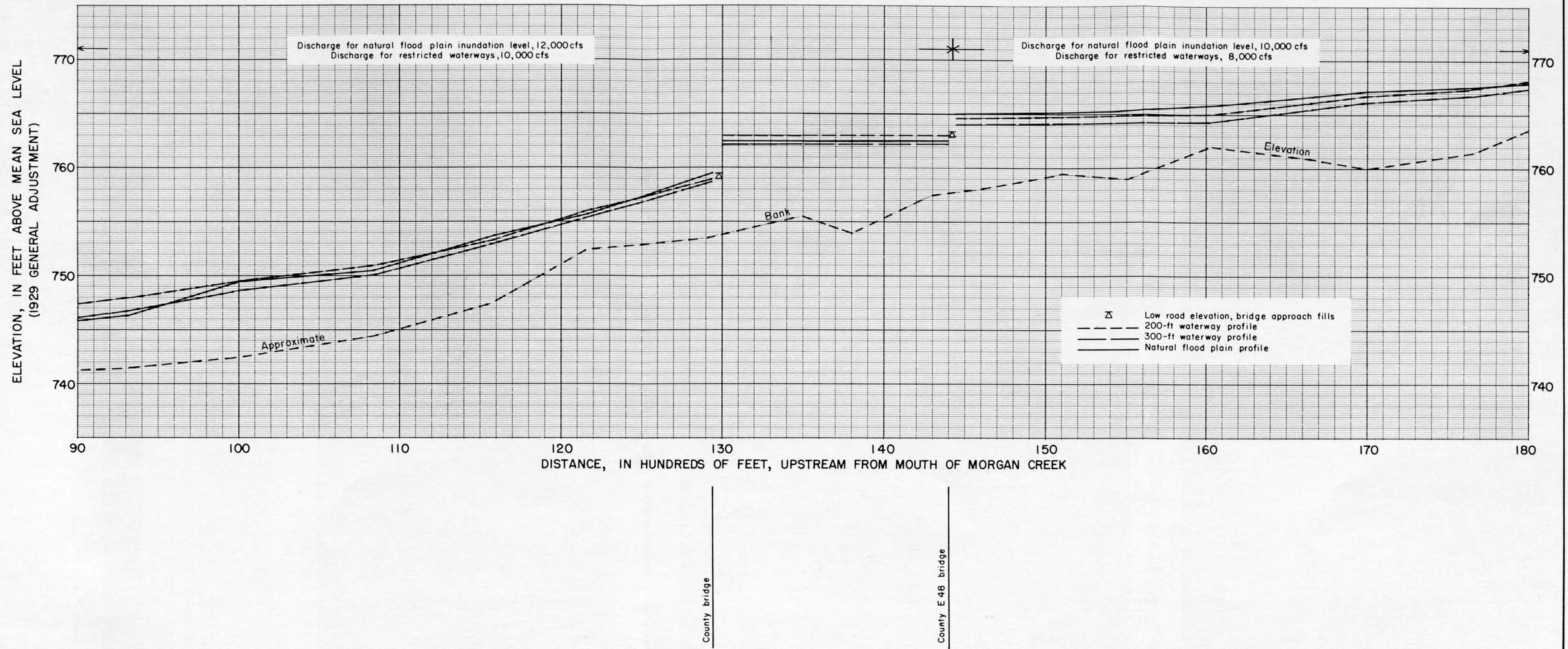


Plate 8. Flood profiles, station 90 to 180, on Morgan Creek.

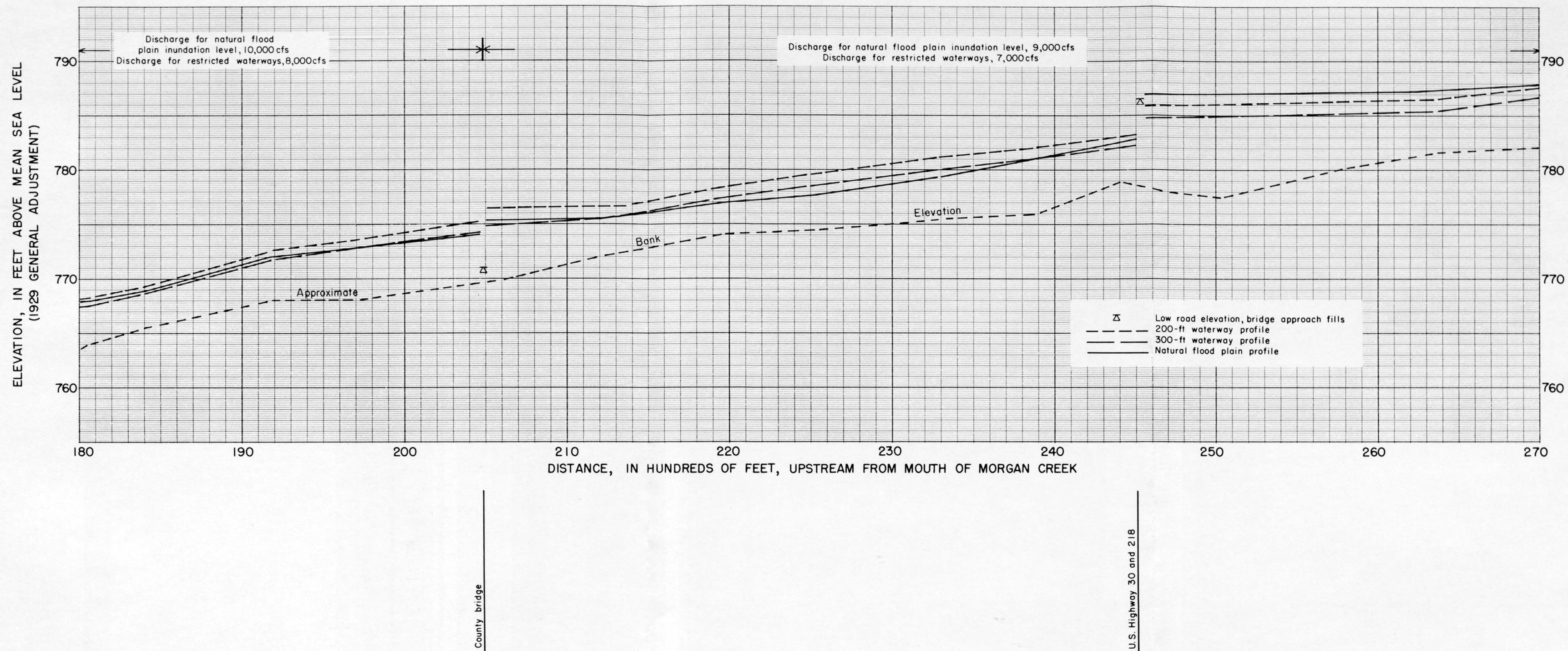


Plate 9. Flood profiles, station 180 to 270, on Morgan Creek.

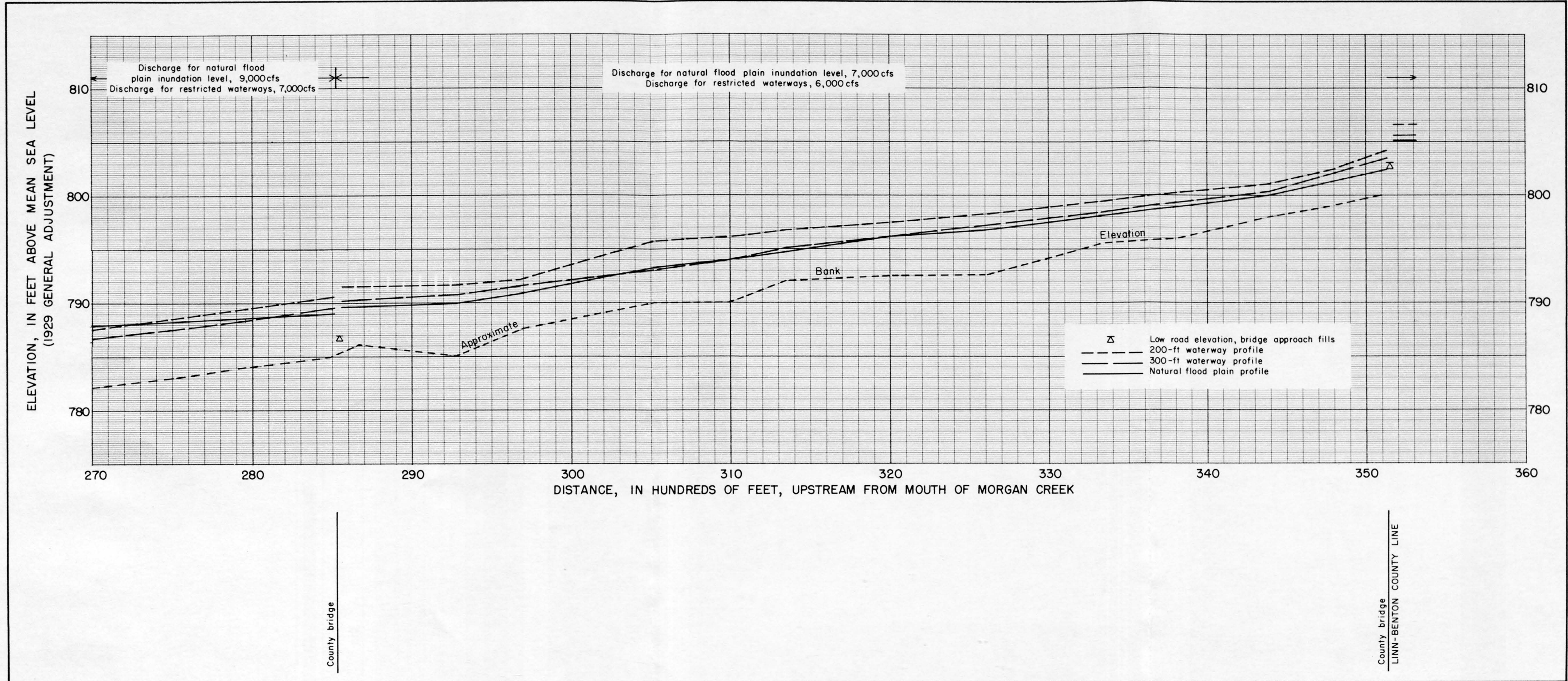


Plate 10. Flood profiles, station 270 to 352, on Morgan Creek.

APPENDIX I

BENCH MARKS ALONG MORGAN CREEK

Descriptions and elevations of temporary bench marks set during surveys for the report are listed below. Each mark has been given an index number that also shows its land-line location. As an example, 8208-6 NW (1) indicates the first mark established in the northwest quarter of section 6, Township 82 North, Range 8 West. Elevations are referenced to mean sea level, 1929 datum, and are of third-order accuracy. Reference points shown in the list were placed to determine water-surface elevations by using a tape and weight to measure down from a point of known elevation.

8206-6 NW (1) - About 8 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek on county road; right downstream pile post, pole spike and collar. Elev. 802.90

8208-6 NW (2) - (REFERENCE POINT) - About 8 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek on county road; 2 feet left of 4th guardrail post from left downstream end of bridge, pole spike and collar on guardrail. Elev. 806.33

8308-14 SW (1) - About 1.7 miles west of Cedar Rapids, Iowa, on county road "L" at bridge over Morgan Creek, in left upstream corner of bridge abutment. Linn County brass cap #2286-1958 (found). Elev. 732.61

8308-14 NW (1) - (REFERENCE POINT) - About 3.5 miles west of Cedar Rapids, Iowa, at east-west county road bridge over Morgan Creek, 0.8 mile east of intersection with State Highway 94; on guardrail 2 feet right of 10th post from left downstream end of bridge, chiseled arrow. Elev. 736.71

8308-15 SE (1) - About 4 miles west of Cedar Rapids, Iowa, at State Highway 94 bridge over Morgan Creek; on wingwall at right downstream end of concrete bridge, highway commission plug. Elev. 741.81

8308-15 SE (2) - (REFERENCE POINT) - About 4 miles west of Cedar Rapids, Iowa, on State Highway 94 bridge over Morgan Creek; 1.5 feet right of 8th post from left downstream corner of bridge, chiseled arrow on outer curb. Elev. 741.66

8308-20 SW (1) - About 7 miles west of Cedar Rapids, Iowa, at intersection of county roads 11 and 72; 17 feet north and 56 feet east of crossroads centerline, punched hole in metal culvert (found) (USGS-UE8C). Elev. 845.14

- 8308-21 NE (1) - About 5 miles west of Cedar Rapids, Iowa, at "T" road intersection of county roads about 0.8 mile west of Morgan Creek Park; east side power pole, 0.4 foot above ground, pole spike and collar. Elev. 823.68
- 8308-21 SE (1) - (REFERENCE POINT) - About 5 miles west of Cedar Rapids, Iowa, at county road bridge over Morgan Creek, on county road about 0.2 mile west of intersection with north-south county road; on 5th wood guardrail post from left downstream end of bridge, 1.5 feet above curb, pole spike and collar. Elev. 766.14
- 8308-22 NE (1) - About 4 miles west of Cedar Rapids, Iowa, in Morgan Creek Park on east-west county road bridge over Morgan Creek; on 1-foot square timber at left upstream end of bridge LCED disk 2193-1953 (found). Elev. 743.32
- 8308-22 NE (2) - (REFERENCE POINT) - About 4 miles west of Cedar Rapids, Iowa, in Morgan Creek Park on east-west county road bridge over Morgan Creek; one foot right of 8th guardrail post from right downstream end of bridge, pole spike and collar on deck plank. Elev. 743.47
- 8308-22 SW (1) - About 5 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek about 0.15 mile north of intersection of county roads; on one-foot square timber pile cap at left downstream end of bridge, pole spike and collar. Elev. 757.95
- 8308-22 SW (2) - (REFERENCE POINT) - About 5 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek about 0.15 mile north of county road intersection on diagonal brace 20 feet right of left downstream corner of bridge, 3.5 feet above deck, two chiseled lines. Elev. 762.58
- 8308-22 NW (1) - About 4.5 miles west of Cedar Rapids, Iowa, about 0.3 miles west of Morgan Creek Park; about 0.5 mile east of "T" road intersection of county roads on concrete box culvert under county road on left downstream headwall; chiseled square. Elev. 756.12
- 8308-28 NE (1) - About 5 miles west of Cedar Rapids, Iowa, just west of intersection of county roads, at southwest corner of concrete box culvert headwall, USGS disk 8DDB 1966. Elev. 769.89
- 8308-28 NE (2) - About 5 miles west of Cedar Rapids, Iowa, at county road bridge over Morgan Creek, on county road about 0.2 mile west of intersection with north-south county road; on upstream curb between 8th and 9th guardrail post, chiseled square (USGS-UE8A) (found). Elev. 764.78
- 8308-28 SW (1) - (REFERENCE POINT) - About 6 miles west of Cedar Rapids, Iowa, at bridge on county road over Morgan Creek, about 0.3 mile north of intersection with Highway 30; between 5th and 6th posts from left downstream end of bridge, on deck plank, pole spike and collar. Elev. 773.64
- 8308-28 NW (1) - About 6 miles west of Cedar Rapids, Iowa, at 4-way county road intersection; 29 feet south and 38 feet east of crossroads centerline, top end of 24-inch corrugated pipe, punched hole (found) (USGS-UE8B). Elev. 815.39

8308-29 SE (1) - About 6 miles west of Cedar Rapids, Iowa, at bridge on county road over Morgan Creek, about 0.3 mile north of intersection with Highway 30; on left upstream wingwall pile, pole spike and collar. Elev. 774.45

8308-29 SE (2) - About 6 miles west of Cedar Rapids, Iowa, at bridge on county road over Morgan Creek tributary, about 0.5 mile north of intersection with Highway 30; on right upstream wingwall, chiseled cross (found). Elev. 774.60

8308-32 NW (1) - About 6.5 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek on Highway 30; on left upstream wingwall curb at junction with end of bridge, highway commission plug (found). Elev. 787.70

8308-32 NW (2) - (REFERENCE POINT) - About 6.5 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek on Highway 30; top of handrail between 4th and 5th brace posts from right upstream end of bridge, chiseled arrow. Elev. 789.95

8308-29 NW (1) - About 7 miles west of Cedar Rapids, Iowa, on county road; second telephone pole north of windmill on east side of road, one foot above ground, pole spike and collar. Elev. 842.61

8308-31 SE (1) - About 7 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek on county road; on right upstream pile post, pole spike and collar. Elev. 788.93

8308-32 SW (1) - (REFERENCE POINT) - About 7 miles west of Cedar Rapids, Iowa, at bridge over Morgan Creek on county road; 21 feet from left downstream end of bridge, 0.7 foot below bridge deck, pole spike and collar. Elev. 788.53

8308-32 NW (3) - About 7 miles west of Cedar Rapids, Iowa, at intersection of Highway 30 and county road; concrete corner fence post southeast from center of intersection, top center of post. Elev. 829.99