SPECIAL STUDY FOR

JOACHIM CREEK

JEFFERSON COUNTY, MISSOURI

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS

ST. LOUIS DISTRICT

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Introduction.

This report presents the findings of a special study for a portion of Joachim Creek, Jefferson County, Missouri. The intention of the study was to evaluate existing flooding problems rather than the development of flood control solutions. Included within the report are sections summarizing hydrologic and hydraulic computations, a review of the study area, a summary of the Lake Virginia Dam inspection report, a profile sheet displaying the 100 year flood level and a map delineating the boundary of the 100 year flood.

Study Area

The headwaters of the creek are found near the town of Halifax with the creek eventually discharging into the Mississippi River upstream of the confluence of the Mississippi and Ohio River.

The study covers a 3.1 mile portion of Joachim Creek starting just upstream of the 21A highway bridge near Harrison Lake and extending approximately 0.5 miles beyond the creek crossing south of Hematite. The study reach extends from approximately river mile 12.6 to river mile 15.7.

In general, the creek flows in a well defined channel, with a wide flood plain on the north side of the creek. The overbank area is very flat with steep hills confining the flow on both sides. The area near the creek is heavily wooded with the majority of the remaining flood plain being pasture and farmland. The drainage area of the creek is 107.2 square miles at the 21A Highway Bridge. The only creek discharging to Joachim Creek in the study reach with significant drainage area is Buck Creek.

Due to the steep terrain draining to the floodplain, periods of heavy rain could cause flash flooding along the creek. High water marks in the area indicate that past flood levels have reached at least the bottom of the deck on the bridge crossing the creek at Hematite.

Hydrologic Method

The drainage areas and slopes at three locations along the study reach, where peak discharges were estimated, are displayed in Table 1. The St. Louis District's Regression Equations (Table 2) (Reference 1) were used to compute the estimated peak discharges for the HEC-2 backwater model. These values were compared with the values obtained using other regression equations including the U.S.G.S. Technique for Estimating Magnitude and Frequency of Floods in Illinois (Table 3) (Reference 2), U.S.G.S. Technique for Estimating the Magnitude and Frequency of Missouri Floods (Table 4) (Reference 3), and Magnitude and Frequency of Missouri Floods by the Missouri Geological Survey and Water Resources (Table 5) (Reference 4). Based on conversations with the St. Louis District Corps of Engineers the values in Table 2 were scaled down by approximately 6.8 percent in order to be compatible with previous downstream studies. Table 6 presents the final peak discharge values that were used in this analysis.

The values obtained by the recommended method (Reference 1) were significantly higher than those obtained by the alternate methods. Further checking showed that in the adjacent Plattin Creek watershed, where rainfall runoff analysis using the HEC-1 program was completed, similar results as those found on Joachim Creek were obtained when comparing various discharge determination methods. Since the HEC-1 computer model results indicated that the St. Louis District Regression Equations provided the best peak flow estimates for the Plattin Creek Watershed, the results of this method were used in the Joachim Creek Study.

Hydraulic Method.

A total of ten bridge and valley cross sections were obtained for use in the backwater modeling. All but one of these were obtained using standard leveling methods during the field survey. The information just upstream of the 21A highway bridge was obtained from as built drawings provided by the Missouri Highway Department (Reference 5). The U.S. Army, Corps of Enginers HEC-2 Water Surface Profiles (Reference 6) computer program was utilized in determining the 100 year water surface profile.

The selection of the appropriate bridge routine and other modeling input was made during the course of two field inspections. Where necessary interpolated cross sections based on the survey data, contour mapping, and field inspection have been added to the computer program to properly model the flow pattern. Roughness coefficients (n-value) were selected based on the engineer's judgement during the course of the field reconnaissance and using appropriate background publications (Reference 7 and 8) The starting elevation for the 100 year flood profile was provided from a previous flood hazard study (Reference 9).

Lake Virginia Dam.

Within the study area the Lake Virginia Dam presents another possible flood hazard. Hydraulic computations for the effect of a dam break on the flooding are beyond the scope of this study. The following text provides a summary of the findings of an existing dam safety report prepared by the St. Louis District, Corps of Engineers (Reference 10).

The dam is an earth structure built across a tributary to Joachim Creek north of the Joachim Creek floodplain. It is located about one-half mile northwest of the town of Hematite in Jefferson County, Missouri. The lake level appears to fluctuate over a wide range in response to various runoff conditions. At the time of the field inspection for the Joachim Creek Study the reservoir was nearly dry. The dam has been classified in the High Hazard Classification. The findings of the dam safety report indicate that no drawdown facilities are available to evacuate the pool and that maximum spillway release could endanger the integrity of the dam. The spillways have insufficient capacity to pass the minimum required flood of one-half the Probable Maximum Flood (PMF), without the dam being overtopped. Assuming a full reservoir, this dam will start to be overtopped by the 100 year flood event. This could erode the downstream face of the dam causing a release of impounded water with increased flood hazard in the study area downstream of the dam. The dam safety report concludes that "the effect from rupture of the dam could extend approximately three miles downstream of the dam. There are five inhabited homes downstream of the dam which could be severely damaged and lives of the inhabitants lost should failure of the dam occur." Based on this it can be concluded that the dam represents an increased flood hazard for structures in the floodplain downstream of the dam.

<u>100 Year Flood Profile and Base Map</u>.

The 100 year flood is representative of a flood event with a one percent chance of occurrence in any given year. The water surface profile has been plotted on Plate 1. On the profile the elevations of the stream bed, the high bank, the 100 year water surface, and the surveyed cross section locations are plotted. The horizontal scale is in river miles and is representative of river miles measured from the confluence of the creek with the Mississippi River.

A representation of the extent on the 100 year flood event is shown on the base map at the end of this report (Plate 2). The map is a reproduction of a portion of the U.S.G.S. topographic map of the study area enlarged to a scale of 1" = 800'. Minor modifications of the original map were made to reflect information obtained during the field inspection and survey. The floodplain representation was interpolated between surveyed cross sections using the contour map. Due to the large contour interval (20' contour interval) the representation of the effected area on the map will be less accurate than obtaining a water surface elevation from the profile.

Conclusion.

This study has been prepared by Clark Dietz Engineers for the St. Louis District, Corps of Engineers.

TABLE 1

Watershed Data

Location	Drainage Area Sq. Miles	Elevation At 10 Percent	Elevation At 85 Percent	Length Miles	Slope (Ft/Mile)
21A Highway Bridge	107.2	407	714	17.5	17.5
Upstream of Buck Creek	98.8	411	715	17.0	17.9
Hematite Bridge Creek Crossing	94.4	424	729	15.3	19.9

TABLE 2

St. Louis Regression Results

Location	Q_{100}
21A Highway Bridge	44,600 c.f.s.
U.S. at Buck Creek	42,400 c.f.s.
Hematite Bridge	43,500 c.f.s.

$Q_{100} = MAP_{100}\ (DA)^{0.8029}\ (S_{10-85})^{0.6011}$

$MAP_{100} = 187.3$

S_{10-85} = Slope (Ft./Mile)

DA = Drainage Area (Square Miles)

TABLE 3

Illinois Regression Results

Location	Q_{100}
21A Highway Bridge	28,100 c.f.s.
U.S. at Buck Creek	26,700 c.f.s.
Hematite Bridge	27,300 c.f.s.

$$Q_{100} = 152.0\ A^{0.762} S^{0.515}\ (I-2.5)^{0.876}\ Af$$

A = square miles

S = slope

I = rainfall intensity = 3.6

Af = aerial factor = 1.11

TABLE 4

Missouri Regression Results (U.S.G.S.)

Location	Q_{100}
21A Highway Bridge	23,600 c.f.s.
U.S. at Buck Creek	22,400 c.f.s.
Hematite Bridge	23,000 c.f.s.

$$Q_{100} = 85.1\ A^{0.934(A) - 0.02}\ S^{0.576}$$

S = Slope (Ft/Mile)

A = Drainage Area (Square Miles)

TABLE 5

Missouri Regression Results (M.G.S.W.R.)

Location	Q_{100}	Q_{25}	Q_{50}
21A Highway Bridge	11,600 c.f.s.	18,300 c.f.s.	21,100 c.f.s.

$Q_{16} = 90.1\ A^{0.757} S^{0.462}$

$Q_{25} = 74.8\ A^{0.776} S^{0.654}$

$Q_{50} = 70.4\ A^{0.804} S^{0.680}$

A = Drainage Area (Square Miles)

S = Slope (Ft/Mile)

TABLE 6

Q_{100} For HEC-2 Runs

Location	Q_{100}*
21A Highway Bridge	41,600 c.f.s.
U.S. at Buck Creek	39,500 c.f.s.
Hematite Bridge	40,600 c.f.s.

*Values from Table 2 reduced approximately 7 percent to be compatible with downstream study

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7. Chow, Ven Te, Open-Channel Hydraulics, McGraw Hill Book Co., N.Y., 1959, pp. 101-123.

8. Roughness Characteristics of Natural Channels, U.S. Geological Survey, Water Supply Paper - 1849, 1967.

9. Special Flood Hazard Information Study - Joachim Creek, Russel & Axon, July, 1976.

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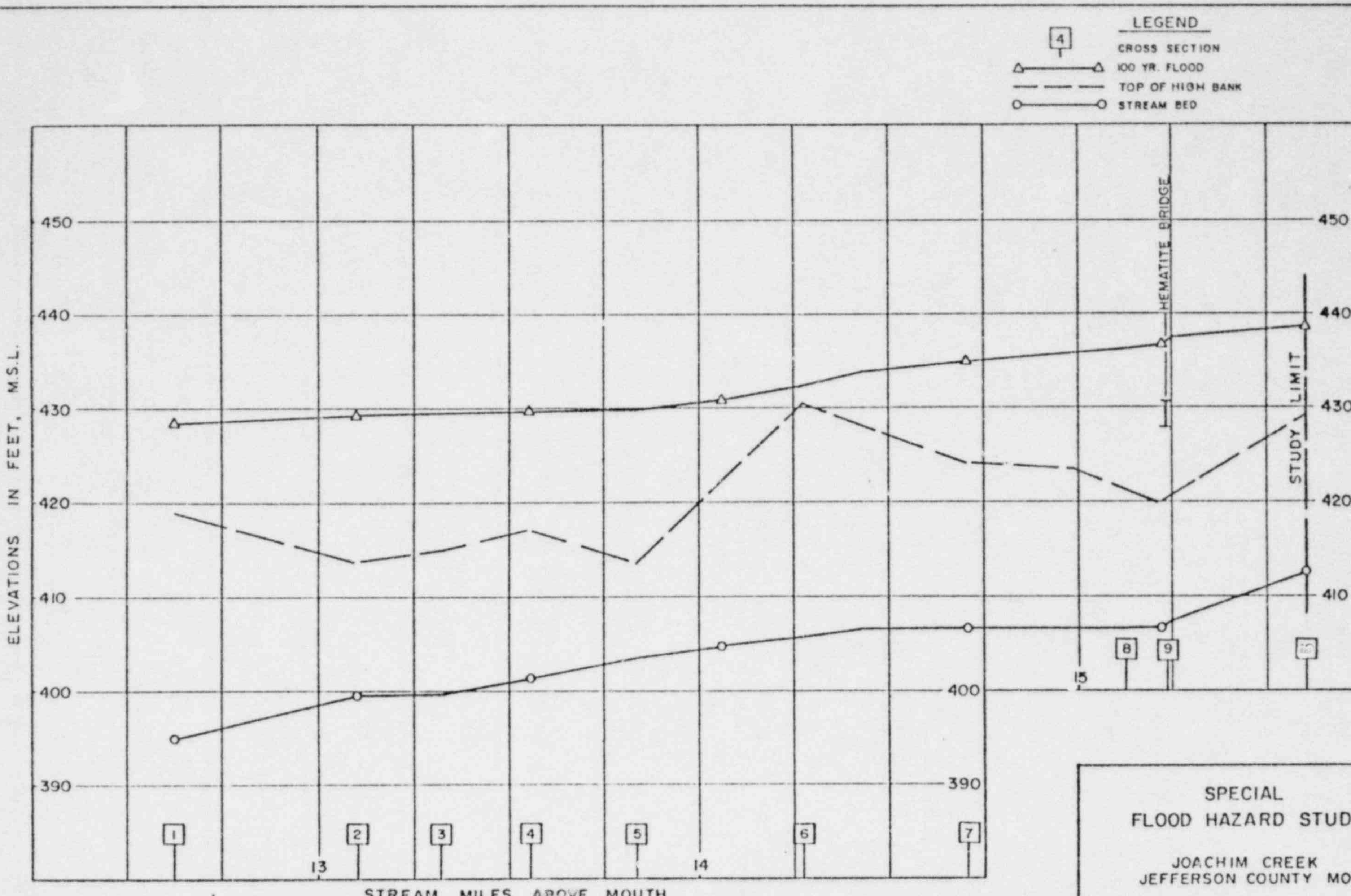

SPECIAL
FLOOD HAZARD STUDY

JOACHIM CREEK
JEFFERSON COUNTY MO.

100 YR. FLOOD PROFILE

PLATE 1
MAR. 1980