Flood Plain Information

MARAIS DES CYGNES RIVER
OTTAWA TO OSAWATOMIE
KANSAS

VOLUME II

PREPARED FOR
KANSAS WATER RESOURCES BOARD
BY
CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT
JANUARY 1975

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COVER PHOTO: Photograph of July 1951 flood at Osawatomie's inundated business district.

BASIN

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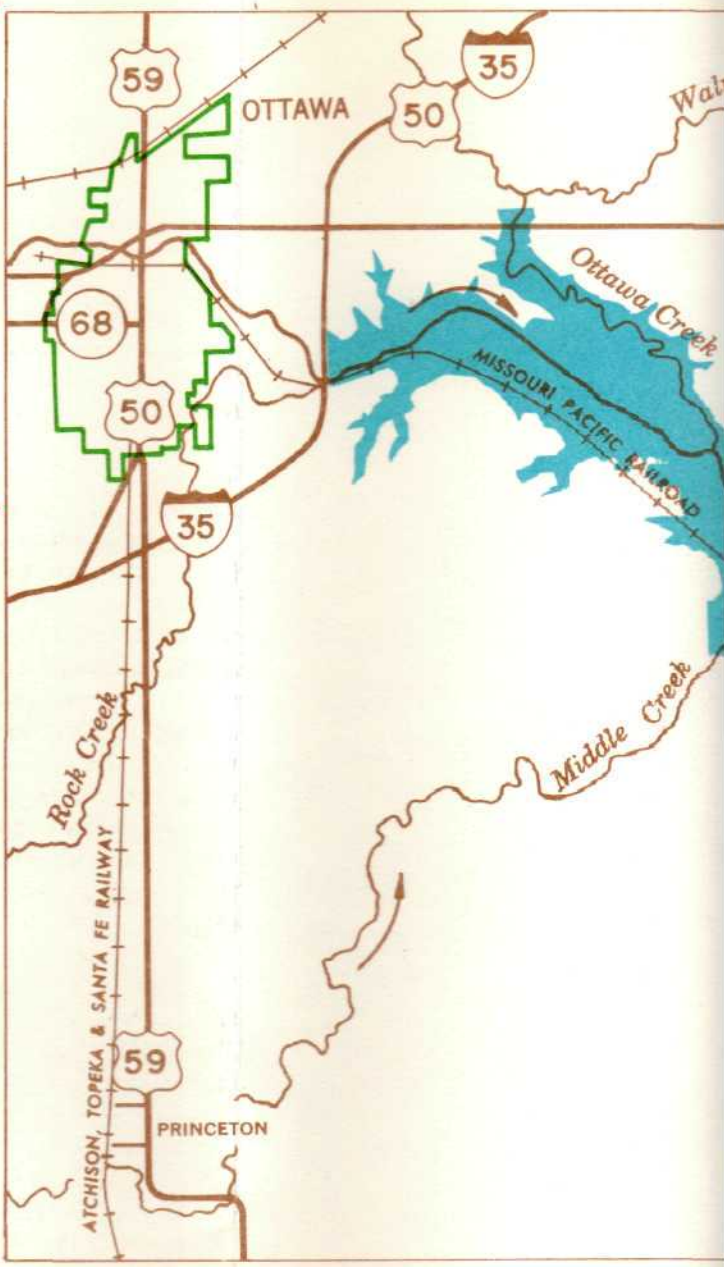
SCALE IN MILES



CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

GENERAL MAP

MARAIS DES CYGNES RIVER

OSAWATOMIE TO OTTAWA, KANSAS

VOLUME II

JANUARY 1975 FILE NO. 0-6-411

LEGEND

Study Reach of this Report. _ _

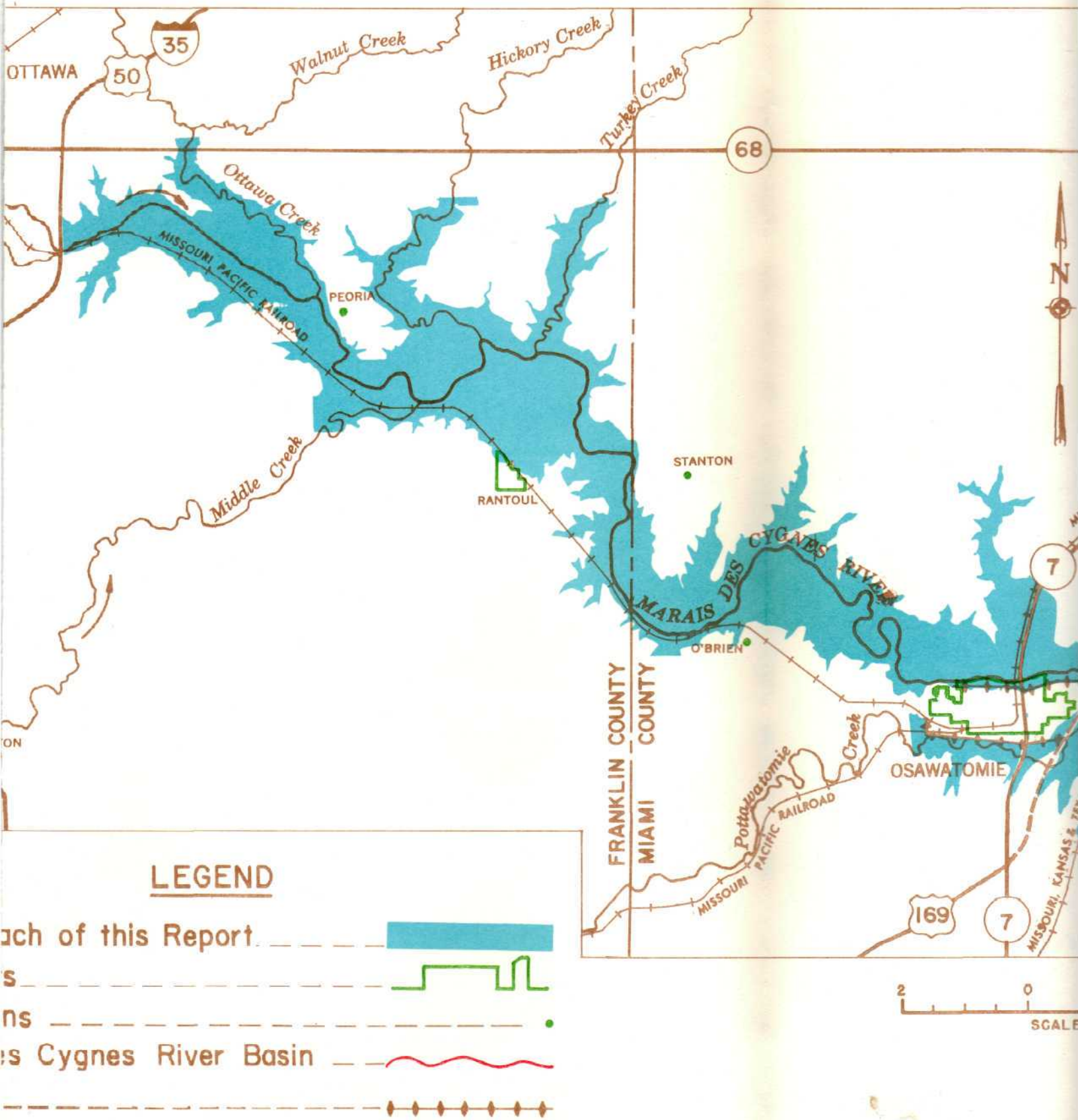
City limits_ _ _ _ _ _ _ _ _ _ _ _

Other towns _ _ _ _ _ _ _ _ _ _ _

Marais des Cygnes River Basin

Levee_ _ _ _ _ _ _ _ _ _ _ _ _ _

PLATE NO. 1


OTTAWA
35
50
Walnut Creek
Hickory Creek
Turkey Creek
68
Ottawa Creek
MISSOURI PACIFIC RAILROAD
PEORIA
Middle Creek
RANTOUL
STANTON
MARAIS DES CYGNES RIVER
O'BRIEN
N
7
FRANKLIN COUNTY
MIAMI COUNTY
Pottawatomie Creek
OSAWATOMIE
MISSOURI PACIFIC RAILROAD
MISSOURI, KANSAS &
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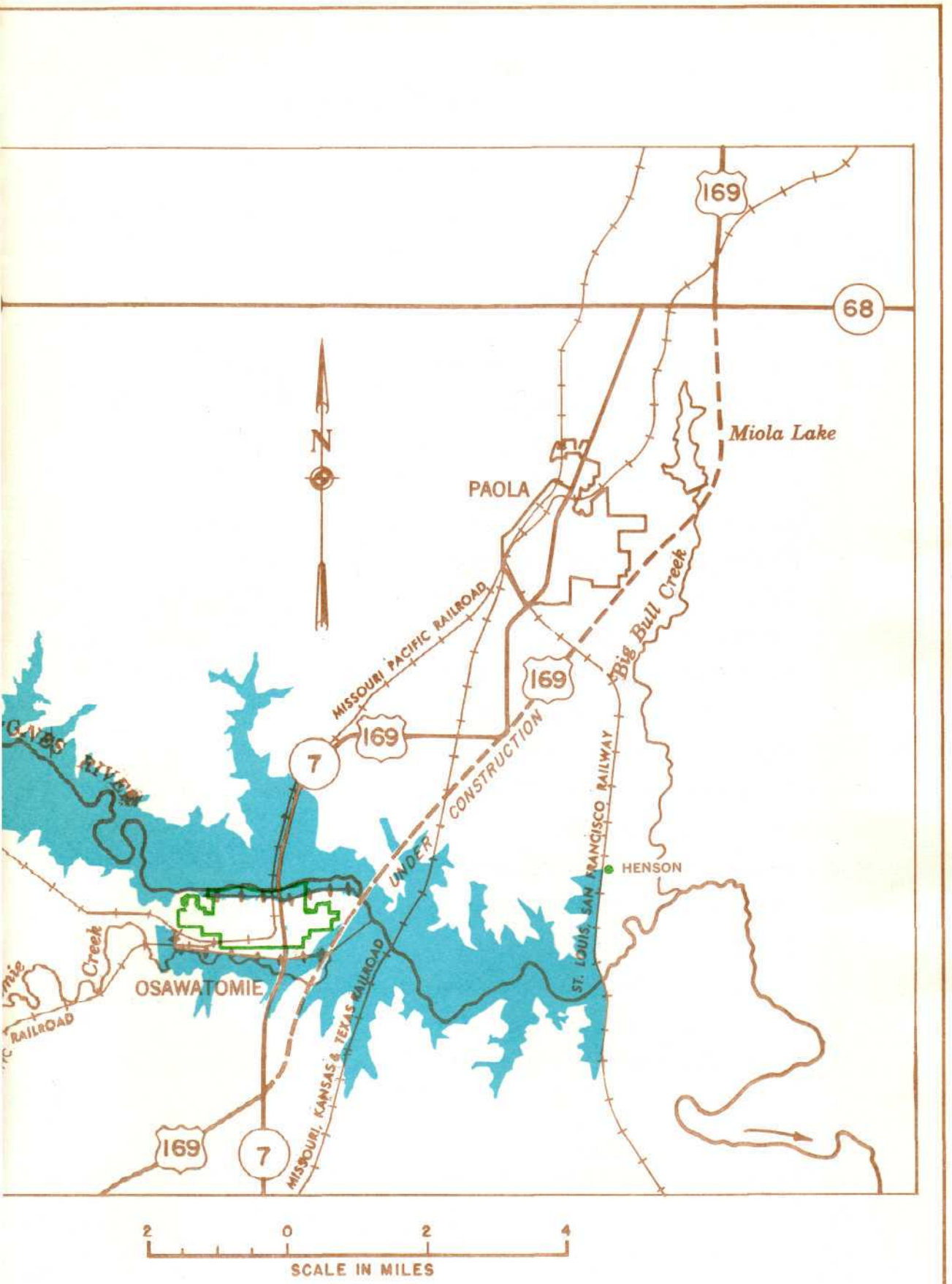
SCALE


169
68
N
Miola Lake
PAOLA
MISSOURI PACIFIC RAILROAD
Big Bull Creek
169
169
7
UNDER CONSTRUCTION
ST. LOUIS, SAN FRANCISCO RAILWAY
HENSON
OSAWATOMIE
MISSOURI, KANSAS & TEXAS RAILROAD
169
7
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SCALE IN MILES

PREFACE

This report evaluates the hazards resulting from floods occurring on the Marais des Cygnes River from a point about one mile downstream of Ottawa, Kansas, to a point about six miles downstream of Osawatomie, Kansas. The area upstream from the location referred to above, was covered in a prior Flood Plain Information Report, Marais des Cygnes River, Melvern to Ottawa, Kansas, dated July 1973. Flooding comparable to that which has occurred in the past, could become a serious problem as there is a growing interest for future development of flood plain areas. Although a large flood such as the one that occurred in July 1951 would now be modified by Melvern and Pomona Lakes and also by the flood protection projects at Ottawa and Osawatomie, area residents would still be confronted with serious problems from a comparable event.

Contents of the report include maps, profiles, and cross sections indicating the approximate extent of flooding which could be expected in the future under existing conditions. A glossary to assist in the understanding of unfamiliar terms used in the report is also included. All available historical information, streamflow records, precipitation data, and other technical data were used in defining the size and occurrence of potential floods along the Marais des Cygnes River. The information as presented is intended to be used as an aid in the identification of local flood problems and to promote the best use of lands subject to overflow. This information may also be used by general or special interest groups to appraise flood risk during the development of their programs to avoid or reduce flood damages. However, it should be recognized that the flood hazards as presented are evaluated as of the date of this report. Special plans and recommendations for the solution of flood problems are not included as these are properly the responsibility of local government. Use of flood plain regulations, zoning regulations, flood proofing, and construction of flood protection works, or a combination of these approaches may be implemented by planners to guide those who intend to use the flood plain.

This report was prepared at the request of the Kansas Water Resources Board under the continuing authority provided the Corps of Engineers in Section 206 of the 1960 Flood Control Act (Public Law 86-645) as amended. Plate 1, on the opposite page, shows the study area discussed in this report.

Assistance and cooperation of the National Oceanic and Atmospheric Administration (NOAA) National Weather Service, the U. S. Geological Survey, the Kansas Water Resources Board, the Kansas State Highway Department, the St. Louis-San Francisco Railway Company, the Missouri-Kansas-Texas Railroad Company, the Missouri Pacific Railroad Company, the Osawatomie Graphic-News, the Kansas State Historical Society, and private citizens in supplying useful information and photographs used in the preparation of this report are appreciated.

Copies of this report and information on its use are available from the Kansas Water Resources Board in Topeka, Kansas. Technical assistance to Federal, State, and local agencies in the interpretation of the information contained herein will be provided, upon request, by the Kansas City District, Corps of Engineers.

BACKGROUND INFORMATION

Settlement

Miami County, initially called Lykins County after one of the first white settlers in the area, is located in the eastern part of Kansas. The name was changed on June 3, 1861, in honor of the original settlers, the Miami Indians. Other tribes within the area included the Pottawatomie, the Shawnee and Confederated Tribes.

Franklin County, adjacent to Miami County, was first settled by several Indian tribes including the Sac, Fox, Osage and Ottawa tribes. The county was organized in 1855 and named in honor of the American statesman Benjamin Franklin.

The first white pioneers settled in the southwest part of Miami County in 1854. From this settlement sprang the town of Osawatomie. The name is said to be a combination of Osa - of Osage and watomie of Pottawatomie. The townsite, selected in February of 1855, was located on the Marais des Cygnes River, one mile above the mouth of Pottawatomie Creek. Osawatomie recorded a population of 200 within two years, and presently has a population of 4,294.

Ottawa, Kansas, settled in 1864 and named after the Ottawa Tribe, is located about 32 river miles upstream from Osawatomie. Ottawa was chosen as County seat in August of 1864 and presently has a population of 11,036.

The Stream and Its Valley

The Marais des Cygnes River basin above Osawatomie, Kansas, contains a total drainage area of 1,627 square miles. Two upstream dams, forming Melvern and Pomona Lakes, control 671 square miles of that amount, leaving 956 square miles of uncontrolled drainage area. The fan-shape of the basin extends in a northwesterly direction from Osawatomie encompassing the major portion of Franklin County and segments of Coffee, Osage, Douglas, and Miami Counties.

The portion of the basin covered in this report is mostly comprised of undulating prairie with interspersed farmland. Flood plains along the Marais des Cygnes River and its tributaries vary from 0.5 to 2.0 miles in width and ranges from an elevation of about 840 feet, mean sea level (m.s.l.) at Osawatomie to 880 feet, m.s.l. at the Interstate 35 bridge near Ottawa, Kansas. The channel has a slope of about 1.3 feet per mile between Ottawa and Osawatomie, Kansas. The basin shape and major drainage features for the portion of the basin located in Kansas are shown on the General Map, Plate No. 1.

Development in the Flood Plain

The flood plain along the reach of the river considered in this report is primarily used for farming and ranching operations. Thus, the flood plain areas are relatively free from encroachment except for structures at highway and railroad crossings and the area surrounding the city of Osawatomie, Kansas.

FLOOD SITUATION

Sources of Data and Records

Streamflow gaging stations located within the reach of the Marais des Cygnes River covered in this report are listed in Table 1.

TABLE 1

MARAIS DES CYGNES RIVER GAGE LOCATIONS

River Mile	Location	Gage Equipment	Zero Gage Elevation (1)	Years of Record
367.4	Mill Street Bridge, 1 Mile East of Osawatomie, Kansas	Wire-Weight Gage	808.44	1
367.4	First Utility Pole from Levee on Downstream Side of Mill Street	Staff Gage	845.38	2
369.4	Downstream Side of Pumping Plant Well Tower at Osawatomie, Kansas	Staff Gage	816.3	30
398.9	Sewage Treatment Plant at Ottawa, Ks.	Continuous Recorder	857.68	56

(1) Elevation in feet above mean sea level (m.s.l.)

Other sources of data besides the gaging stations listed above are also available. High-water marks set for significant past floods have provided a valuable source of data to be used in conjunction with information obtained from newspaper files, historical documents and related records. Reference marks have been established at many of the highway and railroad bridges and at several other locations in the reach for documentation purposes. This information is on file in the Kansas City District Office.

Climatological records have been kept for Osawatomie since 1882, and for Ottawa since 1885. The records for Osawatomie include daily precipitation measurements for 1882 to present and temperature measurements for 1951 to present. The records for Ottawa include daily pre-

cipitation measurements for 1885 to present, hourly precipitation records for 1943 to present, and temperature measurements for the period of 1895 to the present time. The normal annual precipitation is 35.85 inches with variations from 22.11 inches recorded in 1911 to 61.41 inches in 1951. Snowfall occurring in November through March averages about 20 inches but has no significant effect upon flooding.

Maps prepared for this report were based on 7.5 minute U. S. Geological Survey quadrangle sheets with a horizontal scale of 1 inch to 2,000 feet and a ten foot contour interval. Structural data on bridges and updating of mapping features were obtained by field surveys performed in August 1973 by Corps of Engineers personnel.

Flood Season and Flood Characteristics

The Marais des Cygnes River and its tributaries are subject to floodflows resulting primarily from runoff occurring from intense rainfall. The shape of the basin, pattern of the drainage system, topographical conditions, and fairly dense soil are contributing factors toward rapid concentration of runoff into flood producing discharges. About 75 percent of all flood stages recorded for the reach of the Marais des Cygnes River between Ottawa and Osawatomie, have occurred during the period of April through July. However, major floods have occurred during other months, such as the November 1928 flood, which is discussed in this report.

Factors Affecting Flooding and Their Impact

Obstructions to floodflow - There are no major natural obstructions within the flood plain of the Marais des Cygnes River or its tributaries, except for an overgrowth of brush and trees. Most obstructions affecting floodwaters have been created by man's continued encroachment onto the flood plain. Bridges are the most prominent man-made obstacles encountered. The bridges located within the flood plain considered in this report are shown in Figures 1 through 11.

Flood damage reduction measures - A planned effective flood damage prevention program has been initiated in the Marais des Cygnes River basin, both along the main stem and its tributaries. Completion of Pomona and Melvern Lakes has substantially reduced the amount of flooding in the upper portion of the basin. The combined flood control capacity of the two lakes is about 362,500 acre-feet. (One acre foot equals one foot of water over one acre.) Flooding is still quite possible through the entire reach of the study area from storms occurring below the lakes. The potential severity of such flooding is evidenced by the flood protection provided for the cities of Osawatomie and Ottawa. Those portions of the flood plain not protected by levees are subject to potentially severe flood hazards.

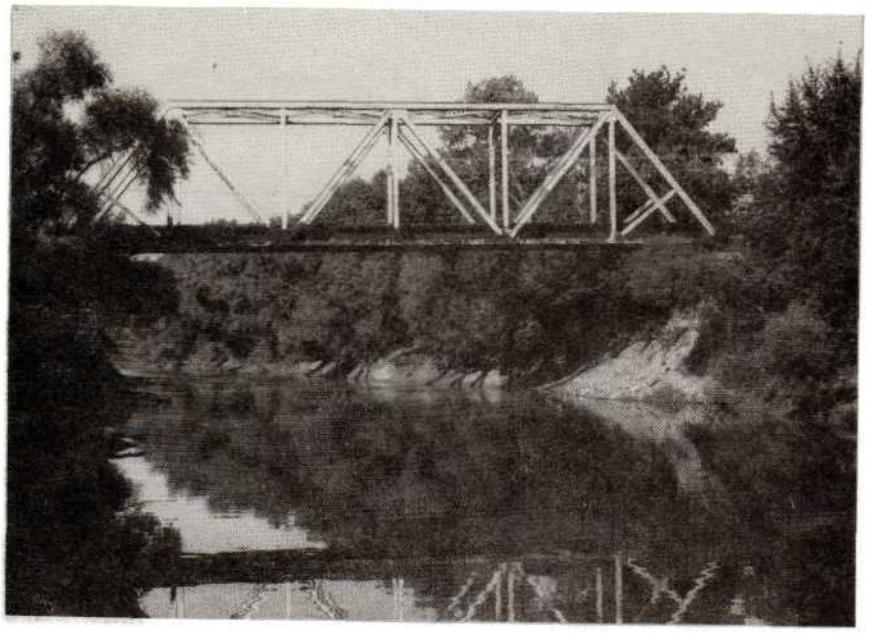

FIGURE 1 - St. Louis-San Francisco Railway Company Bridge over Marais des Cygnes River. (Mile 362.53). Looking upstream.

FIGURE 2 - Missouri-Kansas-Texas Railroad Company Bridge over Marais des Cygnes River. (Mile 366.83). Looking downstream.

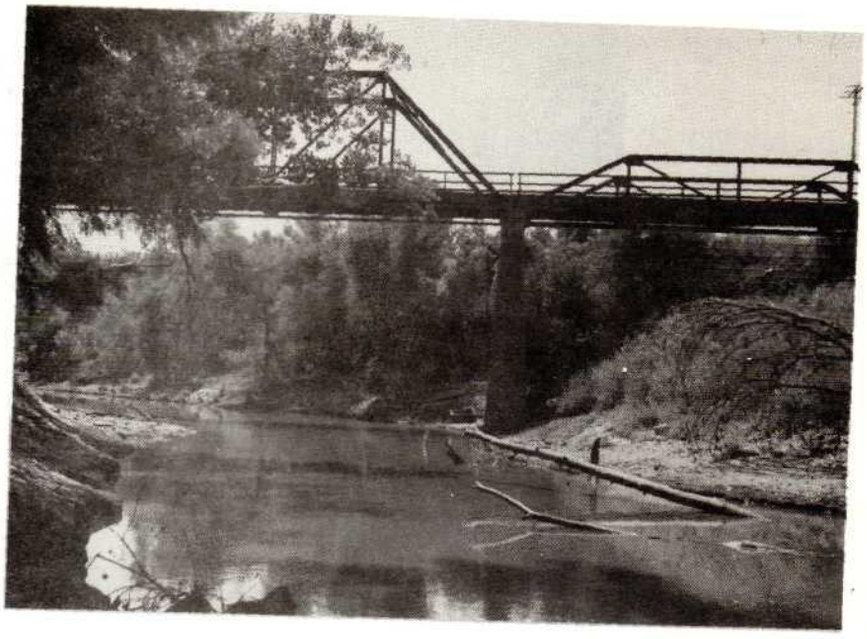

FIGURE 3

Mill St. Bridge over Marais des Cygnes River, 1 mile east of Osawatomie, Kansas. (Mile 367.43). Looking downstream.

FIGURE 4

First St. Bridge over Marais des Cygnes River, at Osawatomie, Kansas. (Mile 368.57). Looking upstream.

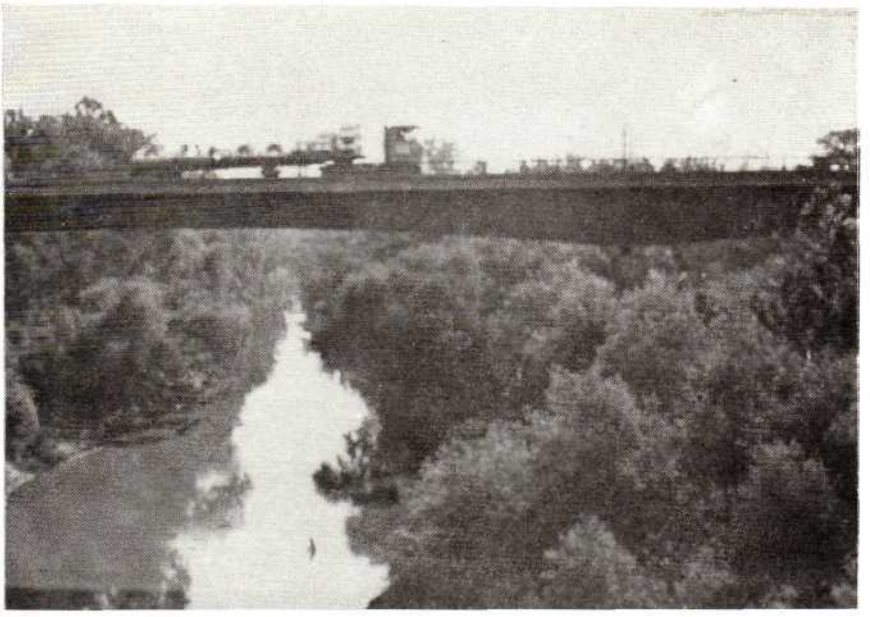

FIGURE 5 - Highway 169 Bridge over Marais des Cygnes River, at Osawatomie, Kansas. (Mile 369.14). Looking downstream.

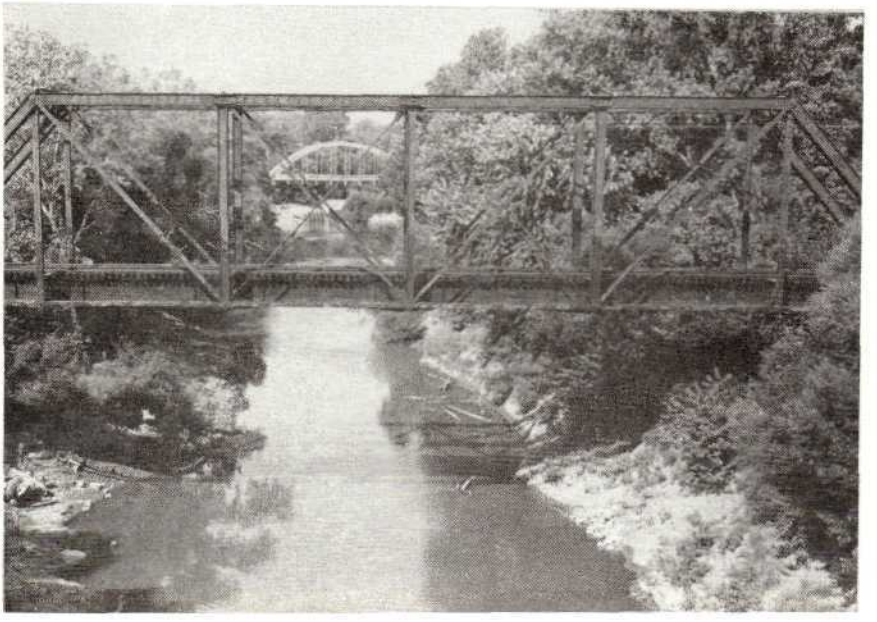

FIGURE 6 - Missouri Pacific Railroad Company Bridge over Marais des Cygnes River, at Osawatomie, Kansas. (Mile 369.18). Looking upstream.

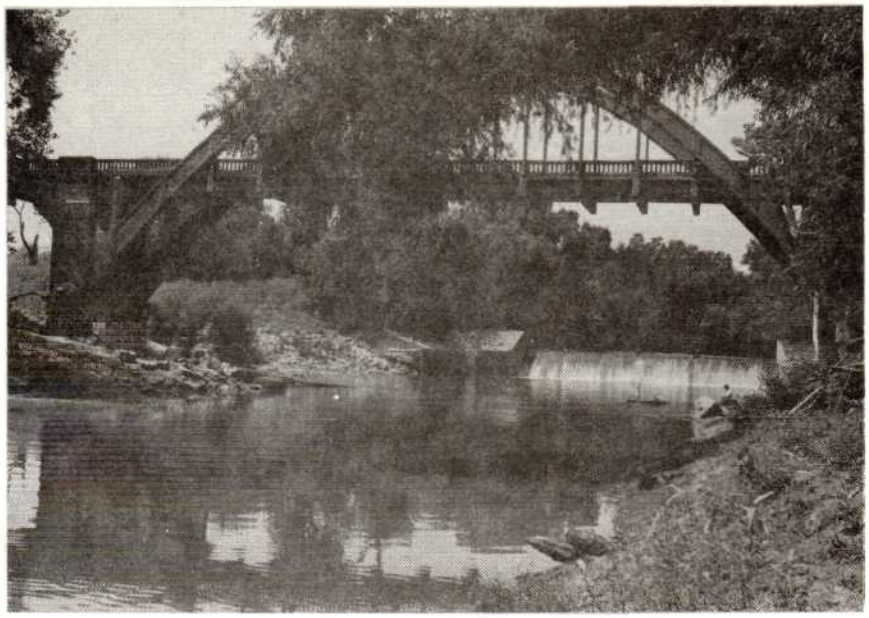

FIGURE 7 - Eighth St. Bridge over Marais des Cygnes River, at Osawatomie, Kansas. (Mile 369.31). Looking upstream.

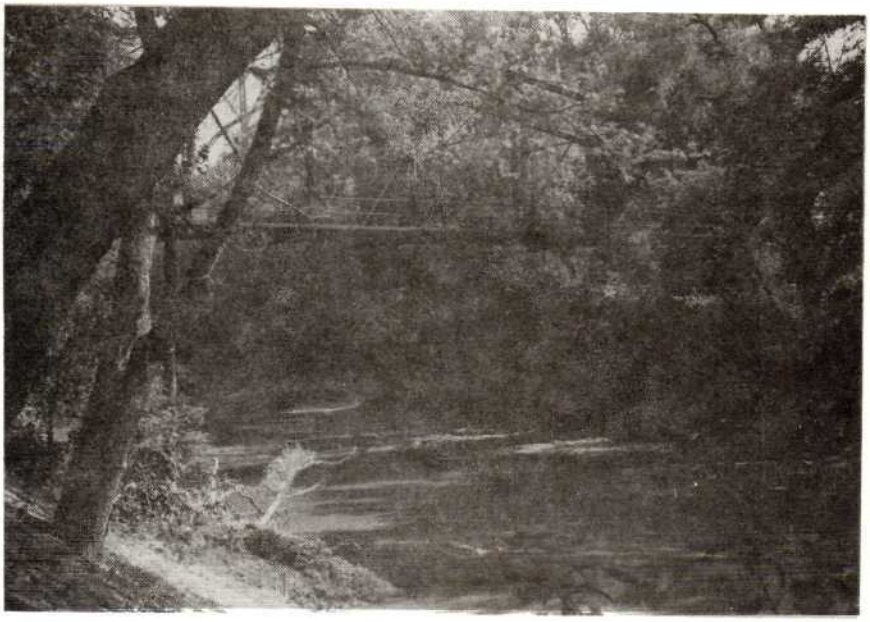

FIGURE 8 - County Road Bridge over Marais des Cygnes River, 1.5 miles south and 1 mile east of Stanton, Kansas. (Mile 377.24). Looking downstream.

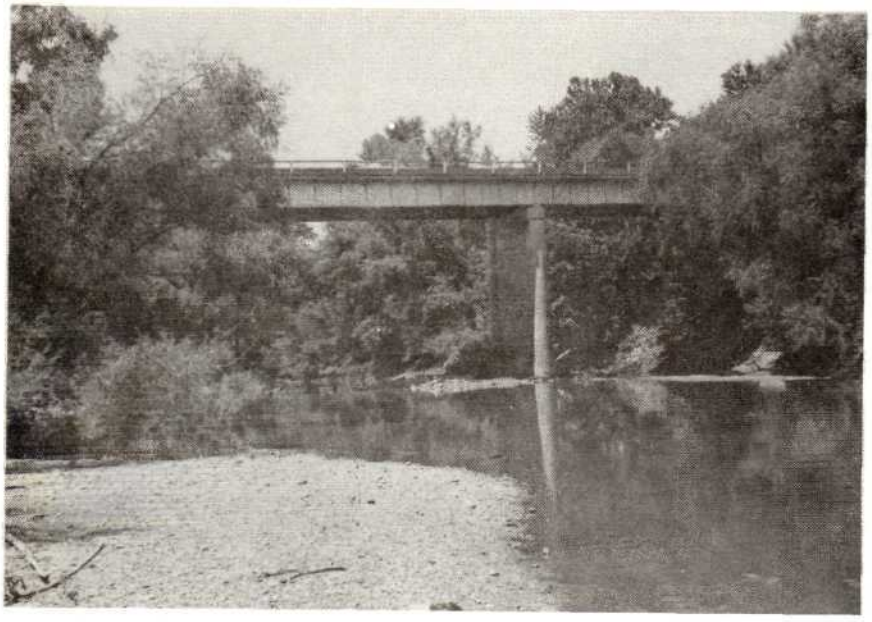

FIGURE 9 - County Road Bridge over Marais des Cygnes River, 2 miles north of Rantoul, Kansas. (Mile 386.19). Looking upstream.

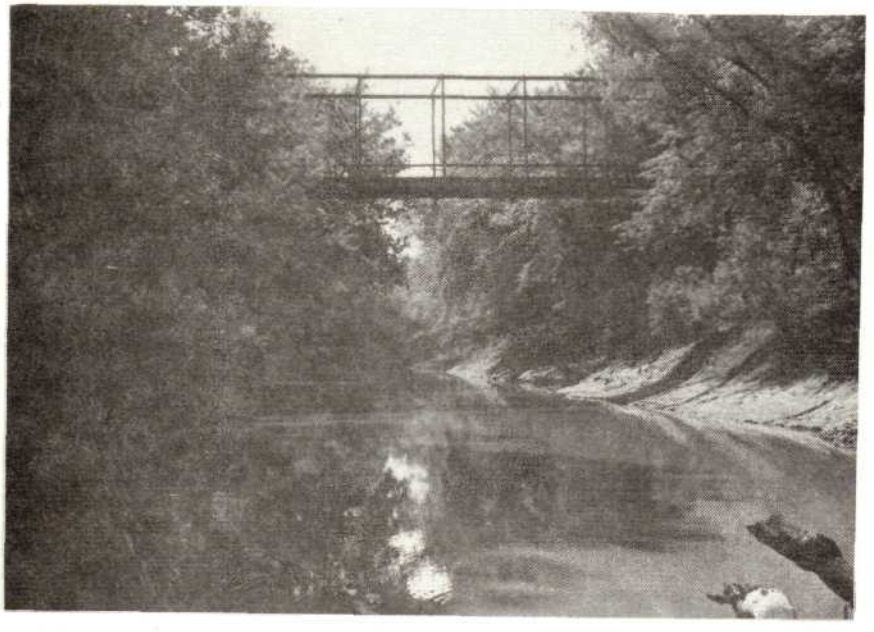

FIGURE 10 - County Road Bridge over Marais des Cygnes River, 0.5 mile west and 1 mile south of Peoria, Kansas. (Mile 391.24). Looking downstream.

FIGURE 11 - County Road Bridge over Marais des Cygnes River, 1.5 miles north and 3 miles west of Peoria, Kansas. (Mile 395.11). Looking upstream.

Other factors and their impacts

Flood warning and forecasting services - The following statement furnished by the National Oceanic and Atmospheric Administration (NOAA) National Weather Service, describes the flood warning services available.

> The National Oceanic and Atmospheric Administration (NOAA) National Weather Service provides flood forecasting service for major river basins. This system involves predictions of anticipated stages at a particular gage or gages in the basin. These forecasts are based on observed precipitation and stages at upstream points and anticipated weather conditions. The flood forecast is transmitted to city officials, to newspapers, and to radio and television stations in the basin. These media disseminate the information to residents of the flood plain in the form of a flood warning. This timely forewarning permits protective measures to be undertaken by industrial plants, public utilities, municipal officials and individuals with property in the lowlands. Services available are of the following three types:
>
> **Flash Flood** - The weather service at Topeka, Kansas is responsible for providing flash flood warnings for the Marais des Cygnes Basin above Osawatomie which is under the radar umbrella of the WSR-57 at Kansas City and the local use radar at Topeka. These radar facilities are capable of immediate detection and evaluation of rainfall intensity and location and movement of storms and areas of heavy rainfall. Information is promptly relayed by teletype circuits and telephone to radio and TV for broadcasts and to responsible municipal and local officials and people in the potentially flooded area.

Major Forecasts - River stage forecasts are based on radar coverage, reports from 10 river stations, and about 18 rainfall reporting stations in or near the basin. The river forecast center at Kansas City is staffed with professional hydrologists responsible for the preparation of river forecasts based on water equivalent of snow cover, rainfall-runoff relations, streamflow routing, and a working knowledge of anticipated weather conditions. The lead time between distribution of the forecasts and the flood crest may be short, however, lead time normally ranges from 12 to 18 hours for rainfall and up to a week or more for snowmelt. Specific crest forecasts are issued for gaging stations upstream and for Ottawa and Osawatomie on the Marais des Cygnes River and for Garnett and Lane on Pottawatomie Creek as required. The River District Office at Topeka is responsible for the interpretation and distribution of flood forecasts and the operation of the hydrologic substation network. In view of the short lead time,office also has the capability of issuing crest forecasts for the Marais des Cygnes at Ottawa and for Pottawatomie Creek at Garnett.

Hydroclimatic Data - Most of the data from the network is published. These records provide the basis for forecasts as well as for the planning and design of protective works and their operation during floods.

Flood fighting and emergency evacuation plans - Upon completion of the flood protection projects at Ottawa and Osawatomie, plans for flood fighting were prepared and suggested for use. The plans are outlined in the Operation and Maintenance Manuals prepared for each of the above cities. However, no flood fighting or emergency evacuation plans are in effect for the areas not protected by the above projects. Residents of such areas must rely solely upon the warning system of the National Weather Service described in the preceding paragraphs. If the need arises, State and local law enforcement agencies together with the local residents could assist in the rescue of stranded persons and perform other flood fighting activities. Since the lead time between the dissemination of flood warning and the crest of the flood may be short, it is important that officials be familiar with the rapid emergency measures required to remove people and valuable possessions from the flood plain.

PAST FLOODS

Summary of Historical Floods

Information obtained from historical records and newspaper accounts indicate a long history of flooding for the area covered in this report. Many of the early floods in the Marais des Cygnes River basin are a matter of legend rather than actual historical record. Some of the major floods effecting the area of study occurred in 1826, 1844, 1875, 1882, 1895, and 1896, but unfortunately, elevations for these floods are not available.

Flood Records

Discharge records date from 1902 at Ottawa and 1928 at Osawatomie, but the early discharges were based primarily upon readings taken only at times of high water. Detailed information pertaining to flooding has been kept since 1918 at Ottawa and 1944 at Osawatomie. Table 2 contains a summary of flood events on the Marais des Cygnes River that have effected these two cities in the past.

Flood Descriptions

The following composite accounts describe the three largest floods of record and the most recent flood for the segment of the Marais des Cygnes River covered in this report.

Flood of November 1928 - An average depth of 8.6 inches of rain fell over the portion of the basin above Osawatomie during the period of 15-17 November, producing the second largest flood of record. A peak stage of 38.7 feet was reached at Ottawa resulting in a discharge of 87,400 cubic feet per second (c.f.s.). A peak stage of 44.32 feet, 16.32 feet above flood stage, was reached at Osawatomie resulting in a discharge of 94,000 c.f.s. above the mouth of Pottawatomie Creek.

Flood of April 1944 - During the storm of 21-24 April, an average depth of 5.7 inches of rain fell over the upper portion of the basin. The peak stage at Ottawa was 37.5 feet, resulting in a discharge of 73,000 c.f.s. As the flood moved downstream, a peak stage of 42.70 was reached at Osawatomie resulting in a discharge of 54,700 c.f.s.

Flood of July 1951 - The largest flood of record resulted from a rainstorm that started at 3:50 p.m. on 9 July and continued until 1:00 p.m. on 12 July 1951. During this period Ottawa received a total of 10.83 inches of rain from local downpours with intermittent light showers. The peak stage of 42.5 feet was reached at Ottawa on 11 July, representing a peak discharge of 142,000 c.f.s. The average rainfall above Osawatomie of 10.3 inches with a runoff of about 8.3 inches, resulted in a maximum stage of 50.3 feet or 22.3 feet above flood stage. The resultant peak discharge was about 162,000 c.f.s. as determined from rainfall-runoff computations. It should be emphasized that these discharges occurred prior to the construction of the dams forming Melvern and Pomona Lakes. Flood damage was estimated at 6 million dollars at Ottawa and one-half million dollars at Osawatomie. It should be noted, however, that a comparable flood under present day conditions would cause no damage in the protected areas at either city.

TABLE 2

ANNUAL MAXIMUM EVENTS ABOVE FLOOD STAGE

Marais des Cygnes River at Ottawa, Kansas			Marais des Cygnes River at Osawatomie, Kansas		
Date	Crest Stage (1) (in feet)	Discharge Cubic Feet Per Second (c.f.s.)	Date	Crest Stage (5) (in feet)	Discharge Cubic Feet Per Second (c.f.s.)
Apr 10, 1922	32.9	27,300	—	—	—
Jun 11, 1923	31.0	17,800	—	—	—
Apr 21, 1927	31.4	19,500	—	—	—
Nov 17, 1928	38.7	87,400	Nov 18, 1928	44.32	94,000
Nov 25, 1931	29.7	14,800	—	—	—
Jun 03, 1935	34.3	43,200	Jun 03, 1935	42.48	47,500
Jun 13, 1938	31.0	17,700	—	—	—
Oct 22, 1941	32.8	26,600	—	—	—
Jun 18, 1943	29.2	13,800	Jun 19, 1943	—	23,800
Apr 23, 1944	37.5	73,000	Apr 24, 1944	42.70	54,700
Apr 16, 1945	37.3	70,100	Apr 17, 1945	42.10	51,100
May 12, 1946	27.3	12,500	May 13, 1946	—	13,600
Mar 15, 1947	31.2	18,800	Mar 16, 1947	—	23,300
Jul 23, 1948	30.0	15,300	Jul 24, 1948	—	19,500
Jul 07, 1949	28.3	13,100	Jul 08, 1949	—	9,400
Aug 15, 1950	29.7	14,800	Aug 16, 1950	—	22,700
Jul 11, 1951	42.5	142,000	Jul 12, 1951	50.30	162,000
Mar 10, 1952	27.3	12,000	Mar 11, 1952	—	18,000
Mar 27, 1960	28.4	12,200	Mar 27, 1960	32.60	13,000
Sep 14, 1961	31.0	26,800	Sep 14, 1961	41.80	30,600
Mar 22, 1962	29.6	16,600	Mar 22, 1962	33.20	16,100
Jun 07, 1965	33.6	17,600 (2)	Jun 08, 1965	—	20,000 (2)
Jun 22, 1967	33.6	18,700 (2)	Jun 23, 1967	—	29,000 (2)
Jun 28, 1969	34.6	24,000 (2)	Jun 28, 1969	—	29,000 (2)
Jun 04, 1970	27.4	11,700 (2)	—	—	—
Mar 25, 1973	30.2	12,500 (2)(3)(4)	—	—	—
Oct 11, 1973	33.9	20,000 (2)(3)	Oct 13, 1973	40.1	35,000 (2)(3)

(1) Flood Stage 27.0 feet on gage.
(2) Pomona Closure July 1962.
(3) Melvern Closure October 1970.
(4) Estimated.
(5) Flood Stage 28.0 feet on gage.

The following account is typical of flood plain conditions existing at the present time.

Flood of October 1973 - Heavy rain over the upper basin during the first two weeks of October produced crest elevations of 33.9 feet at Ottawa and 40.1 feet at Osawatomie, representing 20,000 c.f.s. and 35,000 c.f.s., respectively. On an average, a flood of this magnitude can be expected to occur about every ten years at each of the above cities.

Newspaper Accounts

Extracts from the Ottawa Herald and the Osawatomie Graphic-News are quoted below to recount the four largest and the most recent flooding events of record.

Rainfall of 6 Inches Brings a River Flood Marais des Cygnes Out of Banks by Nightfall

At 2:00 P.M. today the total rainfall at Ottawa has been 6.39 inches. The greatest in history of the local weather bureau. The river was at 24 feet stage at the Ottawa Main Street Bridge and rising at the rate of a foot an hour. All persons living in low places either in or near Ottawa were asked to move out immediately or be faced with loss of life and property by not doing so.

November 16, 1928
—Ottawa Herald

River to Second All-Time High

The second worst flood in the history of this community has taken a heavy toll of property damage, and after five days thousands of acres of land and a large area of Osawatomie city are still under water.

At the crest of the flood it was estimated that one-fourth of the total city area was under water.

The Marais des Cygnes River reached a peak of 42 feet, only 18 inches below the record of the 1928 flood. However, it is believed that this flood has been even more destructive because of the much swifter current. In many places the river was more than a mile wide.

April 27, 1944
—Osawatomie
Graphic-News

Flood Crests at 50.3 Feet

Half the Town Under Water as Rivers Go to Record Heights; 400 Homes Evacuated as Waters Pour Into Community

The most terrific flood in the history of this community struck last week, leaving in its wake damage estimated at one-half million dollars.

Osawatomie was cut off from all vehicle traffic except to the west for three days, and the town was isolated from a normal communications stand point from Wednesday afternoon until Saturday noon. Telephone and telegraph wires were out of operation, and mail service was out after Wednesday.

Along with the Marais des Cygnes, the Pottawatomie River on the south of town went to record heights, making the center of town an island with water stretching almost two miles from outside banks of both streams.

For the first time in history, the downtown section of Osawatomie was vulnerable, with water coming to the Osawatomie Hotel on the south side of Main Street and to the Nu-Way cleaners on the north side.

Both Main and Brown Streets were under water at the railroad tracks and the Missouri Pacific depot was filled with about two feet of water.

The volunteer workers started about three o'clock Wednesday, and most of them stayed through until Thursday evening getting people out of their homes. Much of the time they were working in waist deep water. The rise came so suddenly that many were caught too late to move furniture and were fortunate to get themselves out.

Thursday morning, the only remaining water supply was in the stand tower. Citizens were warned not to use the city water for anything but drinking and dishwashing.

The State Board of Health, Friday flew in vaccine for inoculation against typhoid fever.

July 19, 1951
—Osawatomie
Graphic News

Flood is Fourth Highest

Last week's flood on the Marais des Cygnes River was the fourth worst in Osawatomie's history. The crest of 41.8 feet was reached at 2:00 P.M. on September 14th as a result of rainfall amounts of 6 and 7 inches, common over a wide area west of Osawatomie.

Supt. Howard Matney of the Power Plant said the all-time flood crest was reached in July 1951. The second worst flood was registered on November 18, 1928 and the third highest mark was recorded on April 24, 1944.

September 21, 1961
—Osawatomie
Graphic-News

Farmers Eligible for Disaster Funds

Because of recent floods, Miami and Franklin Counties have been declared disaster areas by the U. S. Farmers Home Administration. Flood losses in Miami County have been estimated at 1.5 million dollars.

Two upstream reservoirs, one of which isn't completed, prevented flood damages in excess of 4 million dollars in the Marais des Cygnes River valley due to heavy rains.

October 11, 1973
—Osawatomie
Graphic-News

Photographs, Past Floods

Figures 12 through 16 show pictorially what happened during past floods at Osawatomie. Photographs of the 1951 flood at Ottawa were presented in the Flood Plain Information Report, Marais des Cygnes River, Melvern to Ottawa, Kansas, Volume I, dated July 1973.

FIGURE 12 - Aerial view of Osawatomie on 8 June 1965. Photograph taken from a point southeast of Osawatomie, looking northwest toward business district.

FIGURE 13 - Aerial view of Osawatomie on 8 June 1965. Looking west toward Highway 169 Bridge over Marais des Cygnes River.

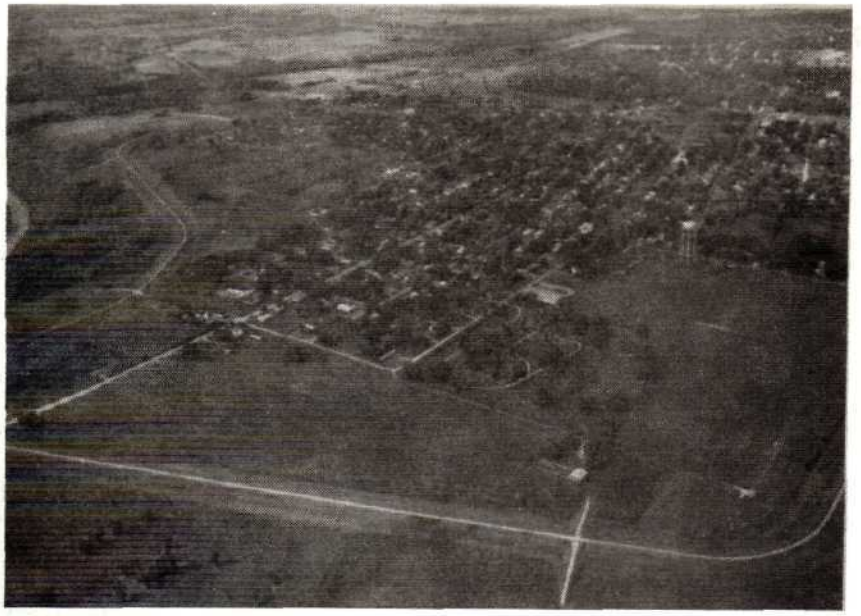

FIGURE 14 - Aerial view of approximately the same area shown in figure 13 after completion of Flood Protection Project. Photo taken in 1971.

FIGURE 15 - July 1951 flood. Looking north toward Osawatomie depot.

FIGURE 16 - July 1951 flood. Main Street in Osawatomie during crest of flood. Four hundred families were evacuated.

FUTURE FLOODS

Although the flood control projects at Ottawa and Osawatomie have been completed and Pomona Lake on 110 Mile Creek and Melvern Lake on the main stem have a combined total flood control capacity of 362,500 acre-feet, flooding will continue to be a problem within the flood plain on the Marais des Cygnes River basin. Floods having discharges of the magnitude of the Intermediate Regional Flood (I. R. F.) and the Standard Project Flood (S. P. F.) will be of particular concern; thus, will be discussed to provide a basis of comparison for future floods.

Unfortunately, data presented for I. R. F. or S. P. F. are often ignored as many people believe that floods such as these will never occur during their lifetime. However, this is an erroneous assumption as will be discussed in the following paragraphs.

Intermediate Regional Flood

The Intermediate Regional Flood is defined as a flood having an average frequency of occurrence of once in 100-years, but can occur in any year or even in successive years. Streamflow and precipitation records of gages located within the basin were analyzed in conjunction with reservoir operation techniques to develop discharges used within the study area. Table 3 contains the I. R. F. discharge at selected locations under existing conditions. I. R. F. depths at various locations within the flood plain can be determined by comparing the stream profile on Plate 9 to the elevation listed in Table 4.

Standard Project Flood

Only in rare instances has the maximum known flood reached what hydrologists regard as the maximum flood potential of any given basin; thus, the threat of flooding in excess of any past event must be recognized. The Corps of Engineers, in cooperation with the National Weather Service, has developed generalized procedures for estimating the flood potential of streams. These procedures, based on records of past floods, were used in determining the Standard Project Flood for this study. The S. P. F. is defined as the flood that can be expected from the most severe combination of meterological and hydrological conditions considered reasonably characteristic of the geographical region involved. Table 3 contains the S. P. F. discharges at selected locations under existing conditions. The S. P. F. depths at various locations within the flood plain can be determined by comparing the stream profile on Plate 9 to the elevations listed in Table 4.

Frequency

For purposes of flood hazard evaluation, peak flow frequency curves can be used to illustrate the relative magnitude of flooding experienced in the past and that which can be reasonably expected in the future. As an example, the October 1973 flood in the Marais des Cygnes River at Osawatomie had an estimated discharge of 35,000 c.f.s. That discharge represents a 10-year frequency flood; that is, a flood having a probability of occurrence of one in ten for any year.

Floods larger than the Standard Project Flood are possible; however, the combination of factors that would be necessary to produce such floods would seldom occur. Consideration of floods of this magnitude would be important to potential developers of the flood plain, if possible damages indicate the need of extremely high assurance that the flood risk be eliminated.

TABLE 3

PEAK FLOWS FOR INTERMEDIATE REGIONAL AND STANDARD PROJECT FLOODS

River Mile	Location	I. R. F. c.f.s.	S. P. F. c.f.s.
362.53	St. Louis-San Francisco Railway Bridge 1.25 Miles South of Hensen	121,600	212,400
367.43	Mill Street Bridge, 1 Mile East of Osawatomie	100,000	130,000
395.11	County Road Bridge, 1.5 Miles North and 3 Miles West of Peoria	79,000	114,700

Hazards of Large Floods

Everyone living within or near the flood plains of the Marais des Cygnes River should be aware of the possible hazards to life, health, and property from a flood the size of the Intermediate Regional Flood. Floodwater flowing at a high velocity or carrying floating debris creates conditions hazardous to people, livestock, or vehicles attempting to cross flooded areas. Generally, floodwater two or more feet deep and flowing at a velocity of 4 feet per second can easily sweep people off their feet, and possibly cause injury or drowning. This situation would be a common occurrence along the Marais des Cygnes River during lesser floods. Rapidly rising and swiftly flowing floodwaters may trap individuals in homes or vehicles; create definite health hazards through contamination; or result in hazards related to medical, fire, or law enforcement emergencies. Such hazards would effect not only those living in the flood plain, but everyone in the community.

Flooded areas and flood damage - Flood plain areas that would be inundated by I. R. F. and S. P. F. flows are shown on Plates 3 through 8. An index map showing the general relationship of these areas is presented on Plate 2. Limits of the flooded areas as shown on the plates were determined from previously described maps. Flood levels for the entire study area

may be obtained from the profiles shown on Plate 9. Actual limits may vary from those shown due to map limitations, contour intervals, and changes in surface contours since the completion of mapping.

Depths of flooding at any location can be determined by subtracting the ground elevation, shown on the flooded area maps, from the water-surface elevations indicated on the profiles. Approximate ground elevations can be determined from contours on the flooded area maps. Accurate elevations can be obtained by leveling to known benchmarks. Typical cross sections of the flood plain at selected locations, along with the water-surface elevation and lateral extent of I. R. F. and S. P. F. flows are shown on Plate 10.

Obstructions - Obstructive future flood plain development could add to the flooding problems presently existing along the Marais des Cygnes River. Brush and debris washing downstream during floods could reduce waterway openings by collecting at bridge and culvert openings. This could result in a damming effect which would cause greater depths and increased overbank flooding.

Flood crests and pertinent elevations for all the bridges spanning the Marais des Cygnes River in the study reach are listed in Table 4. For study purposes, it was assumed that limited clogging of waterway openings had occurred but that all structures remained intact. Significant changes in these assumptions imposed by the varying conditions of future floodflows, could alter the flood crests and flood limits shown.

Velocities of flow - Water velocities during floods vary widely from place to place along the stream. Factors influencing the velocity of flow include topographical and geological features of the flood plain, the condition of the channel, and the slope of the streambed. Velocities generated by a flood of the magnitude of the I. R. F. are generally lower than those associated with the proportionately larger S. P. F., but may still pose a substantial risk. An indication of the average velocities that could be generated by these floods at selected locations within the study area are shown in Table 5.

Water flowing at these average velocities is capable of causing severe erosion to streambanks, and of transporting large rocks and trees. Fills around bridge abutments and embankments are highly susceptible to erosion from velocities of this magnitude.

Rates of rise and duration of flooding - The rate of rise and the period of advance warning of possible flooding depend largely upon the intensity and location of a flood producing storm over the basin. The flood of October 1973, on the Marais des Cygnes River at Osawatomie, reached its peak flow about 36 hours after it had exceeded flood stage. The rate of rise during that period varied from 0.9 of a foot per hour at the beginning of flooding to 0.1 foot per hour near the peak, with an overall average of about 0.35 of a foot per hour. The flood remained at its peak discharge for a period of 7 hours. It then receded at an average rate of 0.2 of a foot per

TABLE 4

BRIDGES ACROSS MARAIS DES CYGNES RIVER

Miles Above Mouth	Identification	Streambed	Low Steel	Bridge Floor	Immediate Vicinity of Bridges I. R. F. U. S.	I. R. F. D. S.	S. P. F. U. S.	S. P. F. D. S.
367.43	Mill Street	815.3	852.8	854.3	858.2	857.4	862.7	862.4
368.01	New U. S. Hwy. 169	817.0	878.6	885.5	859.5	859.5	863.9	863.9
368.57	First Street	819.2	854.0	855.7	860.1	860.1	864.7	864.7
369.14	U. S. Hwy. 169	821.0	860.0	870.2	861.2	861.1	865.7	865.6
369.18	Mo.-Pac. R. R.	819.0	854.0	858.0 (1)	861.3	861.2	865.8	865.7
369.31	Eighth Street	817.4	856.4	857.9	861.3	861.3	865.8	865.8
377.24	Co. Road near Stanton	828.3	861.3	862.6	866.5	866.4	869.5	869.4
386.19	Co. Road near Rantoul	844.8	880.3	885.3	883.3	883.2	884.9	884.8
391.24	Co. Road S. of Peoria	846.7	881.7	884.2	888.3	888.0	890.2	889.9
395.11	Co. Road W. of Peoria	852.5	888.5	890.0	893.2	892.0	895.7	894.6

(1) Top of rail

Note: Elevations in Feet Above Mean Sea Level

hour for a period of 70 hours before falling below flood stage. Thus, the river remained above flood stage for a period of 114 hours or about 5 days. As previously mentioned, the October 1973 flood was approximately equal to a 10-year flood. Floods of larger proportions would have larger values for both the rates of rise and the duration of flooding. The July 1951 flood had a peak discharge of about 162,000 c.f.s. and was above flood stage for 7 days. The peak flow would have been reduced to 130,000 c.f.s. if Pomona and Melvern Lakes had been in operation. The stages of gages at upstream stations, rainfall reports, upstream lake regulations, and weather conditions are used by the National Weather Service to prepare advance warning forecasts. Local residents normally have 8 to 18 hours of advance warning of flooding on the Marais des Cygnes River.

TABLE 5

AVERAGE VELOCITIES AT SELECTED LOCATIONS (IN FEET PER SECOND)

Miles Above Mouth	Location	Intermediate Regional Flood		Standard Project Flood	
		Channel	Overbank	Channel	Overbank
362.60	About 1.25 Miles Southeast of Osawatomie	10.01	1.97	12.58	2.21
367.45	About 1.0 Mile East of Osawatomie	6.71	2.27	6.54	2.43
368.60	North Side of Osawatomie	8.17	2.29	8.06	2.61
377.28	About 1.5 Miles South and 1 Mile East of Stanton	3.34	1.39	3.12	1.41
386.23	About 2 Miles North Of Rantoul	4.57	1.24	4.58	1.45
391.30	About 0.5 Mile West and 1 Mile South of Peoria	3.21	1.41	3.71	1.72
395.20	About 1.5 Miles North and 3 Miles West of Peoria	6.83	1.66	7.11	2.19

Photographs, future flood heights - Figures 17 through 21 show flood heights that could be expected from I. R. F. and S. P. F. flows at presently existing facilities on the Marais des Cygnes River.

FIGURE 17

Mill Street Bridge over Marais des Cygnes River (Mile 367.43). Looking west.

FIGURE 18

First Street Bridge over Marais des Cygnes River (Mile 368.57). Looking north.

FIGURE 19

Missouri-Pacific Railroad Bridge over Marais des Cygnes River. (Mile 369.18). Looking north.

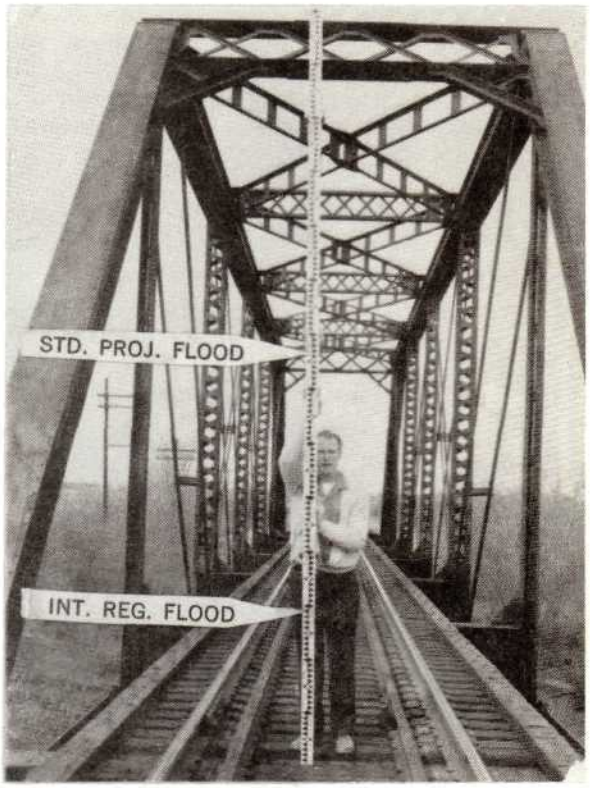

FIGURE 20

Eighth Street Bridge over Marais des Cygnes River. (Mile 369.31). Looking north.

FIGURE 21

County Road Bridge over Marais des Cygnes River, 1.5 miles south & 1 mile east of Stanton. (Mile 377.24). Looking southwest.

INTERPRETATION OF DATA

Flooded area maps, profiles, and selected cross sections are provided in the report to define the limits of flooding that would occur during an Intermediate Regional Flood or Standard Project Flood. Hypothetical examples of these presentations, depicting the areas flooded and the elevations of the respective floods at an imaginary location will be shown at cross section number three, Marais des Cygnes River, mile 381.60, shown on Plate 10.

The "Flooded Areas," Plates 3 through 8, show the Intermediate Regional Flood (I. R. F.) shaded light-blue, while the darker-blue area indicates the additional area that would be inundated by the Standard Project Flood (S. P. F.). The "Flood Profile," on Plate 9 shows the relative depth of floodwaters along the centerline of the stream. The "Cross Sections," on Plate 10, indicates the depth and lateral extent of flooding that would occur at the specified cross section. Specific information on floodflow depths at mile 381.60, which is the location of the cross-section No. 3, is tabulated in Table 6. At this location the elevation shown on the profile is 877.4 feet m.s.l. for the I. R. F., and 878.9 feet m.s.l. for the S. P. F.

Point A, for example, is located 3,050 feet to the right from the stream centerline with a ground elevation of 870.0, obtained from cross-section No. 3 on Plate 10. Simple subtraction shows that this ground elevation is 7.4 feet lower than the I. R. F. elevation and 8.9 feet lower than the S. P. F. elevation. The depth of floodwater at Points B and C is found in the same manner.

TABLE 6

HYPOTHETICAL EXAMPLE OF DEPTH OF FLOODWATER

Locations on Cross Section (M+381.60)	Distance to Right From Stream Centerline (feet)	Ground Elevation (feet)	Depth of Floodwater I. R. F. (feet)	Depth of Floodwater S. P. F. (feet)
Point A	3,050	870.0	7.4	8.9
Point B	3,400	875.0	2.4	3.9
Point C	3,600	878.0	—	0.9

Similar data can be developed for any other flood plain location in the study reach. For example, suppose a permit is received to build at Point D, shown on Plate No. 6. By inspection, this is about at mile M+381.9. The elevation of the I. R. F. and S. P. F. at this stream mile are 878.2 and 879.8, respectively. The site, located about 2, 200 feet west of the centerline of the Marais des Cygnes River, is estimated to be at ground elevation 861.0. Thus, the site is estimated to be 17.2 feet below the elevation of the Intermediate Regional Flood and 18.8 feet below the elevation of the Standard Project Flood. More precise data can be obtained by field survey.

By using information as illustrated above, together with other data such as frequency of occurrence, velocity of flow, and duration of flooding, concerned individuals can make knowledgeable decisions relative to the use, development, and management of areas subject to inundation.

Cities and counties within the State of Kansas are authorized to enact and enforce land use controls. Assistance and guidance on the enactment of resolutions, ordinances, and regulations that relate to flood plain management is available from the Kansas Board of Agriculture, Division of Water Resources.

GLOSSARY OF TERMS

Flood - An overflow of lands not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or stream or an ocean, lake, or other body of standing water.

Normally, a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest - The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Peak - The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest.

Flood Plain - The relatively flat area or low lands adjoining the channel of a river, stream or watercourse or ocean, lake, or other body of standing water, which has been or may be covered by floodwater.

Flood Profile - A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage - The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Flow Line - The minimum stage or elevation at which flow occurs in a stream.

Head Loss - The effect of obstructions, such as narrow bridge openings or buildings that limit the area through which water must flow, raising the surface of the water upstream from the obstructions.

Intermediate Regional Flood - A flood having an average frequency of occurrence on the order of once in 100 years although the flood may occur in any year or even in successive years. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general region of the watershed.

Left Bank - The bank on the left side of a river, stream, or watercourse, looking downstream.

Low Steel (or Underclearance) - See "Underclearance."

Right Bank - The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood - The flood that may be expected from the most severe combination of meterological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Such floods, as used by the Corps of Engineers, are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance - The lowest point of a bridge or other structure over or across a river, stream, or watercourse that limits the openings through which water flows. This is referred to as "low steel" in some regions.

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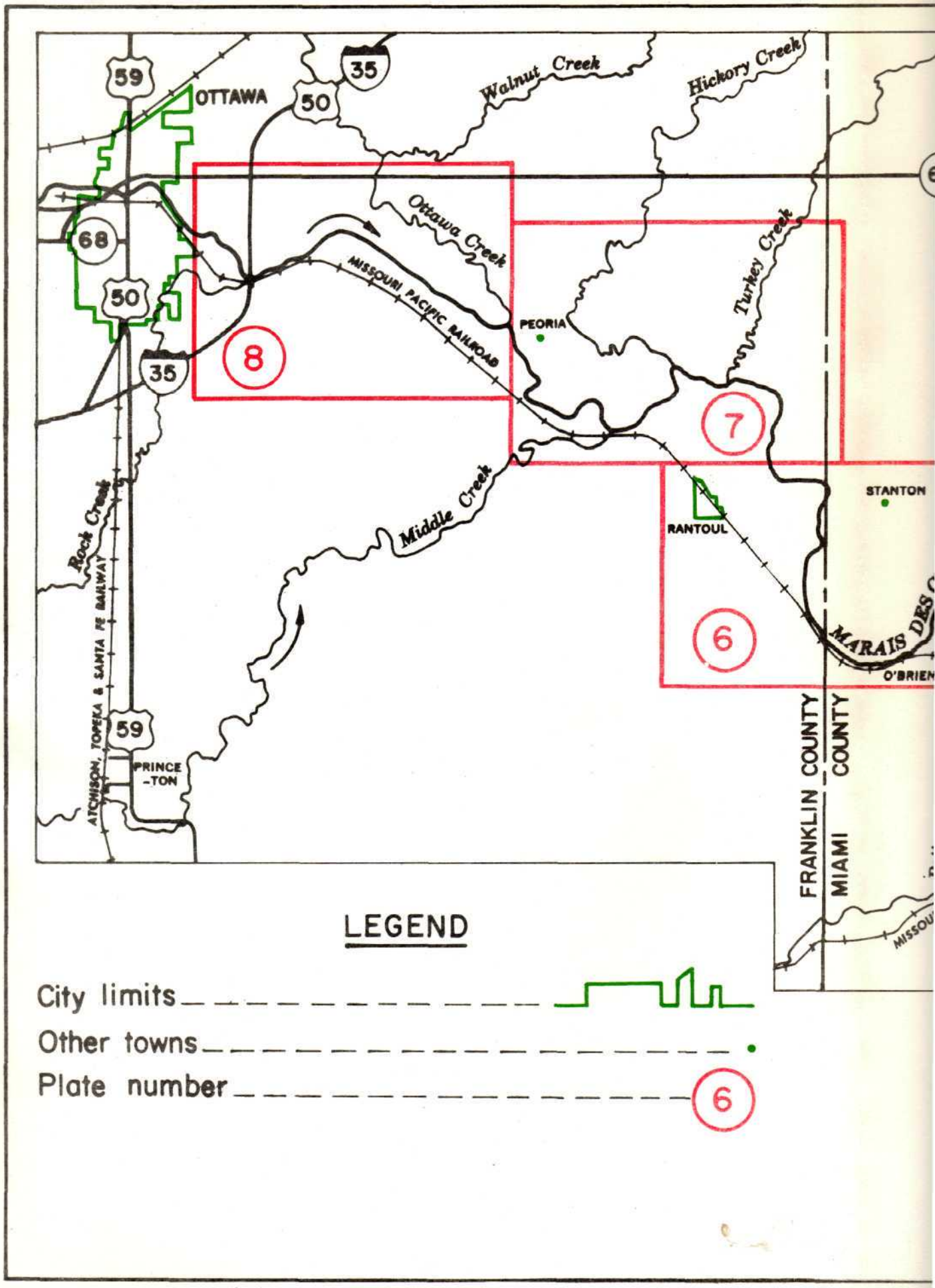
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STANTON
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Rock Creek
ATCHISON, TOPEKA & SANTA FE RAILWAY
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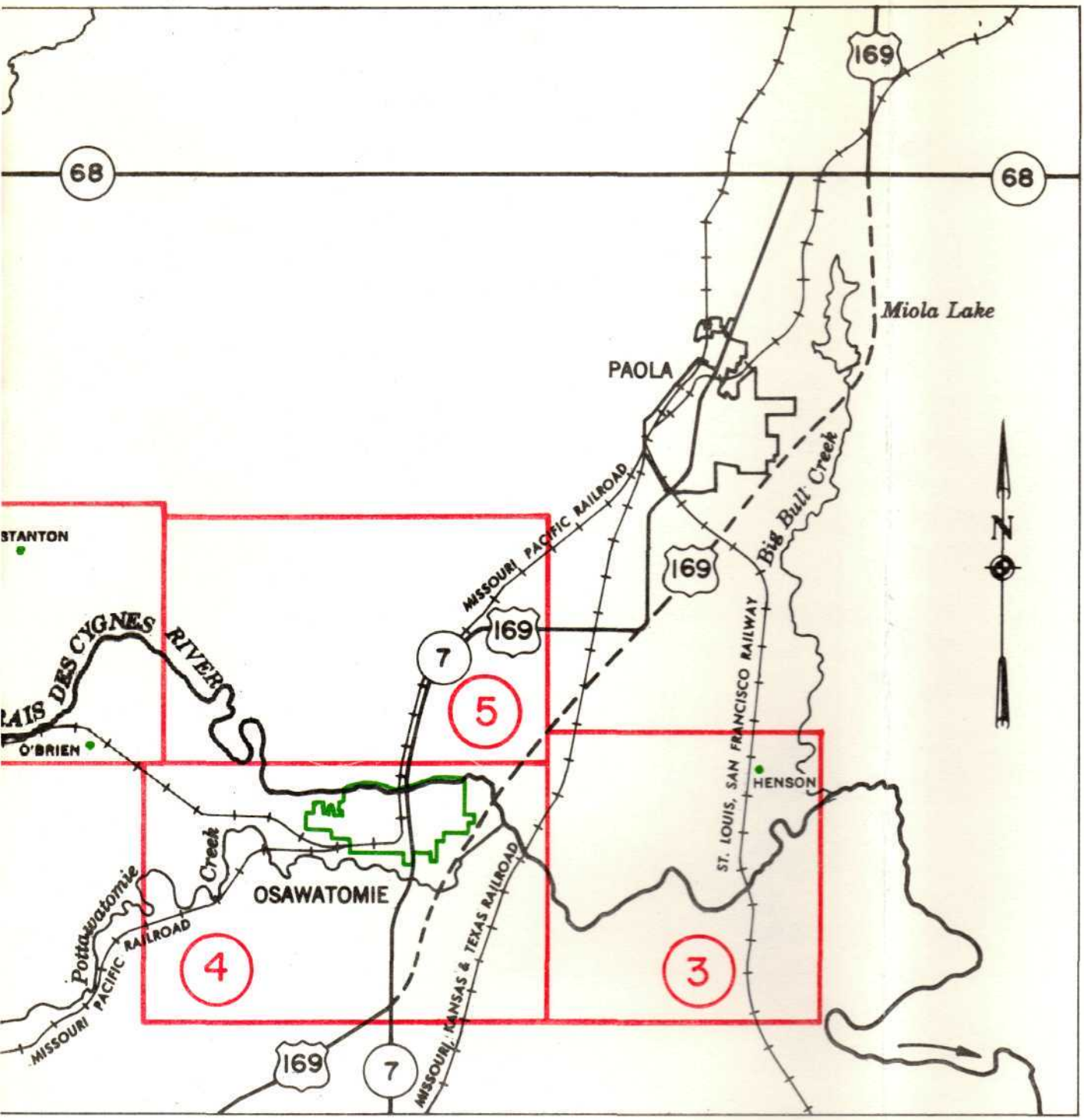

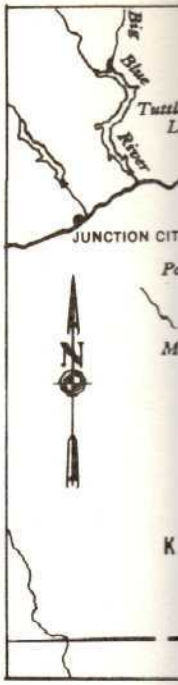

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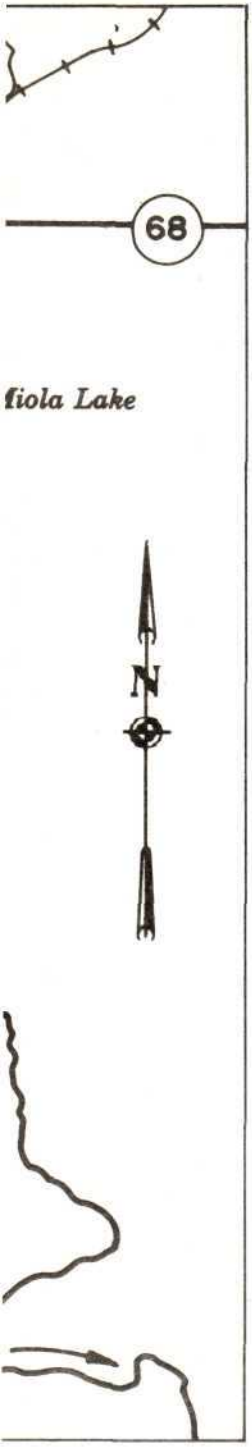

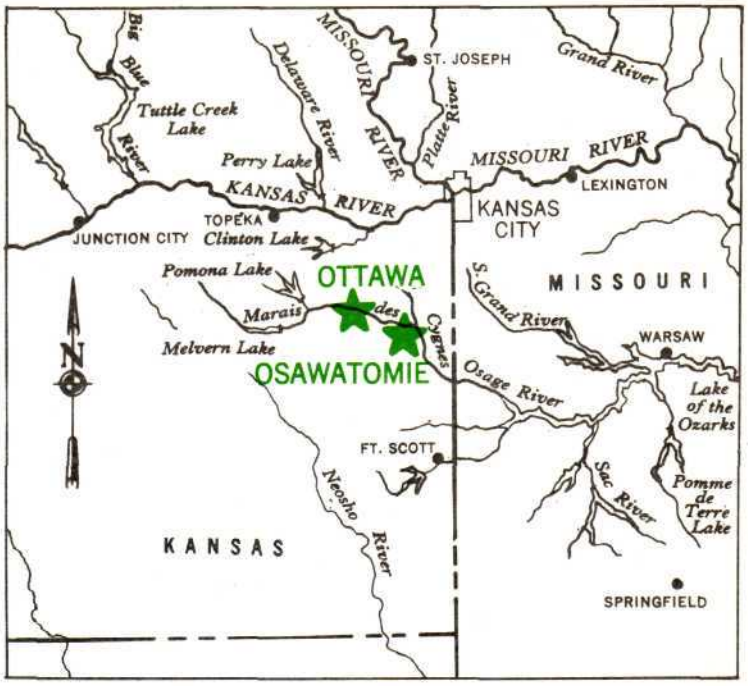

LOCATION

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SCALE IN MILES

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KANSAS CITY DISTRICT

INDEX TO FLOODED AREAS

MARAIS DES CYGNES RIVER

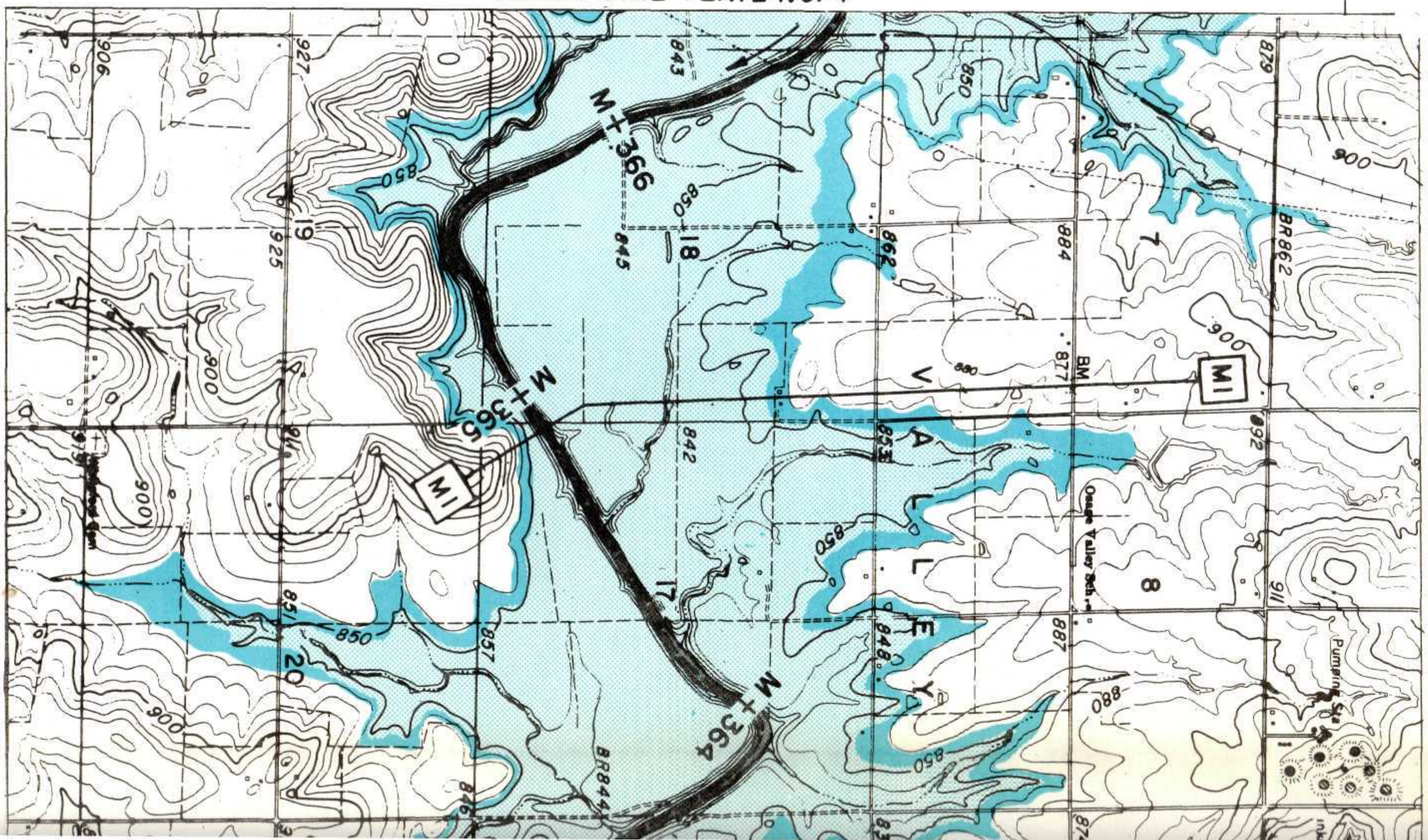
OSAWATOMIE TO OTTAWA, KANSAS

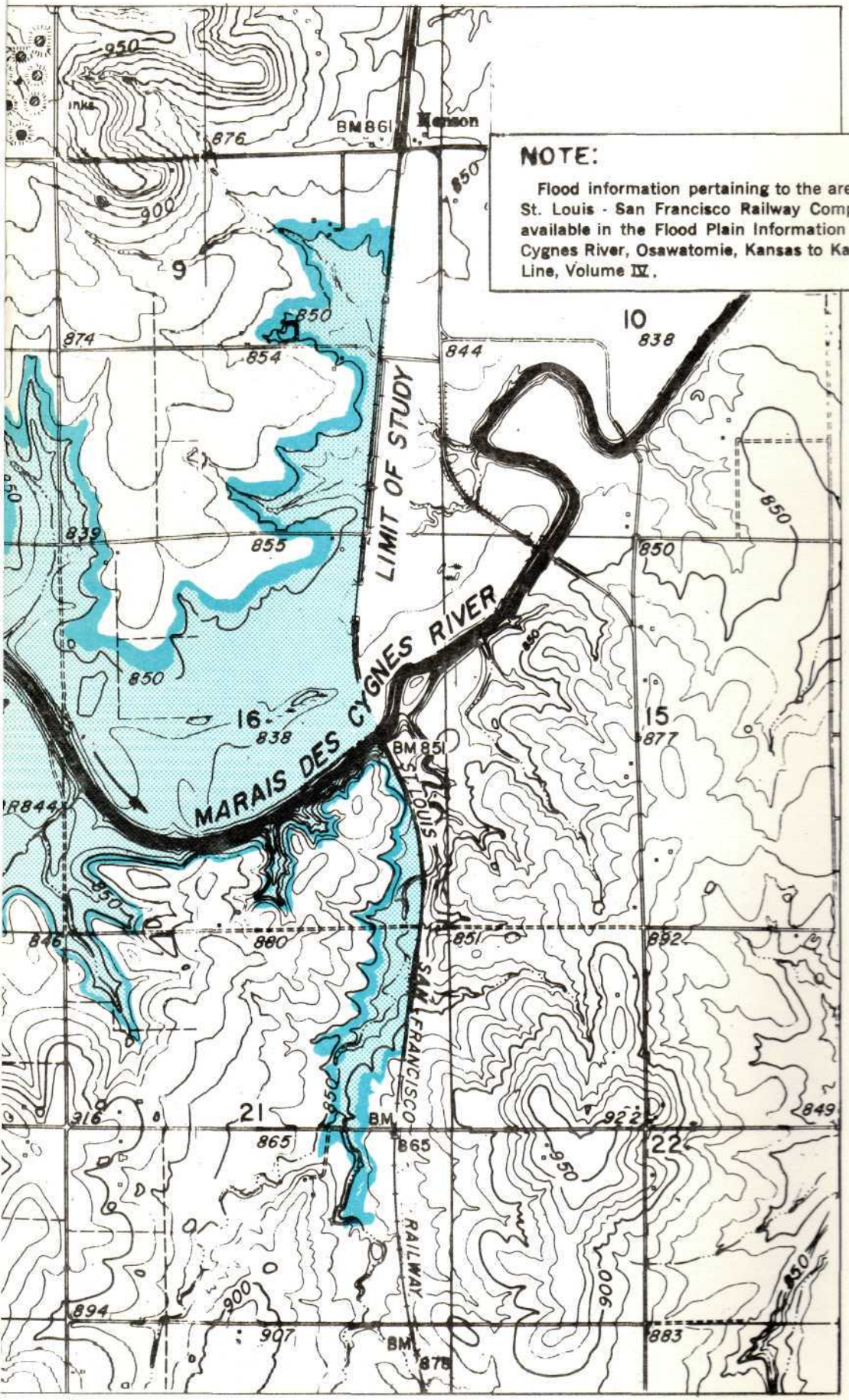
VOLUME II

JANUARY 1975 FILE NO. 0-6-412

PLATE NO. 2

MATCH LINE PLATE NO. 4





NOTE:

Flood information pertaining to the area downstream from St. Louis - San Francisco Railway Company bridge will be available in the Flood Plain Information Report, Marais des Cygnes River, Osawatomie, Kansas to Kansas-Missouri State Line, Volume IV.

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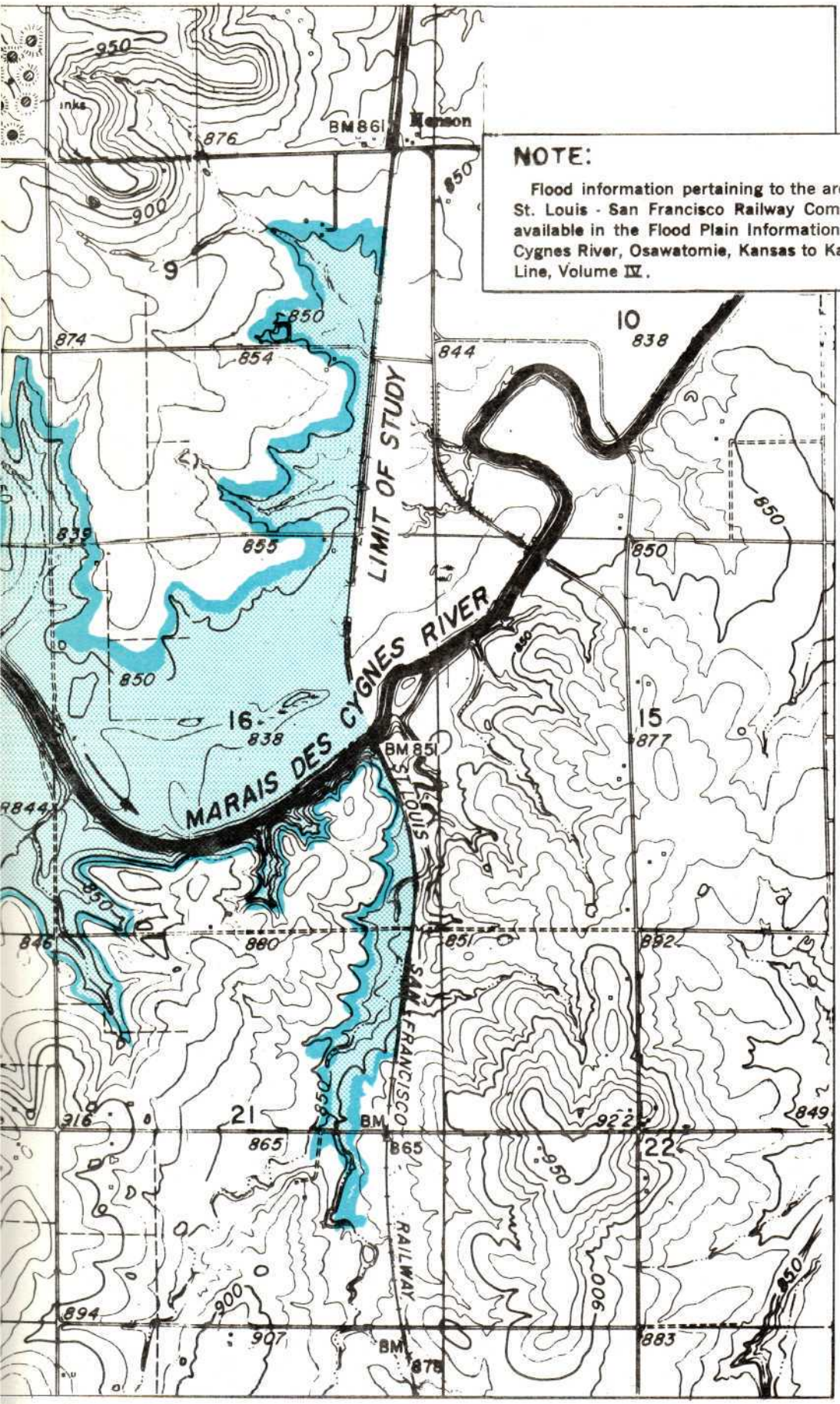
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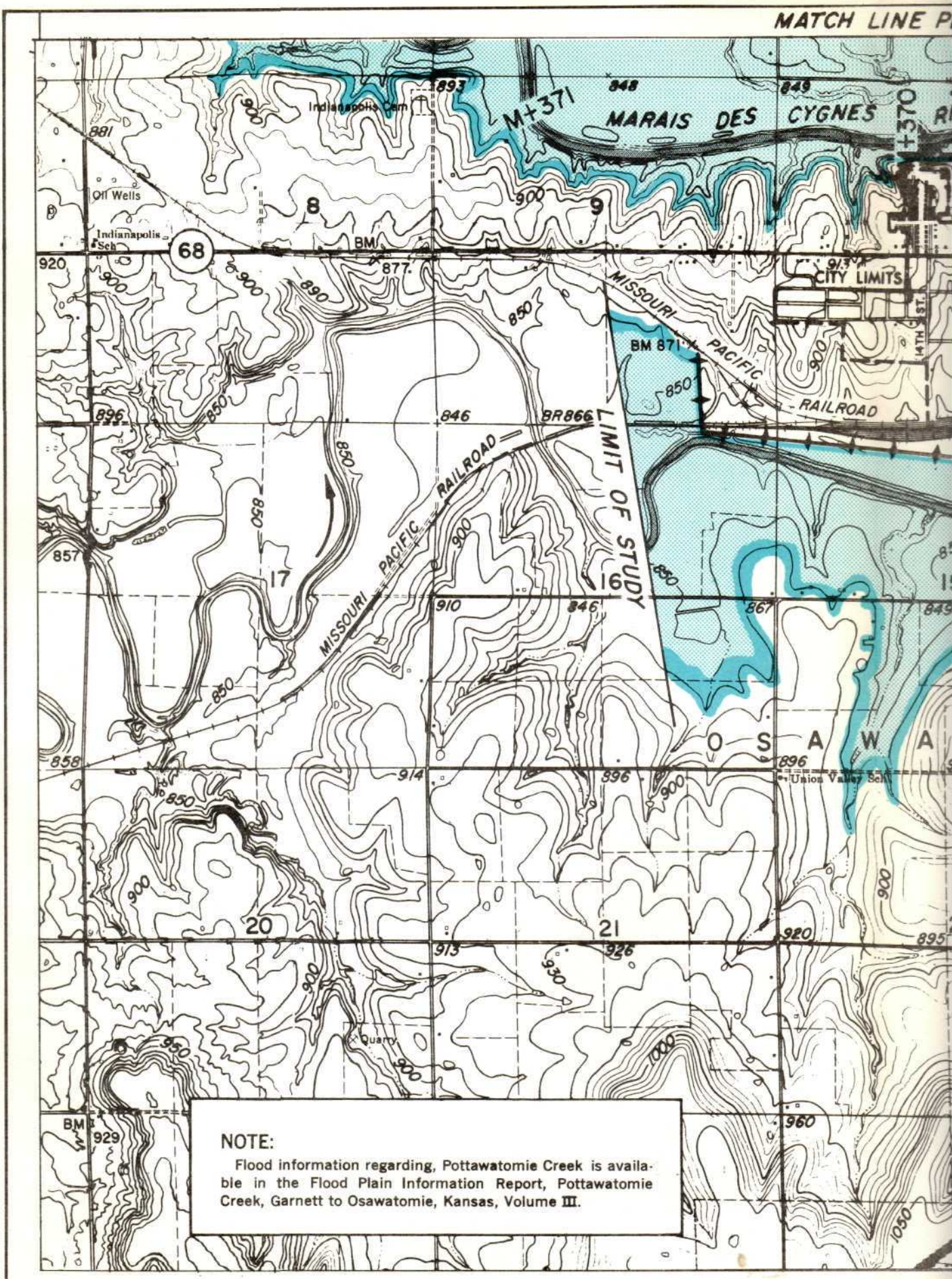
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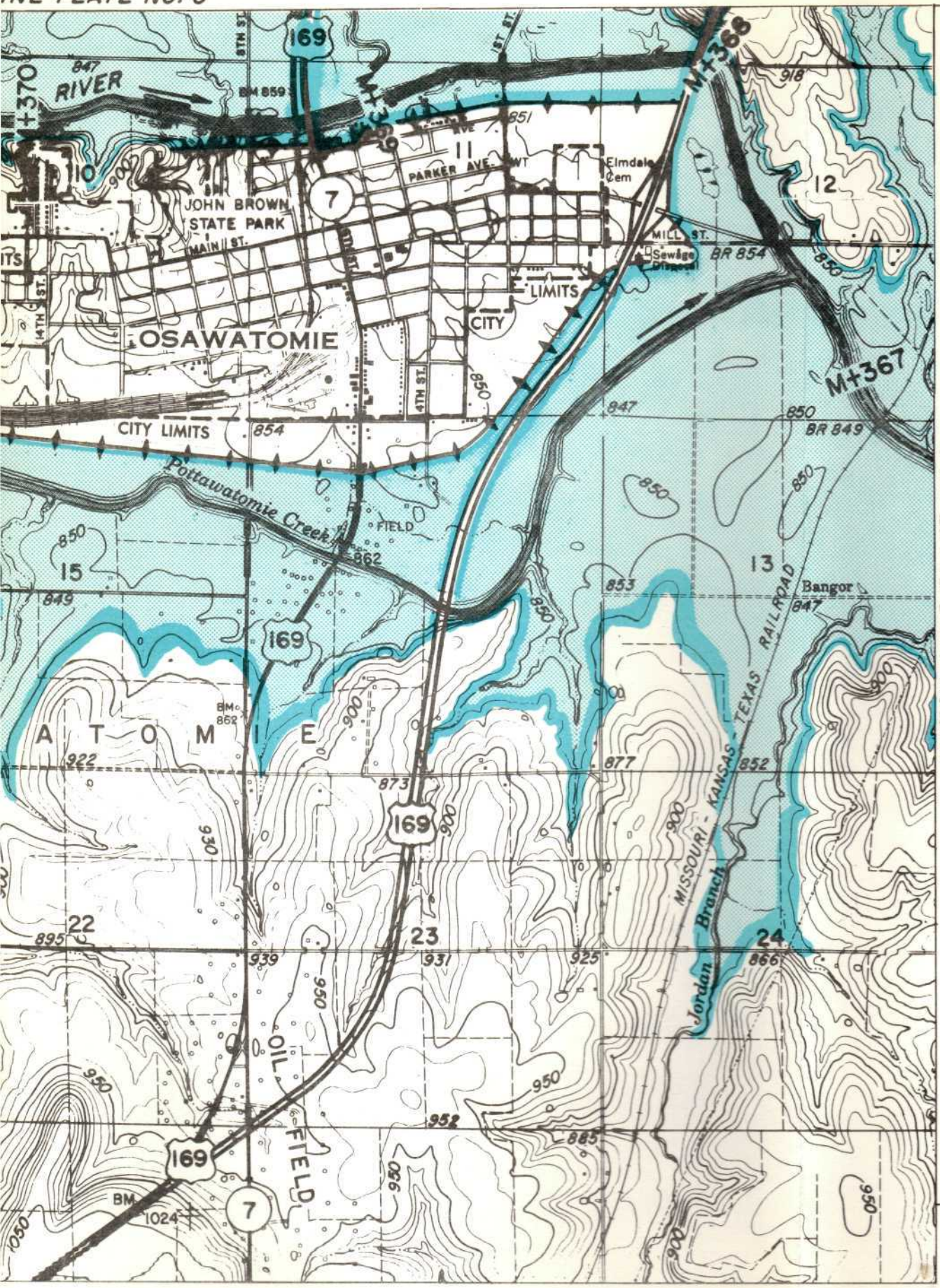
NOTE:
Flood information regarding, Pottawatomie Creek is available in the Flood Plain Information Report, Pottawatomie Creek, Garnett to Osawatomie, Kansas, Volume III.



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OVERFLOW LIMITS

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Contours at 10 Ft. Intervals

Base map supplied by U. S. Geological Survey. Alterations by Corps of Engineers.

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SCALE IN FEET

CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

FLOODED AREAS

MARAIS DES CYGNES RIVER

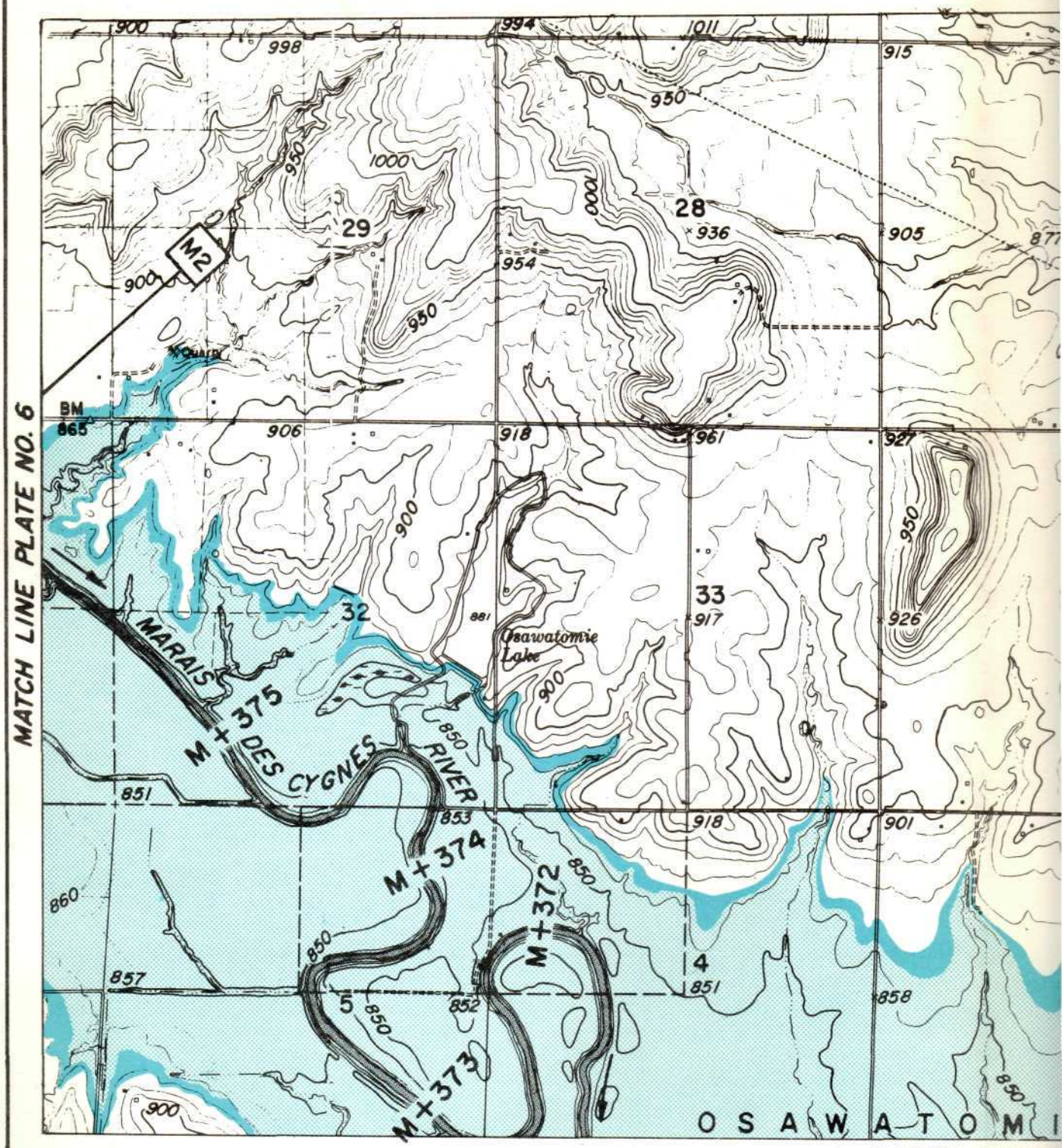
OSAWATOMIE TO OTTAWA, KANSAS

VOLUME II

JANUARY 1975 FILE NO. 0-6-414

Limits of overflow indicated may vary some from actual locations on ground, as explained in the report.

PLATE NO. 4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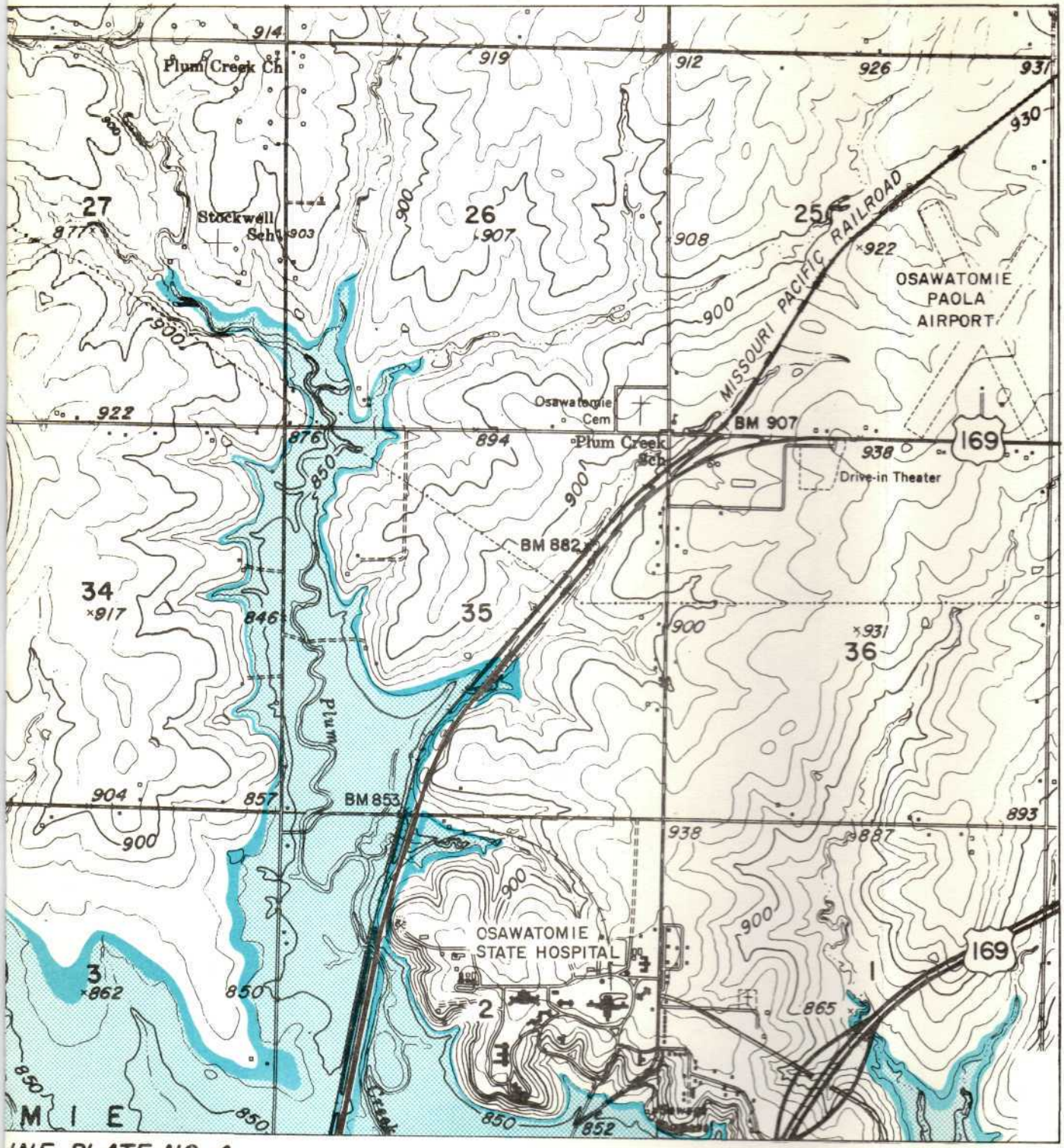

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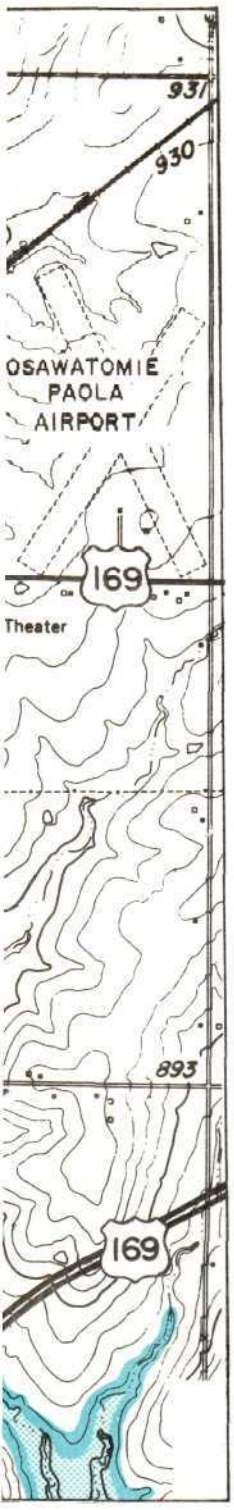

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OVERFLOW LIMITS

M+000..... DISTANCE IN MILES ABOVE MOUTH

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Contours at 10 Ft. Intervals

Base map supplied by U. S. Geological Survey. Alterations by Corps of Engineers.

CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

FLOODED AREAS

MARAIS DES CYGNES RIVER

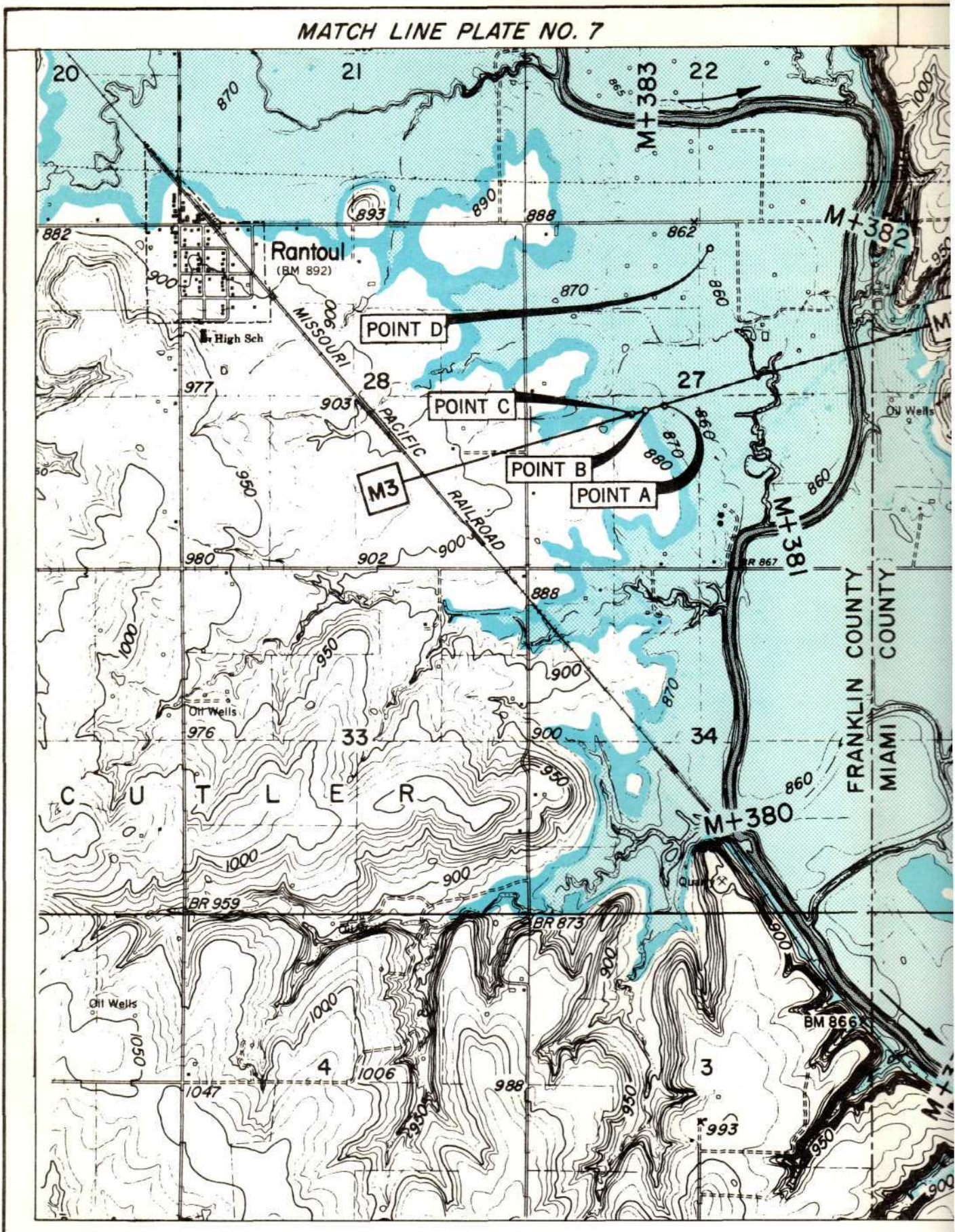
OSAWATOMIE TO OTTAWA, KANSAS

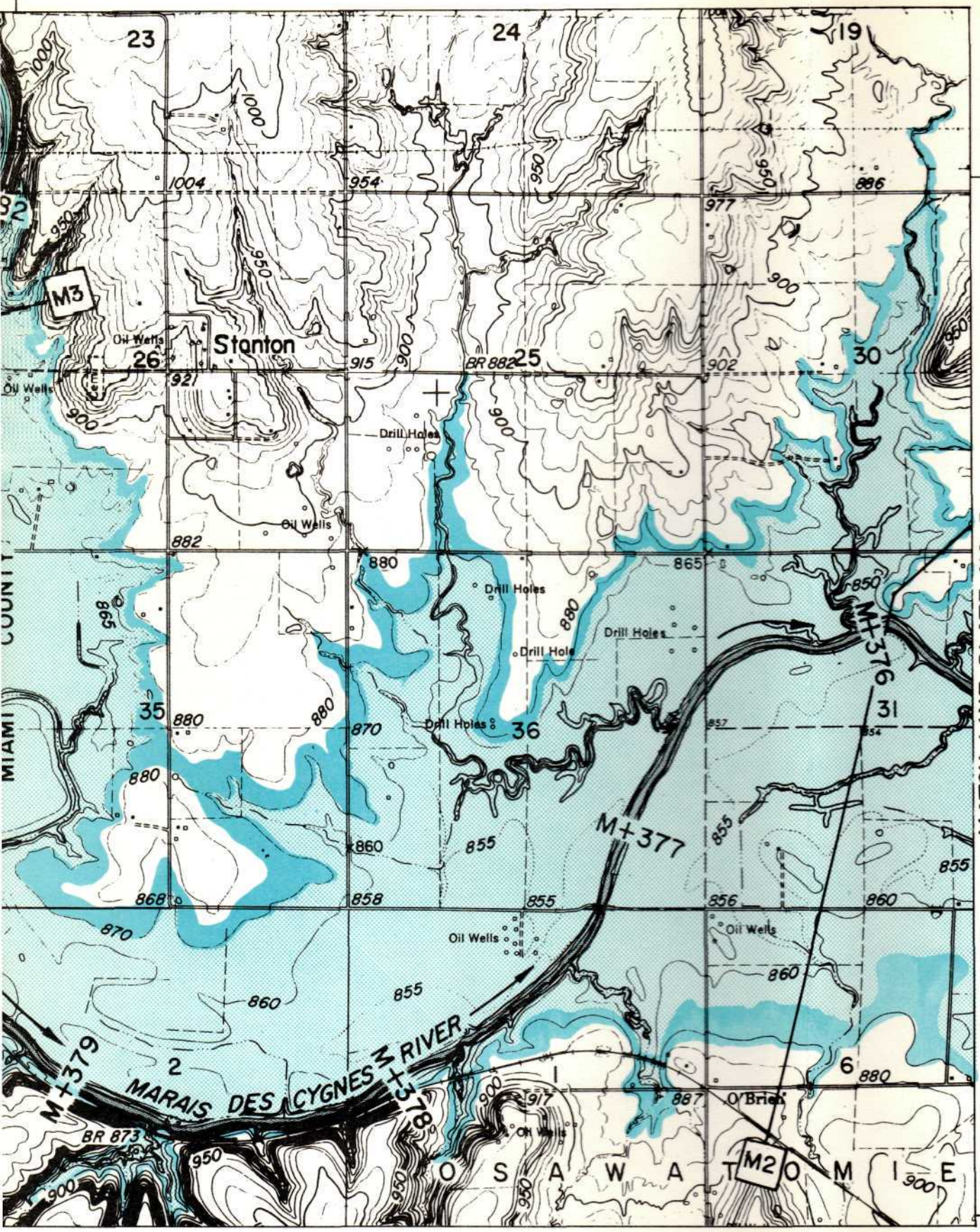
VOLUME II

JANUARY 1975 FILE NO. 0-6-415

Limits of overflow indicated may vary some from actual locations on ground, as explained in the report.

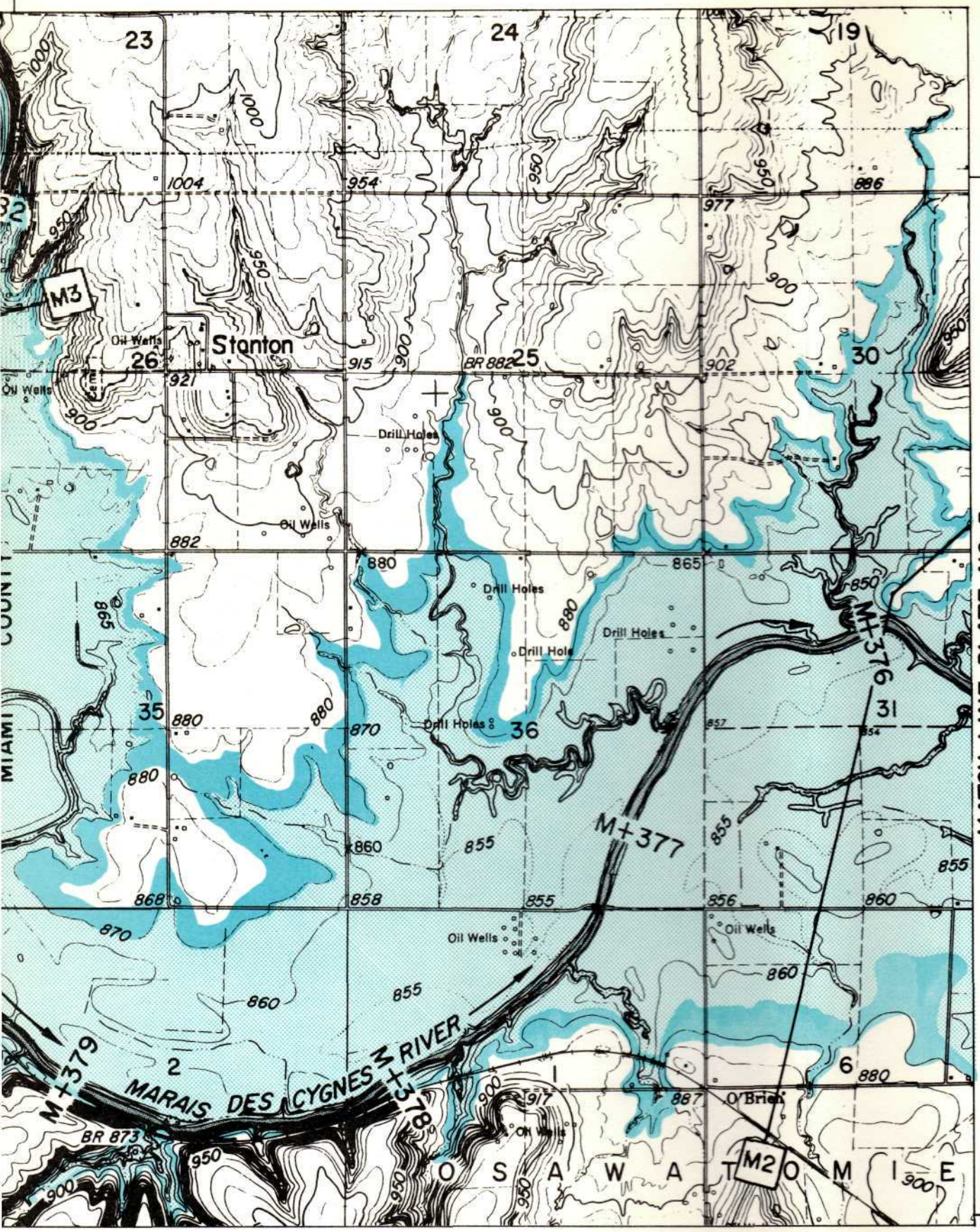
PLATE NO. 5


MATCH LINE PLATE NO. 7
Rantoul
(BM 892)
High Sch
MISSOURI PACIFIC RAILROAD
POINT D
POINT C
POINT B
POINT A
M3
M+383
M+382
M+381
M+380
FRANKLIN COUNTY
MIAMI COUNTY
C U T L E R
Oil Wells
BR 959
BR 873
BR 867
BM 866
Quarry
20
21
22
28
27
33
34
4
3



NOTE:

For a description of Points A, B, C, and D, See text.



NOTE:

For a description of Points A, B, C, and D, See text.

M+000.....

M2 — M2

Base map sup
of Engineers.

2000

CORPS

F

MAR

OSAWATO

JANUARY 19

Limits of overf
ground, as expla

MATCH LINE PLATE NO. 5

LEGEND

OVERFLOW LIMITS

Intermediate Regional Flood

Standard Project Flood

M+000..... DISTANCE IN MILES ABOVE MOUTH

M2—M2 ..... CROSS SECTION

Contours at 10 Ft. Intervals

Base map supplied by U. S. Geological Survey. Alterations by Corps of Engineers.

2000 0 2000 4000

SCALE IN FEET

N

CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

FLOODED AREAS

MARAIS DES CYGNES RIVER

OSAWATOMIE TO OTTAWA, KANSAS

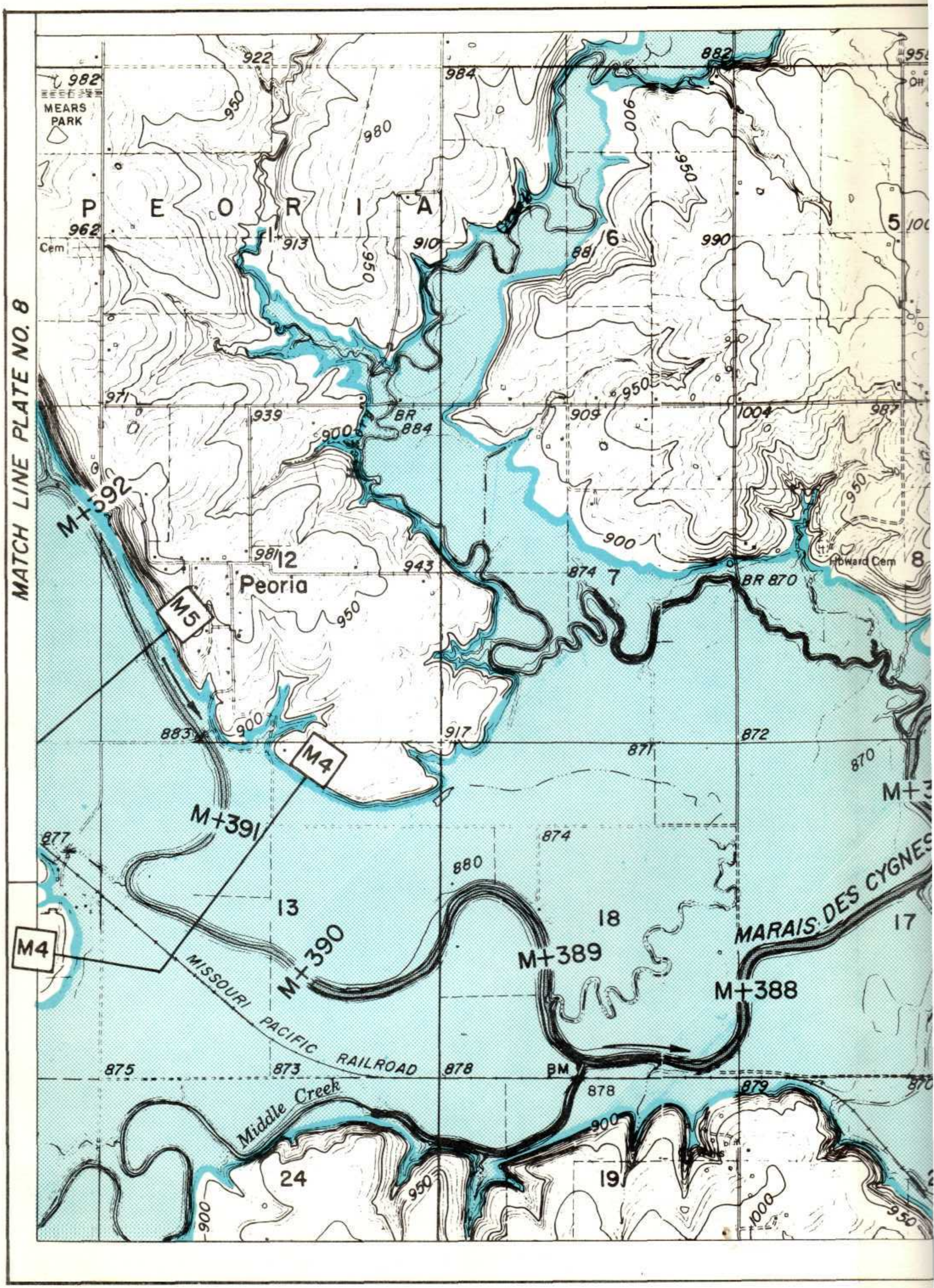
VOLUME II

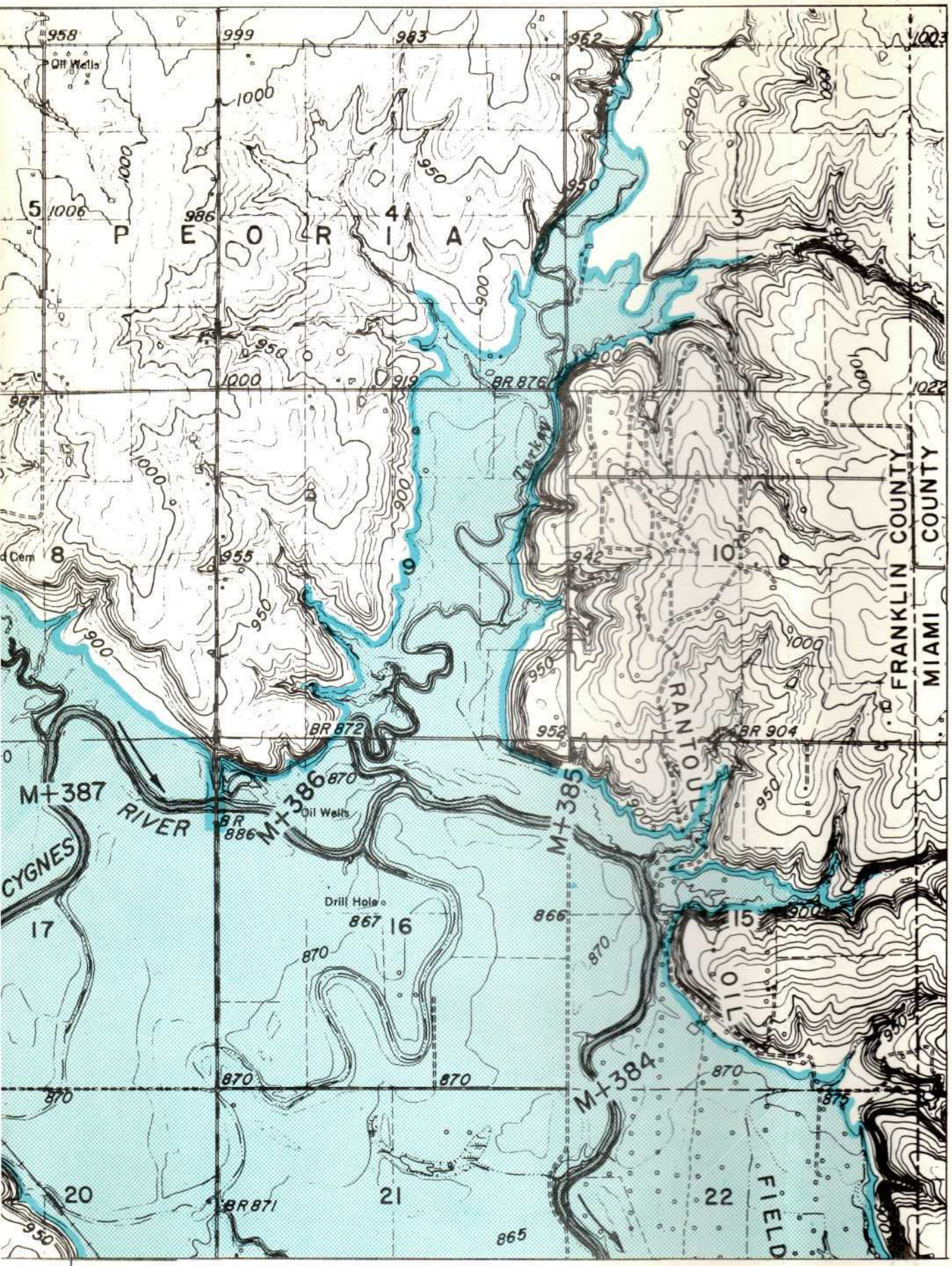
JANUARY 1975 FILE NO. 0-6-416

Limits of overflow indicated may vary some from actual locations on ground, as explained in the report.

D.

PLATE NO. 6


MATCH LINE PLATE NO. 8
MEARS PARK
PEORIA
Peoria
Cem
Howard Cem
M5
M4
M4
M+392
M+391
M+390
M+389
M+388
MARAIS DES CYGNES
MISSOURI PACIFIC RAILROAD
Middle Creek
BR 884
BR 870
BM
6
5
7
8
12
13
17
18
19
24
982
922
984
882
962
913
910
971
939
884
981
943
883
917
871
872
874
880
877
875
873
878
878
879
909
1004
987
990
950
980
900
1000



MATCH LINE PLATE NO. 6

M+000....

M2 — M2

Base map su
of Engineers.

2000

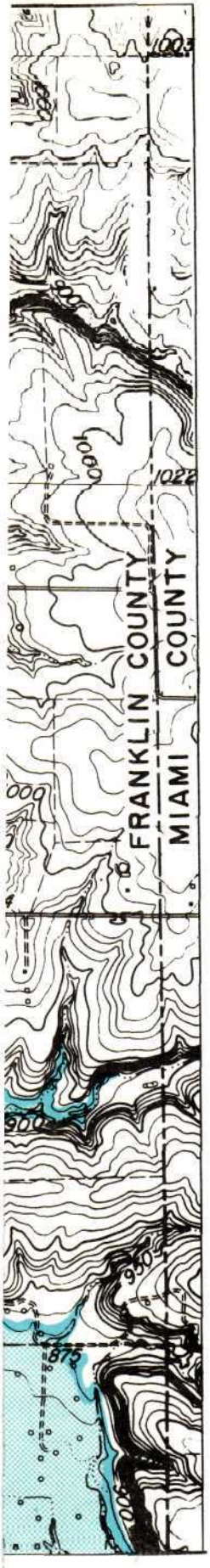
CORP

MAR

OSAWAT

JANUARY 1

Limits of ove
ground, as exp



LEGEND

OVERFLOW LIMITS

M+000..... DISTANCE IN MILES ABOVE MOUTH

M2—M2 ..... CROSS SECTION

Contours at 10 Ft. Intervals

Base map supplied by U. S. Geological Survey. Alterations by Corps of Engineers.

CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

FLOODED AREAS

MARAIS DES CYGNES RIVER

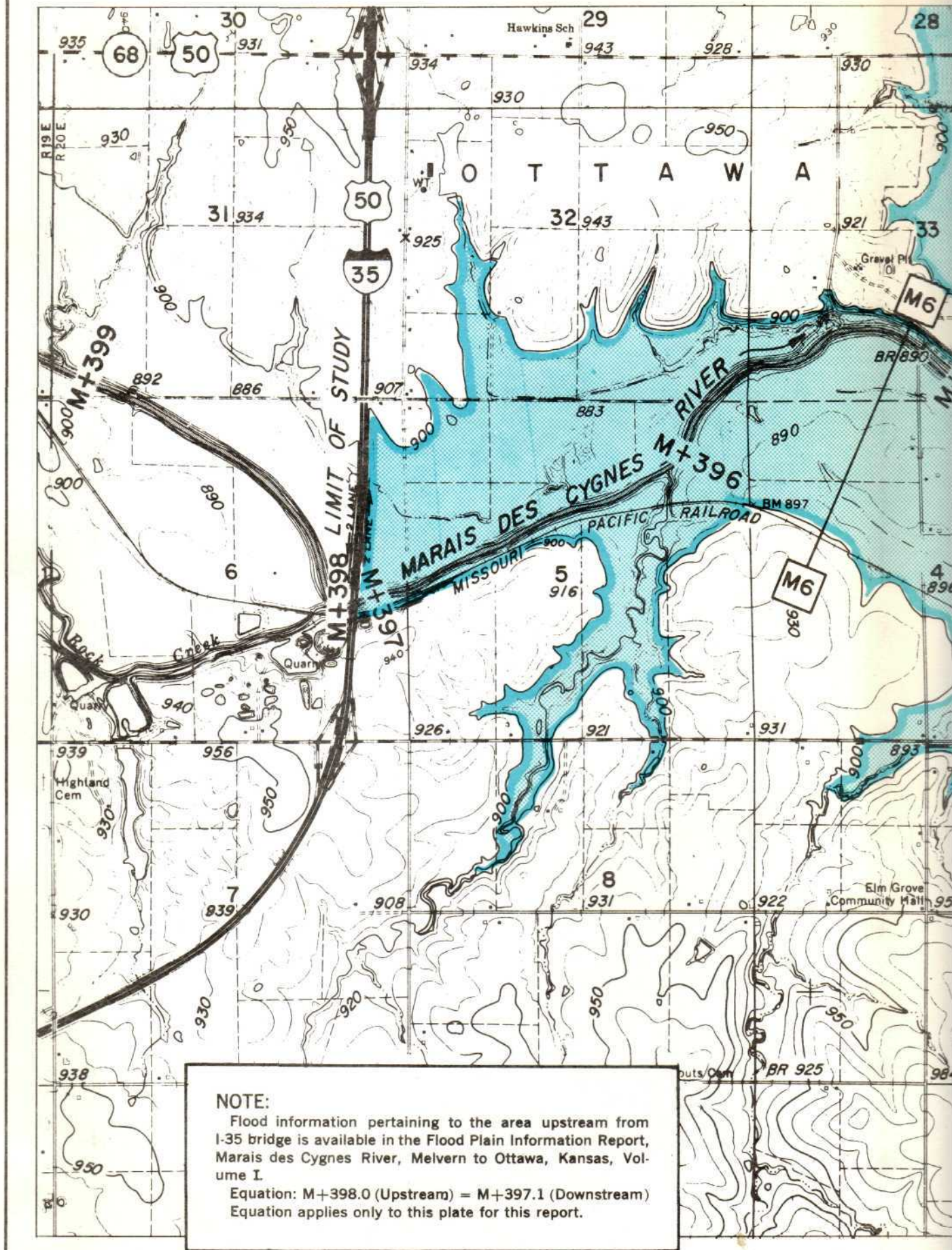
OSAWATOMIE TO OTTAWA, KANSAS

VOLUME II

JANUARY 1975 FILE NO. 0-6-417

Limits of overflow indicated may vary some from actual locations on ground, as explained in the report.

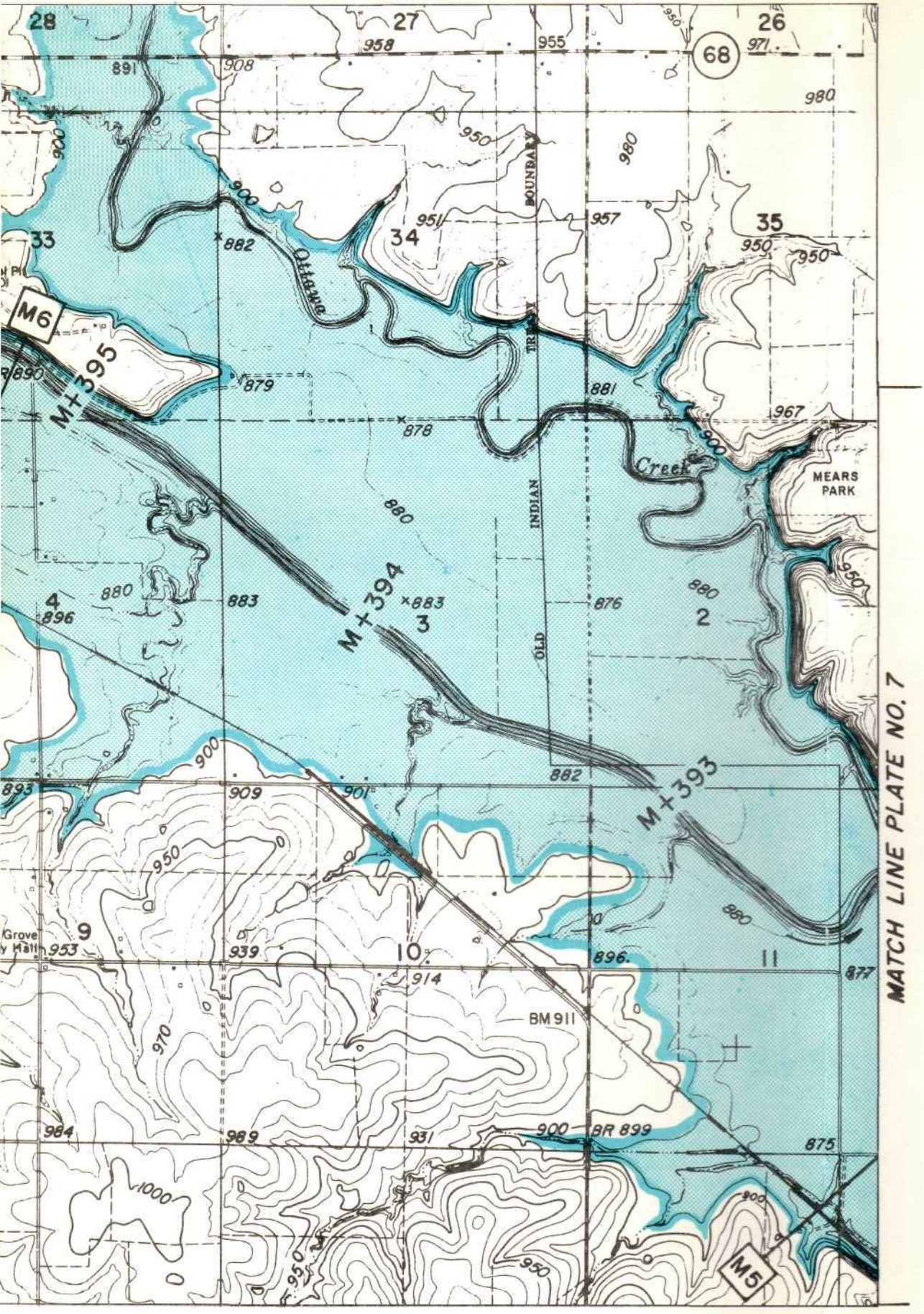
PLATE NO. 7



NOTE:

Flood information pertaining to the area upstream from I-35 bridge is available in the Flood Plain Information Report, Marais des Cygnes River, Melvern to Ottawa, Kansas, Volume I.

Equation: M+398.0 (Upstream) = M+397.1 (Downstream)
Equation applies only to this plate for this report.



M+000..... DIS

M2 — M2 .....

Conto

Base map supplied by
of Engineers.

2000

CORPS

F

MAR

OSAWATO

JANUARY 19

Limits of over
ground, as expl

LEGEND

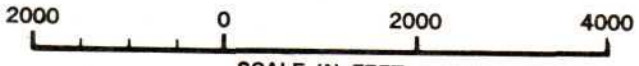
OVERFLOW LIMITS

M+000..... DISTANCE IN MILES ABOVE MOUTH

M2—M2 ..... CROSS SECTION

Contours at 10 Ft. Intervals

Base map supplied by U. S. Geological Survey. Alterations by Corps of Engineers.



MATCH LINE PLATE NO. 7

CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

FLOODED AREAS

MARAIS DES CYGNES RIVER

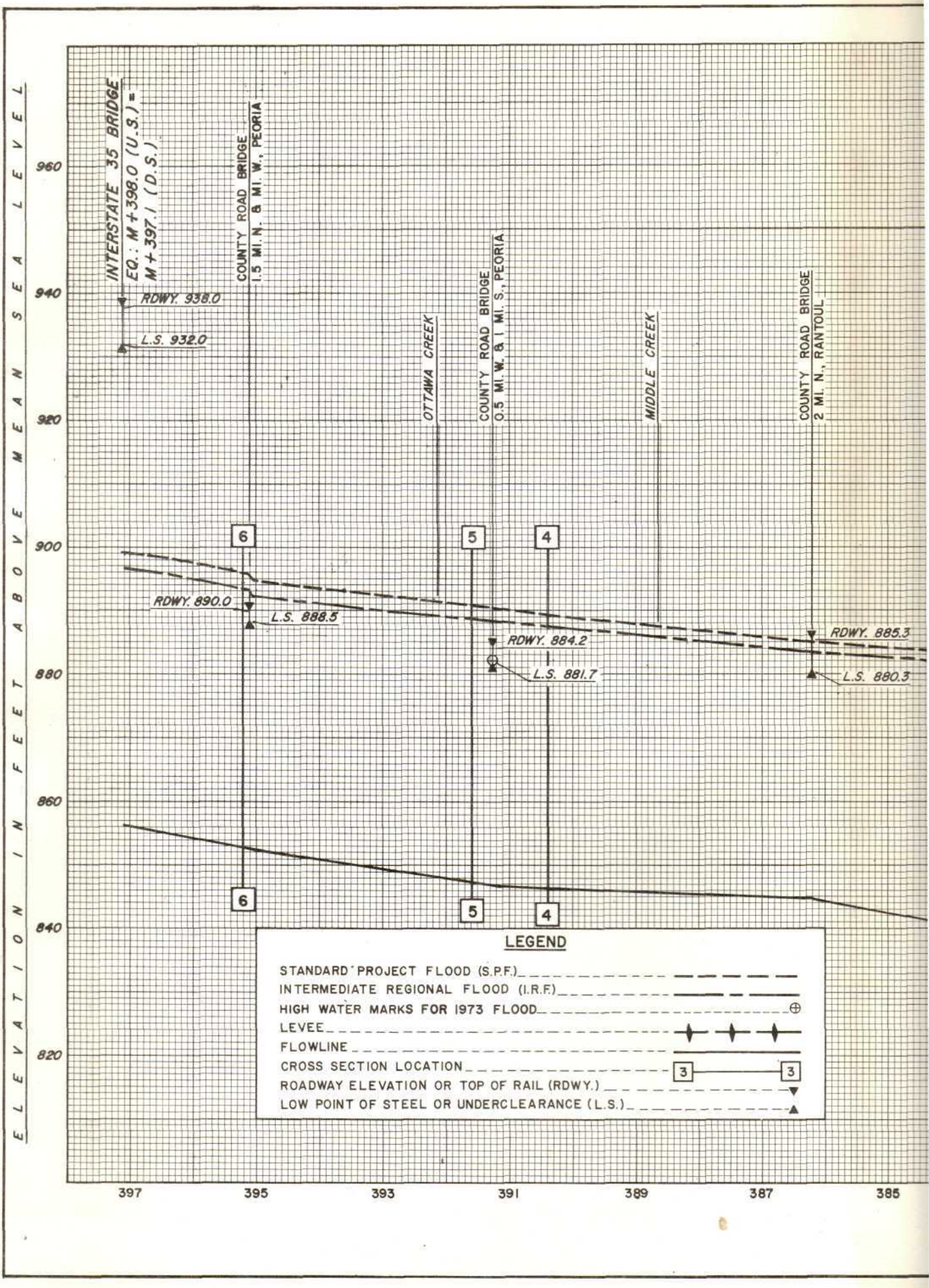
OSAWATOMIE TO OTTAWA, KANSAS

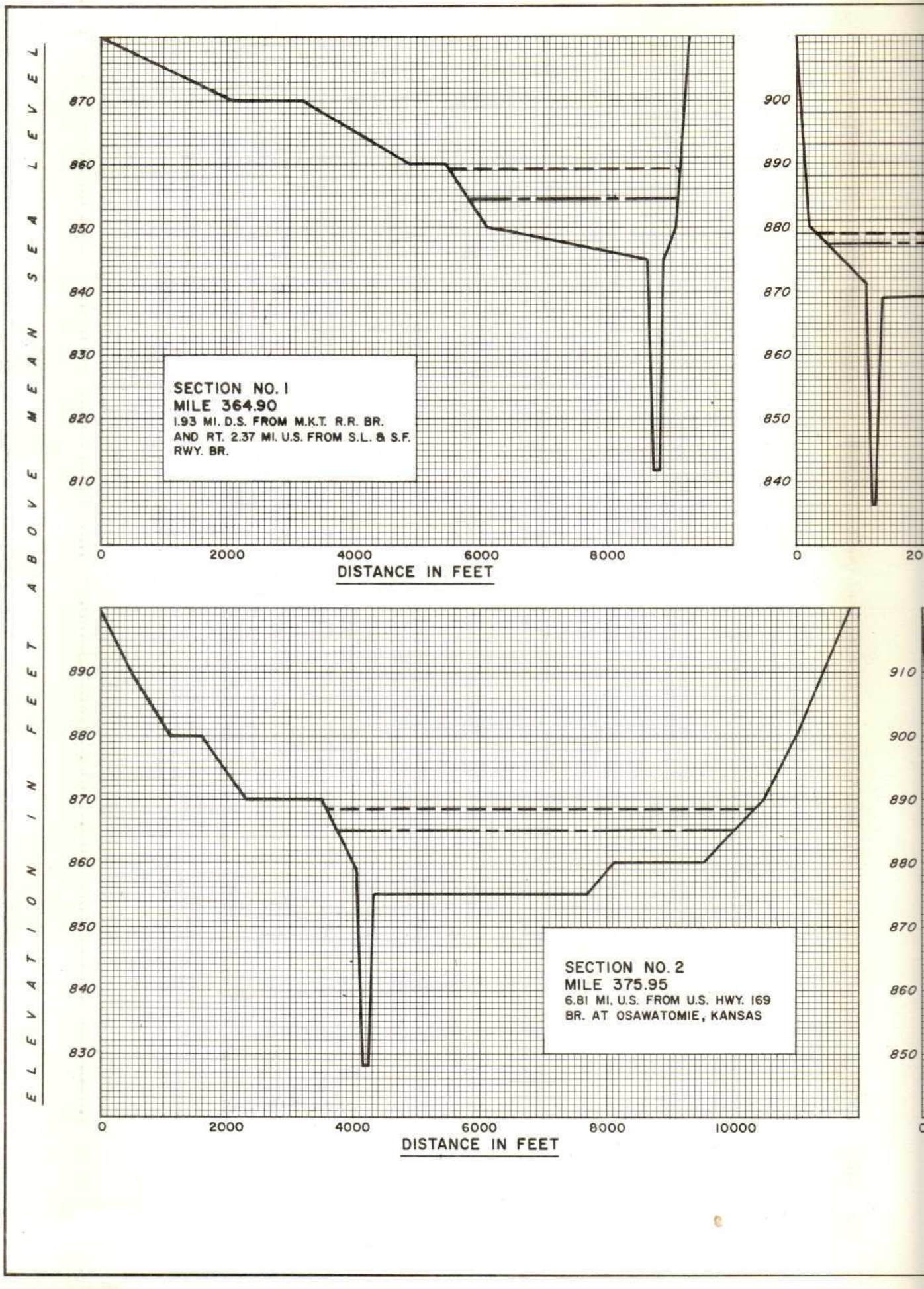
VOLUME II

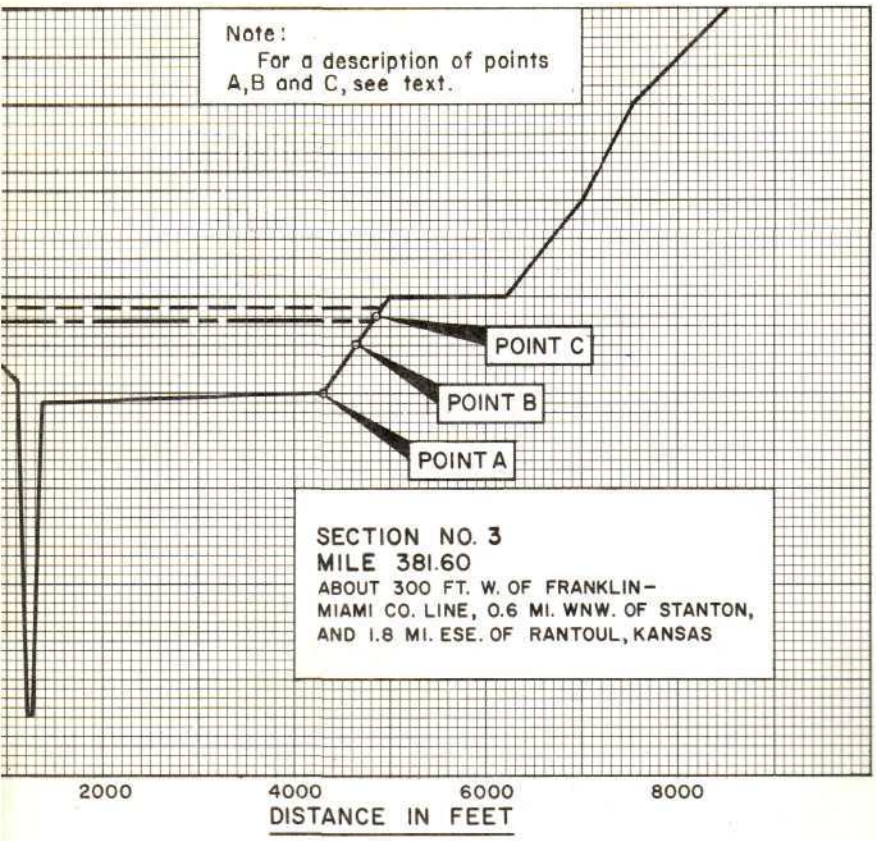
JANUARY 1975 FILE NO. 0-6-418

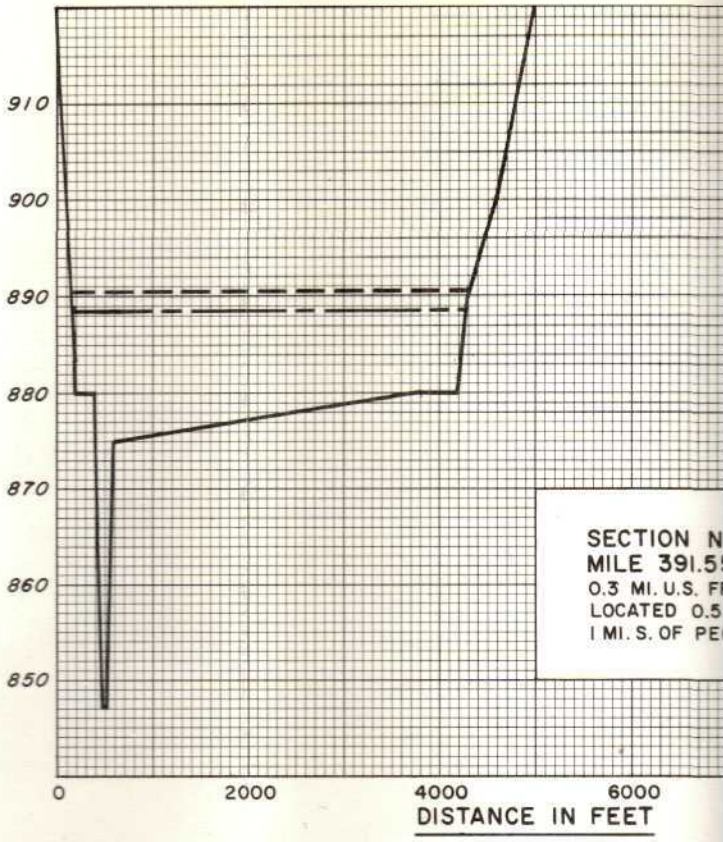
Limits of overflow indicated may vary some from actual locations on ground, as explained in the report.

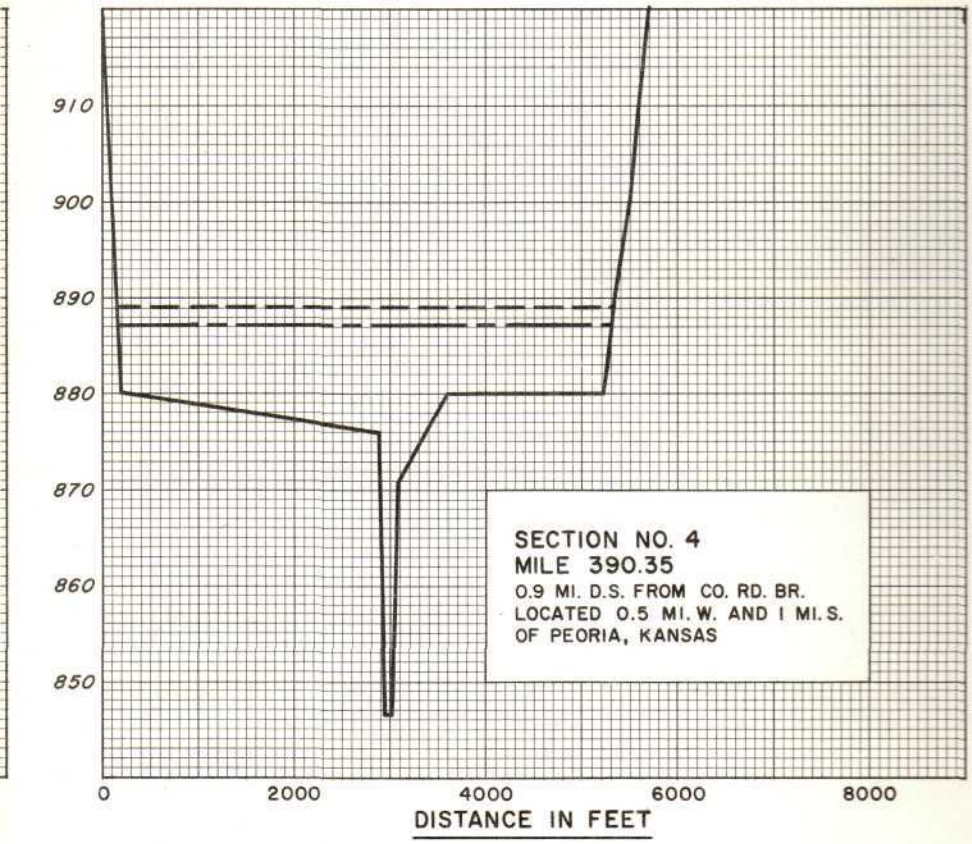
PLATE NO. 8

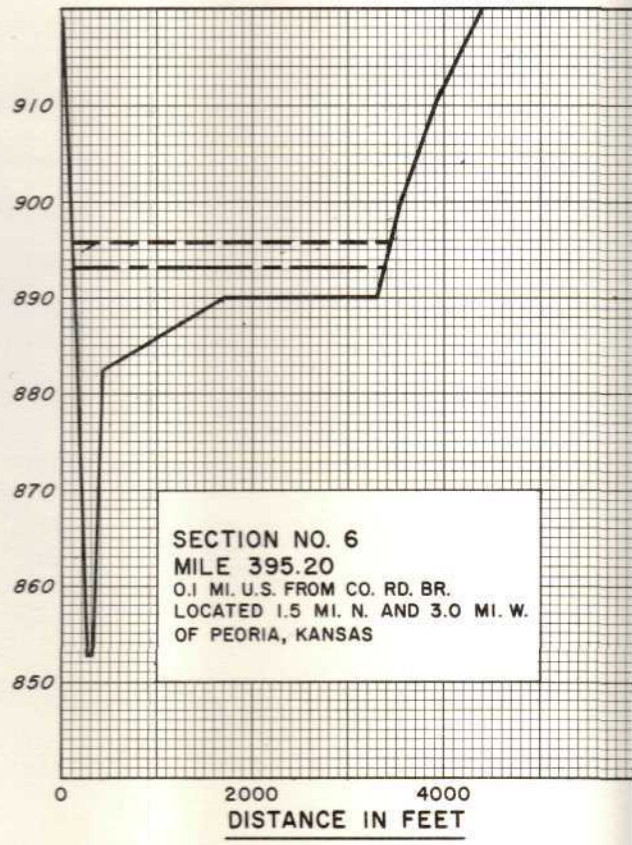

ELEVATION IN FEET ABOVE MEAN SEA LEVEL
960
940
920
900
880
860
840
820
INTERSTATE 35 BRIDGE
EQ.: M+398.0 (U.S.) =
M+397.1 (D.S.)
RDWY. 938.0
L.S. 932.0
COUNTY ROAD BRIDGE
1.5 MI. N. & MI. W., PEORIA
OTTAWA CREEK
COUNTY ROAD BRIDGE
0.5 MI. W. & 1 MI. S., PEORIA
MIDDLE CREEK
COUNTY ROAD BRIDGE
2 MI. N., RANTOUL
6
5
4
RDWY. 890.0
L.S. 888.5
RDWY. 884.2
L.S. 881.7
RDWY. 885.3
L.S. 880.3
LEGEND
STANDARD PROJECT FLOOD (S.P.F.)
INTERMEDIATE REGIONAL FLOOD (I.R.F.)
HIGH WATER MARKS FOR 1973 FLOOD
LEVEE
FLOWLINE
CROSS SECTION LOCATION
3
3
ROADWAY ELEVATION OR TOP OF RAIL (RDWY.)
LOW POINT OF STEEL OR UNDERCLEARANCE (L.S.)
397
395
393
391
389
387
385

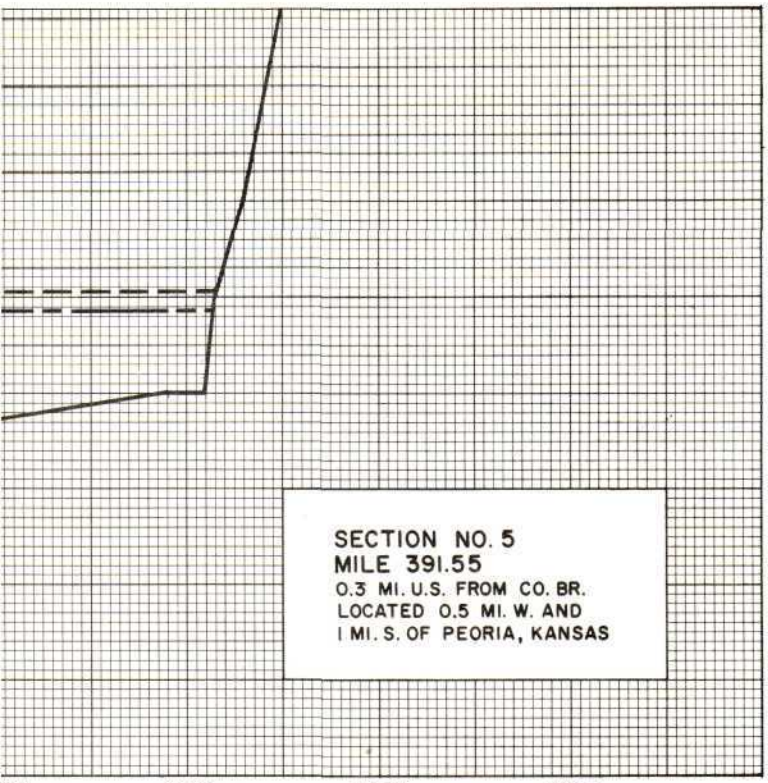

ELEVATION IN FEET ABOVE MEAN SEA LEVEL
870
860
850
840
830
820
810
0
2000
4000
6000
8000
DISTANCE IN FEET
SECTION NO. 1
MILE 364.90
1.93 MI. D.S. FROM M.K.T. R.R. BR.
AND RT. 2.37 MI. U.S. FROM S.L. & S.F.
RWY. BR.
900
890
880
870
860
850
840
0
20
890
880
870
860
850
840
830
0
2000
4000
6000
8000
10000
DISTANCE IN FEET
SECTION NO. 2
MILE 375.95
6.81 MI. U.S. FROM U.S. HWY. 169
BR. AT OSAWATOMIE, KANSAS
910
900
890
880
870
860
850

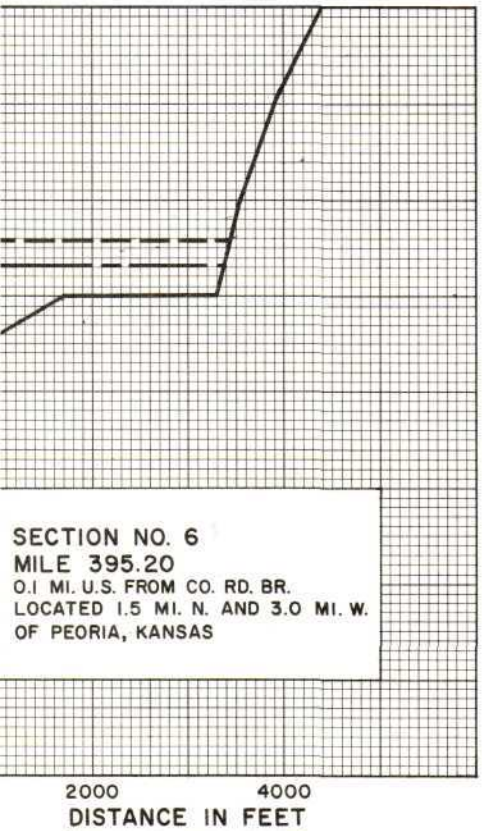

Note:
For a description of points
A, B and C, see text.
POINT C
POINT B
POINT A
SECTION NO. 3
MILE 381.60
ABOUT 300 FT. W. OF FRANKLIN–
MIAMI CO. LINE, 0.6 MI. WNW. OF STANTON,
AND 1.8 MI. ESE. OF RANTOUL, KANSAS
2000
4000
6000
8000
DISTANCE IN FEET


910
900
890
880
870
860
850
SECTION N
MILE 391.5
0.3 MI. U.S. F
LOCATED 0.5
I MI. S. OF PE
0
2000
4000
6000
DISTANCE IN FEET


910
900
890
880
870
860
850
SECTION NO. 4
MILE 390.35
0.9 MI. D.S. FROM CO. RD. BR.
LOCATED 0.5 MI. W. AND 1 MI. S.
OF PEORIA, KANSAS
0
2000
4000
6000
8000
DISTANCE IN FEET


910
900
890
880
870
860
850
SECTION NO. 6
MILE 395.20
0.1 MI. U.S. FROM CO. RD. BR.
LOCATED 1.5 MI. N. AND 3.0 MI. W.
OF PEORIA, KANSAS
0
2000
4000
DISTANCE IN FEET





LEGEND

STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
GROUND LINE

NOTES:

All sections are in miles from mouth of stream. Cross sections are shown looking downstream.

63 additional cross sections are on file in the Kansas City District Office.

CORPS OF ENGINEERS, U. S. ARMY
KANSAS CITY DISTRICT

CROSS SECTIONS

MARAIS DES CYGNES RIVER

OSAWATOMIE TO OTTAWA, KANSAS
VOLUME II

JANUARY 1975 FILE NO. 0-6-420

PLATE NO. 10

FLOOD PLAIN INFORMATION MARAIS DES CYGNES RIVER OTTAWA TO OSAWATOMIE, KANSAS VOLUME II