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FLOODS ON YAHARA RIVER
LAKE KEGONSA DAM TO COUNTY LINE
DANE COUNTY, WISCONSIN

OFR 72-222

open-file report

FLOODS ON YAHARA RIVER, LAKE KEGONSA DAM
TO COUNTY LINE, DANE COUNTY, WISCONSIN

By C. L. Lawrence and B. K. Holmstrom

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10- GEOLOGICAL SURVEY OPEN-FILE REPORT 72-722
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14 PREPARED IN COOPERATION WITH DANE COUNTY REGIONAL PLANNING COMMISSION
15- AND THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES
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FLOODS ON YAHARA RIVER
LAKE KEGONSA DAM TO COUNTY LINE
DANE COUNTY, WISCONSIN

By Carl L. Lawrence and Barry K. Holmstrom

The State of Wisconsin, as a result of recent legislation, is establishing new, and upgrading old, minimum standards for flood-plain regulation. These standards require evaluations of the flood potential of many streams in Wisconsin.

This report provides an evaluation of flood potential for the Yahara River in the 13-mile low-water channel reach from the dam at the outlet of Lake Kegonsa downstream to the county line. Prepared by the U.S. Geological Survey in cooperation with the Dane County Regional Planning Commission and the Wisconsin Department of Natural Resources, this flood-inundation study gives the computed water-surface elevations and defines the areal limits of inundation for the regional flood.

The regional flood is defined by the Wisconsin Department of Natural Resources as a flood having an average frequency of occurrence of once in 100 years and "which is representative of large floods known to have occurred generally in Wisconsin and reasonably characteristic of what can be expected to occur on a particular stream."

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U. S. GOVERNMENT PRINTING OFFICE: 1959 O - 511171
667-100

1 The most significant factor affecting floods in this study reach
2 is the relatively large amount of storage available in the lakes
3 just upstream in the Madison metropolitan area. The four principal
4 lakes listed in downstream order are Mendota, Monona, Waubesa, and
5- Kegonsa. They have a combined surface area of 28.7 square miles.
6 Because of this large storage factor, the regional flood discharge
7 of the Yahara River at the outlet of Lake Kegonsa is less than the
8 regional flood at the inlet to Lake Mendota. The drainage area
9 and regional flood at both sites on the Yahara River are: inlet
10- to Lake Mendota (Hwy 113), drainage area 114 square miles, regional
11 flood 2,600 cubic feet per second; and outlet of Lake Kegonsa,
12 drainage area 384 square miles, regional flood 940 cubic feet per
13 second.

14 Within the study reach the city of Stoughton owns three dams
15- with small powerplants. Stebbinsville Dam, at mile 8.7, is 0.25 mile
16 downstream from the county line. Under low-flow conditions Dunkirk
17 Dam, at mile 13.3, backs water up to a low weir under the 4th Street
18 bridge just downstream from the dam in Stoughton. Stoughton Dam,
19 at mile 16.3, backs water up to the control dam at the outlet of
20- Lake Kegonsa.

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1 Each of the three dams with its powerplant has more than adequate
2 discharge capacity to pass the regional flood, without increasing
3 the stage in the power pool above normal operating levels. Thus
4 the regional flood elevation shown on the flood profiles upstream
5- from each of the dams is the normal operating level as used by the
6 city of Stoughton for power production. Pool levels at the three
7 dams were held several inches below normal during the flood of
8 April 1959, which was the greatest in 40 years of record at the
9 U.S. Geological Survey gaging station, Yahara River at McFarland, Wis.
10- The indicated frequency of the April 1959 flood is 100 years.

11 The regional flood elevations have been computed assuming that
12 Stebbinsville, Dunkirk, and Stoughton Dams would be operated normally
13 to pass the flood. An alternate flood profile has been computed
14 on the condition that the dams would not be operated normally.

15- This report will be useful to persons planning the use of flood
16 plains and especially to Dane County officials who are concerned
17 with flood-plain zoning regulations.

18 Additional information on the data in this report can be
19 obtained from the U.S. Geological Survey, Water Resources Division,
20- 1815 University Avenue, Madison, Wis.

INUNDATED AREA

The flood maps (sheets 1 and 2) show the area along the Yahara River that would be inundated by the regional flood. Flood boundaries, as shown on the map between surveyed cross sections, were located by interpolating between contour lines or estimated from information obtained during field investigations.

Depth of flooding at any site can be estimated by subtracting the ground elevation from the water-surface elevation indicated by the flood profile (sheets 3 and 4). Regional-flood elevations are indicated on the flood map to aid the user. Approximate ground elevations can be determined by interpolating between the contour lines on the map. More accurate depths of flooding can be obtained if ground elevations are determined by leveling to a point of known elevation.

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RIVER PROFILES

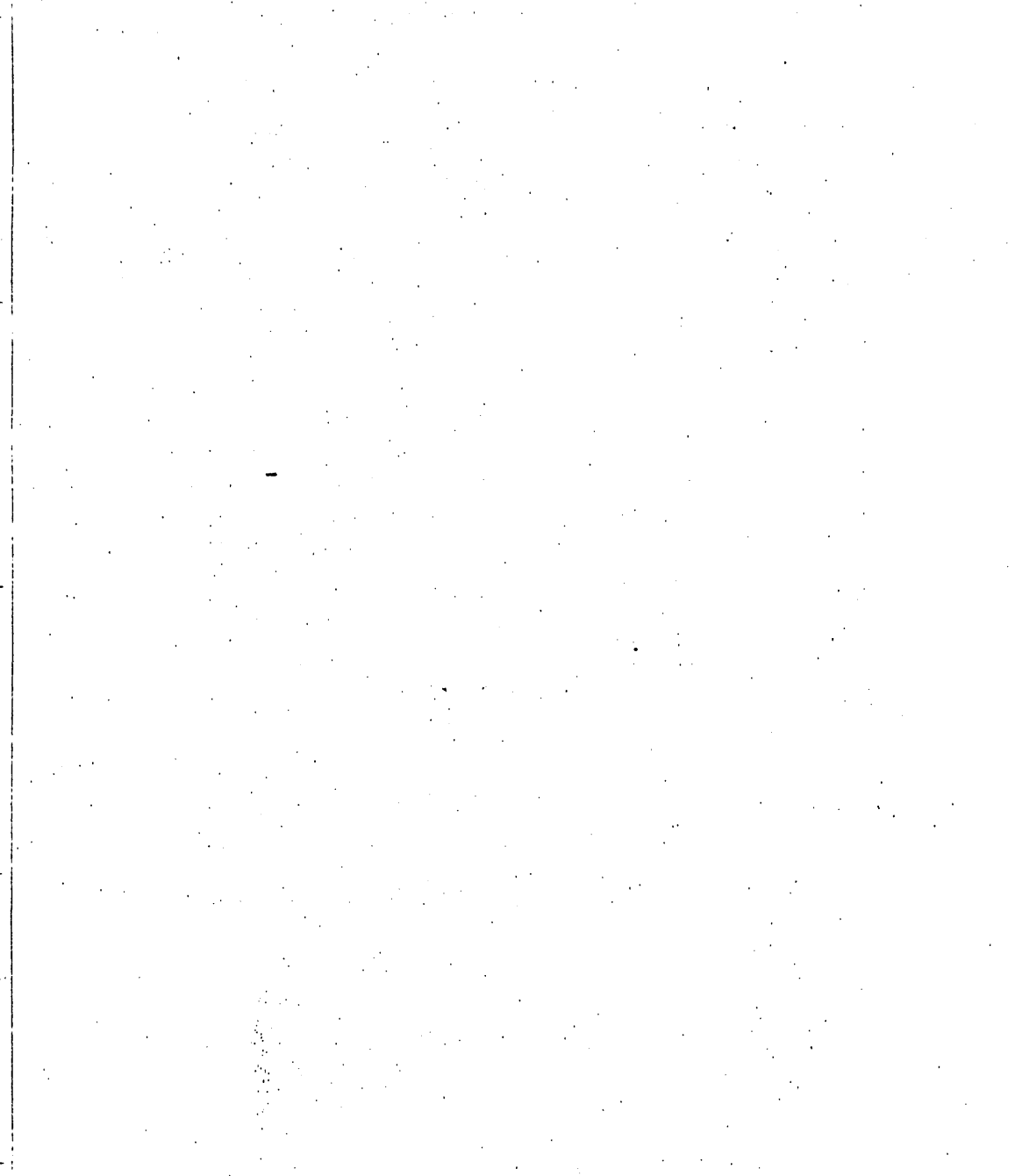
Regional flood.--A water-surface profile of the regional flood is shown on sheets 3 and 4. The flood profile, determined by hydraulic-engineering techniques, is the basis for delineating the flood boundaries (sheets 1 and 2).

The regional-flood profile was based on 61 flood-plain cross sections and supplemental data that included roughness coefficients, bridge and culvert geometry, and dam and powerplant details obtained from field surveys. Field data were augmented by information obtained from topographic maps and from the Stoughton Electric Utility. These data were used to determine the regional-flood profile by standard step-backwater computations. The water-surface elevation of the regional flood at the downstream end of each power pool is the normal operating level for power production.

Alternate flood profile.--The alternate flood profile, also shown on sheets 3 and 4, is the water surface that would occur for a discharge equal to that of the regional flood during the unlikely circumstance that the turbines would be inoperative and the gate and stoplog settings unchanged from those in effect for normal flows. Further, the condition is assumed that flow of water over the dam embankments would not be permitted. Thus the elevation at the downstream end of each power pool is the lowest point of the respective dam embankments.

1 Low-water.--A low-water profile is shown to indicate the
2 magnitude of flood rise at any point.

3 Channel thalweg.--The channel thalweg is the line joining
4 points of greatest depth in successive cross sections.



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