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NCHRP Report 417

Highway Infrastructure Damage Caused by the 1993 Upper Mississippi River Basin Flooding

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This report contains the findings of a study of the effects of the 1993 flooding of the Mississippi River Basin on bridge and related transportation infrastructure. Records of the type of facilities that were damaged are included, along with a damage classification system that can be applied to future natural disasters to aid in data collection and reporting. The contents of this report will be of immediate interest to bridge and structural engineers, hydraulics engineers and hydrologists, and others concerned with the effects of flooding on highway infrastructure.

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state and local governmental agencies, universities, and industry; its relationship to the National Research Council is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

Note: The Transportation Research Board, the National Research Council, the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the individual states participating in the National Cooperative Highway Research Program do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

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NOTICE

The project that is the subject of this report was a part of the National Cooperative Highway Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the program concerned is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation Officials, or the Federal Highway Administration, U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical committee according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

To save time and money in disseminating the research findings, the report is essentially the original text as submitted by the research agency. This report has not been edited by TRB.

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The work was supervised by Arthur C. Parola, Associate Professor of Civil Engineering. The other authors of the report are D. Joseph Hagerty, Professor of Civil Engineering, and Sridhar Kamojjala, Research Engineer for the Department of Civil Engineering.

Comprehensive overviews and aerial photographs of distress in the flooded areas were obtained with the assistance of Louis F. Cohn, Professor of Civil Engineering and pilot. Graduate research assistants Prasad N. Gattu, Bhanu Uday Kuruganty, Daniel Corrigan, Charles J. Melhart, Mojgan A. Taghizadeh, Matthew R. Newman, Tim O'Leary, Sanjeev K. Mahavadi, Michael Kirby and Charles McCormick assisted in this investigation and report production. Tim Baxter, Highway Superintendent of Richardson Couny, Nebraska, as well as many other Federal Highway engineers of the flooded regions, provided information for this study. The authors would like to acknowledge numerous federal, state and county transportation officials and the U.S. Army Corps of Engineers for the valuable information they provided.

FOREWORD

By Staff
Transportation Research Board

This report contains the findings of a study of the effects of the 1993 flooding of the Mississippi River Basin on bridge and related transportation infrastructure. Records of the types of facilities that were damaged are included, along with a damage classification system that can be applied to future natural disasters to aid in data collection and reporting. The contents of this report will be of immediate interest to bridge and structural engineers, hydraulics engineers and hydrologists, and others concerned with the effects of flooding on highway infrastructure.

The Mississippi River Basin experienced substantial flooding in 1993 because of heavy rainfall. The flooding surpassed record levels in many areas and resulted in significant damage to the highway infrastructure. Although similar damage has been documented before, the 1993 catastrophe presented the opportunity to catalog the damage in multiple states in a way that may be useful for planning, mitigation, and remediation efforts related to future flood events.

Designing bridges for flood events historically has been problematic for bridge engineers, especially from the perspective of determining suitable design loads associated with debris and hydrodynamic forces. The AASHTO *Standard Specifications for Highway Bridges* states, "All piers and other portions of structures that are subjected to the force of flowing water, floating ice, or drift shall be designed to resist the maximum stresses induced thereby." Unfortunately, this is the extent of the guidance provided in the specifications for determination of debris or drift forces in bridge design. Accordingly, NCHRP Project 12-39, a six-task effort called *Design Specifications for Debris Forces on Highway Bridges*, was initiated with the objective of developing practical design specifications and supporting commentary for the determination of impact, drag, and hydrostatic forces on bridge piers and superstructures due to debris. The 1993 flooding occurred while NCHRP Project 12-39 was being conducted. The Federal Highway Administration and NCHRP decided to cooperatively fund a seventh research task to (1) conduct field surveys of flood-related highway bridge damages and losses for a sample of representative sites and for classes of problems and failures; (2) conduct in-depth evaluations of the actual mechanisms for bridge-related failure and damage due to extreme flood events for the sample sites and classes of problems and failures; and (3) interact with federal and state damage survey teams and disaster assistance teams and coordinate assessments, data, evaluations, and conclusions where practical. Task 7 of NCHRP Project 12-39 is the basis for this report.

The research was performed at the University of Louisville, in Kentucky, and included a comprehensive field investigation of flood-damaged transportation structures, development of a damage classification scheme for the documentation of such damage, and analysis of apparent mechanisms of damage. This report summarizes the findings from that study and includes sections describing hydrodynamic loads on bridges, general bridge damage from the flood, scour around bridge abutments and

piers, and damage to embankments and (to a lesser degree) pavements. The data for flood damage in multiple states are catalogued in an appendix to the report.

The research observed that the damage from the 1993 flooding was significant and widespread. Substantial damage to bridge supports was noted, along with several structural failures. Although determination of the cause of failure was not always possible, scouring of the riverbed near bridge supports and water and debris forces on bridge super- and substructures appear to be the primary reasons. The research provided a classification scheme to document which structures were damaged, the type of damage, the apparent cause of damage, and the cost estimates of the damage. The classification system can be used to document future flood events. Finally, the research provides recommendations for future activities related to flood-induced damage to transportation facilities.

HIGHWAY INFRASTRUCTURE DAMAGE CAUSED BY THE 1993 UPPER MISSISSIPPI RIVER BASIN FLOODING

SUMMARY

The floods that ravaged the upper Mississippi River and Missouri River basins in 1993 were unprecedented in those basins in terms of magnitude, severity of damage, and season of occurrence *(1)*. Intense rainfall events were coupled with wet antecedent conditions over large areas. Flood recurrence intervals ranged from 100 years to 500 years. The flooding caused extensive damage to embankments, roadways and bridges. More than 158 million dollars was requested from the Federal Highway Administration (FHWA) by officials in nine states for repair and/or replacement of elements of the federal aid highway system at approximately 2,305 sites. More than 100 million additional dollars were requested from the Federal Emergency Management Administration (FEMA) for relief work on secondary highways and associated infrastructure. Areas of highest relief costs were located along the Missouri River between Kansas City and St. Louis, Missouri, and along the Mississippi River between Quincy and Cairo, Illinois. Most of the counties receiving relief money in excess of one million dollars were located in Missouri and Illinois along the largest rivers in the downstream parts of the basins.

Because bridges are designed against scour effects primarily on the basis of information gained from laboratory model studies, and such studies have been influenced by assumptions about scour processes, the 1993 floods provided an invaluable opportunity to obtain data on scour processes, modes of failure and relative vulnerability of highway systems to the effects of extreme flood events. Field reconnaissance was conducted in autumn 1993 to visit areas most heavily impacted by flood effects, and sites representative of categories of damage were inspected and documented. Data on FHWA Disaster Assessment Forms and on FEMA Damage Survey Reports were reviewed, as was information obtained from state and federal transportation agencies.

Hydrodynamic forces involving debris accumulations caused bridge failure at some sites studied in this investigation. Large debris accumulations were found on streams where trees were growing only on the immediate stream banks and where no large forested areas were present to serve as sources of debris. The action of the accumulations was complex, including derangement of flow patterns through channel blockages and deflection of currents against banks and embankments. Hydrologic and hydraulic analyses of available data indicated that much of the force transmitted to the bridge superstructure in these cases was hydrostatic force caused by water elevation differences. The transmission of force to bridge superstructures was only one aspect of the effects of debris accumulations. Debris also caused or aggravated flow conditions contributing to scour.

Scour around bridge abutments was a much more frequent cause of damage than was local scour around bridge piers. In all the instances investigated in this study where piers failed or settled

as a result of scour, flow around abutments and approach embankments and the associated scour at those locations strongly influenced scour at the piers.

A significant portion of the impacted embankments were damaged by scour of shoulders, pavements, and downstream slopes after the embankments were overtopped. Frequently, the overtopping was caused by constriction of flow at bridge openings kilometers away from the location of the overtopping because the embankments traversed very wide floodplains. Failures occurred at relief bridges through long embankments.

Breaches in levees along major rivers allowed flow onto floodplain areas and the waters moving across floodplains overtopped approach embankments when the accumulated flow was constrained by levees that had not failed and/or was contracted at bridge openings. Flow spreading across floodplain areas downstream from breaches in levees and embankments and downstream from bridge openings deposited sediments derived from scour features at the breaches and contractions. These sediments, composed of mostly sands, covered large areas of floodplain. The deepest and most extensive scour holes measured in this investigation (as much as 430 m long and 17 m deep) were located near the ends of long embankment fills on wide, relatively flat floodplains; here floodplain flow transporting little bedload sediment caused negligible erosion or scour upstream of the embankments, but actively scoured at the ends of the embankments (around abutments) and then deposited the scoured material almost immediately downstream of the scour holes.

The largest amount of damage to abutments occurred where they had been placed close to the banks of the main stream or river channel. Lateral migration of streams and/or stream widening processes caused or contributed to damage at many abutments.

In addition to dramatic failures of embankments, abutments and bridges, damage to slopes, drainage facilities and pavements was widespread throughout the flooded areas. High-velocity flow was sustained for long periods where culverts passed through long embankments on floodplains because the elevation differences through the culverts were controlled by bridge openings remote from the culvert locations. Many other culvert failures occurred, however, on secondary roads far from large rivers. Prolonged rainfall caused rise in groundwater levels and consequent failures of embankment slopes and supported roadways throughout the nine affected states.

The largest impact of the 1993 floods in the Midwest occurred at embankments in terms of both repair/replacement costs and number of structures damaged. Approximately 48 percent of the total cost of Emergency Relief Funding was attributed to highway embankment damage. Damage to bridges accounted for 18 percent of the relief costs and about 23 percent of the damaged sites, and the primary cause of damage to bridges was scour around abutments and approach embankments. Eight percent of the bridge sites reported to the FHWA as having been damaged were identified as damaged by scour around piers, and such scour most often was caused by a number of factors including contraction of the waterway, debris accumulation and/or scour at an abutment or approach embankment. In only one instance was local scour at a pier identified as the primary cause of the distress at that pier.

CHAPTER 1

INTRODUCTION

The 1993 floods in the upper Mississippi River and lower Missouri River basins devastated the Midwestern United States. The floods were distinct from all other recorded floods in those basins in terms of magnitude, severity of damage and season in which the floods occurred. The flooding caused the deaths of 47 people and 15 to 20 billion dollars in damages *(1)*. Damage was extensive in nine states: Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. More than 760 mm of rain fell in central Kansas and northern Missouri from April through July, 1993. Up to 460 mm of rain fell at some locations in the month of July alone. These intense rainfall events, coupled with wet antecedent conditions over large areas, produced extensive flooding. Flood recurrence frequencies estimated at several locations within the upper Mississippi River basin varied from 100 to 500 years. Unregulated peak flows in the Missouri River varied from 5,240 m^3/s at Omaha, Nebraska to 24,000 m^3/s at Hermann, Missouri. On the Mississippi River, a peak flow of 30,000 m^3/s was recorded at St. Louis, Missouri *(1)*.

The extent, magnitude and duration of the storms caused flood waters to overtop numerous bridges, roads and levees. The flooding caused extensive damage to embankments, roads and bridges and paralyzed transportation for long periods. Kilometers of roadway were submerged and eroded, and portions of roadway were covered with sediment deposits after flood waters receded. The basin flooding caused submergence of large portions of the highway infrastructure as well as widespread damage.

More than 158 million dollars was requested by state highway departments to repair the federal aid highway system. Less publicized but equally extensive flood damage was caused to the secondary highway system as well. State, county and city governments requested over 100 million additional dollars from the Federal Emergency Management Administration (FEMA) to repair those secondary highways.

Four other major flood disasters occurred in Texas (1994), Georgia (1994), California (1994 and 1995), Missouri and Illinois (1995). Although the damage caused by those floods was not as widespread geographically and did not interrupt traffic flow for as long a period as in the 1993 Midwest flooding, those floods further demonstrated the need for information about flood effects on highway infrastructure, as well as data on local and national economic loss caused by detouring and delaying traffic.

The information used to design bridges against the effects of scour and to prevent or minimize other flood-related damage to highway infrastructure has been obtained primarily from laboratory model studies. Designers and modelers rely on assumptions about the dominant processes that cause damage, and on assumptions about parameters such as soil properties and bridge geometry. Similarity between the large-scale field conditions and the small-scale laboratory

conditions under which the predictive equations were derived also is assumed. Because of the uncertainty associated with the those assumptions, highway engineers are skeptical of the practical worth of predictive equations that provide, for example, scour depths around abutments. The validity of assumptions about scour processes on which the predictive equations are based and the uncertainty associated with the use of laboratory-based predictive equations have not been assessed for extreme flood event conditions.

The reliability of a transportation system subjected to an extensive catastrophic event affecting a large region of the nation has not been considered. Submergence of roadway systems and destruction of submerged roadways that cross large rivers such as the Mississippi River and the Missouri River can affect both local and regional traffic flow. Even if structures are not damaged, uncertainty about the conditions of bridge foundations cause transportation officials to interrupt traffic flow until the structure can be inspected and the safety of the traveling public can be assured. The submergence of highways, damage to highways and uncertainty about the integrity of highways, impact local, regional and national commerce.

Although damaging flood events occur frequently in the United States, the physical impact of flood events on the transportation network and the consequent economic impact on commerce are unknown. The widespread damage caused by the extensive flooding of the upper Mississippi River basin provided an historic opportunity to study the processes and modes of failure of the highway infrastructure and the impact of such failures on the regional transportation network.

The purpose of this study was to document the processes and modes of failure that caused damage throughout the affected basins and to summarize the impact of the damages to the transportation network. The specific objectives of the research were to determine the most frequent causes of observed structural damage, to identify dominant failure modes and processes, to assess susceptibility of structures to flood effects, and to compile information for future assessment of the economic impacts of highway infrastructure damage associated with extreme flood events. The objectives were met by conducting a series of post-flood site investigations, by analyzing flood damage assessments reports and photographs, and through analysis of available flood data as described in the following.

Conduct Field Surveys. Field investigations of flood-related highway bridge damages and losses for a sample of representative sites and classes of problems and failures were conducted. This activity included investigation of damage to primary and secondary highways in Nebraska, Missouri, and Iowa by field reconnaissance conducted in September, October, and November 1993, and subsequent review of aerial photographs.

Damage and evidence of damage processes and failure mechanisms were documented including (a) damage to highway bridges from debris and scour, (b) scour resulting from accumulation of debris and obstruction of the stream crossing, (c) damage to bridge approach sections, (d) overtopping damage to highway bridges and culverts encroaching onto the floodplain,

and (e) localized erosion and damage to highway drainage structures, foundations, road base, and appurtenances.

Evaluate Mechanisms of Damage Processes. In-depth evaluations of the actual mechanisms for bridge-related failure and damage due to extreme flood events for sample sites and classes of problems and failures was conducted. The source, cause, physical process and failure mechanism of flood-related highway bridge, culvert and approach failure/damage were determined. Damage and failure modes, mechanisms and processes were summarized. A classification scheme and matrix of damage processes and failure modes were developed.

Interact with Federal and State Damage Survey and Disaster Assistance Teams. The researchers interacted with federal and state damage survey and disaster assistance teams and coordinated assessments, data, evaluations, and conclusions where practical. Disaster Assessment Forms used for requesting Emergency Relief Funding from the Federal Highway Administration and summaries of Damage Survey Reports used to obtain funding from the Federal Emergency Management Administration (FEMA) were obtained from the affected states.

Assessment reports were compared with detailed determinations of damages and processes at the sample sites. Repair costs to highway users and owners were summarized using the classification scheme and matrix of damage processes.

Document Flood-Related Statistics and Provide Design Recommendations. Flood-related statistics useful for future research were documented. Data and criteria useful for evaluation procedures for design of highway bridges, culverts and approaches in floodplains were provided. Specific considerations for evaluation of levee breaches near bridges were developed.

This report summarizes the investigation to document flood damage. Descriptions of processes and modes of failure in highway infrastructure, a summary of damage to each of the highway networks in the nine states most heavily impacted, and a summary of apparent structure susceptibility to catastrophic flood damage are included.

CHAPTER 2

DAMAGE TO THE HIGHWAY NETWORK

State and local transportation departments received FHWA Emergency Relief Funding of approximately 158 million dollars for approximately 2,305 damage sites. Damage requiring repair or replacement with costs estimated to be greater than $100,000 was reported for at least 260 sites (Figure 2.1); work at those sites accounted for approximately 69 percent of the total Emergency Relief provided by FHWA for the 1993 flooding. City, county, and state agencies received assistance from FEMA for work at 2,364 bridges. Estimated repair and/or replacement costs were greater than $100,000 for 66 of those bridges.

Damage to highway infrastructure during the 1993 Midwest flooding was spread throughout the upper Mississippi River and Missouri River basins as shown in Figure 2.2. Counties with the highest damage relief costs were located along the floodway of the Missouri River between Kansas City and St. Louis, Missouri, and along the floodway of the Mississippi River between Quincy and Cairo, Illinois, as shown in Figures 2.1 and 2.3. Highway infrastructure damage occurred on small streams as well as on major rivers over most of the basin; however, flood impacts were concentrated along the Missouri, Mississippi, and Illinois Rivers in the lower portion of the upper Mississippi River basin. The most distinctive features of the flood included the long duration of the flooding, the extensive flooding on the broad floodplains of the Missouri and Mississippi Rivers, the impacts on and of levee systems and levee breaches and the damage to kilometers of highway embankments that crossed wide floodplains.

Counties having damage costs ranging from $100,000 to $1,000,000 (Figure 2.3) correspond to regions of high rainfall as shown in Figure 2.4, and locations on small streams and rivers where recorded flows were in excess of 50-year discharge events (Figure 2.5). Most of the counties receiving damage relief money in excess of $1,000,000 were in the downstream reaches of the Mississippi River and Missouri River basins and were concentrated along the largest rivers. The observed distribution of damage, as reflected in relief expenditures, can be attributed to several circumstances:

1. Geographic concentration of federal aid routes;
2. Effect of rainfall distribution and antecedent rainfall and soil moisture conditions;
3. Impacts of dams and reservoirs in the upstream parts of the basins; and
4. Hydrologic conditions in the basins.

States in the downstream portion of the basin suffered most in damage to federal aid routes, as shown in Tables 2.1 and 2.2. In Missouri, where damage relief costs were highest, effects included damaged structures on small streams as well as impaired structures along the Missouri River and the Mississippi River. Illinois damage totals were second highest, with the damage locations

UPPER MISSISSIPPI RIVER BASIN
Highway Infrastructure Damage Sites 1993

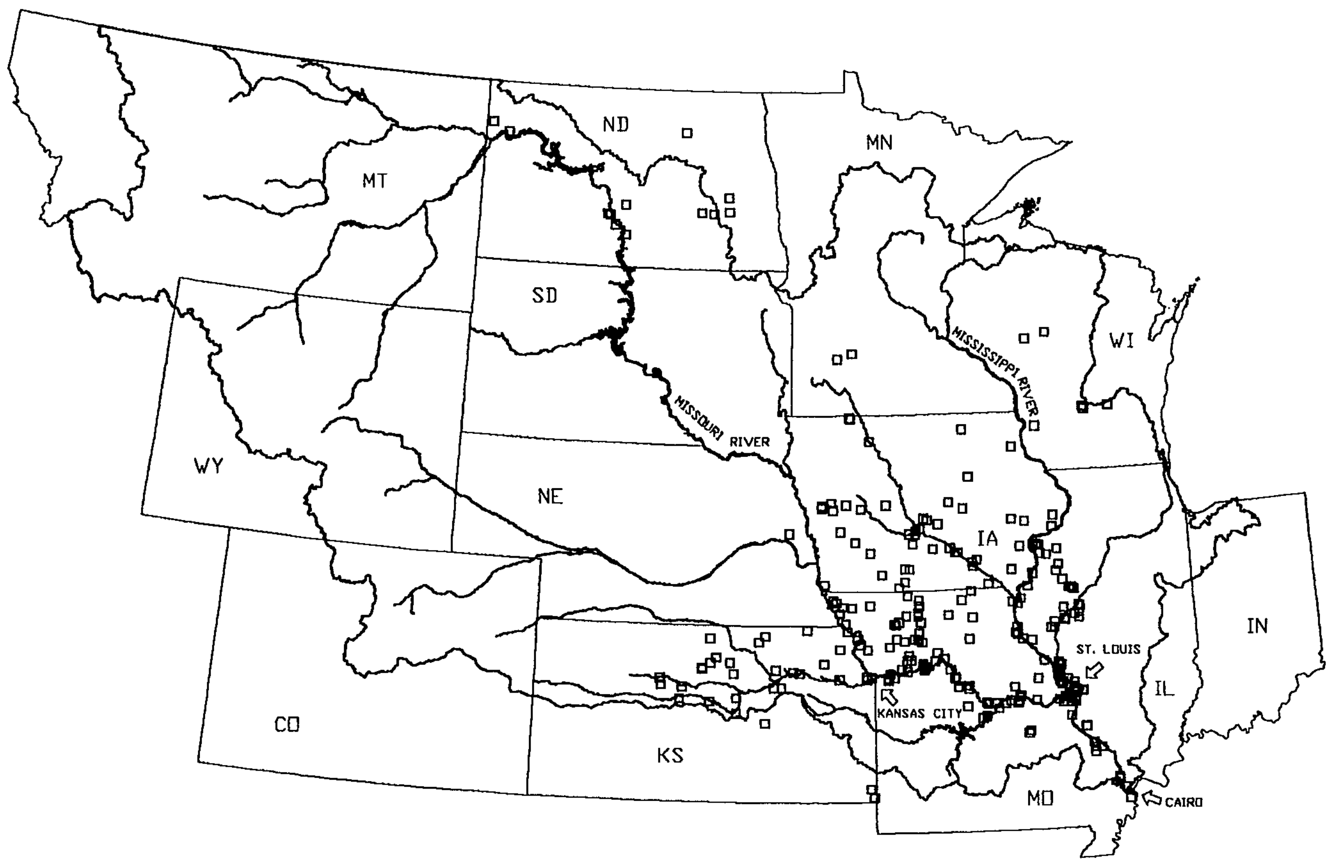


Figure 2.1. Federal aid highway damage sites with cost greater than $100,000 and major rivers in the upper Mississippi River basin.

UPPER MISSISSIPPI RIVER BASIN
Highway Network Damage 1993

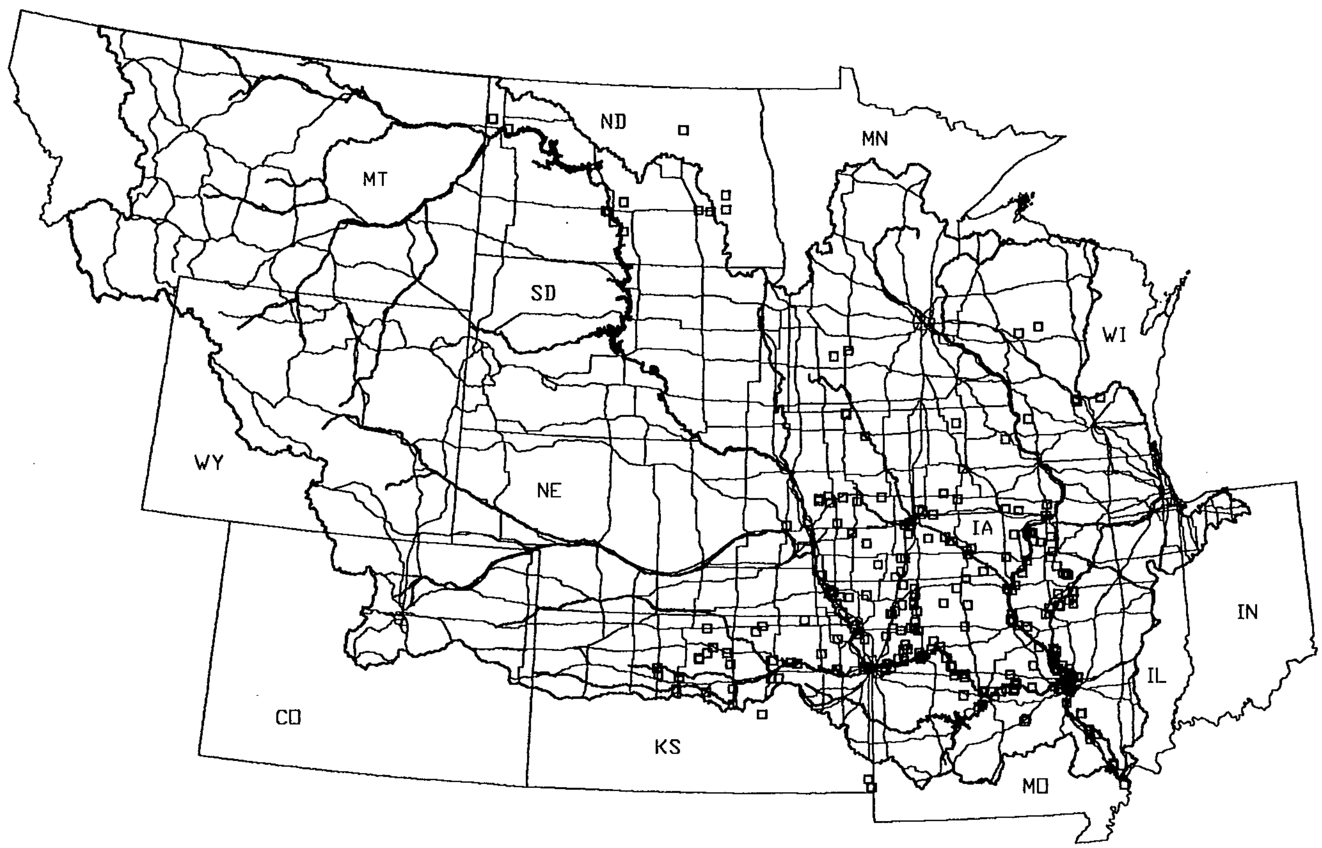


Figure 2.2. Federal aid highway network damage sites with cost greater than $100,000 in 1993.

UPPER MISSISSIPPI RIVER BASIN

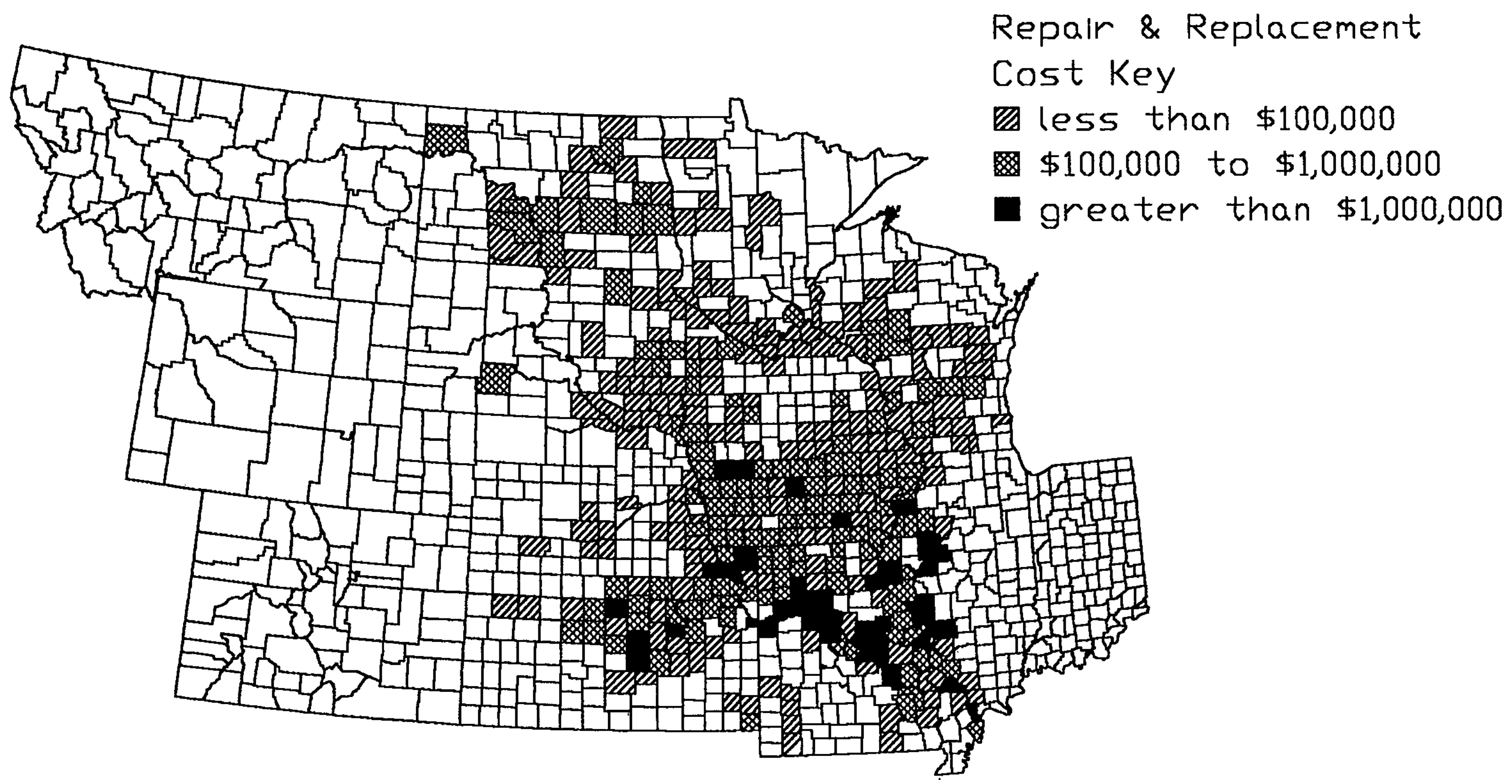


Figure 2.3. Counties with damage to federal aid routes in 1993.

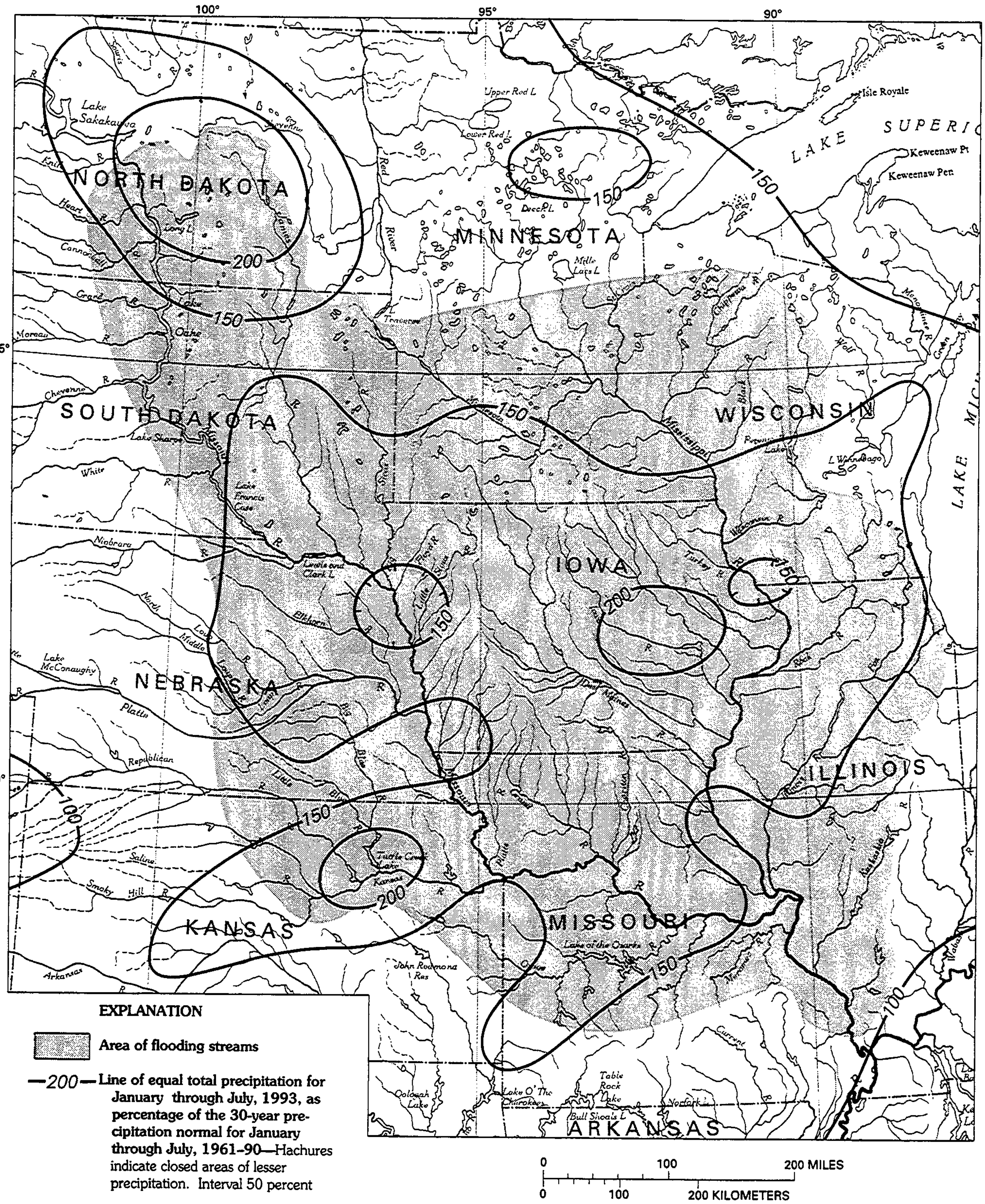


Figure 2.4. Rainfall distribution: January through July 1993 *(2)*.

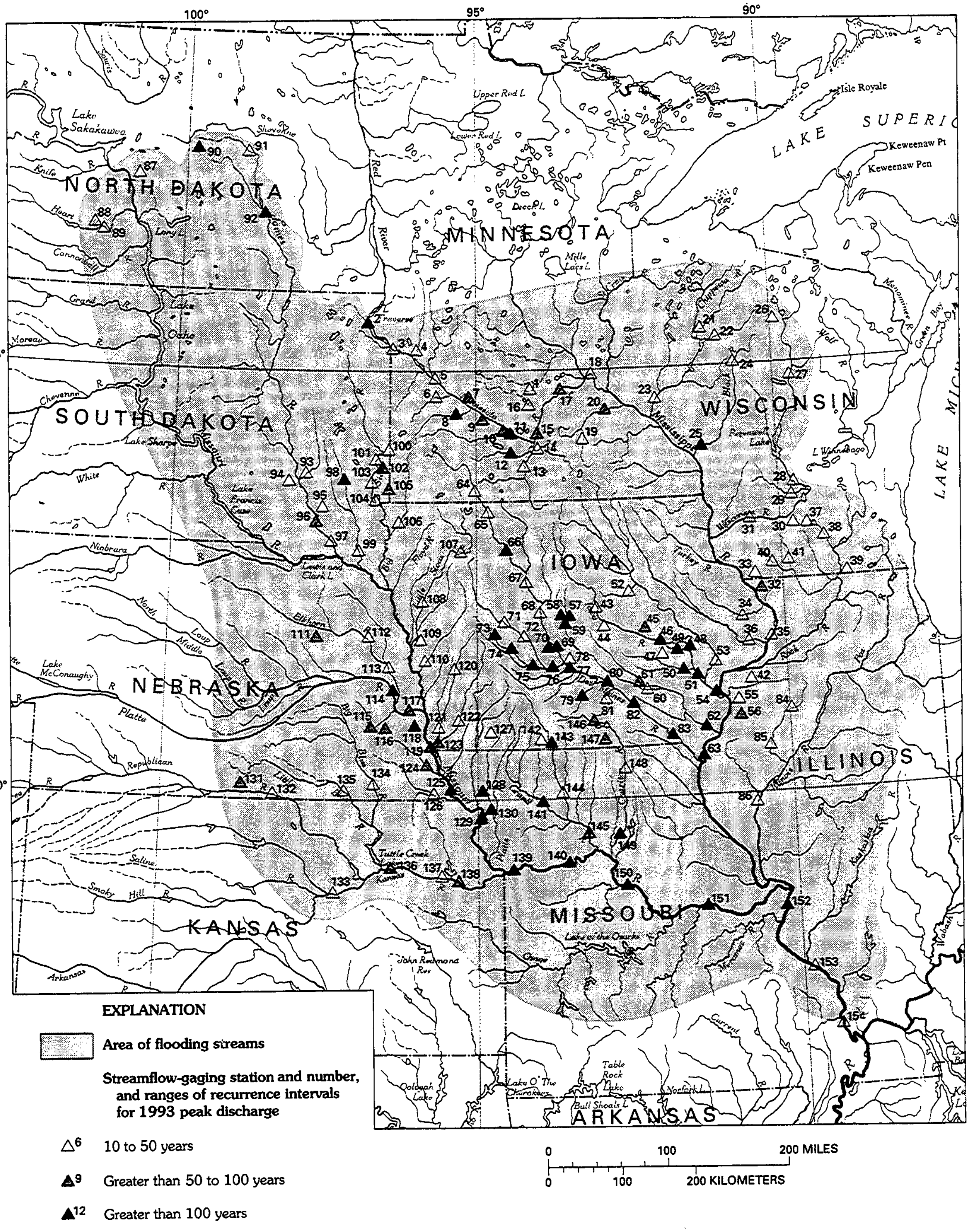


Figure 2.5. Location of selected streamflow-gaging stations and ranges in recurrence interval for the 1993 peak discharges in the upper Mississippi River basin *(2)*.

concentrated along the Mississippi River and the Illinois River. Officials in Iowa requested emergency relief funding for more sites than did officials in any other state (approximately 576 damage sites). Operational and maintenance measures, such as repaving roads damaged by truck traffic after they were used for detours, and temporary traffic control operations cost approximately $ 11.7 million in Illinois alone. Thé distribution of damage costs and sites is shown in Appendix A for sites where location information was provided.

Table 2.1. Highway Infrastructure Damage Costs for Federal Aid Routes

State	Total Damage Cost ($ Millions)	Number of Sites
Illinois	35.5	207
Iowa	21.4	576
Kansas	14.4	204
Minnesota	3.0	207
Missouri	71.6	389
Nebraska	2.9	63
North Dakota	3.9	93
South Dakota	2.6	117
Wisconsin	2.8	449
TOTAL	**158.1**	**2,305**

Table 2.2. Highway Infrastructure Damage to Federal Aid Routes;

Sites with Damage Relief Costs Greater than $100,000

State	**Total Damage Cost ($ Millions)**	**Number of Sites**
Illinois	29.3	50
Iowa	10.1	45
Kansas	12.0	35
Minnesota	0.3	2
Missouri	51.0	107
Nebraska	1.7	2
North Dakota	2.7	12
South Dakota	0.7	4
Wisconsin	0.9	5
Total	**108.7**	**260**

CHAPTER 3

HIGHWAY FACILITIES DAMAGE AND PROCESSES

A description of highway infrastructure damage was developed for selected sites in order to illustrate the most frequent causes of damage. The information for these sites was obtained from highway agencies, from post-flood terrestrial and aerial photographs, and from site reconnaissance and survey information.

Site investigations in the Midwest were initiated September 28, 1993 and concluded on December 22, 1993. These investigations focused on damage sites in Missouri, Iowa, and Nebraska, and were based on the investigators' prior discussions with state and FHWA engineers familiar with the damage. Although the original intent of the research team was to obtain damage reports before site investigations, often such information was unavailable to the research team until several months after the scheduled investigation.

Assessment and description of failure processes were based on information available from the post-flood investigations, photographs taken during and after flood events, flooding reports from the U.S. Army Corps of Engineers *(1)*, and inspection and damage assessment reports provided by state highway agencies and FHWA. The processes associated with flooding are complex and inherently difficult to quantify; however, valuable information about the conditions that cause damage and evidence of damage processes were available at many sites. Rainfall, peak flow rates and water surface elevation data were available at some sites *(2)*.

Drawing inferences about water surface elevations, flow depths and velocities at the time of a structural collapse or maximum scour depths at a specific time during the flooding is difficult. For example, high water marks were used in this study to estimate the flow conditions at the time of collapse of two bridges. However, upstream high water marks may have been higher after the bridge collapses than before bridge collapse if those collapses caused increases in waterway blockage or if flood flow simply increased after the collapses. Scour often cause substantial changes to the geometry of the streambanks and embankments after structures collapse. Scour holes that may have been very deep during the peak of an event may have filled during flood recession. In addition, the side slopes of scour holes are likely to fail after the recession of the event, especially where floodplain soils contain sands and non-plastic silts.

These time variations of site conditions cause uncertainty in the quantification and description of flood damage processes; however, integration of knowledge about scour processes, collection of appropriate site data and analysis of available information can limit that uncertainty. The quantification and the description of damage processes in this study were developed with consideration for these uncertainties.

Hydrodynamic Loads On Bridges

Although hydrodynamic forces on bridge superstructures and substructures cause damage to bridge substructure and superstructure components *(3)*, in this study the researchers found bridge substructures and superstructures damaged by hydrodynamic force effects only where debris accumulated on bridge components. Three modes of bridge failure were identified based on the site investigations and Damage Survey Reports from FEMA: substructure buckling, structure overturning about the streambed and superstructure bearing shear. In two investigated cases of bridge collapse, large portions of the cross-sectional areas of the waterway openings were blocked by debris that had accumulated on the substructures. In one case, the pile bent buckled (substructure buckling), and in the second case, a foundation pile system tilted and rotated about the streambed (substructure overturning). The superstructures were unsubmerged at failure in both cases. Summaries from Damage Survey Reports (FEMA) indicated that some superstructures were sheared from their substructures. Because the debris and in some cases the bridge were not in place after the flooding, quantitative verification of the influence of debris in causing the failures was not possible.

Investigation of Debris Accumulation Failure Sites. Debris accumulations that formed on pile bents contributed to the collapse of two bridges studied during the post-flood investigation: the bridge on Missouri Highway 113 over Florida Creek near Skidmore, Missouri; and the county road bridge over Halfbreed Creek near Falls City, Nebraska. Those bridges were presumed to have collapsed because of the hydrodynamic forces transferred to the bridge by debris accumulations. Important circumstances of both bridges were that 1) the bridge components that failed were the pile bents, and 2) more than half the area of the channel was blocked by debris.

Florida Creek Bridge Failure Site near Skidmore, Missouri. Debris transported by flood flows accumulated on pile bents and caused adverse effects to both bridge and local stream stability at the Skidmore bridge failure site. Figure 3.1 shows the watershed that contributes flow to the site. Figure 3.2 and 3.3 show the collapsed bridge spans. Debris accumulated on the upstream side of the bridge and blocked flow under the bridge. Flow blockage generated forces on the debris sufficient to cause rotation and to rupture the timber pile piers at the streambed. Figure 3.4 shows the bridge location prior to collapse and the debris accumulation as found in its post-collapse position. A large portion of the debris accumulation was compressed between the third span of the superstructure and the streambed. The superstructure and debris were translated downstream as shown in Figure 3.3.

The straight incised reach downstream of the bridge indicated possible channelization. Additionally, channelization or possible bank failures associated with stream widening was indicated by the bank conditions and lack of trees on the downstream banks (Figure 3.5). Trees were thriving on the banks of the upstream channel reach except within 50 m of the bridge. These conditions indicate that channel widening induced by channelization may have progressed upstream slightly

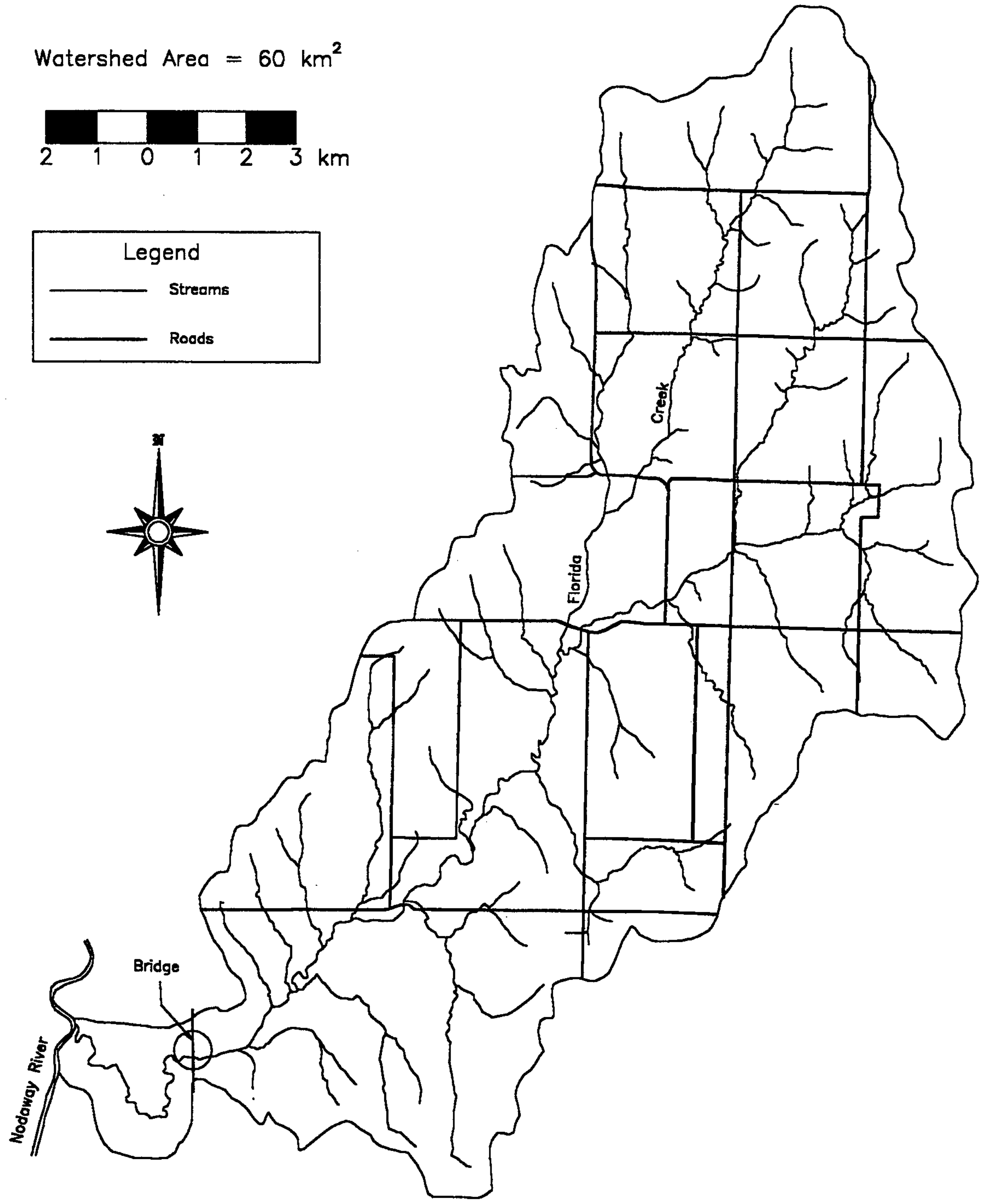


Figure 3.1. Watershed of Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri.

Figure 3.2. Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri, hours after collapse (courtesy of Missouri Highway and Transportation Department).

Figure 3.3. View, looking south, of Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri.

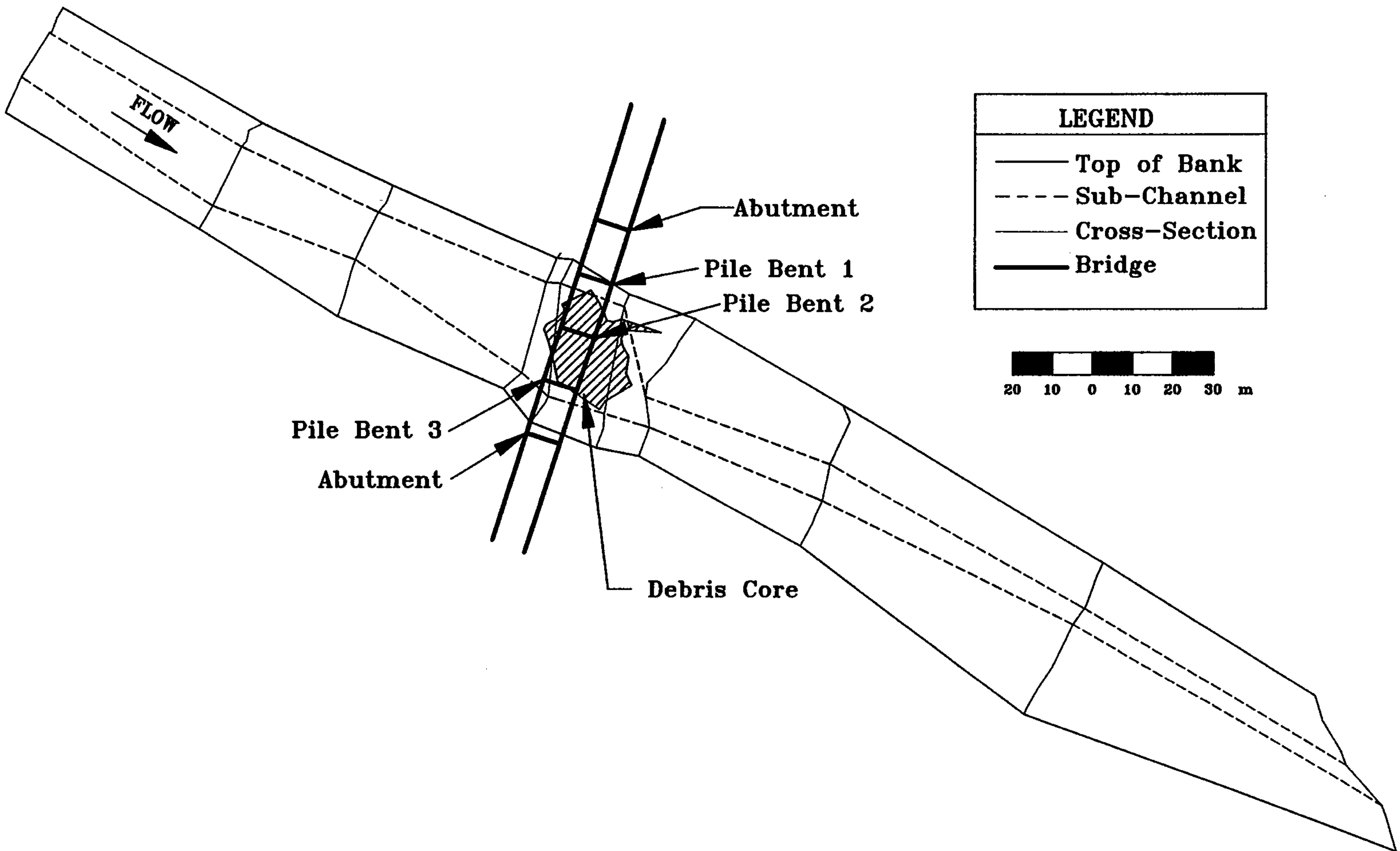


Figure 3.4. Stream flow direction and debris accumulation at Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri.

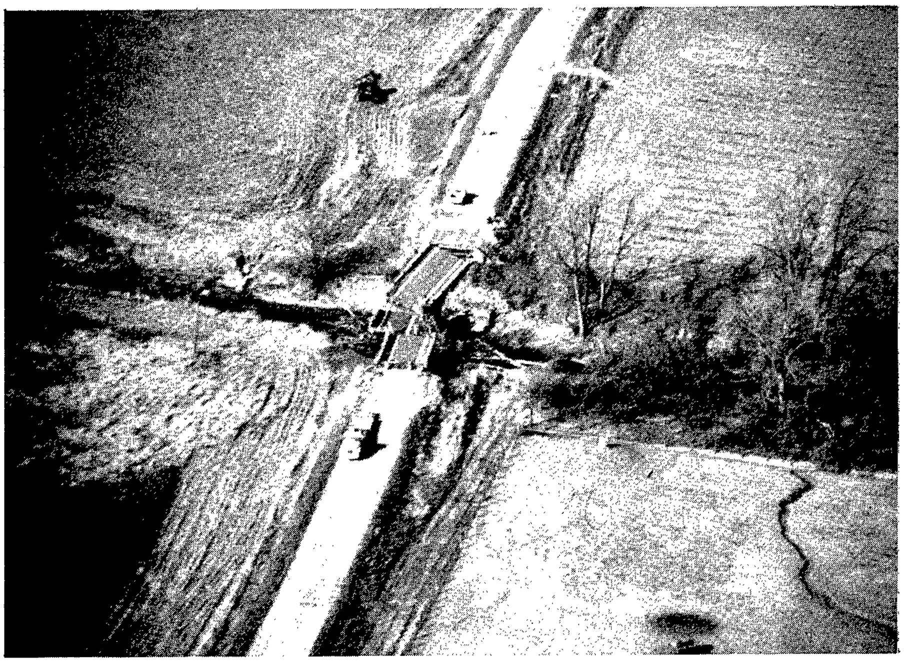


Figure 3.5. Aerial view, looking north, of Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri.

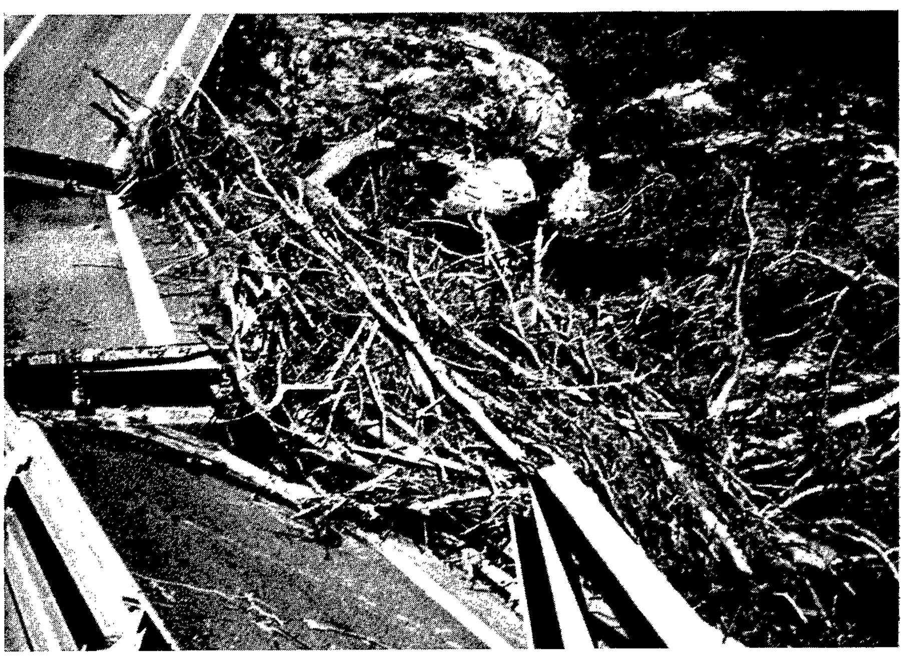


Figure 3.6. View, looking north, of Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri, after flood recession.

from the channelized reach. Bank failures associated with the widening may have provided some of the supply of debris to the site.

The debris accumulation at this site was composed of trees with bark and root masses still attached (Figure 3.6) indicating that those trees were thriving prior to the flooding that dislodged and transported them to the bridge. Elements of debris that supported the accumulation prior to collapse were located beneath the collapsed structure; therefore, no measurements of their geometric characteristics could be obtained. Trees with root masses and limbs intact, with approximately 15-20 m lengths exceeding the 11.4 m bridge spans, were present in the channel immediately upstream of the bridge. The source of the trees most probably was bank erosion upstream of the bridge, as shown in Figure 3.5.

Examination of Figure 3.6 reveals a surficial layer of fine debris on the upstream face of the debris accumulation. This fine debris was composed of small tree limbs, leaves and grass. The surficial layer of fine debris was considered to have completely blocked flow through the accumulation over a core region of the accumulation. Large tree limbs extended beyond the limits of the core region but were not considered to block significant areas of flow.

Halfbreed Creek Bridge Failure Site near Falls City, Nebraska. Debris contributed to the collapse of the county bridge over Halfbreed Creek near Falls City, in Richardson County, Nebraska. Figure 3.7 shows the watershed that contributed flow and debris to the bridge site. Halfbreed Creek is an incised tributary of the heavily channelized Muddy Creek. Debris accumulated on two steel pile bents that supported the girder superstructure. Figures 3.8 and 3.9 show the collapsed span and the pile bent consisting of six steel H-piles with the exterior piles battered. The hydrodynamic force developed on the accumulated debris was sufficient to cause the upstream pile of the main channel bent to buckle. The location of the debris accumulation at the time of inspection and the location of the bridge prior to collapse are shown in Figure 3.10.

Substantial scour around the east abutment most likely occurred during and after the bridge collapse. The vertical position of the base of the sheet pile structure also indicated that the sheet pile enclosures of the abutment wings were not undermined prior to the collapse of the span. The streambed configuration around the failed pile bent indicated that deposition occurred after the buckling of the pile bent. Bank failure material that spread over a large portion of the channel downstream of the debris accumulation was derived in part from a mass failure of a bank downstream of the bridge. Also, flow circulation in the wake zone downstream of the debris accumulation transported sediments from bank failures immediately downstream of the bridge and suspended sediment from the main current to the downstream side of the accumulation where the sediments were deposited.

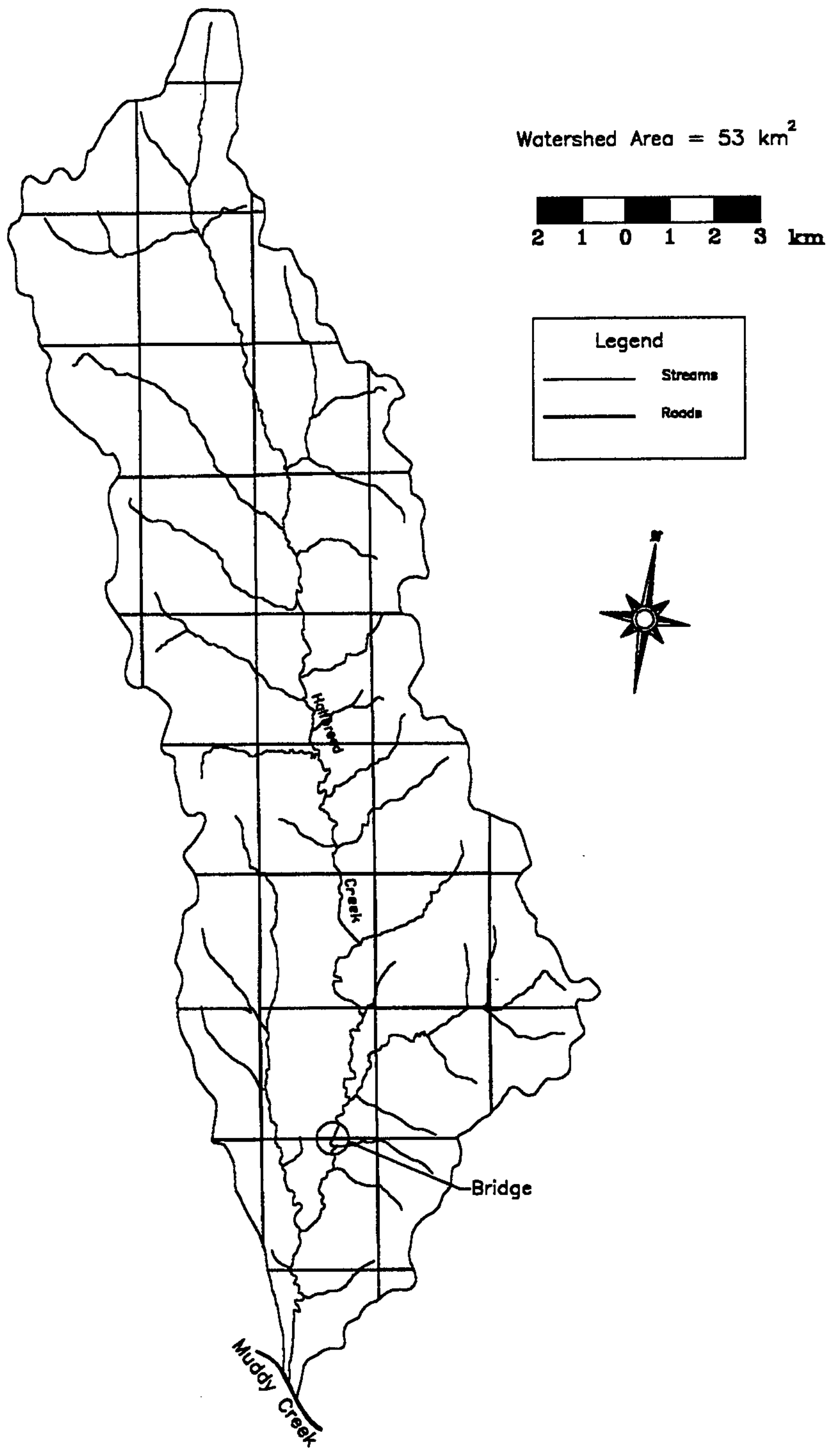


Figure 3.7. Watershed of county bridge over Halfbreed Creek, near Falls City, Nebraska.

Figure 3.8. Aerial view, looking northeast, of county bridge over Halfbreed Creek, near Falls City, Richardson County, Nebraska.

Figure 3.9. View of county bridge near Falls City, Richardson County, Nebraska.

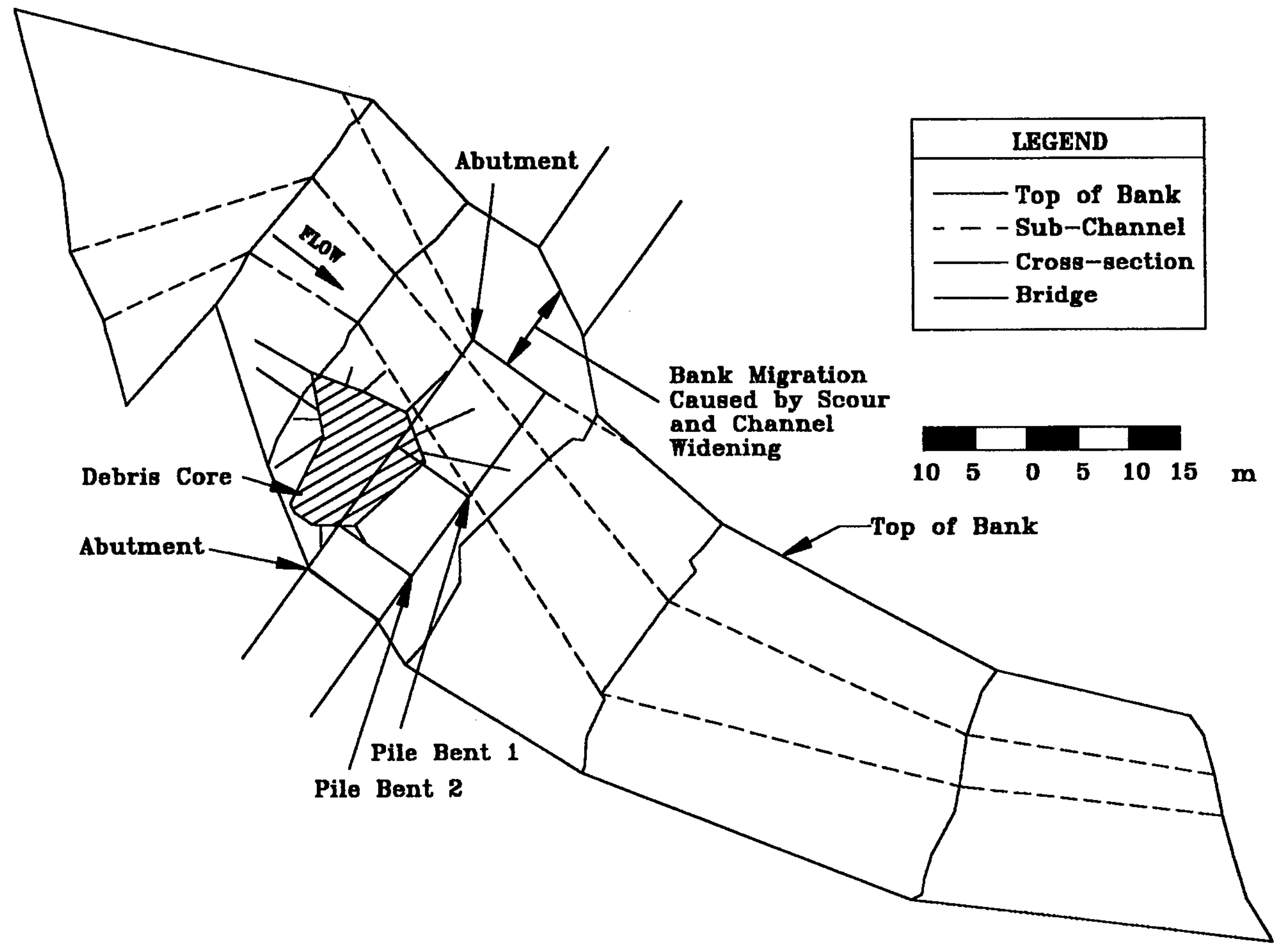


Figure 3.10. Stream flow direction and debris accumulation at county bridge over Halfbreed Creek, near Falls City, Nebraska.

Debris elements consisted mainly of limbs and decaying portions of trees. Few elements of the debris appeared to have been trees growing prior to flooding. The debris matrix was supported by large trees. A surficial layer of fine debris formed over the upstream face of the debris accumulation similar to the surficial layer found at the Skidmore site. The surficial layer of fine debris was considered to have completely blocked flow through the accumulation over a core region of the accumulation.

Computation of Hydrodynamic Forces Due to Debris Accumulations. Debris loading was indicated as the primary cause of structure collapse of the Missouri 113 Bridge over Florida Creek near Skidmore, Missouri and the county road bridge over Halfbreed Creek near Falls City, Nebraska. Hydrologic models were developed to estimate a range of flow rates at the times of the collapses because streamflow gages were not present on these streams. The hydrologic models were based on the SCS dimensionless unit hydrograph method *(4)* developed using HEC-1 *(5)* and available rainfall data from gages located near the basins that contributed flow to the bridge sites. These flow rates were used only to define the initial range of possible conditions. The flow rates developed for these sites ranged from 70 m^3/s to 200 m^3/s at the Skidmore site and 40 m^3/s to 100 m^3/s at the Falls City site.

The high water information at both sites indicated that the bridge superstructures and the approach roadways were not overtopped prior to collapse. Debris was not found beneath the portions of the superstructures that did not collapse. Flow downstream of the Skidmore bridge exceeded the top elevation of the streambanks by less than 1 m. High water marks at the Falls City site indicated that the flow was confined to the main channel. Hydraulic analysis based on the water-mark limits imposed on the upstream and downstream water surface elevations were used to estimate the range of likely flow conditions and forces on the debris accumulations.

Water surface elevations through the bridge openings were estimated using the one-dimensional energy approach provided in the computer program HEC-RAS *(6)*. Channel cross-section data and debris accumulation location data were obtained from surveys and photographs of the sites taken during and after the flood event. Water surface elevations through the bridge openings were estimated for situations with the debris accumulation. The downstream water surface elevations were limited at the Skidmore site to 1 meter above the top of bank. The downstream water surface elevations measured at the Falls City site were used in all scenarios of that site.

The core region of the debris was modeled as a wide pier. Contraction and expansion coefficients typical of bridge flows were used to model losses. The flowrate was varied to cover the range of flowrates developed from the hydrologic analysis.

At both sites the weight of the fallen superstructures compressed the debris, while collapse probably released some of the debris. Additional debris accumulated beneath and on the upstream faces of the collapsed structures. The model debris width was varied from 100 percent to 75 percent of the measured width after the collapse to accommodate the uncertainty in debris configuration.

The geometry of the debris perimeter was highly irregular; therefore, the edges of the core region (portion of the accumulation with a surficial layer of fine debris) were approximated by vertical edges. The simplification of vertical core edges was considered justified in the context of the great uncertainty about the debris geometry at the time of collapse. Flow was assumed completely blocked over the core regions of the accumulations. A range of likely flow conditions based on the hydraulic analysis with debris and high water limitations was developed: 50 m^3/s to 250 m^3/s at Skidmore and 40 m^3/s to 100 m^3/s at Falls City.

Streambed and bank geometry information was necessary to estimate the water surface elevation change and the velocity through the bridge opening. However, the debris accumulation and the collapsed structures prohibited the collection of geometric data in the bridge cross-section. In addition, streambed erosion and bank failures caused by highly contracted flow velocities, estimated to be between 3 m/s to 4 m/s, altered the geometry of the bridge cross-sections before and after the collapses. At both sites the stream width was larger in the sections at the bridges than in sections upstream or downstream from the bridges. Cross-sections were selected upstream from the bridge at the Skidmore site and downstream of the bridge at the Falls City site to estimate geometry of the opening just before failure of the bridge.

Streambed erosion and bank failures downstream of the Skidmore bridge considerably changed the cross-sections downstream from the bridge. Vegetation growing on the banks upstream of the bridge indicated that the cross-section there was not changed substantially from the conditions before the collapse of the bridge; therefore, the upstream cross-section was used to represent the bridge section.

A sharp bend upstream of the bridge at the Falls City site made the post-flood cross-section upstream of the bridge inappropriate for representing the bridge section. Although streambed erosion, sediment deposition and bank failures changed the geometry of the channel downstream of the bridge, the downstream cross-section was judged to be the best available information to represent the geometry of the bridge opening.

The forces on the debris accumulations were estimated using the water surface profile estimates from the likely range of flow conditions and two blockage widths. Figures 3.11 and 3.12 show the debris accumulations as modeled in the hydraulic analysis with upstream (approach flow) water surface elevations and downstream water surface elevations for selected flow conditions. The debris accumulations were divided into vertical segments as shown in Table B.1 to determine the hydrodynamic force distribution. The horizontal component of hydrodynamic force on each debris segment caused by the variation in hydrostatic pressure between the bridge approach section and the downstream sections was computed over two areas: 1) the projected area above the downstream water surface of the wetted debris parallel to the upstream face of the piers over which the debris spanned, and 2) the projected area below the downstream water surface of the wetted debris parallel to the upstream face of the piers over which the debris spanned. The hydrostatic component of force on the upstream projected area above the downstream water surface was computed as

$$F_{h1} = w\ h_c\ A_{h1} \tag{3.1}$$

where

F_{h1} = total horizontal hydrostatic force (N) on area A_{h1}

A_{h1} =vertically projected area of the submerged portion of the debris segment above the downstream water surface elevation and parallel to the upstream face of the piers (m^2)

w = specific weight of water (9810 N/m^3)

h_c = distance from top (upstream water surface) to centroid of area A_{h1} (m)

The net hydrostatic component of pressure on a plane area of a segment below the downstream water surface was assumed to be distributed uniformly on the upstream face of the debris and was computed as

$$F_{h2} = w\ \Delta WSE\ A_{h2} \tag{3.2}$$

where

F_{h2} = total horizontal hydrostatic force (N) on area A_{h2}

A_{h2} = vertically projected area of the submerged portion of the debris segment below the downstream water surface elevation and parallel to the upstream face of the piers (m^2)

ΔWSE = water surface elevation difference between upstream side of debris and downstream side of bridge (m)

The drag force on each debris segment was estimated as

$$F_D = C_D\ w\ A_D\ \frac{(V_c)^2}{2\ g} \tag{3.3}$$

where

F_D = horizontal water pressure force on the debris segment due to stream flow (N)

C_D = from Figure B.1 Appendix B.

g = gravitational acceleration constant, (9.81 m/s^2)

A_D = projected area of debris segment below the upstream water surface elevation and normal to flow direction (m^2)

V_c = the average velocity in the contracted section of the bridge opening (m/s)

The actual force distribution to each pier was dependent on many factors including the force transferred to the streambed and the configuration of the debris matrix.

Figure 3.13 shows the range of possible flow conditions, total forces and hydrostatic component of forces on each debris accumulation at both bridge sites. The upper bound lines show the total force. The lower bound lines were developed assuming only a hydrostatic pressure variation. The portion of the computed force attributed to water surface gradients (hydrostatic pressure variation) ranged from 49 to 91 percent at the Skidmore site and from 38 to 39 percent at the Falls City site. The blockage of waterway opening through the bridges ranged from 55 to 82 percent at the Skidmore site and from 48 to 66 percent at the Falls City site.

The analysis of failure conditions of these collapsed structures was hampered by the following uncertainties:

1. The bridges collapsed at least one month prior to the initiation of the site investigations. High water marks were difficult to obtain because of subsequent rainfall events.
2. Debris may have accumulated on the structures following their collapse.
3. Scour and sedimentation changed the geometry of the channels and banks during and after the failures.
4. Stream gage information was unavailable at these sites.

Scour Around Abutments and Approach Embankments

Downstream Embankment Slope Failure. Embankment slopes within bridge openings located on wide floodplains sometimes failed into scour holes which formed downstream of the bridge openings. Embankment relief bridges with spill-through abutments having side slopes at

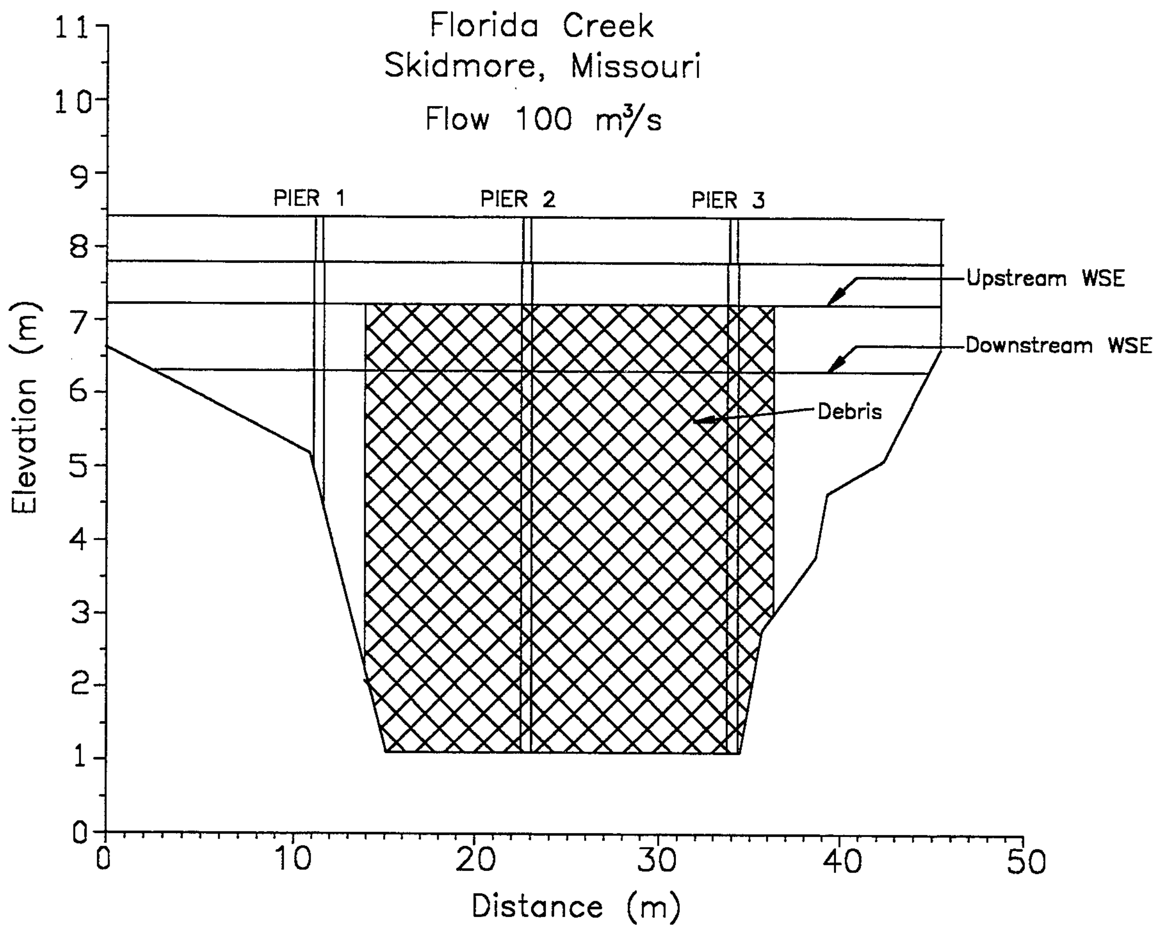


Figure 3.11. Computed water surface elevations with debris accumulation, Missouri Highway 113 bridge over Florida Creek, near Skidmore, Missouri.

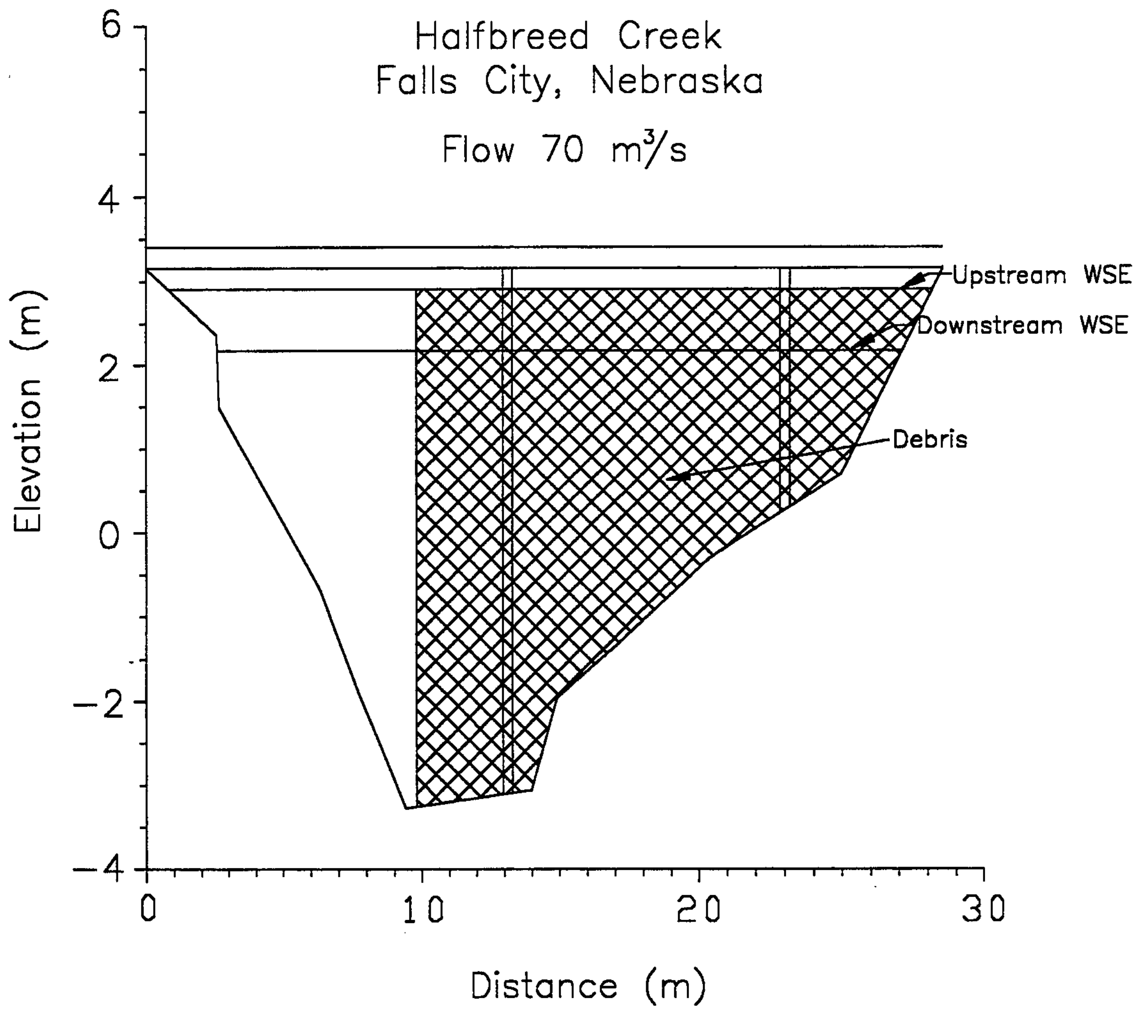


Figure 3.12. Computed water surface elevations with debris accumulation, county bridge over Halfbreed Creek, near Falls City, Richardson County, Nebraska.

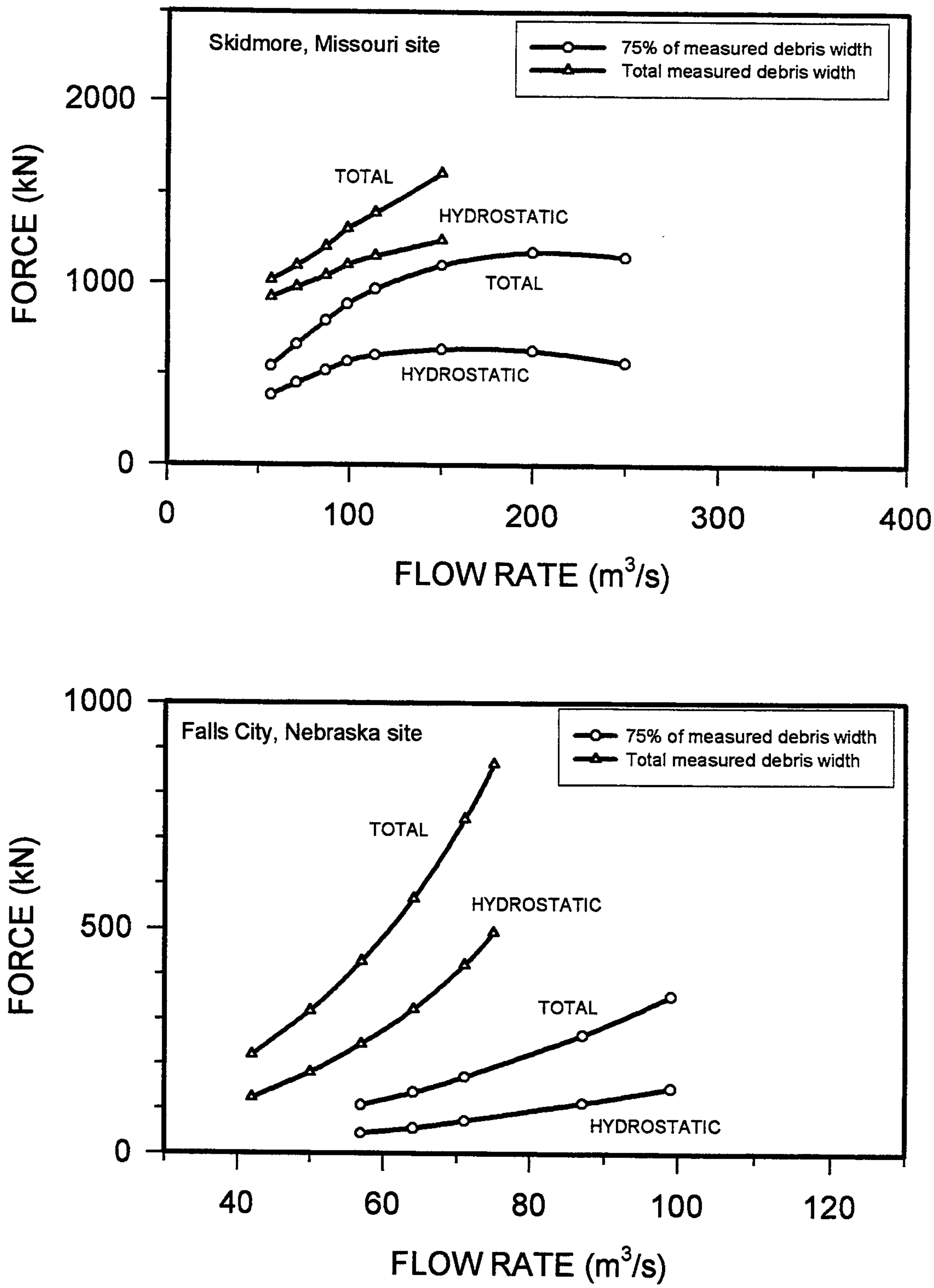


Figure 3.13. Total and hydrostatic debris force variation with flowrate for Skidmore, Missouri and Falls City, Nebraska sites.

approximately two horizontal to one vertical experienced failure of the downstream portions of the spill slopes and slope protection on those slopes, as shown in Figures 3.14a, 3.14b, 3.14c, and 3.14d. The bridge for U.S. Highway 54 over the KD Trail functioned as a relief bridge for the U.S. Highway 54 embankment that traverses 1.4 km of the Missouri River floodplain. The non-uniform contraction through the bridge opening caused erosion of the ground surface around the KD Trail on the downstream sides of the spill-through slopes. The embankment collapsed into the scour hole by slope failures. The approach flow conditions may have contributed to the lack of scour on the upstream side of the bridge opening; the approach flow velocities were likely to be very low compared to the velocity through the bridge opening. This failure is evidence that the depth and entire pattern of scour is changed by the shape of the embankment and the approach flow conditions. Bridges located on wide floodplains in which the upstream and downstream reaches are essentially shallow lakes may exhibit scour features downstream from the bridges, as shown in Figures 3.14b and 3.14d. At the site shown in Figures 3.14b and 3.14c, the pavement on the side slopes of the spill-through abutment and the roadway pavement through the bridge opening also affected the scour pattern.

Deep scour holes formed upstream of bridge abutment embankments at some sites and downstream of bridge openings at other sites. The reason for the variation in the location of maximum scour may be linked to the intensity of the flow approaching embankments and the general flow pattern caused by bridge embankments that encroach on floodplains. In channels with significant approach flow velocity, the flow stagnates in the region near the embankments, causing an *adverse water surface slope* (water surface elevation increases in the direction of flow). The adverse water surface slope and the curvature of flow into the contraction, in combination with the *non-uniform velocity distribution* across the floodplain, causes a flow separation and a region of secondary flow upstream of the embankments. The adverse water surface slope can be attributed to the pressure field induced by the embankment and the flow velocity intensity and distribution approaching the abutment. The non-uniform velocity distribution of the flow approaching the embankment can be attributed to the interaction of the floodplain and the main channel, local variations in roughness and topography, and the presence of valley walls. The flow separation region upstream from the embankment has been called the "dead water" region *(7)*. The flow reattaches to the embankment and the location of the reattachment point influences flow curvature with considerable implications for the pattern of flow, and, consequently, for the scour around abutments.

In the cases of relief bridges located on floodplains, and other bridges not intended to function as relief bridges but that allow flow through long embankments, the approaching flow velocity may be negligible. As a result, a substantial adverse water surface slope may not form at the abutment. The upstream vortical motion along the embankments may be much weaker and have opposite rotational direction in the cases without substantial adverse water surface slope than where substantial upstream momentum is present. These factors have substantial implications on large-scale vortical motion, flow separation at the abutment and the spatial distribution and depth of scour. The flow pattern upstream of the bridge opening is driven primarily by water surface elevation difference through the bridge opening rather than by the momentum of the flow upstream of the

Figure 3.14a. Aerial view, looking northwest, of high-velocity flow at U.S. Highway 54 and KD Trail before southwest embankment erosion, at Jefferson City, Missouri (courtesy of Missouri Highway and Transportation Department).

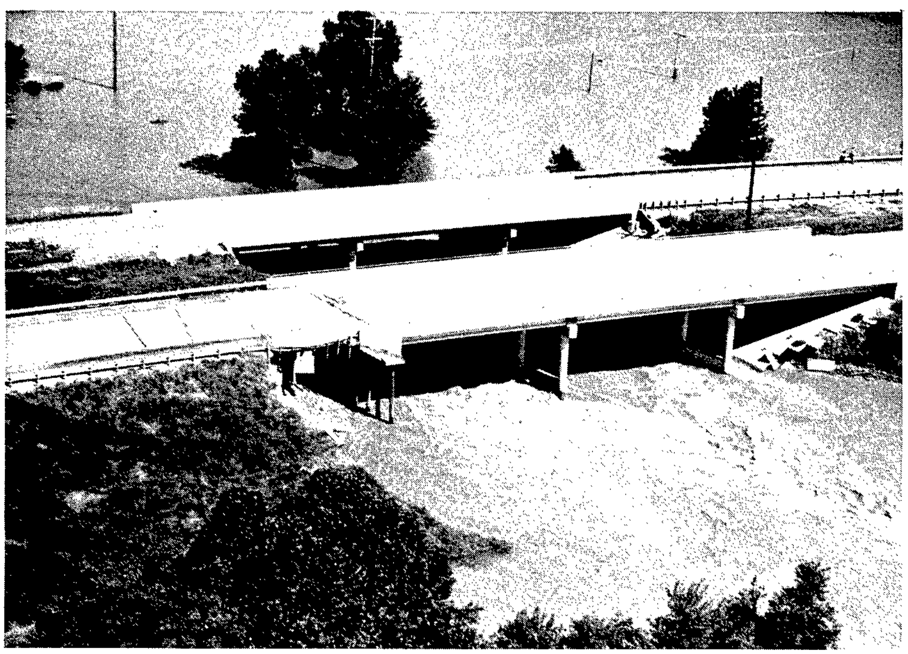


Figure 3.14b. Aerial view, looking north, of high-velocity flow at U.S. Highway 54 and KD Trail after southwest embankment erosion, at Jefferson City, Missouri (courtesy of Missouri Highway and Transportation Department).

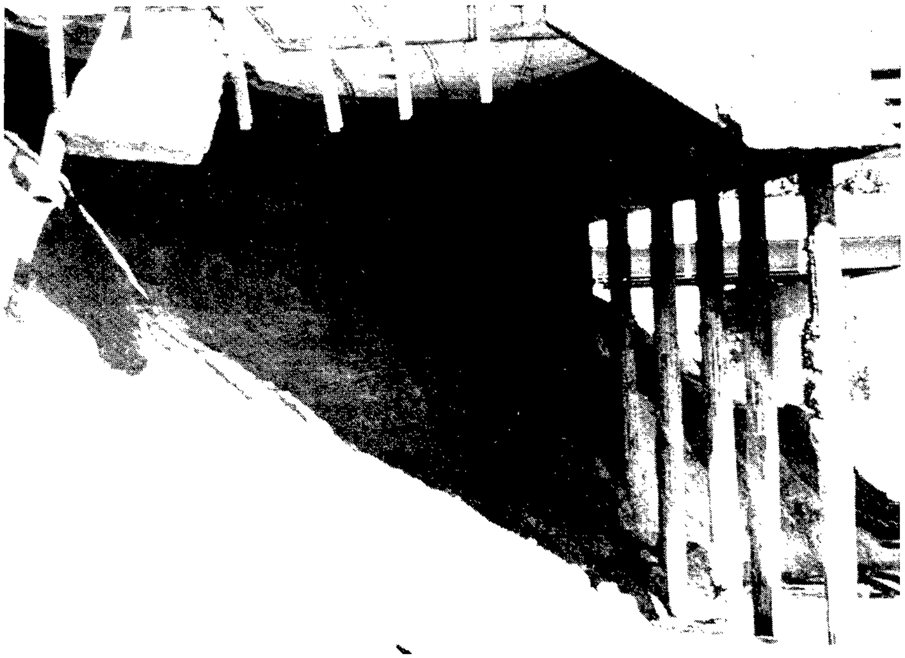


Figure 3.14c. U.S. Highway 54 southwest abutment undermining at intersection with KD Trail, at Jefferson City, Missouri (courtesy of Missouri Highway and Transportation Department).

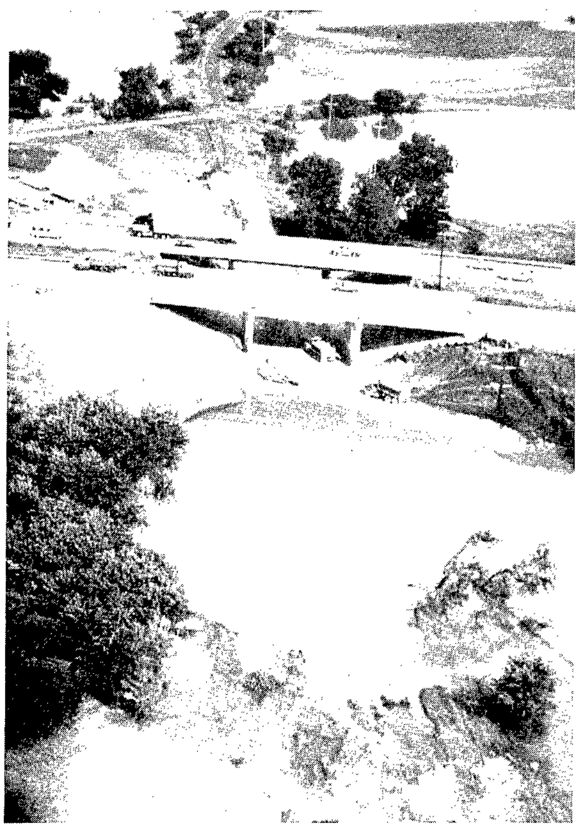


Figure 3.14d. Aerial view, looking northwest, of scour hole and southwest embankment restoration at U.S. Highway 54 and KD Trail, at Jefferson City, Missouri (courtesy of Missouri Highway and Transportation Department).

opening. The velocity distribution upstream of a relief bridge is likely to be very different from a velocity distribution that is strongly influenced by upstream momentum of floodplain flow. A separation zone may not form upstream without a sufficient strong upstream adverse water surface slope. A substantial flow component along the embankment face may form due to the lack of a large upstream separation zone. The lack of a substantial adverse water surface elevation slope may also affect the formation of the primary vortex system (similar to the horseshoe vortex system at piers) at the upstream sides of the abutment embankments. Consequently, the effects of contraction dominate the flow, and scour holes form downstream of the embankment opening. The downstream ends of the embankment collapse when the supporting subsoil moves into the scour holes by mass failure. The shape of the spill-through slopes also may prevent the formation of a sufficient adverse pressure gradient to cause a strong upstream vortex formation, affecting the location of the region of highest boundary stress. Laboratory experiments on spill-through embankments show that the riprap initially fails downstream of the spill through embankments *(8)*.

Scour with Superstructure and Approach Embankment Submergence. Scour around bridge abutments and damage to bridge approach embankments occurred at sites where flow partially or completely submerged the bridge superstructure. Flow over the approach embankment occurred at water surface elevations lower than the elevations of bridge curb and railing systems. As a consequence, complex flow systems developed around the bridge superstructures and over the bridge approach embankments. In addition to the horizontal contraction caused by the highway embankments, the superstructure caused vertical contraction of flow. Such complex flow conditions can cause failure of a bridge abutment and damage to the approach embankment through the possible combination of several scour processes: contraction scour caused by bridge railing systems, lateral bank migration, wingwall turbulence, and scour around the abutment similar to that which occurs under conditions in which the superstructure is not submerged. An example of an embankment breach and erosion of the foundation soil around an abutment is shown in Figure 3.15.

Railing-Induced Embankment Breach and Abutment Failure. Flow occurred around the bridge railing system and over the approach roadway at sites where the upstream water surface elevation exceeded the roadway elevation. Flow velocity typically was high over the roadway, and flow was contracted around the edges of the bridge railing system. Flow cannot occur over a bridge usually until the upstream water surface elevation exceeds the elevation of the concrete portion of the curb and railing system on the bridge. Because of the railing system, especially concrete parapet railings, flow velocity around the abutment approaches is extremely high before the bridge is overtopped. Although only a portion of the projected area of the railing system is blocked, at some metal bridge railing systems debris may become lodged within the railing and block flow through the railing system. High velocity flow erodes the roadway embankment as a result of such blockage. Flow from the main channel may shift toward the breach once the upper portion of the roadway embankment is breached. The remaining abutment structure induces a complex flow pattern composed of large-scale vortex systems similar to the horseshoe vortex system and wake vortex

systems at piers. If flow is sustained for sufficient time, the abutment and wingwalls may be undermined causing settlement and/or failure of the abutment.

Abutment and Wingwall Scour. Scour holes on the upstream side of an abutment embankment can cause a slope failure in the embankment material near the edge of the abutment wingwall *(7, 9)*. After this failure occurs, the embankment material slumps into the scour hole to partially fill the hole. If the embankment material includes alluvium similar in size to the floodplain material, the highly disturbed material is likely to erode rapidly.

The change in geometry in the vicinity of the wingwall caused by local scour and slumping increases the local turbulence and creates large-scale vortex systems that cause direct erosion of the embankment slope. Small-scale laboratory experiments have shown that the erosion of the embankment behind the abutment becomes increasingly severe as erosion changes the geometry of the bank and the embankment slumps into the scour hole *(7, 9)*. The direct erosion eventually may cause a breach in the approach embankment. This type of failure has been termed "outflanking" *(7, 9)*. The scour at the upstream end of vertical walled abutments may cause portions of the embankment to fail by slope instability even though the abutment pile caps or footings were placed below the maximum scour depth. The slope failures can induce vortex systems similar to those found in experiments in which abutment scour failure mechanisms were investigated in a laboratory model *(7, 9)*. In those experiments, secondary currents along the embankment and wingwall caused additional erosion and backfill slope failures until the abutment backfill was breached.

Lateral Migration and Abutment Scour. Lateral migration of streambanks during the 1993 floods caused changes in flow direction along those banks and around abutments located on or near the banks. Bank failures along large portions of streambanks upstream of a bridge can be caused by lateral bank migration associated with meander migration or can be caused by stream widening. The bank migration can be associated with a shift in the flow distribution of the channel toward the eroding bank, as is the case in meander migrations. Lateral bank migration associated with channel widening may cause flow redistribution because of increased flow conveyance. Widespread bank erosion upstream of a bridge abutment located on or near the bank can increase the portion of the abutment structure exposed to the flow and can cause a redistribution of flow such that velocity increases locally upstream of the abutment. Increased exposure of the abutment causes an increasingly larger relative obstruction of the flow as lateral erosion continues. At some point, the entire upstream foundation face may be exposed. The abutment backfill may become unstable as a result of the scour on the upstream side of the abutment and fail into the scour hole. If the abutment is supported on piles, backfill material may move between the piles into the scour hole.

The collapse of the Nebraska Highway 8 bridge over the South Fork of the Big Nemaha River is illustrative of several types of instability problems that occurred widely throughout the affected watersheds. The collapse of the west span of the bridge, shown in Figure 3.16, was caused by lateral bank migration toward the west abutment. The cause of this lateral migration, however, is not immediately obvious from the photograph. Lateral migration and channel widening was caused by

Figure 3.15. Erosion of bridge approach embankment, frequently called "washout"; Crawford County Road M14, Iowa (courtesy of Iowa Department of Transportation).

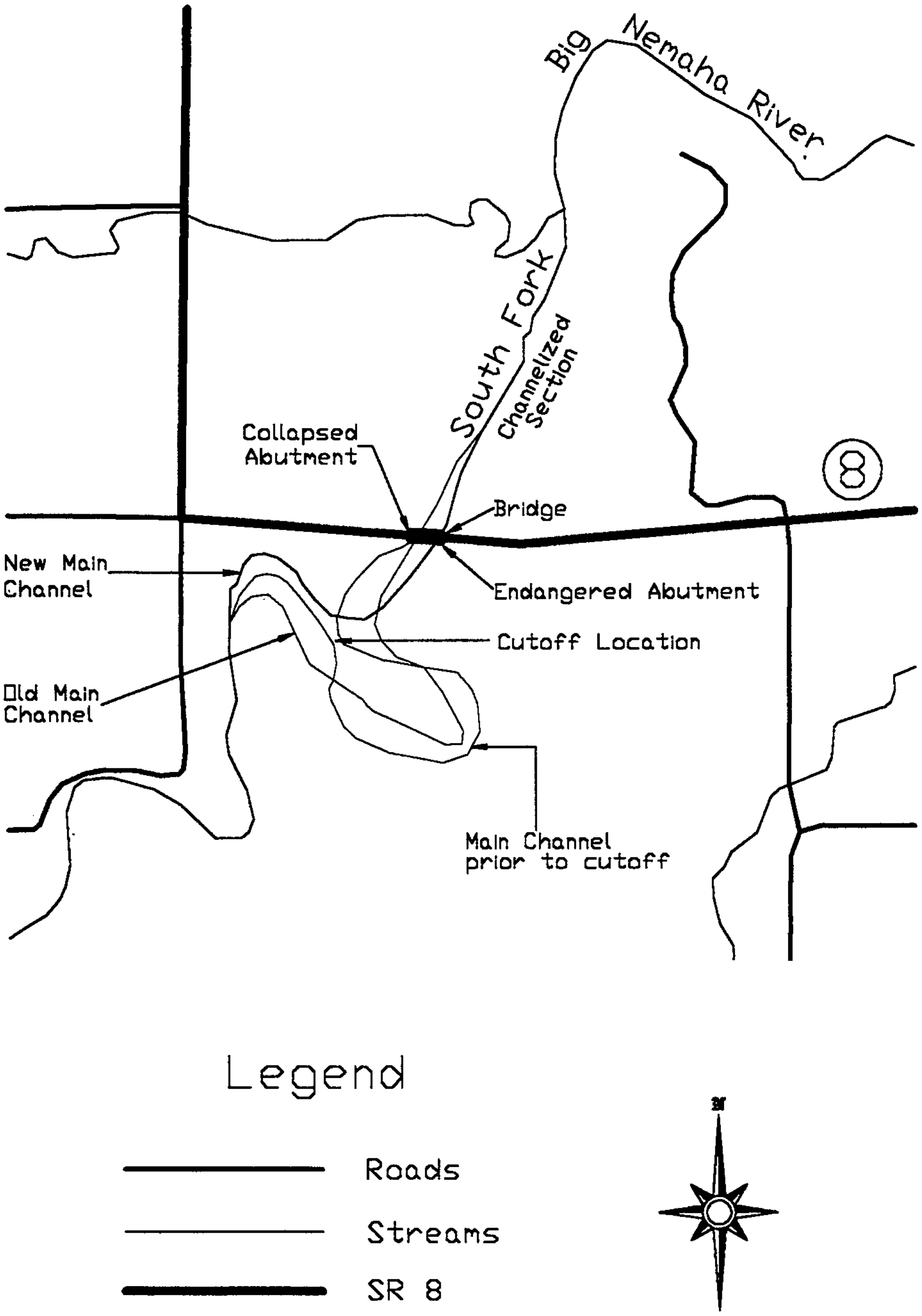
Figure 3.16. Collapsed span of Nebraska Highway 8 bridge over the south fork of the Big Nemaha River (flow was from left to right in figure).

stream instability induced by channelization of reaches upstream and downstream of the Highway 8 bridge *(10)*. Figure 3.17 is a plan view of the section of the river showing the change in planform of the main channel.

Figure 3.18, an aerial view of the site, shows that the thalweg of the stream was located against the east bank, indicating that the most active scour would have been likely to occur there and that deposition had occurred upstream of the bridge on the west bank line. Both of these photographs provide no reason that lateral bank migration would be expected on the west bank. However, observation of the entire reach of river and evaluation of data that included geometric information about the current and past river channel indicated that a meander cutoff occurred upstream (southwest) from the bridge during the 1993 flooding, as shown in Figure 3.19. The position of the bank line before the meander cutoff occurred suggested that the thalweg was against the west bank; that position would be consistent with the bank erosion and lateral bank migration that caused the collapse of the west abutment of the bridge. After the stream removed the area between the ends of the meander loop and the cutoff occurred, the channel shifted to the opposite (east) bank where the stream flowed through the bridge opening. The photograph in Figure 3.18 illustrates this shift.

The foundation piles of the collapsed west bridge abutment shown in Figure 3.16 had been exposed by erosion during the first part of the flood event in 1993 and were covered at the time the site was photographed by a recent alluvial deposit that had formed after the meander cutoff. The Damage Assessment Form completed by Nebraska Department of Transportation personnel states that the east abutment then was in danger of damage because of lateral bank migration. The bank line changes at the site, shown in Figure 3.19, occurred over a relatively short time period. Bank failures along large portions of the South Fork of the Big Nemaha River indicated that the river stream system was unstable. The South Fork of the Big Nemaha River was undergoing channel widening caused by channelization for agricultural purposes. Rapid meander migration and meander cutoffs are typical of streams undergoing channel widening.

Abutment Scour on Wide Floodplains. The deepest and most extensive scour holes measured were located near the ends of long embankment fills on wide relatively flat floodplains. Figures 3.20 and 3.21 show one of the largest scour holes measured in this study. Bathometry of the scour hole was obtained using a chart recording fathometer and an electronic distance measuring theodolite. The depression was located in the floodplain alluvium of the Missouri River at the west abutment of the Interstate 70 bridge near Rocheport, Missouri. The width of the floodway is 2.9 km at this location. The west embankment traverses 2.1 km of floodplain. The bridge crosses 0.5 km of floodplain and 0.3 km of the main channel of the Missouri River. Agricultural levees extend along the west bank line of the Missouri River. The elevation of the floodplain is approximately 176.8 m. The upstream high water marks indicated an elevation of approximately 181.1 m, or that the depth of flow in the floodplain was approximately 4.3 m. The high water mark downstream of the bridge was at approximately 180.1 m indicating that the drop in water surface elevation through the bridge opening was approximately 1.0 m. Agricultural levees reaching to approximately



Note: Drawing not to scale.

Figure 3.17. Changes in main channel, South Fork of the Big Nemaha River south of Nebraska Highway 8, Pawnee County, Nebraska.

Figure 3.18. Downstream view of Nebraska Highway 8 bridge failure caused by lateral bank migration of left bank. Sediment deposition after the collapse has covered portions of the collapsed structure and the thalweg has shifted to the opposite bank.

Figure 3.19. Meander loop cutoff that occurred subsequent to collapse of Nebraska Highway 8 bridge (flow through bridge is from left to right in figure).

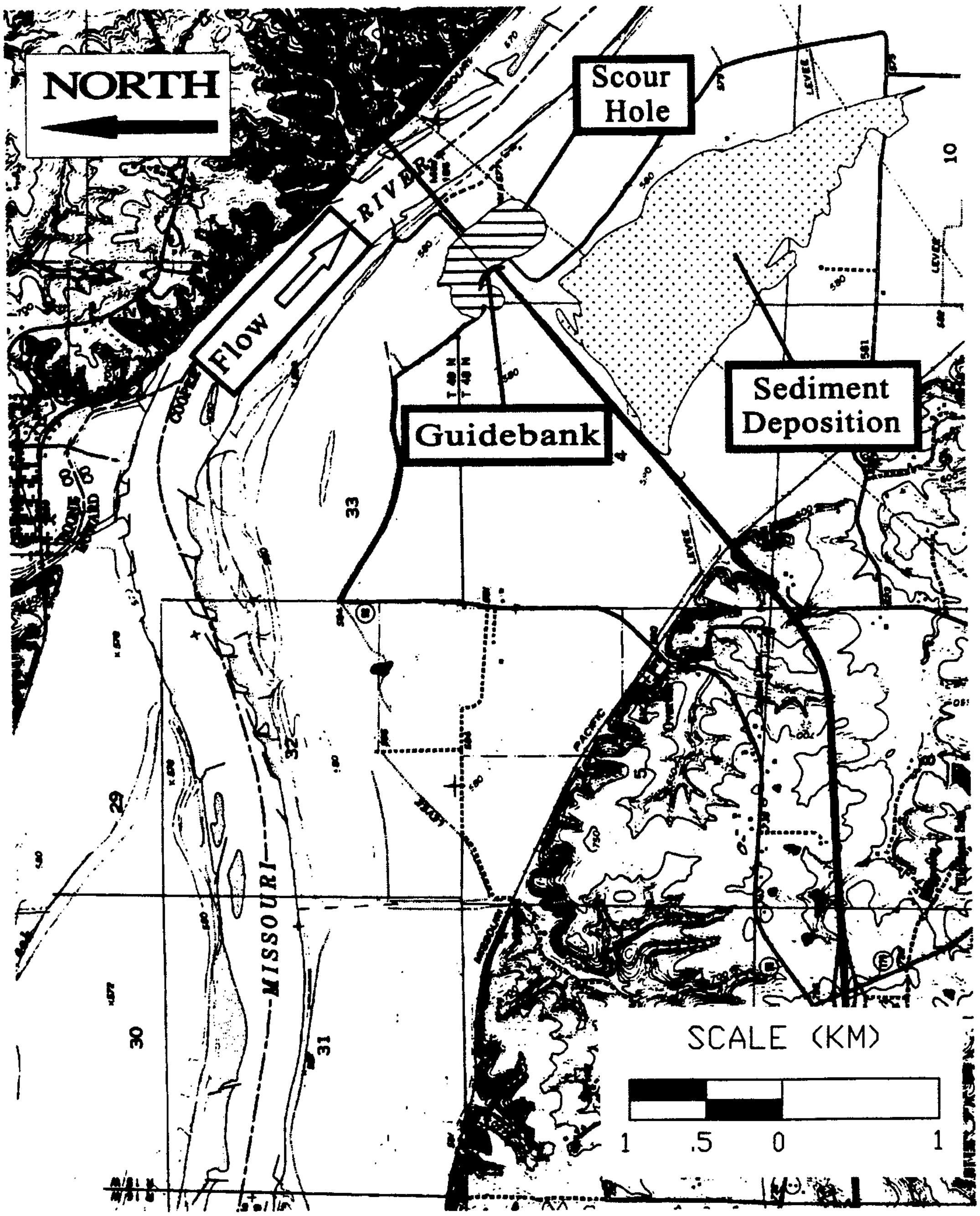


Figure 3.20. Scour and sediment deposition downstream of Interstate 70, near Rocheport, Missouri.

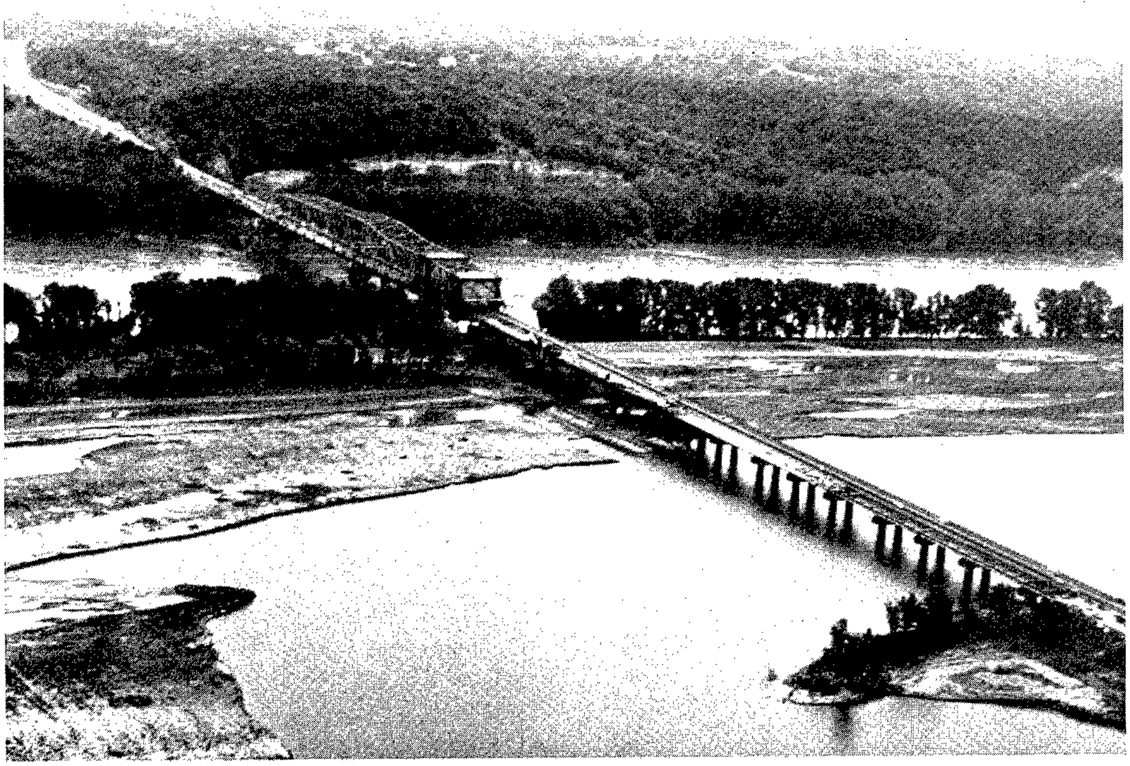


Figure 3.21. Downstream view, looking southeast, of the Missouri River floodplain scour hole at Interstate 70 crossing, near Rocheport, Missouri.

elevation 178.3 m along the river and on the floodplain were breached by flow that overtopped the levees by approximately 2.7 m. A guidebank extended upstream from the west abutment. The resulting scour hole is shown in Figure 3.22. The maximum depth within the scour hole measured in December 1993 (two months after the recession of the flood) was approximately 17 m below the surrounding floodplain elevation of 180 m. The maximum extent of the scour hole perpendicular to the bridge was approximately 430 m. Nine piers of the bridge approach were located within the scour hole. An agricultural access roadway followed the guide bank and the terminus of the levee. A section of the guidebank and a large portion of the levee were breached and eroded as shown in Figure 3.23. A second levee that extended along the main bank of the river also was breached in several locations in the vicinity of the I-70 bridge. Levee breaches complicated the interaction between the flow in the main channel and the flow on the floodplain upstream of the bridge. Although the floodplain upstream of the bridge was relatively flat, the roadways and agricultural levees constrained the flow. In addition, dikes within the main channel made the flow situation extremely complex. Examination of the terrain at the bridge site, shown in Figure 3.23, indicated a natural levee along the edge of the floodplain.

The maximum average flow depth in the floodplain was approximately 4.3 m and the maximum depth of scour measured was 17 m giving a calculated ratio of scour depth, y_s, to flow depth, y, of 3.9. The bed material on the floodplain was silty sand that had been submerged for several months. The lack of sedimentation or erosion on the section of the floodplain upstream of the scour hole provided evidence that significant bedload movement did not occur upstream of the scour holes; therefore, the erosion around the abutment was considered to be clear-water scour. The following equation has been recommended *(11)* for computing scour depth for scour at embankments with lengths across the floodplain greater than 25 times the flow depth:

$$\frac{y_s}{y} = 4.0 \left(\frac{V}{\sqrt{g\ y}} \right)^{0.33} \tag{3.4}$$

where V = the average flow velocity on the floodplain and g = acceleration of gravity. Assuming that the floodplain Froude number was between 0.2 and 0.5, Equation 3.4 predicts a scour depth ratio, y_s/y, between 1.9 and 3.2. The actual scour depth was significantly larger than would be predicted by Equation 3.4.

Several explanations may be offered for the discrepancy between actual and predicted scour. First, levees in the floodplain tended to retard flow interchange between the main channel and the floodplain. Levee breaches on the bank of the main channel upstream of the bridge and upstream of the west bank dike field indicated that flow occurred from the main channel onto the floodplain. The main channel bank levees far upstream of the bridge tended to impeded flow from the main channel to the floodplain and reduced floodplain flow compared to the floodplain flow without levees. The levee that extended along the main channel bank impeded flow from the floodplain to

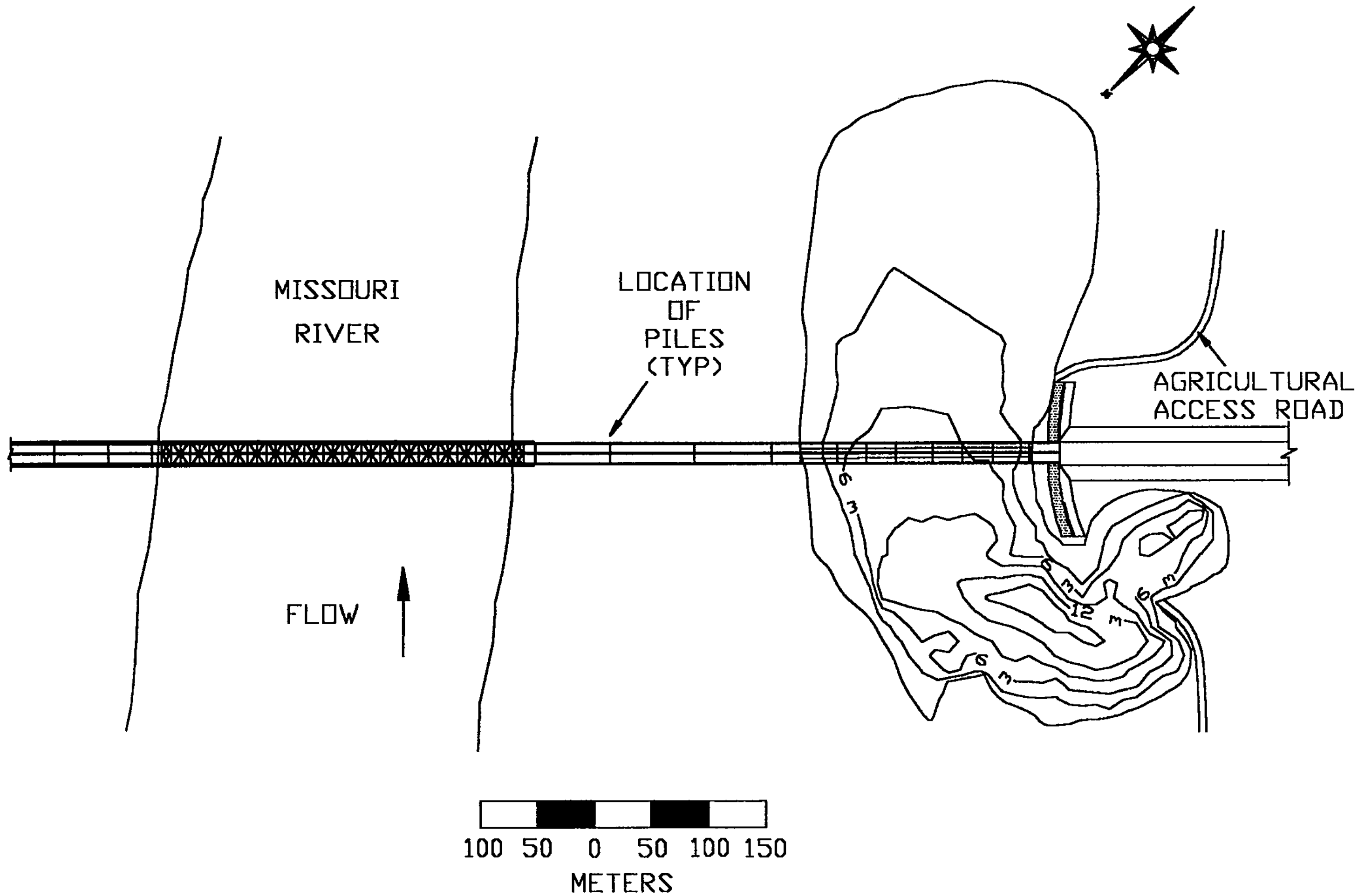


Figure 3.22. Scour hole contours at west abutment of Interstate 70 bridge, near Rocheport, Missouri.

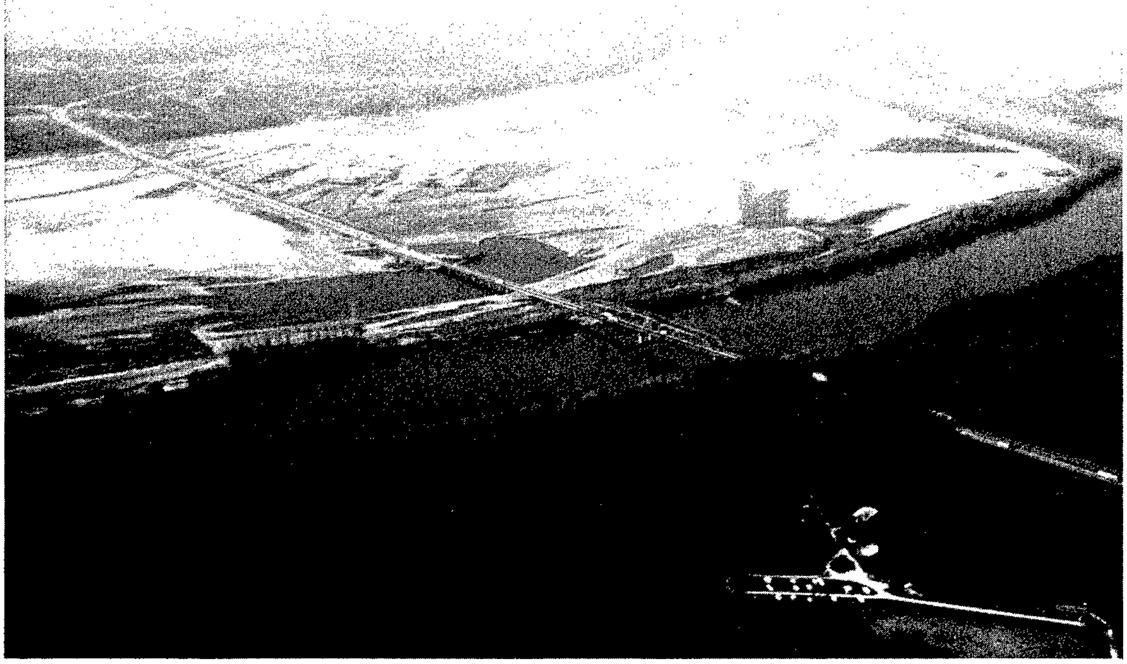


Figure 3.23. View, looking northwest, of the Missouri River floodplain at Interstate 70 crossing, near Rocheport, Missouri.

the main channel so that the contraction was more severe through the bridge opening than for the contraction without the levees.

Close inspection of the actual geometry of the scour hole revealed three interesting aspects of the scour distribution. First, the scour hole side slopes were flatter than those obtained in laboratory model studies. Second, the ratio of flow depth to floodplain width was approximately 1:750; i.e., flow approaching the embankment was very wide and "shallow," unlike laboratory experiments that have a much higher flow depth to width ratio. Third, the deepest part of the scour hole was located upstream of the guide bank (Figure 3.22). The location of the deepest part of the scour hole may have been influenced by the breach in the roadway. The general shape of the perimeter of the scour hole was similar to those modeled by Karaki *(12)* except for the differences noted.

As shown in Figure 3.24, the maximum depth of scour in the bridge section (9 m) was substantially less than the depth in the deepest part of the scour hole (17 m). Figure 3.24 shows that nine piers were located within the scour hole created at the embankment. Local scour holes were not found at each pier at the upstream or downstream edges of the pile caps. The reason for the absence of local scour holes is unclear. Possibly, sediment transported from the larger surrounding scour hole filled the local scour holes at the piers during flood recession. If substantial sediment transport was occurring within the scour hole during the flood, the scour at the piers may have been live-bed or sediment-transport scour, at least for the time period in which the large embankment scour hole was forming. Another possible explanation is that the localized scour caused by the piles was substantially less than would have been caused by piers and pile caps once the general bed elevations was degraded bellow the pile caps.

The cross-section data from the fathometer measurements were used to generate side slope angles for the scour hole at the Interstate 70 bridge. Histograms are shown in Figure 3.25 for the scour hole slope angles, for three different ranges of elevation. The first histogram (a) represents the distribution of the angles of the slopes between elevation 174 m and elevation 177 m in unsaturated sandy silts and silty fine sands. The maximum observed slope in the unsaturated silts was nearly vertical. The side slopes in the same type of soils below elevation 174 m are shown in the second histogram (b). The maximum slope angle in the saturated interbedded silts and silty sands was typical of the angles of shearing resistance for saturated medium sands and non-plastic silts. The slope angles in the fine sand layer below elevation 158 m are shown in the third histogram (c). The maximum slope angle in the saturated fine sands was typical of the angle of shearing resistance for loose sands. The maximum observed slope angle in the saturated soils was approximately 22 degrees, but much of the slope area below the water surface in the hole was covered with failed and dislodged soils resting on very shallow slopes typical of soil-flow failures in fine sands. The side slope angles in the deepest part of the scour hole near the upstream end of the guide bank were approximately 22 degrees, and those slopes extended to the base of the scour hole, indicating that the scour hole had not filled at its deepest point with slope failure material.

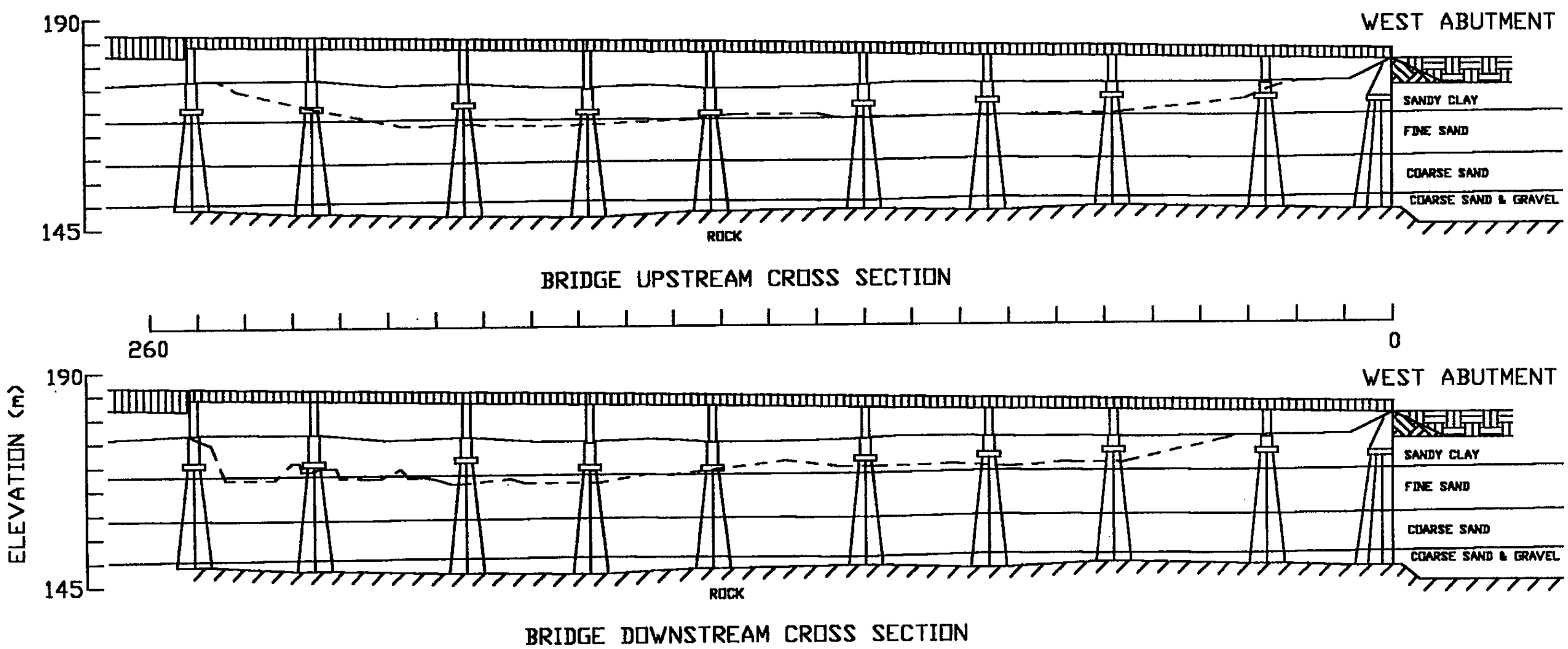
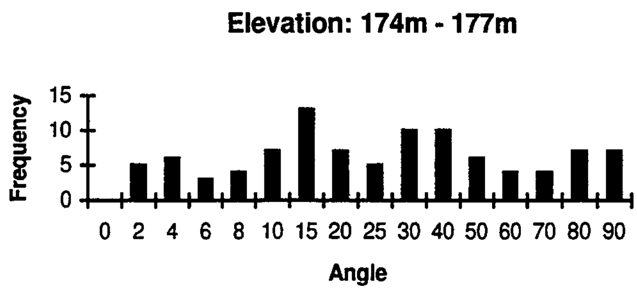
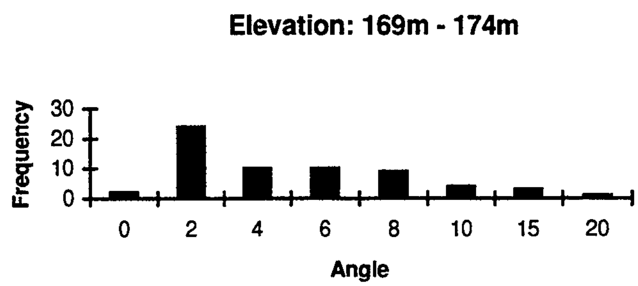


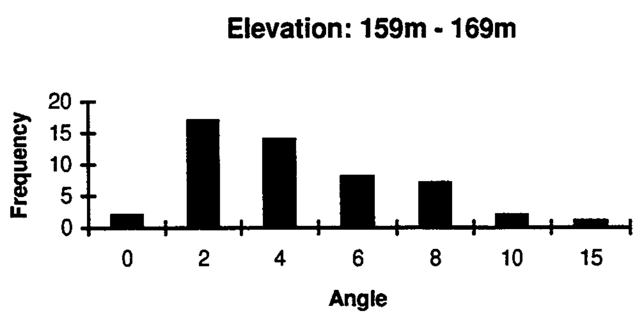
Figure 3.24. Scour hole at west abutment of Interstate 70 bridge over Missouri River floodplain, near Rocheport, Missouri (bridge design courtesy of Missouri Highway and Transportation Department).



(a)



(b)



(c)

Figure 3.25. Side slope angles in scour hole at Interstate 70, near Rocheport, Missouri.

The overall shape of the scour hole was much shallower and wider than shapes of holes observed in laboratory experiments. The large width to depth ratio of the scour hole could be explained by the highly two-dimensional nature of the flow as described in preceding paragraphs. In addition, a layer of relatively resistant bed material may have been present at deeper elevations. The soil boring information provided on the 1956 bridge plans shown in Figure 3.24 indicated that a transition from fine sand to coarse sand was found at approximately elevation 159 m. The deepest part of the scour hole, located upstream of the bridge as shown in Figure 3.22 extended to approximately elevation 158 m.

Scour at Levee and Embankment Connections. Levee breaches and flow around embankments caused scour of floodplain alluvium around embankments and caused the collapse of a railroad bridge in Glasgow, Missouri. Agricultural levees on wide floodplains were found connected to the ends of highway and railway embankments. Flow was forced to return to the main channel over the levees as flow approached the transportation system embankments for conditions in which water overtopped the levee system upstream of the embankments. Flow contraction caused by the embankments and large-scale turbulence caused by the wake flow of the embankments and by complex non-streamlined geometry of the connection of the levee to the embankment, produced conditions in which the levees were likely to breach. If the levee breached in the vicinity of the end of the embankment, large scour holes were formed by the combined flow through the levee breach and around the embankment.

The scour hole that formed at Glasgow, Missouri occurred at the connections of a levee to the upstream and downstream sides of parallel railroad and highway embankments. The railroad embankment was located upstream of the highway embankment. As can be seen from Figure 3.26, the 674 m-long railroad bridge spanned 250 m of floodplain and 420 m of main channel. The embankment blocked approximately 6.9 km of the floodway that is 7.7 km wide. A portion of the railway embankment and part of the highway embankment failed at the location shown in Figure 3.26. The agricultural levee located along the south side of the main channel had breached in several locations. High water marks upstream of the confluence of the Calton River and the Missouri River (192.2 m), and downstream of the Missouri Highway 240 embankment (190.6 m) indicated that the difference in water surface elevation from upstream of the embankment to downstream of the embankment was on the order of 1.6 m. Floodplain elevations in this region ranged from 186.0 m to 187.5 m. The top elevation of the levees that terminated at the railroad embankment and highway embankment was approximately 189 m. The levees were overtopped by 1.5 m to 3.0 m of water on the upstream side of the railroad bridge.

The scour pattern caused by the complex flow over the levees and around the railroad embankment can be inferred from Figures 3.27 and Figure 3.28. The maximum depth of the scour hole from the ambient floodplain level (186 m) was approximately 9 m. The location of the maximum scour depth coincided with the third pier from the west abutment of the railroad bridge. The third pier collapsed and caused with two spans of the railroad bridge. A large truss section was transported downstream until it lodged against the highway bridge piers. The combination of local

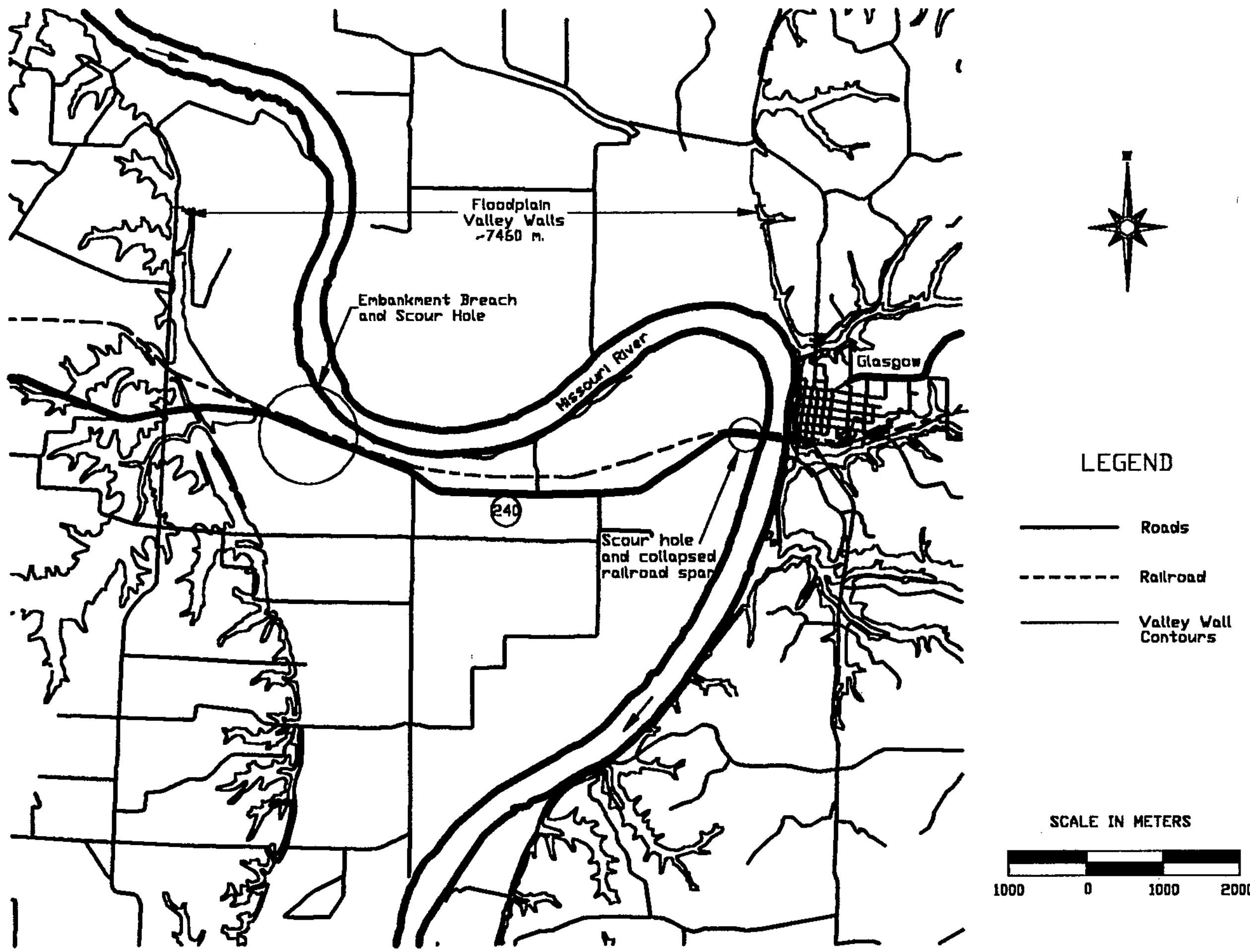


Figure 3.26. Locations of large scour holes on the Missouri River floodplain, at Missouri Highway 240, near Glasgow, Missouri.

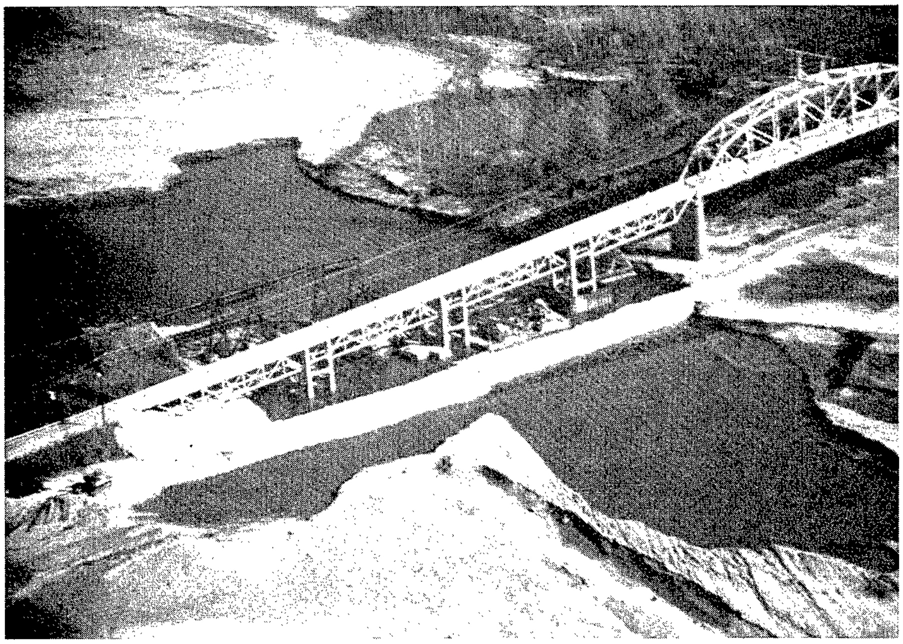


Figure 3.27. View, looking north, of scour holes and levee breach at west embankment abutment of railroad bridge and Missouri Highway 240 bridge, near Glasgow, Missouri. (Note: fill for repair work in place along downstream side of embankment).

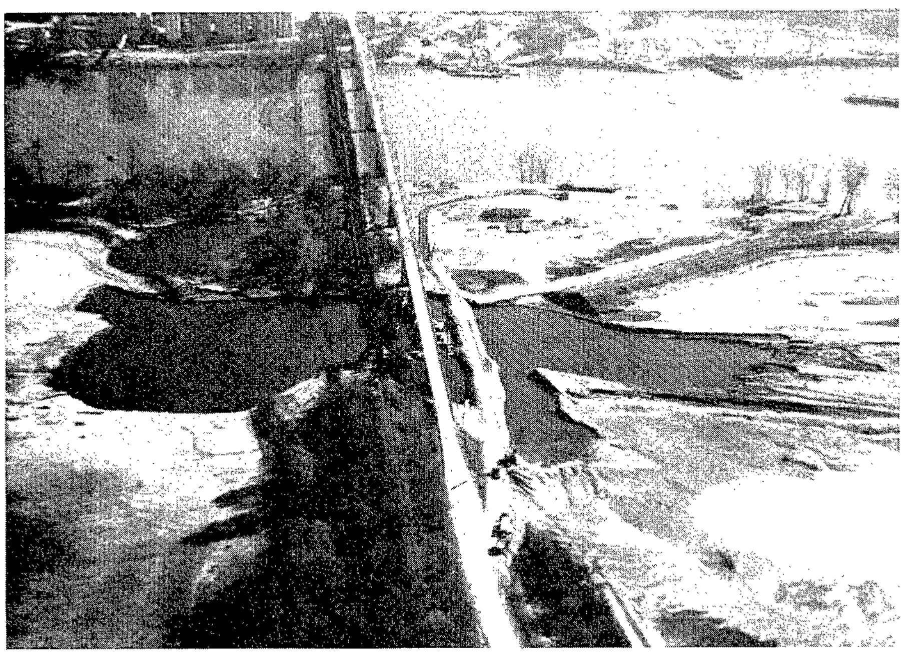


Figure 3.28. View, looking east, of scour hole and levee breach at Missouri Highway 240 bridge, near Glasgow, Missouri.

scour and the scour caused by complex flow at the levee breach and long embankment removed soil to a depth sufficient to undermine the railroad pier foundation.

Five trusses varying from 68 m to 105 m in length carry Missouri Highway 240 between Saline and Howard Counties, just downstream from the railroad bridge. Figure 3.27 shows the collapsed railroad span, the highway bridge, and the scour hole that developed at this location. Four 29.3 m-long approach spans carry the highway up to the truss structure. Figures 3.29 and 3.30 show the cross-section of the Missouri Highway 240 bridge, the railroad bridge and scour hole. The scour hole was located between the second and fourth piers from the west abutment of the railroad bridge, and around the second (E) and third (D) piers of the highway bridge. Figure 3.31 shows the collapsed approach span of the bridge. All of the highway bridge main trusses are supported on foundations carried down to bedrock. The approach span piers are supported on four columns each founded on friction piles. The bedrock, at elevations between 168 m at the west end of the trusses and 177 m at the east end, is covered by only 3 to 5 m of soil under the channel. Divers inspected the foundation under the west pier of the easternmost truss found no sediments over the rock but no undermining of the pier. However, severe undermining had occurred at the scour hole under the foundations of the west approach spans. The floodplain elevation under the approach spans was about 188 m before the flood. The bottoms of the 0.75 m-thick pile cap footings were located at elevation 181 m, and the timber piles had been driven 9 to 11 m below the bottoms of the caps. Divers who inspected the foundations of piers D and E found the deck of the fallen railroad bridge lodged against both north legs of pier D and the northeast leg of pier E. All of the piles under pier D were exposed for depths varying between 4.4 m and 5.6 m. Between 11 m and 12 m of floodplain soils had been scoured from around the foundations of pier D. Only about one-half of the pile embedment depth remained. The concrete underside of the northwest pile cap had spalled so that one pile was no longer bearing load. The underside of the northeast pile cap had spalled so badly that all but one entire pile and about 20 percent of another pile had lost contact with the pile cap. The floodplain at pier E had been scoured down to the bottoms of the pile caps, but only slight undermining of the cap footings was noted. Pier D oscillated transversely to the bridge axis during the flood. Sheet piles were driven around the perimeter of the pier, and the space inside the sheet piles was filled to restore support to the friction pile foundation.

The scour hole that undermined the bridges formed 180 m from the right descending bank of the Missouri River. A second scour hole had formed closer to the bank of the stream; the two holes very nearly merged on the upstream side of the collapsed span. Examination of the walls of the scour holes, after the floodwater receded, showed that the holes had formed in layered alluvial soils consisting primarily of sands and silts; typically, sandy silt layers 100 to 300 mm thick were separated by clean sand layers 20 to 50 mm thick. Thick recent deposits of such soils downstream of the scour hole showed that most of the scoured material was moved only a short distance before the flow velocity decreased sufficiently that the scoured material was deposited. The approach embankments for the bridges form a long barrier to flow over the floodplain to the west of the main bridge site; in contrast, the floodplain to the east of the Missouri River is relatively narrow at Glasgow. The constriction of flow by the approach embankments caused the scour that undermined the bridge piers.

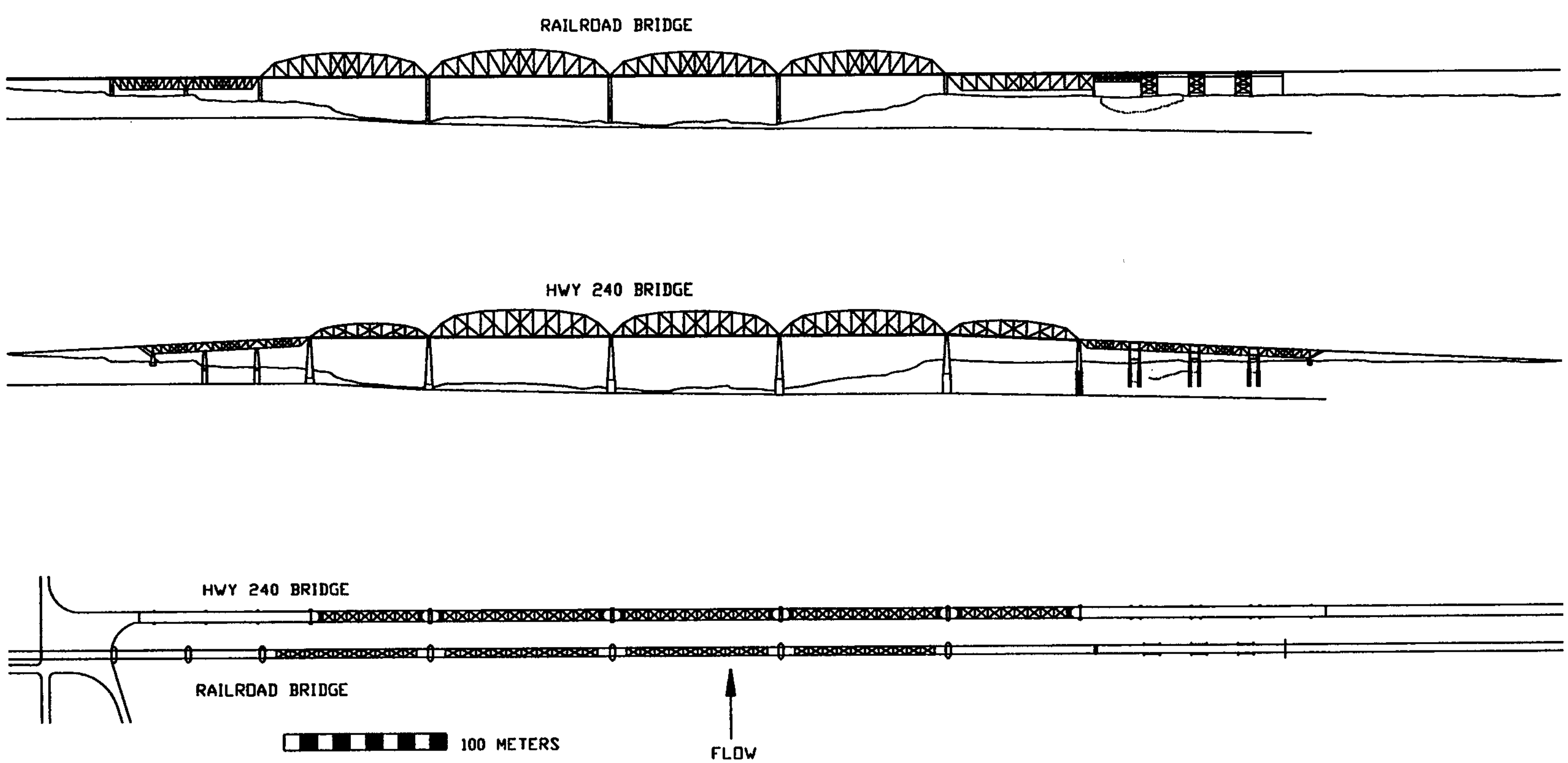


Figure 3.29. Downstream view of Missouri Highway 240 highway bridge and railroad bridge, near Glasgow, Missouri (bridge design courtesy of Missouri Highway and Transportation Department).

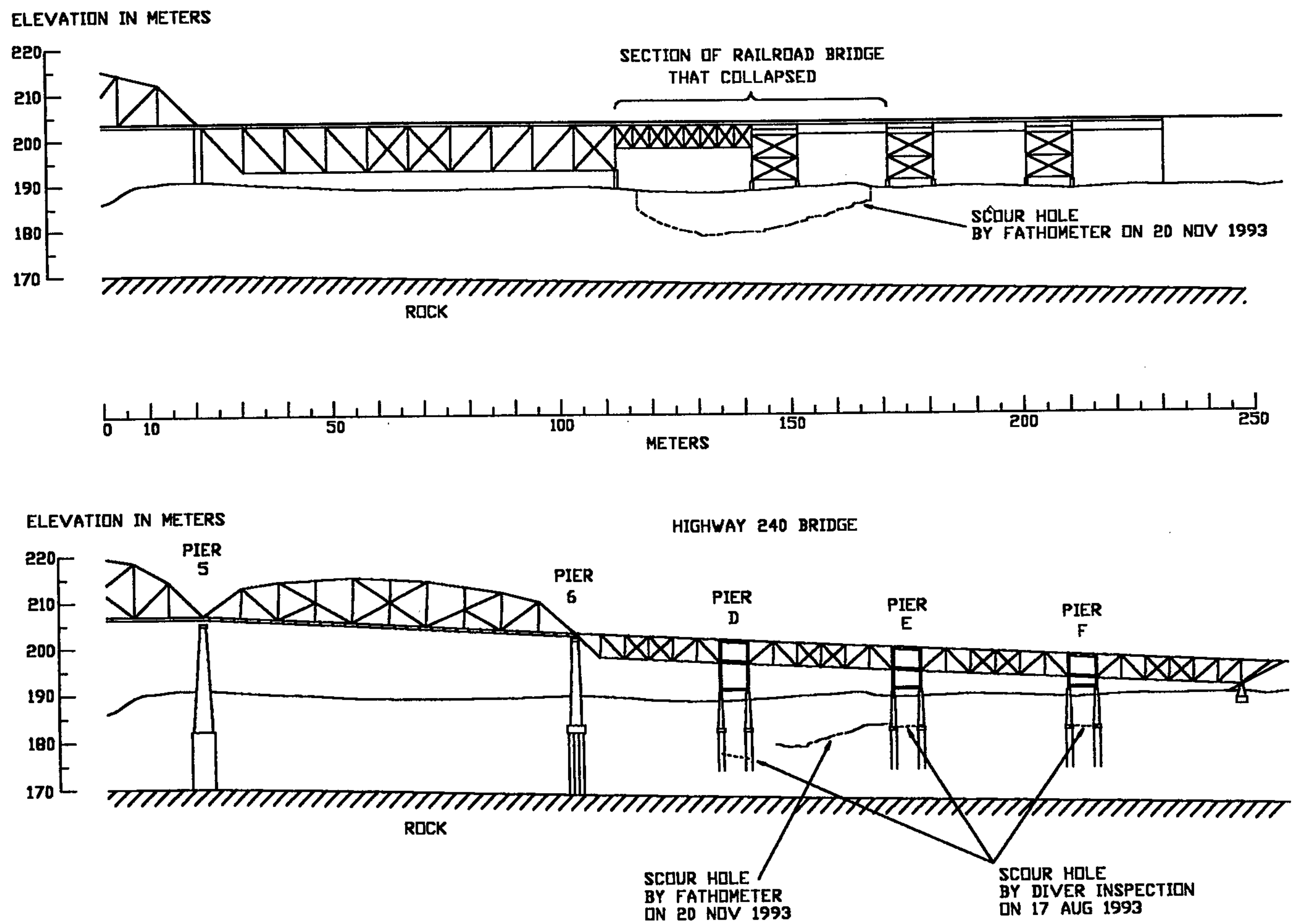


Figure 3.30. Downstream view of west floodplain section at railroad bridge and Missouri Highway 240 bridge, with sections of scour holes, near Glasgow, Missouri (bridge design courtesy of Missouri Highway and Transportation Department).

The dominant mechanism of failure was scour by water transporting little bedload sediment to the edge of the constriction in flow over the floodplain. The sides of the scour holes contained cavities when the holes were inspected after the floods receded. The cavities appeared to have been caused by groundwater seeping into the scour holes. The seeping water originated as temporary storage into the floodplain during inundation. The water levels in the holes were still considerably above the level of the Missouri River even in November, but well below the original floodplain elevation. Outflow seepage effects were minor compared to the scour during the flood, but the outflow seepage caused delayed failures in the scour hole sides. The exposed surfaces of the scour holes could not be considered necessarily representative of the shapes of the scour holes during the flooding.

A breach in an agricultural levee at its connection to the U.S. Highway 159 bridge approach embankment caused undermining of the abutment wall and slope failure of the highway embankment as shown in Figure 3.32. The failure of the highway embankment at the abutment was caused by contraction scour at the end of two long embankments; the highway embankment is in the downstream wake of the railroad embankment. The floodplain around the railroad embankment showed no signs of scour. The scour of the alluvium at the base of the highway embankment and the failure of the highway embankment could be attributed to the high velocity of flow through the levee breach. The impact of bridges on sediment transport also is apparent from Figures 3.33 and 3.34. As flow approached the crossing, water from the floodplain transported a negligible concentration of bedload sediments toward the main channel and through the bridge contraction. The flow from the floodplain mixed with flow from the main channel in the contracted section of the bridge. On the downstream side of the bridge, flow from the main channel expanded back into the floodplain and transported sediment into the floodplain. The contraction of flow caused mixing of the floodplain flow, that supported a relatively low concentration of suspended and bedload sediment, with the main channel flow, that carried a high concentration of bedload sediment and suspended sediment. The expansion of the mixed flow, with a high concentration of bedload and suspended sediment, caused deposition in the floodplain downstream of the bridge. This phenomenon of redistribution of main channel sediments to the floodplain was apparent in the lack of sediment deposition upstream of the bridge crossings, and the deposition downstream of the bridge crossings, as shown in Figures 3.33 and 3.34.

Scour Around Abutments on Vegetated Floodplains. Trees and their root systems may have a considerable impact on the scour pattern around bridge approach embankments. An example of the impact of vegetation on scour is the erosion at a bridge on a county road that crosses the Des Moines River at Chillicothe, Iowa. Peak discharge from the Red Rock Reservoir located 61 km upstream of the bridge was approximately 3680 m^3/s during the flood. The water surface at the bridge was at approximately elevation 201.2 m. Figure 3.35 shows the topography and location of the county bridge at Chillicothe. The highway embankment traverses approximately 980 m of floodplain; a bridge near the east valley wall provides passage through the embankment for Comstock Creek. The Des Moines River bridge crosses 155 m of floodplain and 150 m of main channel. An agricultural levee, approximately 1.6 m above the floodplain, extended parallel to the

Figure 3.31. View, looking east, of collapsed railroad bridge span upstream of Missouri Highway 240 bridge, near Glasgow, Missouri.

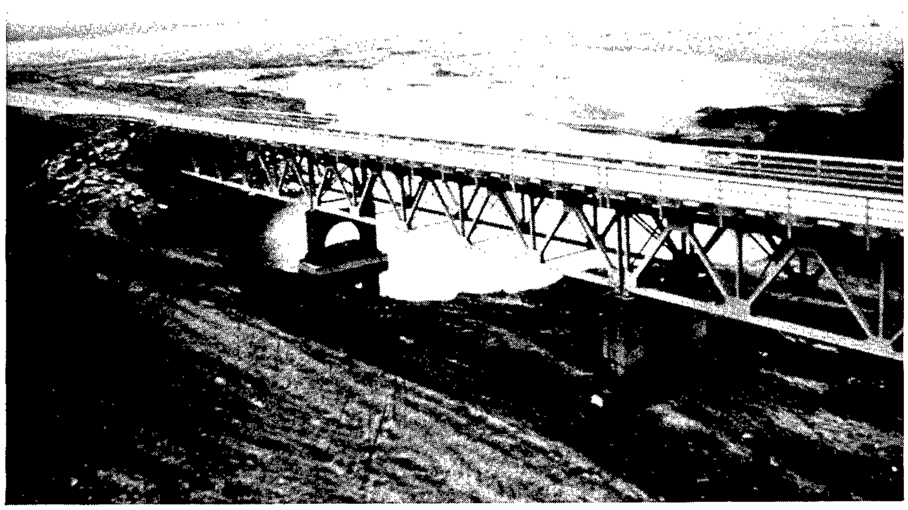


Figure 3.32. Scour hole formed at breached terminus of levee and U.S. Highway 159 bridge embankment, causing failure of approach embankment. View from top of railroad embankment, near Rulo, Nebraska.

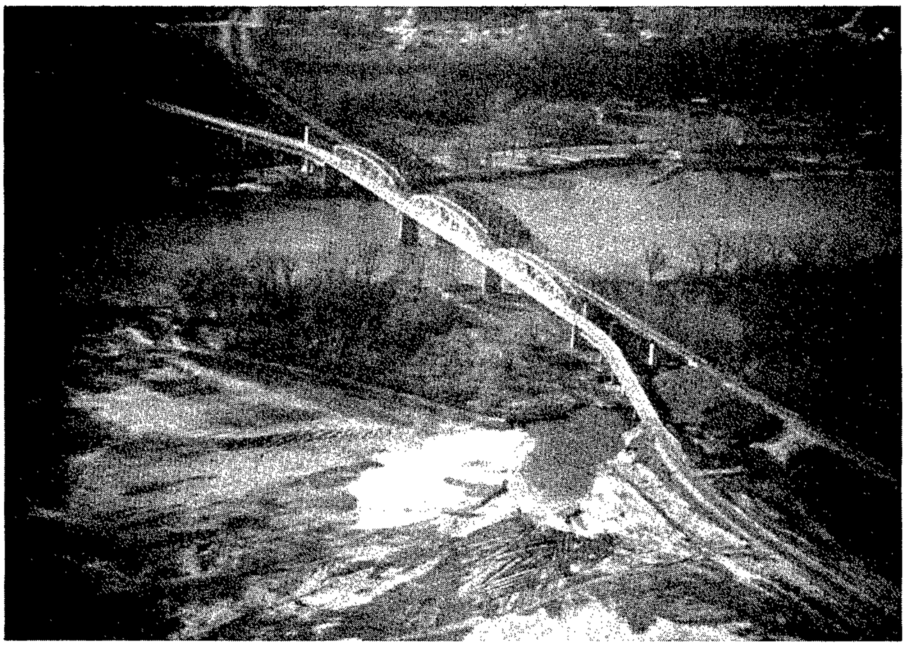


Figure 3.33. Aerial view, looking northwest, of U.S. Highway 159 bridge embankment on Missouri River floodplain, near Rulo, Nebraska. (Flow from right to left).

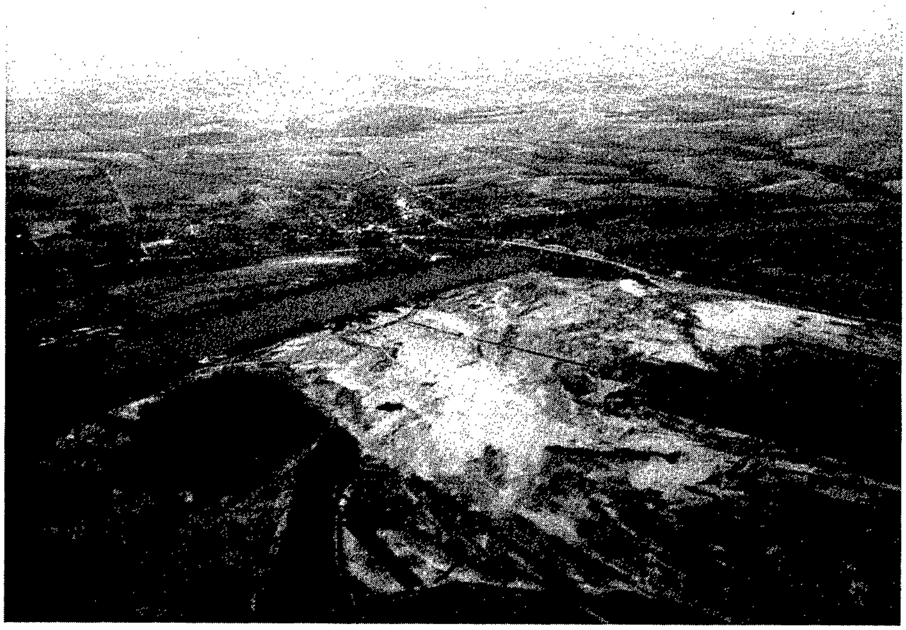


Figure 3.34. Aerial view, looking northwest, of scour and deposition downstream of agricultural levee break, near U.S. Highway 159 bridge abutment, near Rulo, Nebraska. (Flow from right to left).

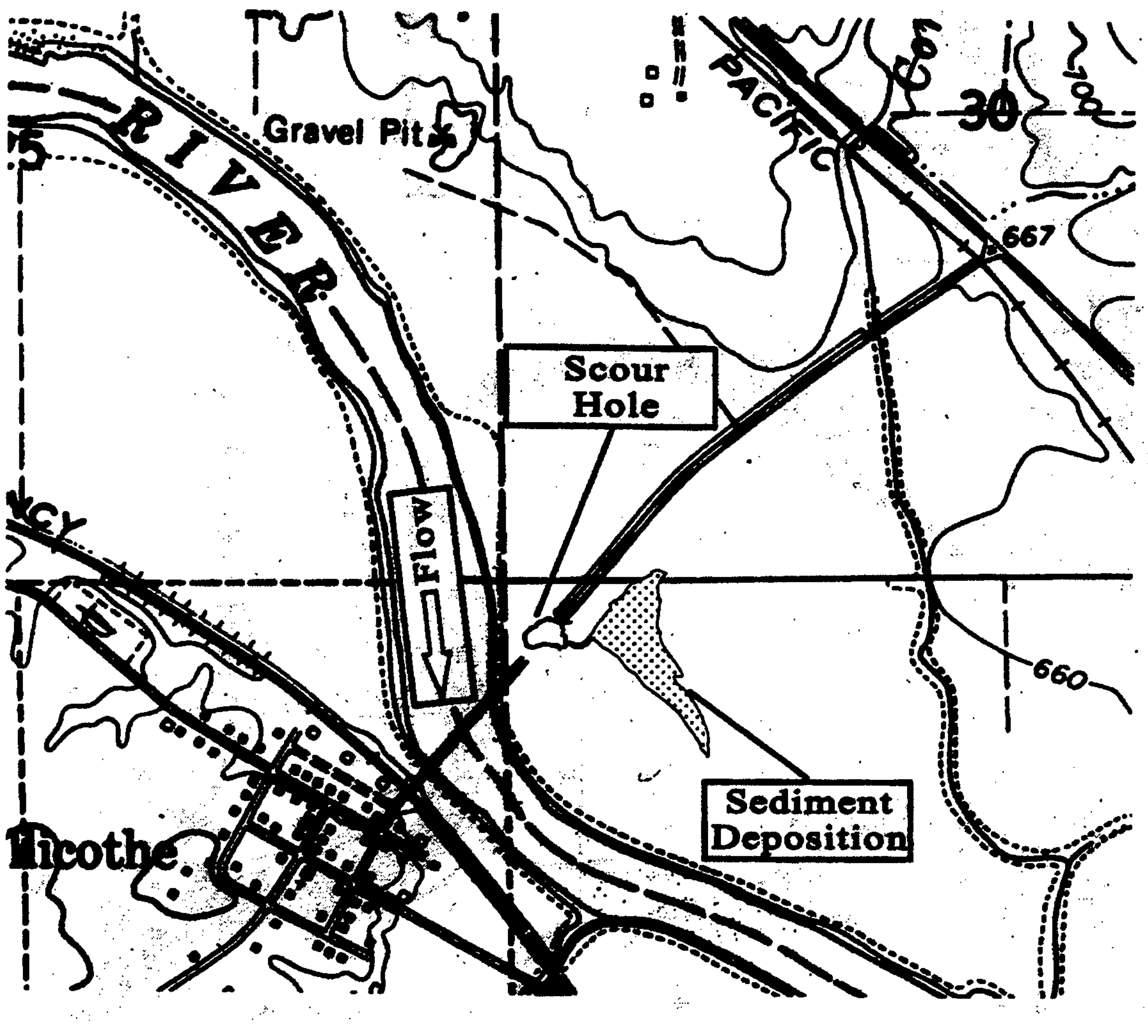


Figure 3.35. Scour hole and sediment deposition on the Des Moines River floodplain, near Chillicothe, Iowa.

river at approximately elevation 198 m. An important feature of this bridge environment and the resulting scour hole was the forested areas upstream and downstream of the open floodplain section at the bridge. The floodplain alluvium was scoured under the bridge. As shown in Figure 3.36, the upstream boundary of the scour hole was essentially parallel to the bridge. Tree root systems provided tensile reinforcement to the soil at the scour hole. The roots affected the upstream slopes of the scour hole and apparently increased the capacity of the upstream floodplain to resist erosion. The maximum depth of scour was approximately 7.0 m. Figures 3.37 and 3.38 are photographs taken from the east end of the embankment. These figures show nearly vertical boundaries between the uneroded upstream and downstream floodplain surface and the scoured region under the bridge. Dense root systems were draped over the edges of the hole, and fallen trees bordered the upstream edge of the scour depression. The scour pattern can be attributed to the flow system around the embankment, and to the variation in soil reinforcement by vegetation between the upstream and downstream areas. Vegetation was not observed under the bridge, most probably because of inadequate sunlight and prior clearing. Vegetation may have been removed under the bridge by scour.

Local scour holes were observed around several piers under the superstructure. An extensive deposit of clean medium sand was observed immediately downstream of the bridge. The entire agricultural field downstream of the bridge was covered with a layer of fine sand and silt as shown in Figures 3.39 and 3.40. Readings from gages in Ottumwa, Iowa, 16 km downstream of the bridge, and Tracy, Iowa, 41 km upstream of the bridge, indicated that the floodplain was submerged for at least one month.

Scour Around Piers

In all the bridges considered in this investigation where piers failed or settled as a result of scour, flow around abutment approach embankments and the associated scour there, strongly influenced flow around the pier and the scour that produced the failure of the pier. The most dramatic pier failure was the collapse of the railroad bridge pier at Glasgow, Missouri as shown in Figures 3.27, 3.28, and 3.30. The pier was located in the scour hole produced by the combination of levee breaches, flow contraction around an embankment and local scour around the pier. Although information about the foundations of the bridge was not available, the foundations were assumed to be pile foundations because of the limited bearing capacity of footings founded on floodplain alluvium. Two pier foundations of the Missouri Highway 240 bridge downstream of the railroad bridge were located within the scour hole produced by the railroad embankment, as shown in Figures 3.27 and 3.30.

The bridge failure at U.S. Highway 71 over Brushy Creek, approximately 13 km south of Carroll, Iowa, also involved the contraction of flow and overtopping of approach embankments and bridge structure. Two concrete pile bents and the abutment foundations failed, causing collapse of the entire three-span structure. Figures 3.41 and 3.42 show the location of the U.S. Highway 71

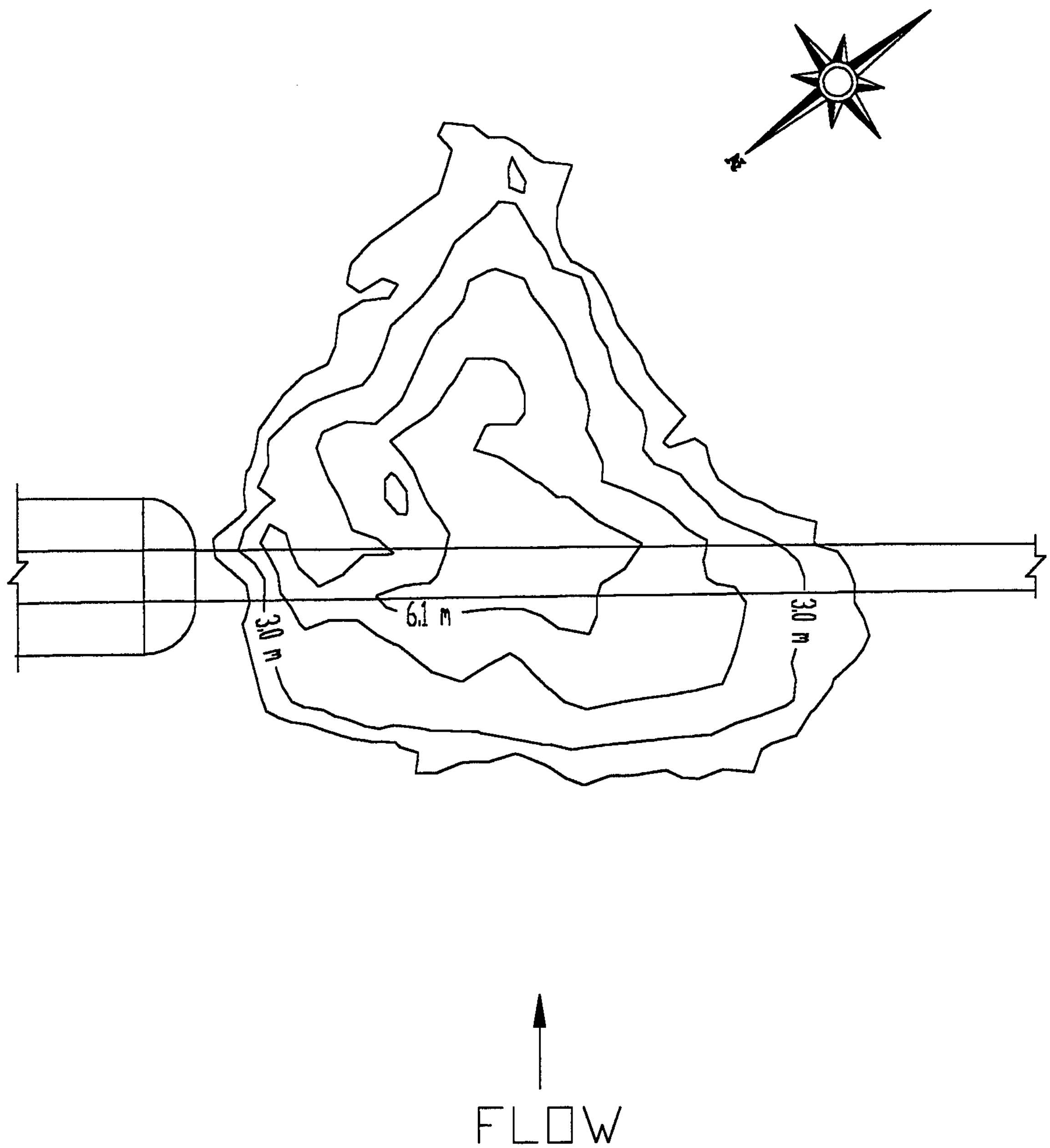


Figure 3.36. Scour hole contours at east abutment of county road bridge crossing the Des Moines River at Chillicothe, Iowa.

Figure 3.37. View, from east abutment of county road bridge, toward the Des Moines River, upstream vegetation and root systems affected scour pattern.

Figure 3.38. View, looking southwest, from east abutment toward the Des Moines River, and Chillicothe, Iowa.

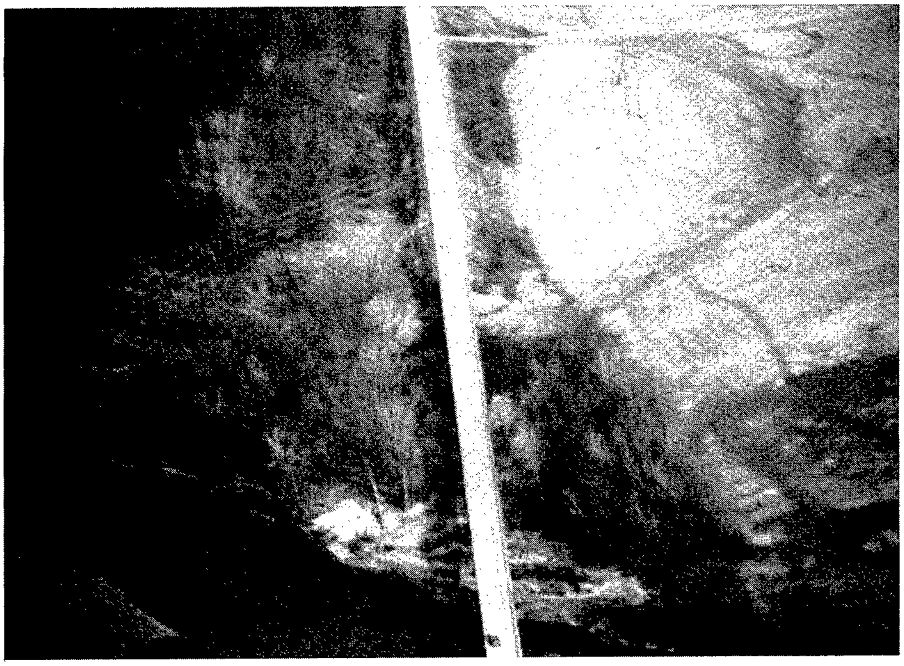


Figure 3.39. Aerial view, looking northeast, of county road and bridge over the Des Moines River, near Chillicothe, Iowa. Developed scour hole (center in figure) and transported sediment (located to the right).

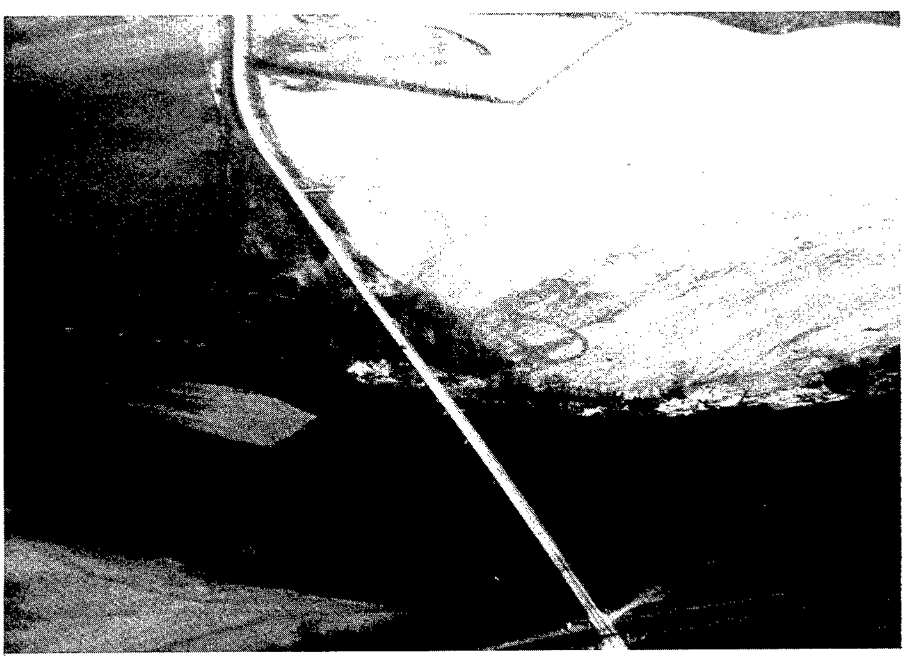


Figure 3.40. Aerial view, looking east, of county road and bridge over the Des Moines River, near Chillicothe, Iowa.

Figure 3.41. Aerial view, looking west (upstream), of Iowa Highway 71 bridge failure at Brushy Creek, approximately 13 km south of Carroll, Iowa.

Figure 3.42. View, looking southeast (downstream), of Iowa Highway 71 bridge failure at Brushy Creek, approximately 13 km south of Carroll, Iowa.

bridge failure. Undisturbed bank vegetation beyond the reaches of bank failure immediately upstream and downstream of the bridge indicated that the banks there had remained stable and that flow localized at the bridge caused the bank failures. The most severe bank erosion occurred on the north edge of the floodplain upstream of the bridge. The north abutment rotated toward the upstream direction as a result of the failure, indicating that scour upstream of the bridge probably was most severe around that abutment. The south abutment rotated toward the downstream direction, indicating that the most severe scour there occurred on the downstream side of that abutment. The collapse of the structure was attributed to the complex combination of large-scale vortical flow systems around the abutments and the effect of the intense, non-uniform contraction of flow through the bridge opening which caused scour that undermined the two concrete pile bents and both bridge abutments. In addition, flow over the roadway and around the bridge also contributed to scour, especially around the abutment wingwalls. The increased width of the stream at the bridge opening and the steep, bare disturbed streambanks are indications of slope failures.

The Raccoon River scoured the shale beneath a pier foundation of the 7th Street Bridge in Des Moines, Iowa. The spread footing supporting the pier located in the main channel was undermined during the flooding and required emergency repairs, as shown in Figure 3.43, to prevent collapse.

An example of local clear-water scour around a pier was found under the floodplain portion of the U. S. Highway 159 Bridge over the Missouri River. A scour hole formed in silty fine sand around a complex pier supported on a pile cap, as shown in Figure 3.44. The depth of this scour hole below the surrounding floodplain was estimated to be in excess of 3 m. Apparently no scour occurred as a result of the railroad embankment upstream of the pier; rather, scour occurred because the flow was severely misaligned with the long axis of the pier. The angle between the flow direction and the long axis of the pier was approximately 45 degrees. The peninsula-shaped portion of the side of the scour hole, on the left side of Figure 3.44, was located in the wake of the flow around the pier. The two eroded regions on the sides of this peninsula mark the portions of the scour hole eroded by the wake vortices shed from the pier.

The railroad bridge pier shown in Figure 3.45 is located upstream of the highway 159 pier shown in Figure 3.44. The top surface of the foundation for the railroad bridge pier was located less than 0.3 m beneath the surface of the surrounding alluvium. Large-scale vortex systems that developed around the pier during the flooding eroded the soil over a portion of the footing surface; however, a deep scour hole did not form.

The events at this pier are an example of how a footing or pile cap may prevent scour and undermining of a pier if the lateral extent of the foundation is sufficient to cover the region of the streambed under the large-scale vortex systems that cause local scour. The floodplain surface at this site was not eroded except locally over the foundation of the railroad pier and around the highway 159 pier. If the floodplain surface had been degraded more than 0.3 m because of general degradation of the floodplain or because of contraction of flow around an embankment, the top surface of the pier foundation would have projected above the surrounding floodplain. The

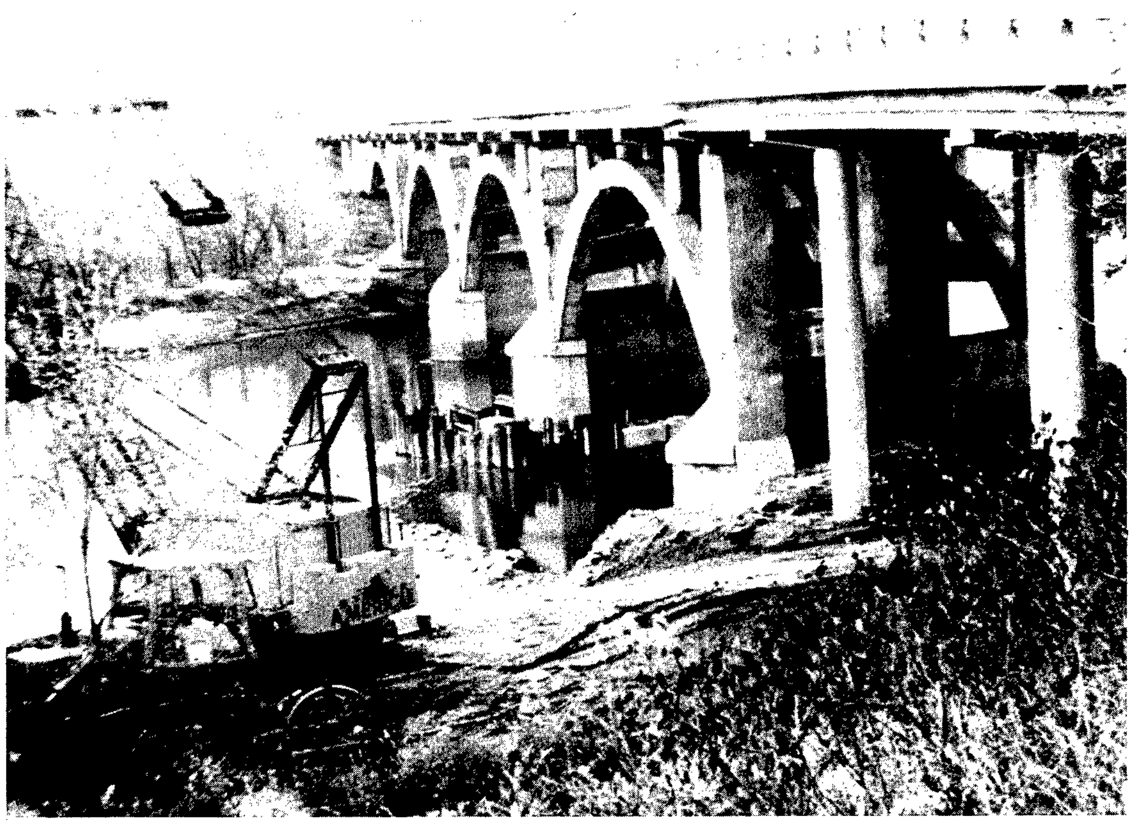


Figure 3.43. Emergency repair work of the 7 th Street bridge over the Raccoon River, in Des Moines, Iowa.

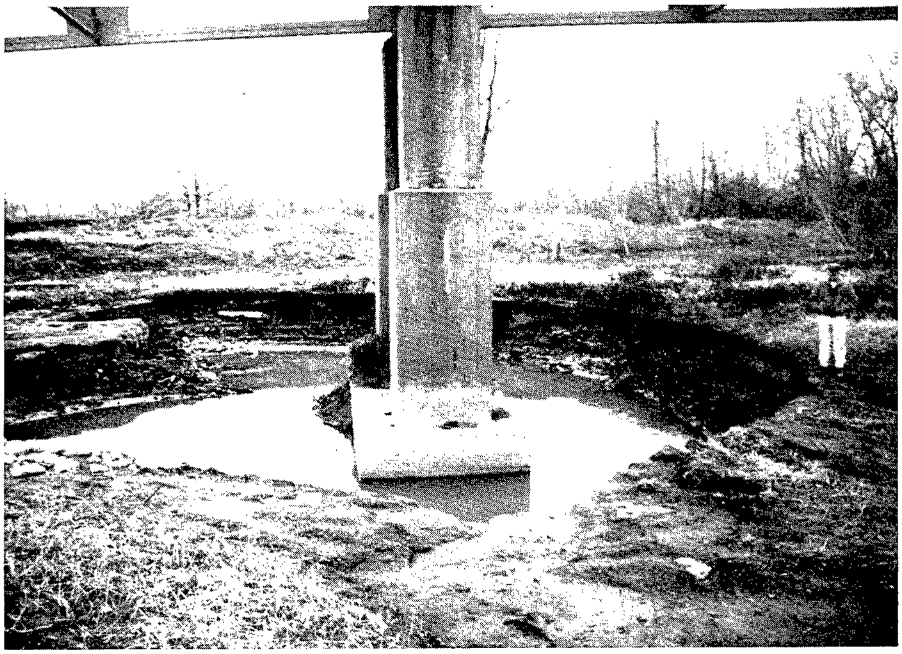


Figure 3.44. U.S. Highway 159 bridge pier located downstream of pier shown in Figure 3.45.

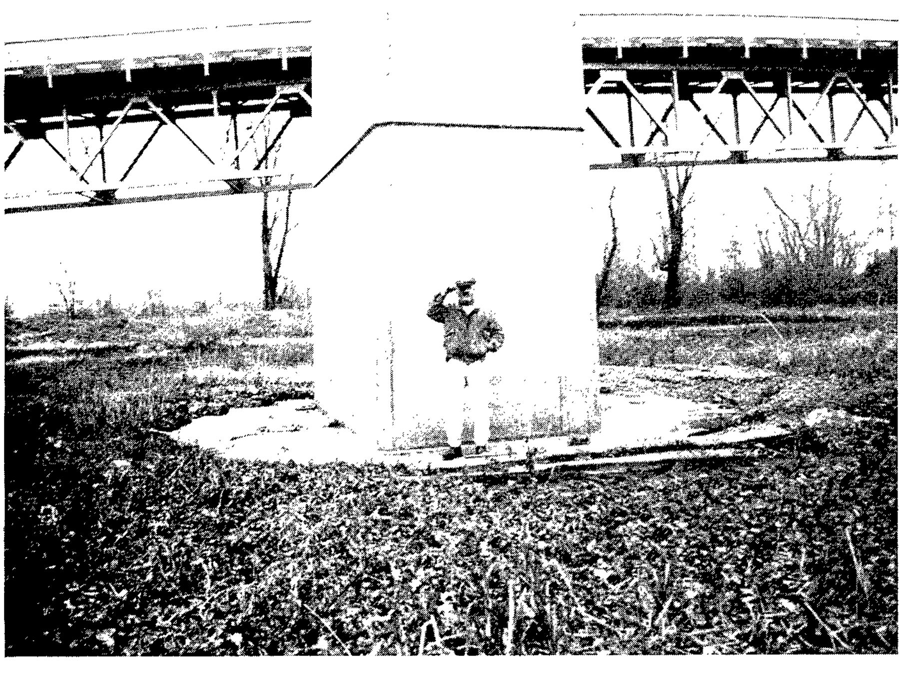


Figure 3.45. Railroad bridge pier (upstream from U.S. Highway 159 bridge) protected from Missouri River floodplain flow by wide foundation, near Rulo, Nebraska.

protrusion of the foundation above the surrounding surface would have caused the formation of vortex systems similar to those that are created by a pier, and foundation scour would have been likely. Degradation of the floodplain should be considered as a possibility when scour depths are computed for design of wide foundations to protect bridge piers from scour. If floodplain degradation does not expose wide foundation elements, actual scour may not match predicted scour depths because the foundation may shield the bed from pier vortex effects and may dominate the actual scour *(13)*.

Embankment and Pavement Damage

Three types of embankments are defined for the purpose of describing types of damage and their causes: culvert embankments, wide floodplain embankments, and bridge approach embankments. *Culvert embankments* cross valleys that have relatively small floodplains, with a culvert as the primary drainage structure providing flow through the embankment. *Wide floodplain embankments* are those that cross river floodplains with a bridge as the main drainage structure. Wide floodplain embankments do not include the section of embankment adjacent to the bridge. *Bridge approach embankments* are considered to be the sections of embankment where the flow pattern and large scale vortical flow around the bridge opening causes erosion. These sections of embankment are the portion of the embankments within 100 meters of the bridge abutment for most situations.

Wide Floodplain Embankments. Highway and railroad embankments located on wide floodplains, especially those on the Missouri River and Mississippi River floodplains, were damaged extensively in the 1993 floods. When agricultural and municipal levees were overtopped or breached, floodwater often flowed onto the floodplain on the upstream sides of transportation embankments and rose to elevations above those embankments. The water surface elevation differences across the embankments caused flow that was mainly perpendicular to the embankment, typically. Parallel highway embankments and their drainage ways can cause flow in other directions. The differences in water surface elevations between the upstream and downstream sides of embankments were controlled by flow-through (relief) bridges that were located kilometers from the overtopped section of embankment, as well as by other sections of overtopped embankments and levee conditions. The water surface elevation differences at bridges, were caused by flow contraction and expansion, and usually were less than two meters. Levee breaches in upstream areas and lack of breaches near embankments probably caused several meters of water surface elevation difference from the upstream side of embankments to the downstream sides. Bridges that generated upstream backwater may have caused the levees on the upstream sides of the bridge embankments to overtop and breach, while the levees on the downstream side may not have been overtopped. The highway embankments may have acted as dikes, with meters of excess water on the upstream sides and much lower water surface elevations on the downstream sides. The interaction of floodplain flow, breached and overtopped levees, and embankment overtopping and breaches formed complex flow systems that caused extensive damage.

Flow over floodplain embankments caused kilometers of damage to pavement structures that included erosion of shoulders, undermining and collapse of asphalt and concrete pavement, and partial or complete breaching of embankments. Scour holes formed where embankments breached in patterns similar to scour patterns around severely contracted and long bridge abutment embankments. Unlike the flow around long bridge embankments, however, the flows around the ends of the embankment breach interacted. The water surface elevation difference between the upstream and downstream side of the embankment at a breach were controlled by levee elevations and the flow through a bridge opening kilometers from the highway embankment breach. Sustained high-velocity flow apparently occurred through the many of the breaches. For example, the sustained high-velocity flow, contraction of flow, and highly three-dimensional vortex system that developed near the breach shown in Figure 3.46, caused a deep scour hole to form in the floodplain alluvium and deposition of relatively coarse sediment on the downstream floodplain. The hole extended upstream and downstream of the repaired highway embankment that traverses the Missouri River floodplain downstream of Jefferson City, Missouri. The formation of the scour hole after the breach was similar to scour caused by heavily contracted flow at a floodplain relief bridge. The floodplain flow approaching the breach was incapable of transporting bedload sediment. The dark color of part of the floodplain surface area in Figure 3.46 was caused by decaying crop residual. If movement of bedload on this part of the floodplain had occurred at some point, bedforms typical of sand bedload transport would have been left in place over the original floodplain soil. The flow approaching the bridge was considered as "clear-water" because of the very low bedload sediment transport. The scour that occurred in the breach could be modeled as a heavily contracted flow that caused "clear-water" scour.

The wide floodplain embankment breaches were similar to levee breaches away from the main river channels. Figure 3.47 shows breached parallel highway and railroad embankments on the floodplain of the Missouri River. Scour that occurred at levee breaks and at breaks in highway embankments may be a major source of fine sand deposited on the sandy silt floodplain alluvium of the Missouri River.

Long reaches of highways were damaged by scour and erosion, particularly where long approach embankments were situated on broad floodplains. One such situation existed at Glasgow, Missouri as described previously. A continuous railroad embankment (6.9 km) traversed the Missouri River floodplain from the west to a truss bridge. A similar embankment for Missouri Highway 240 was located just downstream (south) of the railroad embankment. The main thread of the river flows south in this area but bends just upstream of the embankment to flow east along the embankment to the east side of the floodplain. The river turns to the south at the east side of the floodplain where bridges carry the railroad and highway across the stream (see Figure 3.26). The embankments were overtopped and breached, and more than 600 m of the embankments were eroded. The failed embankments are shown in Figure 3.47. A scour hole more than 15 m deep formed at the location of the breaches. Sediment from the scour hole was deposited downstream from the breach and on Missouri Highway 240 east of the breach.

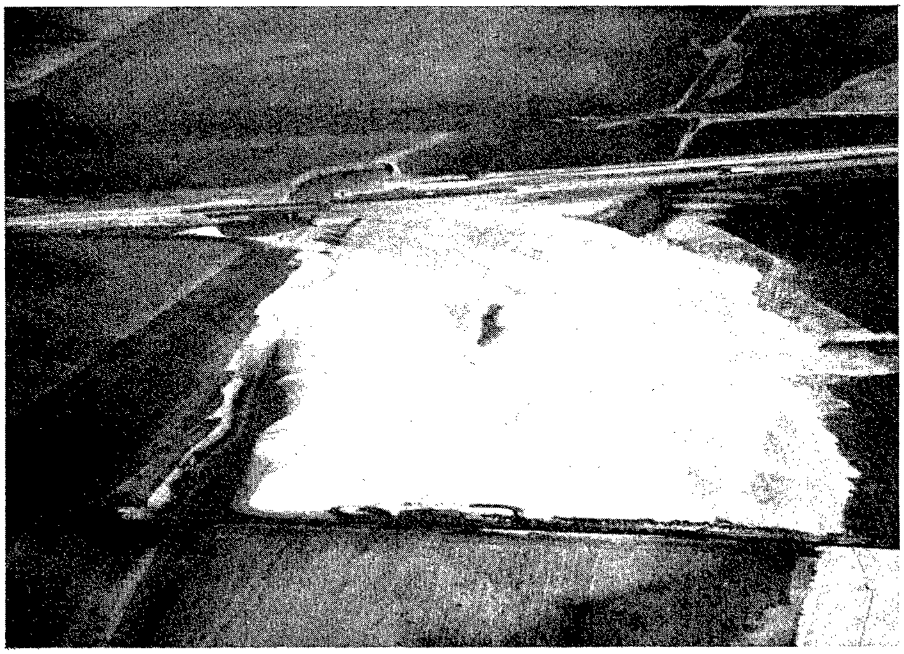


Figure 3.46. Highway embankment scour and downstream sediment deposition on the Missouri River floodplain, near Jefferson City, Missouri.

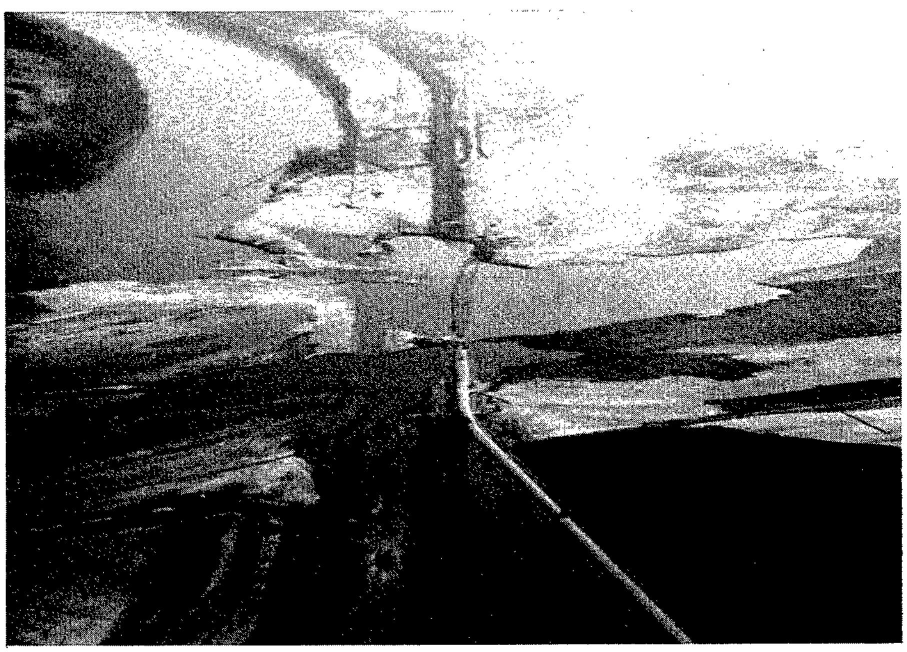


Figure 3.47. Aerial view, looking east, of breach in railroad and Missouri Highway 240 embankments, near Glasgow, Missouri. Scour hole on the Missouri River floodplain (flow from left to right).

The failures of these embankments were typical of many similar events that occurred during the 1993 flooding: deep scour holes formed in wide flat floodplains at locations where embankments were breached by overtopping flow. After an embankment was breached, floodplain flow was concentrated through the breach. The concentrated flow typically carried low sediment load to the breach but large quantities of sediment from the scour hole were deposited short distances downstream from the breach where the flow expanded. The scouring action was similar to clear-water scour at bridge abutments in floodplains. Overtopping damage to roadway embankments was a common occurrence in the affected floodplain areas of the Missouri River and Mississippi River.

Less severe but more widespread damage to highway embankments was caused in wide, flat floodplains by overtopping flow that did not breach the embankments, as shown in Figure 3.48. Frequently observed damage included erosion of embankment slopes downstream from overtopped areas, as well as erosion of shoulder material and asphalt pavements and undermining of concrete pavements where overtopping occurred. Interruption of traffic on highways because of erosion on downstream embankment slopes and railroads had a serious impact in some communities. Figure 3.49 shows the stages of unprotected embankment erosion under free fall and high tailwater conditions.

Intersections of trunk highways located on the Missouri River floodplain were damaged by the complex flow under bridges that were constructed as highway overpasses but functioned as relief bridges. Flow over pavements on clover leafs and nearby parallel highway embankments was complex, as shown in Figure 3.50. The combination of large water surface elevation differences across embankments and local flow accelerations around highway structures caused scour. Headcuts (small waterfalls) formed where high-velocity flow over embankments caused erosion of shoulders and undermining of pavements.

Culvert Embankments. Culvert embankments, associated pavement structures, culverts, and downstream channels were damaged as a result of the flooding. High-velocity flow at the downstream ends of culverts caused erosion of downstream channels that frequently undermined culvert outlets. Flow on the upstream sides of the culverts at many sites exceeded the capacity of the culverts and overtopped roadways. Flow over roadways at hundreds of sites eroded the downstream embankment slope and around culvert outlet structures. High-velocity flow over roadway pavement and shoulders caused the erosion of shoulder material, undermining of concrete pavement, and in some cases an embankment breach and culvert "washout", as shown in Figure 3.51.

The principle differences between failures in culvert embankments and failures in wide floodplain embankments were the complexity of the flow systems that generated the overtopping conditions and the erosion that occurred after embankments breached. In the culvert embankment cases, a culvert or culverts were the main drainage structures controlling flow and water surface elevation. In many narrow valleys, the embankment breach was wider than the drainage structure (culvert) and relatively wide compared to the valley width. In addition, the breach controlled the

Figure 3.48. Erosion of highway embankments, shoulders, and undermining of pavement on the Missouri River floodplain (courtesy of Missouri Highway and Transportation Department).

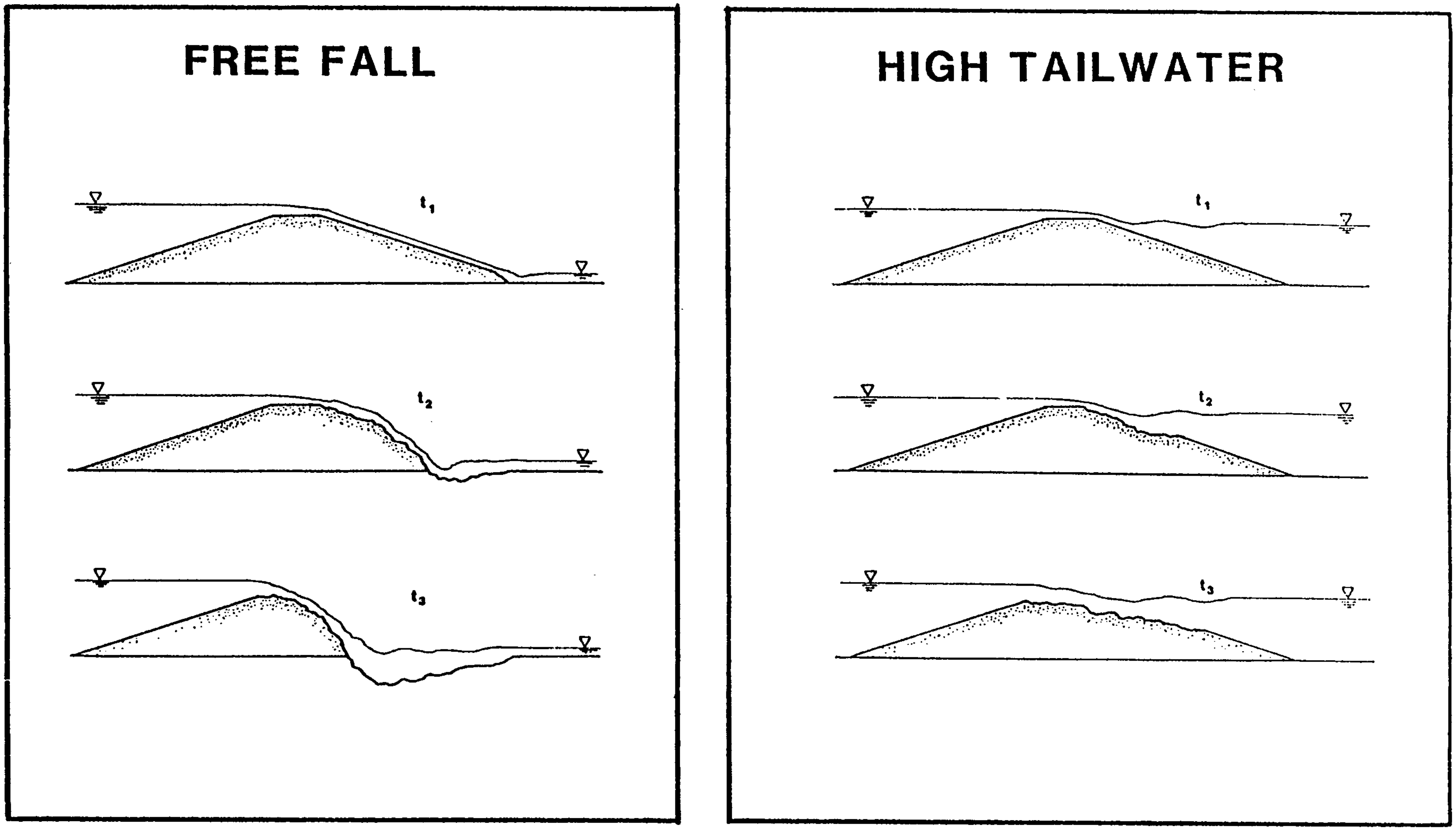


Figure 3.49. Progressive stages of unprotected embankment erosion under freefall and high tailwater conditions *(14)*.

Figure 3.50. Complex flow over a wide floodplain embankment, Missouri River floodplain. Large water surface elevation difference between the upstream and downstream sides of embankment (courtesy of Missouri Highway and Transportation Department).

Figure 3.51. Culvert "washout" located on County Highway BB in Adair County, west of Kirksville, Missouri (courtesy of Missouri Highway and Transportation Department).

water surface elevation upstream and downstream of the breach such that flow velocities decreased substantially after the breach formed. The reduction in velocities prevented further degradation of the streambed under the breaches.

High-velocity discharge from culverts caused scour holes to form downstream of highway embankments; an example is the hole that formed on Williams County Road 15 near Williston, North Dakota shown in Figure 3.52. The erosion downstream of many culverts caused undermining and structural failure of the outlets.

Slope Failures. Intense and prolonged rainfall during summer 1993 caused landslides and slope failures that had direct and indirect effects on highways and railroads. In some instances, landslides carried away portions of roadways; in other cases, failing soils blocked roads and streams. Throughout the flooded region, distress occurred in roadway shoulders, pavements subsided locally, and embankment side slopes failed because of high groundwater levels. Water ponded in ditches and at raised culvert entrances, and seeped laterally through embankments. Seeping water eroded fine-grained soil particles from within embankments and subgrades. Emergent seepage destabilized embankment slopes; localized slumps occurred in destabilized areas, and/or seepage outflow produced cavities in embankment and slope faces. Figure 3.53 shows an embankment failure on Missouri Highway 59 approximately 8 km north of Craig, Missouri where the embankment bulged and subsided when zones of soil flowed laterally out of the west side of the embankment. The distress was aggravated by down cutting in the ditch along the toe of that embankment. In localized areas on the west slope of the embankment, concentrated outflow had produced cavities in the face of the slope. Large pieces of rock had been dumped into the slump zone in an effort to buttress the slope. The distress in this embankment was typical of the noncollapse, undramatic but very widespread damage which occurred in the flooded watersheds far from large streams.

Effect of Debris

Debris blockage of bridge openings generated high-velocity flow and redirected flow through those openings. Figure 3.54 shows a debris at abridge over a tributary stream in the Big Nemaha River system in Nebraska and erosion of the adjacent streambank. The debris accumulated on the pier and deflected high-velocity flow toward the bank. The blockage of flow area and deflection of flow contributed to the bank erosion on the bend downstream of the bridge.

Sediment deposition downstream of debris accumulations were found on the Raccoon River (Figure 3.55) and the Des Moines River (Figure 3.56). These sediment accumulations filled voids between the debris elements, forming a composite body similar to a mass of reinforced earth. Combined debris and sediment accumulation may yield a composite structure that is capable of blocking a large portion of a channel. Flow deflected by a debris accumulation eroded the inside of the bend on the Raccoon River, as shown in Figure 3.55. Flows deflected by the accumulated debris

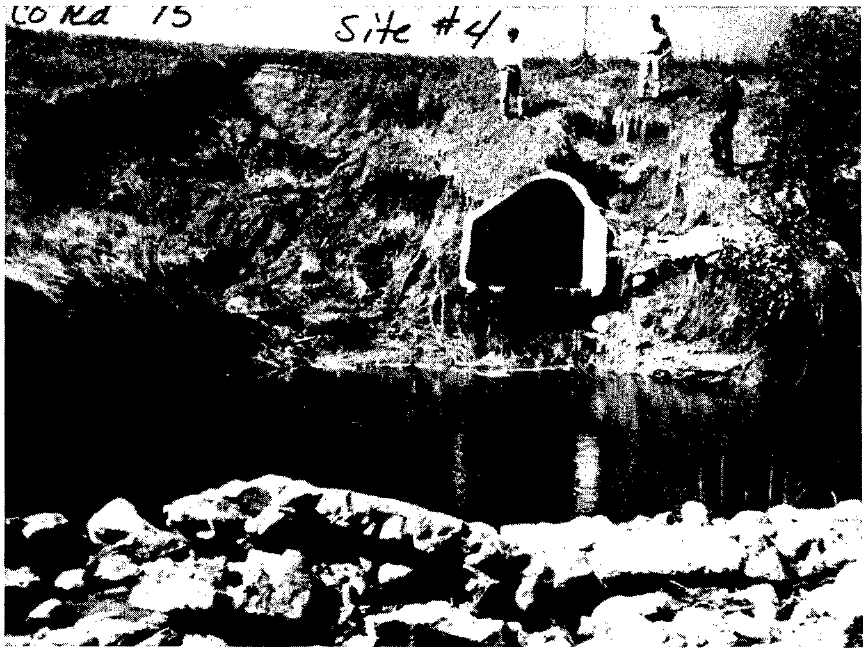


Figure 3.52. View of roadway embankment erosion and scour at culvert outlet, Williams County Road 15, near Williston, North Dakota (courtesy of North Dakota Department of Transportation).

Figure 3.53. Embankment failure on Missouri Highway 59, caused by high groundwater levels (8 km north of Craig, Missouri).

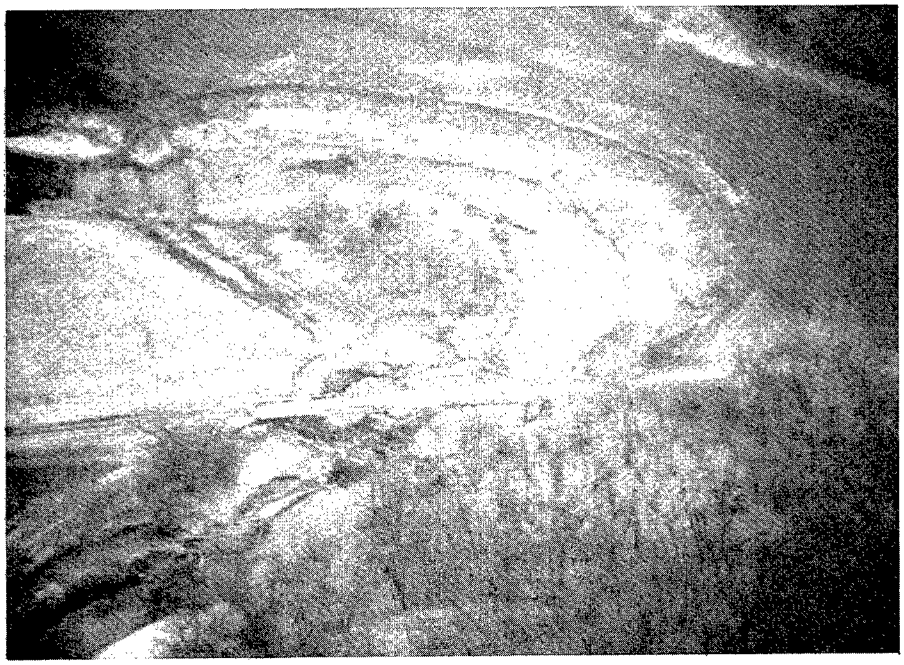


Figure 3.54. Debris accumulation on a pier of a county bridge tributary stream in the Big Nemaha River system, Nebraska.

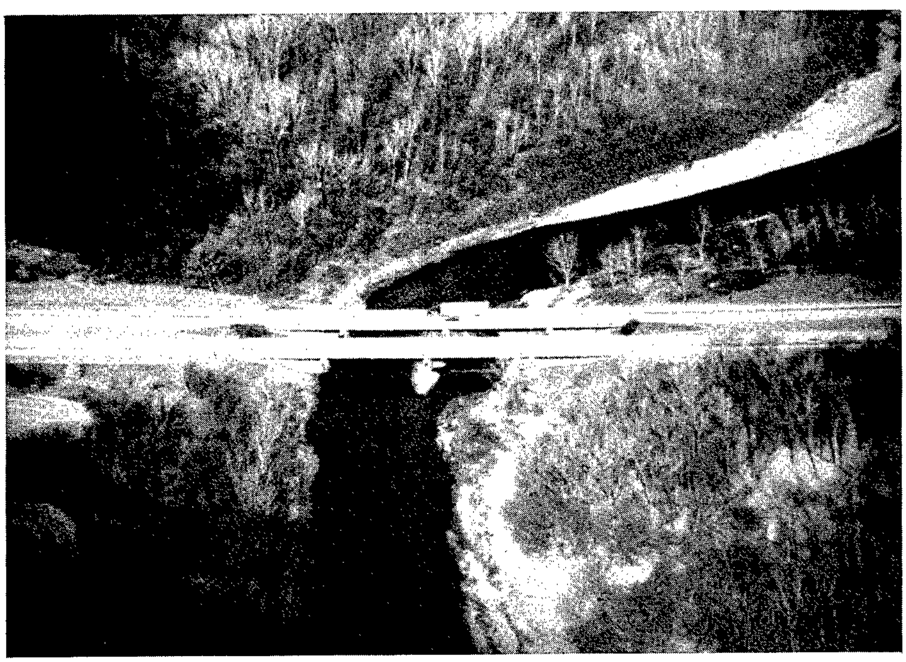


Figure 3.55. Raccoon River debris accumulation and downstream sediment deposit (Flow from top to bottom).

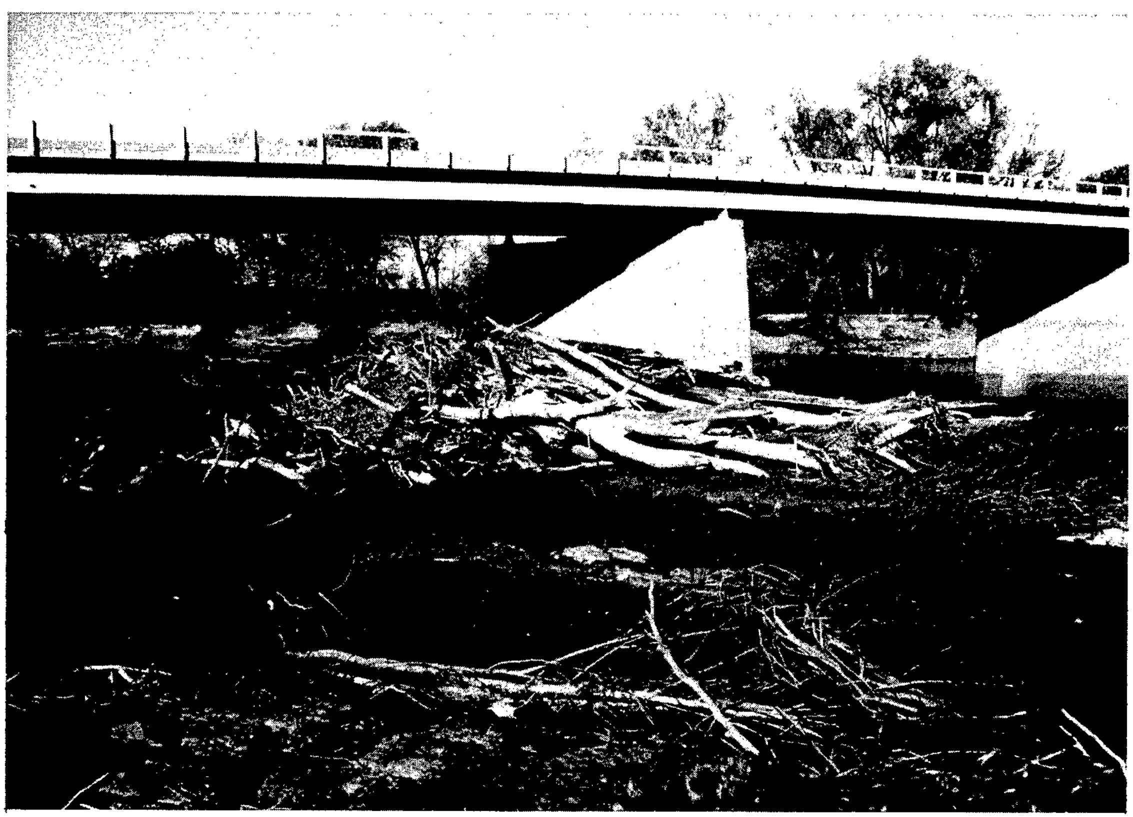


Figure 3.56. Des Moines River debris accumulation and downstream sediment deposit (view looking upstream).

Figure 3.57. View, looking northwest, of the South Skunk River, northwest of U.S. Highway 65 bridge, northeast of Des Moines, Iowa.

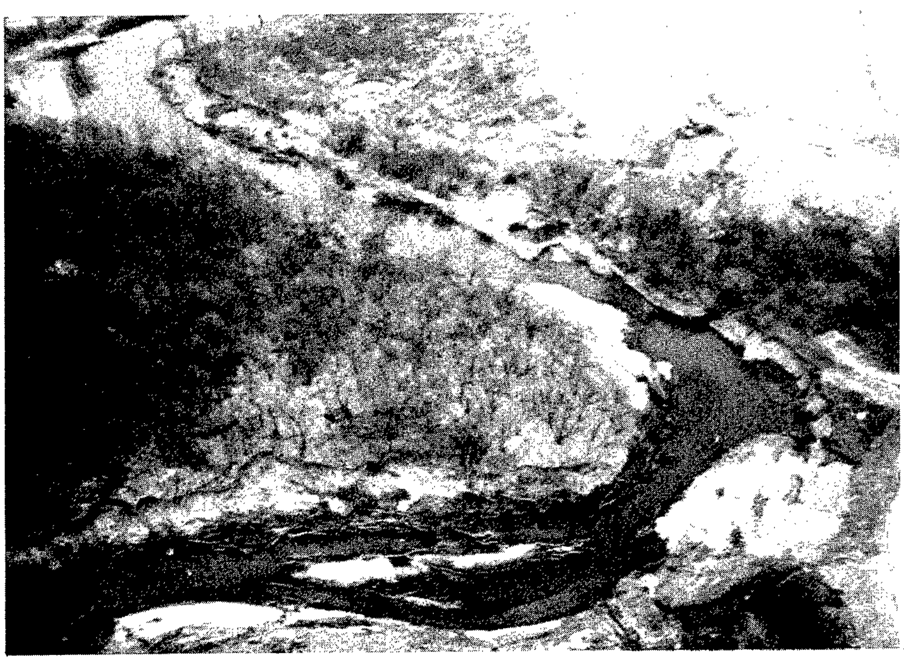


Figure 3.58. Bank failure and sources of debris, Big Nemaha River, near Falls City, Nebraska.

at bridges scoured the toe and faces of abutment embankments, eroded streambanks, and locally widened channels. Flow around debris on piers locally scoured under and upstream of the debris and formed a wake region downstream of the debris where large sediment deposits formed.

Sources of Debris. Debris was found in channels after flood recession where bank failures occurred. Figure 3.57 shows debris along the banks of the South Skunk River in Polk County, Iowa upstream of the U.S. Highway 65 bridge. The presence of fine leafed branches, attached root masses and bark indicated that the dislodged trees had been thriving in the growing season prior to their failure and entrance into the river. The root masses with loose soil and the tree orientations with respect to the bank and flow direction indicated that the trees had not been transported far from their original locations at the points of bank failure. The concentration of trees upstream of the bridge was attributed to turbulence created along the banks by the flow returning to the main channel from the floodplain. The flow returning to the main channel from the floodplain upstream of the bridge, had a substantial component perpendicular to the streambank; that component caused large-scale turbulence which increased the tendency for upstream banks to erode. The supply of debris depended upon the type and density of vegetation growing on those banks.

High concentrations of woody debris were found in stream systems with extensive bank erosion. Figure 3.58 shows a section of the Big Nemaha River where bank failure furnished sources of debris. The presence of fine, leafed branches, attached root masses, and bark indicated that the trees in the debris had been thriving in the growing season prior to their entrance into the river. Roots devoid of soil and trees aligned with flow direction indicated that the trees may have been transported far from the bank failures that supplied the trees to the river. Although bank erosion obviously had occurred at this site, it was not clear if the trees in the debris were derived from the immediate vicinity shown in Figure 3.58. The fact that the trees were not removed by the flood waters suggested that the trees were derived from local bank failures that occurred after the recession of the flood event. The lack of bank soil around the root systems of the trees in the debris indicated that the flow in the channel was sufficient to remove that soil. The trees in the debris were available for transport in the next sufficient flow event.

CHAPTER 4

DAMAGE CLASSIFICATION AND SUSCEPTIBILITY OF HIGHWAY INFRASTRUCTURE

Information from 2,305 Damage Assessment Forms completed by agencies to request Emergency Relief Funding from FHWA was used to categorize damage at sites according to structure type and cause of damage. Information obtained from federal, state, and county engineers also was used to develop a classification system. Although the reports and report summaries were completed to secure financial assistance for emergency repair and replacement, the description of damage to structures was sufficient to classify broadly the type of structure damaged and the processes that caused the damage. However, very specific information about the sites was available at only a few sites where the researchers conducted field investigations or obtained detailed information from highway agencies. Where possible, informed speculation about the site conditions was done to categorize the damage processes. The key to the classification system is shown in Appendix C. The classification system was developed to categorize the *observed damages* and was *not* intended to include all possible types of structures or all possible causes of damage. A database of structure types and damage causes was developed and is provided in Appendix D. The database was used to examine the damage processes, the susceptibility of specific structures and the costs associated with specific causes and structures.

Mention of scour around piers and abutments does not mean specifically local scour. The degradation of the bed around the pier or abutment could be attributed to local scour, lateral shift, long-term degradation of the entire streambed through a reach, scour around an embankment, scour in a bend or a combination of these forms of degradation. The investigators observed that the degradation of the streambed around piers was affected by local acceleration of flow around embankments or substantial contraction of the waterway opening at all cases of pier settlement where photographs of the damage site were available or site inspections were conducted. Local scour that caused pier failure without substantial influence of an embankment or debris was identified at only one site: scour in shale at the 7th Street bridge in Des Moines, Iowa. The pier did not settle at that site, although it was undermined partially and required emergency repairs.

Some information was not usable in site categorization. Although data on the total number of damage sites and total relief costs were provided by officials in Minnesota, the information was insufficient to categorize the structure types or causes of damage. Information from Kansas damage assessments were inadequate for positioning some sites on state maps.

Structures Damaged on Federal Aid Routes

Embankment Damage. Failures at 999 sites and approximately 48 percent of the total cost of Emergency Relief Funding were attributed to highway embankment damage that included

damage to the associated pavement, shoulder, and drainage systems. Embankments were divided into three groups according to drainage structures, relative length, and proximity to a stream bridge: *culvert embankments*, *wide floodplain embankments*, and *bridge approach embankments*.

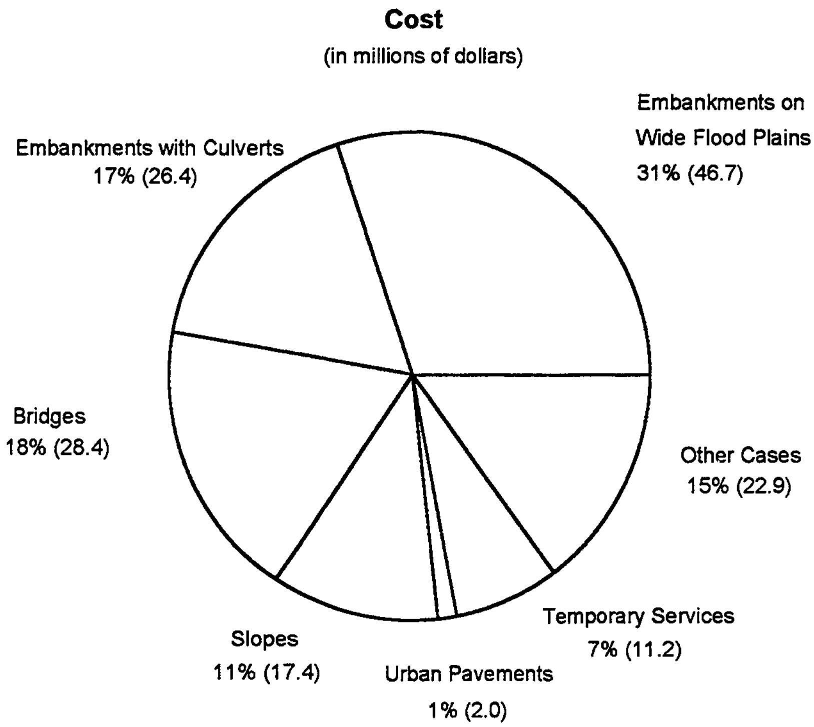
Embankments where culverts were the main drainage structures providing through flow were considered to be *culvert embankments*. Approximately 17 percent ($26.4 million) of the total damage cost and 38 percent of the sites (783 sites) involved damage to culvert embankments.

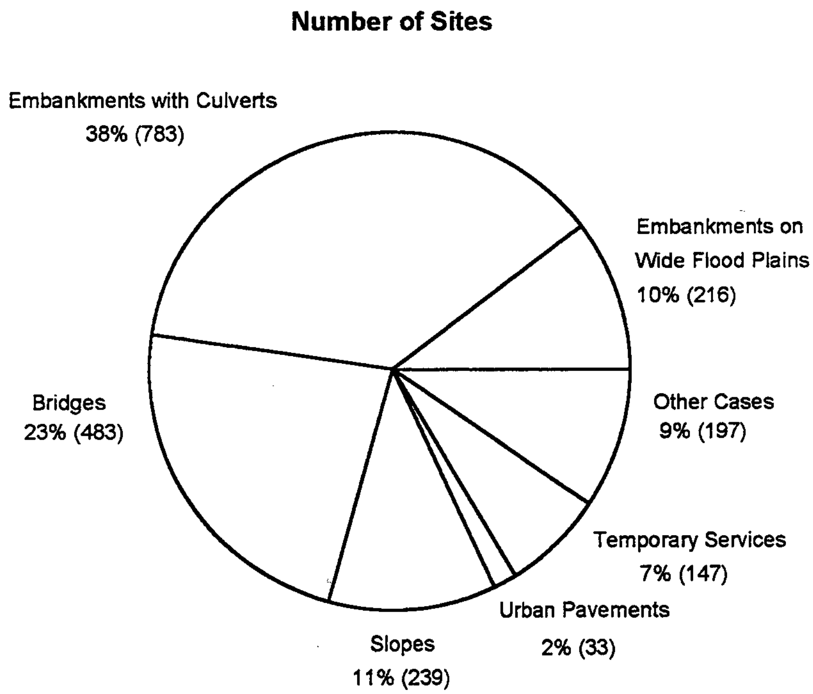
Embankments located on wide floodplains of rivers such as the Missouri, Mississippi, Illinois and Kansas Rivers where the main drainage structures providing through flow were bridges were considered *wide floodplain embankments*. Although only 10 percent (216 sites) of the total number of sites involved damage to wide floodplain embankments, 31 percent of the total cost ($46.7 million) was attributed to these sites, as shown in Figure 4.1. Figure 4.2 provides a breakdown of the parts of the embankments damaged. In nearly half the cases the embankment slopes as well as the shoulders and pavement were damaged. Pavements on many embankments were damaged from truck traffic associated with the transportation of repair materials to damaged embankments.

Bridge approach embankments were the sections of embankments within 100 m of the bridge abutments; those embankment sections were considered parts of the bridge structures for this analysis.

Bridge Damage. Damage to bridges included damage to substructures, superstructures, approach embankments, and the drainage ways around the bridge occurred at approximately 23 percent (483 sites) of the sites and accounted for 18 percent ($28.4 million) of the total cost of damages (Figure 4.1). The primary cause of damage at 77 percent (370) of the bridges was scour around the abutments or approach embankments (Figure 4.3). Damage caused by scour around piers occurred at only 8 percent of the bridge sites reported as having damage. In most of those cases, the scour around the pier was caused by contraction of the entire waterway, by debris, and/or by scour and flow from an approach embankment. Only one case of pier scour could be identified as being caused by "local scour," scour caused solely by the flow around the pier. The remaining cases involved flow and scour around the pier affected by approach embankments or debris accumulations.

Scour around abutments was caused by one or more processes, as shown in Figure 4.4. Although most of the spectacular scour holes described in Chapter 3 were located on floodplains far from the main channel of a stream or river, the most numerous of the damaged abutments were those located at or very close to the bank line of a main channel. Lateral migration of the channel or channel widening caused conditions in which abutments were damaged. The category of damage to abutments designated "scour at one abutment" also may have included cases of lateral bank migration, but the information provided was insufficient to show that lateral migration was a primary cause. Scour at both abutments was an indication that flow contraction through the entire bridge opening and/or channel widening occurred. Damage to embankments both under and around bridge





Note: 207 cases, amounting to 2.9 milion dollars from Minnesota were excluded due to insufficient information.

Figure 4.1. Federal Highway Administration Emergency Relief Funding.

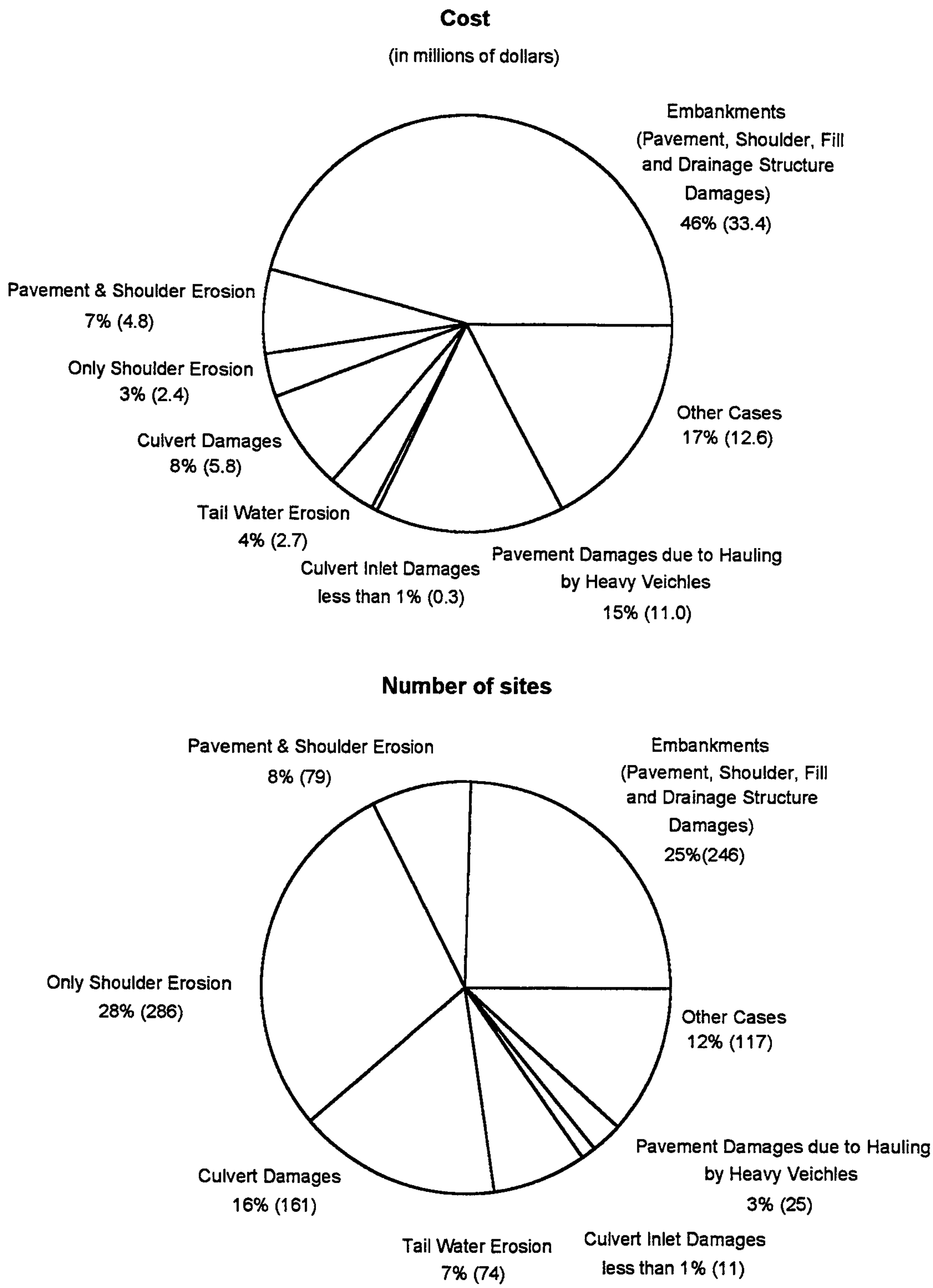
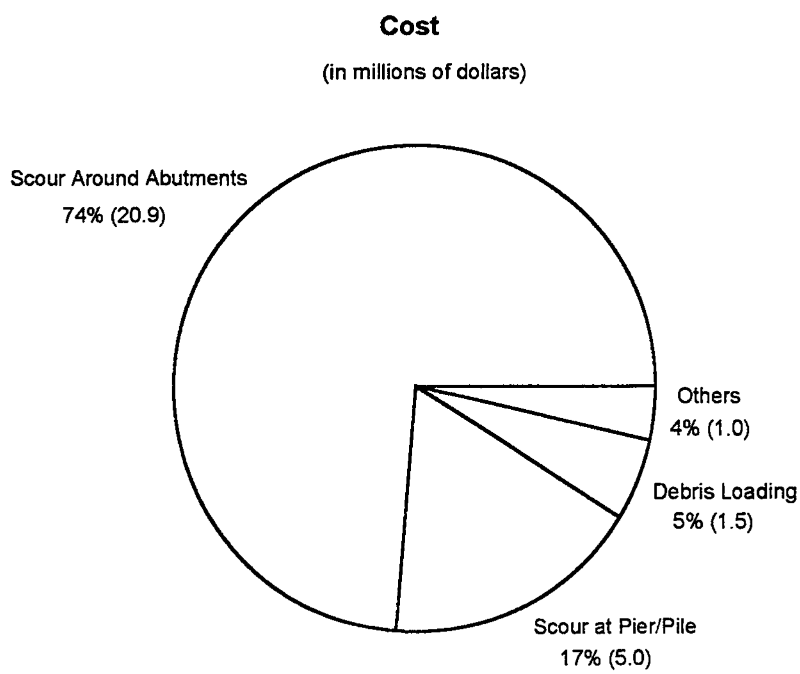
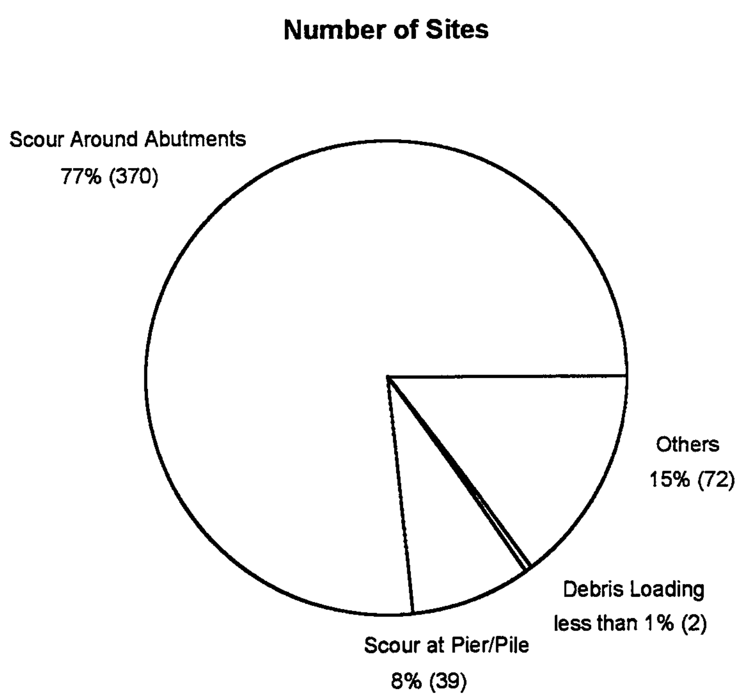


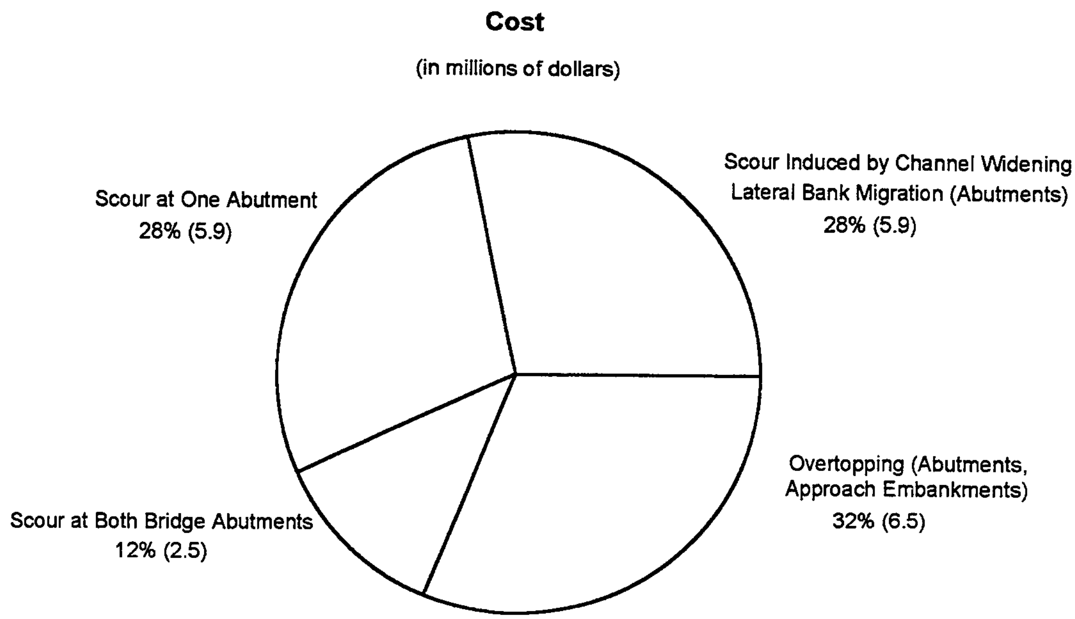
Figure 4.2. Damage to embankments of federal aid highways.





Note: Debris was present in 87 (18%) of 483 cases of bridge damage.

Figure 4.3. Cause of bridge damage on federal aid highways.



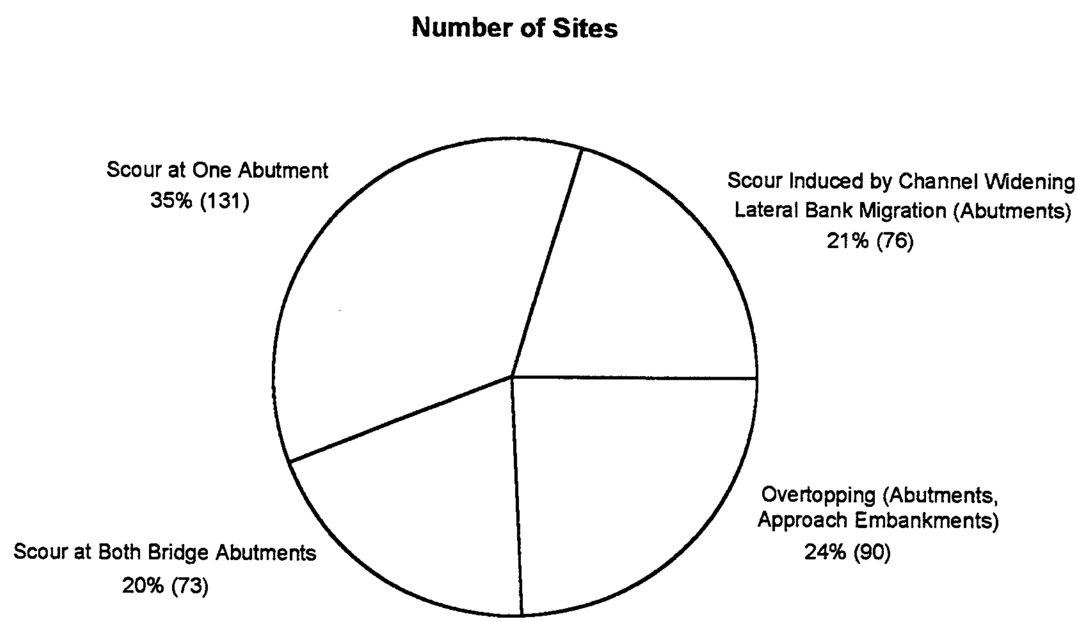


Figure 4.4. Causes of abutment scour on federal aid highways.

abutments was caused most frequently by the complex flow that occurred when the bridge was submerged and flow over the approach embankment breached that embankment behind the abutment.

Structural failure of a substructure caused by debris loading accounted for one bridge collapse. A second bridge supported on a substructure composed of concrete piles with a concrete pile cap was damaged by a combination of scour that caused reduction in lateral support to the piles and the forces acting on a debris accumulation.

Damage to Bridges on Non-Federal Aid Routes

Data on damage to bridges on non-federal aid routes were obtained from the summaries of Damage Survey Reports used by state and local agencies to apply for federal assistance from the FEMA. The information from those reports was adequate for broadly classifying the sites according to the component of structures damaged and the cause of the damage. Figure 4.5 shows that scour around abutments and approach embankments caused most of the damage to those bridges. Damage caused by debris loading was much more frequent on the non-federal aid routes than on federal aid routes. Factors contributing to that damage was the widespread use of pile bents for piers and timber superstructure elements.

Bridge Collapses

Collapsed bridges receive much of the public attention. Two persons were killed when a 2.7 m span timber bridge on Country Road E collapsed into Hikle Creek in Benton County, Iowa. Information provided on FHWA Damage Assessment Forms showed that one or more spans of at least eight separate federal aid route bridges collapsed. Complete loss of support to a span was considered as bridge collapse. Five of the eight bridge collapses were caused by the undermining of bridge abutments by scour or lateral bank migration (See Figure 3.16). One bridge collapse involved both undermining of piers and abutments by scour (See Figure 3.41 and 3.42). No bridges were reported to have a superstructure collapse caused by undermining of the piers alone; although, two central piers of the Kansas 96 relief bridge over the floodplain of Spring River in Cherokee County, Kansas, settled approximately 3 m without collapse of a span. One four span bridge supported by timber piles was pushed over by the hydrodynamic forces caused by debris accumulated on its timber piles (See Figure 3.2 and 3.3). The cost of all bridge collapses on federal aid routes contributed to approximately 25 percent of the bridge damage costs and 4 percent of the total damage cost for federal aid routes.

Over 155 bridges on the non-federal aid routes suffered major structural damage contributing to approximately 7 percent of the total disaster assistance provided by FEMA. Collapsed bridges

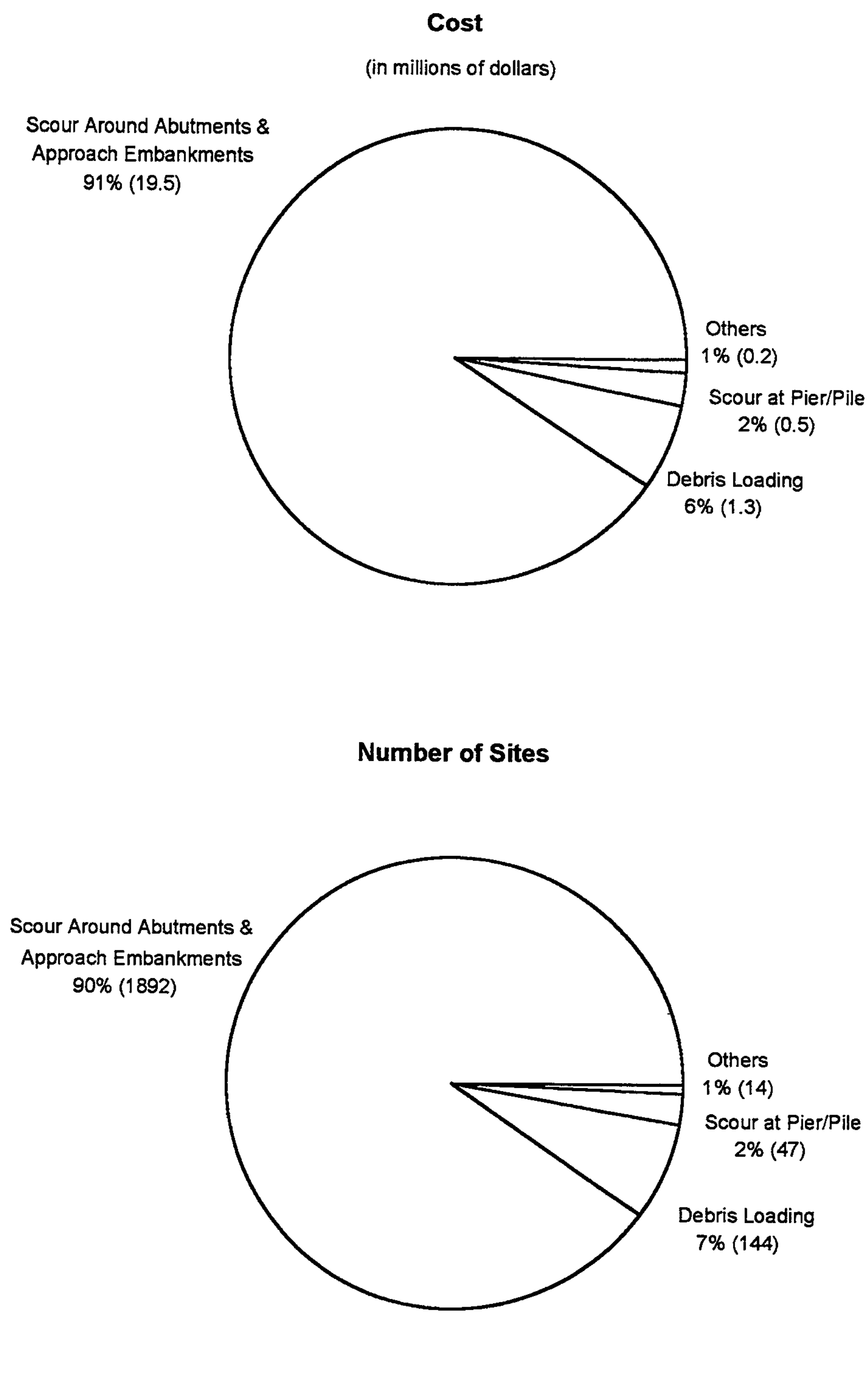


Figure 4.5. Causes of bridge damage on non federal aid highways.

on non-federal aid routes contributed to 2 percent of total damage assistance cost and 14 percent of bridge damage cost. At least 38 bridges had one or more collapsed spans. Scour around abutments was the major cause of structural damage and bridge collapse.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The effects of widespread flooding on the highway transportation infrastructure were investigated in this study to evaluate the overall damage to the infrastructure and specific causes of damage. Conclusions drawn from the results of the study are provided below in sections corresponding to highway infrastructure damage, debris loading on bridges, scour at bridges, and embankment breaches. Recommendations for practice and future research are provided in subsequent text with sections corresponding to the conclusions.

Conclusions

Impact of Extreme Flood Event on the Highway Transportation Network. The impact of an extreme flood event on a regional transportation network was illustrated in this study. Submergence of and damage to highway infrastructure interrupted and diverted traffic for long periods. Access to several large river bridges was prevented by the damage to overtopped highway embankments causing long detours.

The cost to repair the over 2,305 damage sites on federal aid highways was in excess of 158 million dollars. Over 100 million more dollars was requested by state and municipal transportation agencies to repair non-federal aid roadway and over 2,000 bridges. The widespread damage illustrates the importance of considering the function of the highway network during extreme events in the design of each component of that network.

Highway Infrastructure Damage. The most costly damage documented in this study was the destruction of roadways and embankments on wide floodplains such as those which cross the floodplains of the Missouri and Mississippi Rivers. Almost half of the damage sites and half of the total cost of damage to the federal aid system could be attributed to highway embankment and supported pavement damage.

Scour caused by flow around abutments was the primary cause of damage to both piers and abutments for bridges on the federal aid system. Piers were damaged solely by "local" scour caused by turbulent and vortical flow around those piers at only one site. Forces caused by debris accumulations on bridges appeared to have been primary causes of failure at two bridges on the federal aid system. Debris accumulation was listed as a factor contributing to distress (scour or debris loading) at 18 percent of the documented bridge damage sites. Bridge collapses occurred as a result of scour around abutments and piers. Scour around bridge abutments was the primary cause of bridge damage and collapse.

Scour around bridge abutments caused over 90 percent of the reported damage to bridges not in the federal aid system. Scour at piers was indicated as a minor cause of bridge damage on the non-federal aid system because many of the bridges are single-span bridges and because a high percentage of the multiple-span bridges have pile-bent piers. Forces caused by debris impact and accumulation were cited more frequently as causes of damage on the non-federal aid system bridges than on the federal aid system bridges.

Debris Loading on Bridges. Accumulations of buoyant debris composed principally of tree trunks and limbs exacerbated scour at bridges and created damaging loads on timber, steel and concrete pile bents. The following important circumstances were observed at post-flood investigation of two bridges where debris accumulations contributed to their collapse.

1. Debris elements spanned pile bents and accumulated on those bents blocking more than half of the waterway flow areas.

2. The waterways on which these collapses occurred were both small incised streams located near channelized stream sections.

3. The bridges were located in agricultural watersheds where trees were found mainly along the streambanks.

4. Severe scour, bank failure and local widening of the stream channels occurred where severely contracted flow impinged on the channel banks in the unblocked portion of the stream.

5. Tree trunks with lengths in excess of bridge spans supported the debris accumulations and formed the coarse matrix of the debris accumulations.

6. A surficial layer of fine debris formed on the upstream side of the accumulations and filled voids between the coarse debris matrix over a large "core" portion of the accumulations.

The primary forms of uncertainty associated with the estimation of forces on bridges under the above conditions were attributed to uncertainty in determining the flow rate on the ungaged watersheds, the extent of channel blockage, the area of unblocked waterway available for flow, and the changes in channel geometry from scour.

The two cases of bridge collapse studied in this investigation demonstrated that the entire stream flowfield at a bridge may be affected significantly by accumulated debris and that a simple force model based on "free-stream" drag is inadequate to portray the effects of the blockage. The hydrostatic effect caused by flow contraction was a principle factor generating force on the piers of the collapsed bridges. Flow was forced around the debris accumulation rather than under it because the debris extended from the water surface to the streambed at each of these sites. Debris accumulation on bridges over small streams affect the entire extent of the bridge opening flowfields.

The streambanks and bridge approach embankments confine flow around debris accumulations, causing the flow around debris accumulations to be much different from flow around obstacles under "free-stream" conditions. As a consequence, drag coefficients may be substantially different from those under "free-stream" conditions. The method to estimate drag and hydrostatic forces developed in the Project NCHRP No. 12-39 and used in this study incorporates the effects of flow contraction and confinement.

Bridges over small streams with piers located within the main channel cause conditions where severe blockage of the waterway by debris is possible. Under such conditions, bridges are susceptible to damage by scour and debris loading. At such sites, debris blockages in excess of 70 percent of the waterway cross-section are possible, with large water surface elevation increases upstream of the bridge, high velocity flow through the bridge opening, and damaging loads on piers. The high velocity flow created in the contracted flow around the accumulations can erode streambanks severely and undermine bridge abutments.

Although debris accumulations were found on several bridge piers, the bridges that were damaged by hydrodynamic forces transmitted from the debris to the bridge were those supported by pile bents. Concrete, timber, and steel pile bents all suffered damage and proved to be susceptible to damage by debris forces.

Scour at Bridges. The distribution of scour around abutments varies substantially with many factors, including the geometry of the main channel and floodplain, the distribution of floodplain flow, the floodplain soils and vegetation cover, and the bridge-and-embankment geometry and orientation. Variations in these factors lead to various modes of failure in abutment foundations and adjacent embankment slopes and in bridge approach roadways. Slope failure at abutments occurred primarily at spill-fill abutments where wedges of slope material were undermined and translated down slope into scour holes. The location and distribution of scour around abutments vary with many factors. However, this study clearly demonstrates that the location and distribution of scour are critical in determining the stability of spill slopes and the abutments supported by such slopes.

The distribution of scour around abutments also is critical in determining total scour depths at piers. Such piers may be located within scour holes produced primarily by scour caused by flows around the abutments rather than by local scour associated with flow around the piers.

To evaluate the stability of spill-fill slopes and the abutments located in or on such slopes, prediction of the scour distribution and of the consequent change in geometry (over steepening by toe removal) is necessary to perform a slope stability analysis. The lack of representation of the interaction between scour and slope instability, such as occurred in observed failures at spill-fill abutments, is a major inadequacy in current scour evaluation methodologies. Only a limited number of experimental model studies have been conducted in which slope failure has been modeled as a part of the scouring processes *(7, 8, 9, 15, 16)*.

In the abutment scour studies on which current design relations are based, spill-fill abutment embankments were modeled as solid and continuous; i.e., the embankment model extended down into the floodplain or channel alluvium beyond the final scour depth. Failure of the embankment slope was prevented. Failure of spill-fill slopes into scour holes may occur long before the scour depth reaches the "equilibrium" depth predicted by currently available equations. Support under the approach slab was removed as the embankment soil failed into a scour hole in a number of cases investigated in this study. In some instances, such failure caused a breach in the embankment and loss of the approach pavement. Abutments founded on piles of sufficient length to extend substantially below maximum scour depths frequently were not damaged by embankment slope failures because the granular materials composing the embankments failed in progressive but shallow slides; i.e., relatively thin surface layers of the granular embankment fill material could slide around the piles. Slope failures that occurred on both protected and unprotected embankments at spill-fill abutments drastically altered the scour pattern, the flow around the abutments and the final scour depth. Horizontal development of the scour features probably reduced the anticipated scour depth. Surficial failures of embankment slope material into scour holes were difficult to identify in preliminary inspections because they sometimes resembled the effects of surface erosion on the slopes.

Slope failures also influenced the scour pattern around vertical-wall abutments. Such failures appeared to be less influential on final scour depth because these failures tended to be localized and small until and unless the abutment foundation was undermined.

The interaction of large-scale flow vortices and flow concentrations caused by contraction is significant in cases of severe flow contraction. Use of contemporary methods in which the predicted effects of "contraction scour" are added to the anticipated "local scour" effects probably will lead to conservative evaluation of scour depths.

Many small bridges were submersed only partially during the 1993 Midwest floods. Where currents were blocked by railing systems on small bridges, the deflected currents flowed around the bridges causing high velocity flow over the approach embankments near the bridge abutments. Such complex situations of deflected and overflowing near-surface currents, in combination with complex flows under the bridge, caused damage at many bridges. Breaching of approach roadway embankments by flow around bridge railing systems and embankment slope failures caused by scour at the toe of the abutments were identified in this study at a number of sites.

The combined effects of flow contraction around bridge abutments and large-scale vortical motion of flow at abutments increase the possibility of levee breaches near bridges. Those flows can combine with the effects of levee breaches to cause severe flow concentration and deep and extensive scour. The combined contraction, vortex and breach effects are likely to produce scour holes that are deeper and larger than scour features developed at levee breaches away from bridges or features produced around abutments in the absence of a nearby levee breach. Levees and levee breaches also affected the distribution of flow approaching bridge embankments on floodplains and the distribution of flow in bridge contractions.

Lateral migration of the main stream channel was the primary cause of at least one major bridge failure. Scour caused by the combined effects of vortices at bridge abutments, contraction of floodplain flow and bend flow caused damage at many bridge sites. Gradual migration of bendways over time changes channel configurations significantly. Such changes may cause lateral movement of the main channel directly against an abutment or cause unfavorable approach channel alignment that exacerbates subsequent scour during major flood events.

Undermining of and damage to piers located remote from flow around abutments or where no debris had accumulated were reported at very few sites. The most frequent cause of pier damage was the combined effect of flow disruption and consequent scour caused by a nearby abutment.

The overall impact of debris on scour magnitude and distribution was difficult to determine. Debris accumulations were identified as the primary causes of scour damage at only a few sites although it was present at a large percentage of sites. Evidence of debris accumulations causing widening at bridge sites was found several months after the flooding. Deposition of sediment downstream from debris accumulations was verified widely after the flooding.

Embankment Breaches. Three types of embankments were described in this report: embankments on wide floodplains, culvert embankments, and bridge approach embankments. The section of embankments affected by the flow around bridge openings was considered as the approach embankments and part of the bridge. Deep scour holes formed in floodplain alluvium where wide floodplain embankments were breached. In addition, coarse-grained sediments scoured from the alluvium of floodplains covered wide areas of floodplain downstream from the breaches. Extensive deposition of coarse sands over fertile topsoil had adverse impacts on agricultural acreage downstream from embankment breaches and may have affected riparian habitat adversely. Persistent and large differences in elevation between the water surfaces on the upstream and downstream sides of wide floodplain embankments caused overtopping flows and/or breaching flows to form deep and extensive scour holes.

Deep and extensive scour holes such as those formed in levee and approach embankment breaches did not form at culvert embankment breaches. Several partial failures of embankments around culverts showed the important effects of seepage under and through the embankments when culvert capacity was insufficient to pass collected drainage or when a culvert was blocked by debris accumulation.

Recommendations

Highway Infrastructure. Damage during widespread flooding occurs to large portions of the highway infrastructure. Current guidelines for evaluating bridges for scour damage recommend that each bridge be evaluated for two conditions: 1) the flood flow that creates the most severe scour

conditions with a return period of 100 years or less and 2) the "superflood" conditions that give the most severe scour for the floods with recurrence intervals between 100 years and 500 years. These design criteria were developed for evaluation of individual bridges and do not account for the importance of each bridge to the normal function of the transportation network or the critical or essential function of the bridge during an extreme event. The widespread damage to the transportation network noted in the Midwest in 1993 illustrates the importance of considering the function of the entire network in selecting the design conditions for individual components of the network. A design and evaluation methodology that integrates the importance of individual components to the function of the transportation network and social/economic risk associated with failure of those components is not available and should be developed.

Effects of Debris on Bridges. A methodology for predicting the size and extent of debris accumulations at small bridges is necessary in design for the computation of increases in upstream water surface elevations. More data on hydraulic conditions around debris accumulations are needed to provide information necessary to estimate potential scour around bridge foundations and for the application of debris force determination methods.

At bridges where trees with lengths in excess of the span between piers can be transported to the bridge, severe blockage of bridge openings should be considered for the prediction of the potentially damaging debris loads and scour. A methodology for predicting the quantity and characteristics of debris that potentially can be transported to a bridge during flood events is needed to determine the potential for debris blockage. Supply and transport of woody debris and the potential for severe channel blockage should be considered in design of bridges located on streams where bank erosion is prevalent (e.g., streams with high rates of meander migration, channel widening and channel shift).

A debris load prediction methodology that incorporates the effects of flow contraction and channel flow confinement on hydrodynamic forces is recommended for prediction of debris loads in streams where the debris blocks large portions of the flow area.

Scour at Bridges. Consideration should be given to slope failure effects on vertical-wall and spill-fill abutments supported on piles where allowing the approach roadway and embankment to fail into the scour area may be an acceptable way to increase the flow capacity during large infrequent flow events. This technique may be acceptable at locations where such failures would cause no risk to bridge users or would have limited effect on the transportation network.

Very complex interactions of "contraction scour" and "local scour" appeared to have occurred frequently at small bridges. Partial and complete submergence of small bridges was also common and adds to the complexity of "contraction" and "local" scour. Superposition of computed scour depths for different components of scour for these complex conditions is likely to produce non-representative scour depths. The specific conditions of small bridges merit additional research to reduce the uncertainty associated with scour prediction under these complex flow conditions.

Scour around abutments not only endangered bridges but it also caused redistribution of sediment downstream of bridge sites. Large volumes of coarse sediment were transported to and deposited on surficial fine-grained soils on floodplains downstream from bridges. Such redistribution of coarse sediment had adverse effects on agricultural productivity of the affected acreage. Further investigation is needed to evaluate the effects on riparian habitats downstream from bridges where floodplains are blanketed with thick accumulations of coarse sediments.

Levees in the vicinities of bridges should be examined carefully to determine their effects on flow during floods and in the event that flood waters cause breaching of the levees. Increasing the elevation of levees around bridge abutments or lowering levee elevation at remote areas to ensure a levee breach away from the bridge embankment would reduce the risk of bridge damage and the risk of adverse effects caused by floodplain deposition of coarse material transported by abutment scour and embankment breach effects. Design of levees and bridges should include analysis of how levees and levee breaches could affect flow around bridges. Consideration should be given to developing "weak" zones that will produce planned breaches in the levee systems and thereby cause minimum damage to nearby bridges and surrounding protected land.

Consideration should be given to the problem of detecting and evaluating gradual channel shift and alignment changes of streams over time. These changes impact the susceptibility of abutments and piers to scour.

Consideration of the velocity field (magnitude and direction) around piers in the context of the variation of flow around abutment embankments and the distribution of scour around abutments is critical in the evaluation and design of bridge pier foundations. Consideration should be given to the use of cylindrical piers where abutment flow and abutment scour may influence the scour around piers; the local scour produced by vortices at cylindrical piers is independent of the impinging flow direction. However, the most important aspect of this situation is recognition of the possible effects of the two-dimensional distribution of scour caused by the abutment embankment. The need for deep foundations at piers on floodplains has been associated with the potential for migration of the main channel. Deep pier foundations on floodplains also should be considered for protection against scour caused by the complex flow around bridge approach embankments during extreme flood events. This problem highlights the need for reliable scour distribution prediction methodology. Research that provides information about the distribution of scour and flow around abutment embankments is necessary to develop this methodology.

The effect of debris accumulations on scour at piers must be evaluated during flood events so that the resultant scour features can be measured at their maximum depths and extents. Future field efforts should be aimed at determining the extent of debris accumulations and their effects on scour during flood events.

Embankment Breaches. Use of larger bridge openings and relief bridges may reduce the differences in water surface elevation that drive the scouring of approach embankments by

overtopping and breaching flows. In addition, the planned breaching of downstream levee systems may raise downstream water surface elevations and reduce the elevation differences that drive overtopping erosion and scour hole development within breaches. Approach embankments may be raised to prevent overtopping after the difference in water surface elevations is reduced. If the water surface elevation is large at an approach embankment, raising the elevation of the embankment may prevent overtopping but could lead to dangerous underseepage as well as more detrimental flow conditions at the bridge abutment end of the embankment. Consideration should be given to providing a section of embankment that would fail in a controlled breach. The floodplain area where the breach is planned should be protected so that a large scour hole does not form and the resulting transport of coarse sediments does not occur in the breach area.

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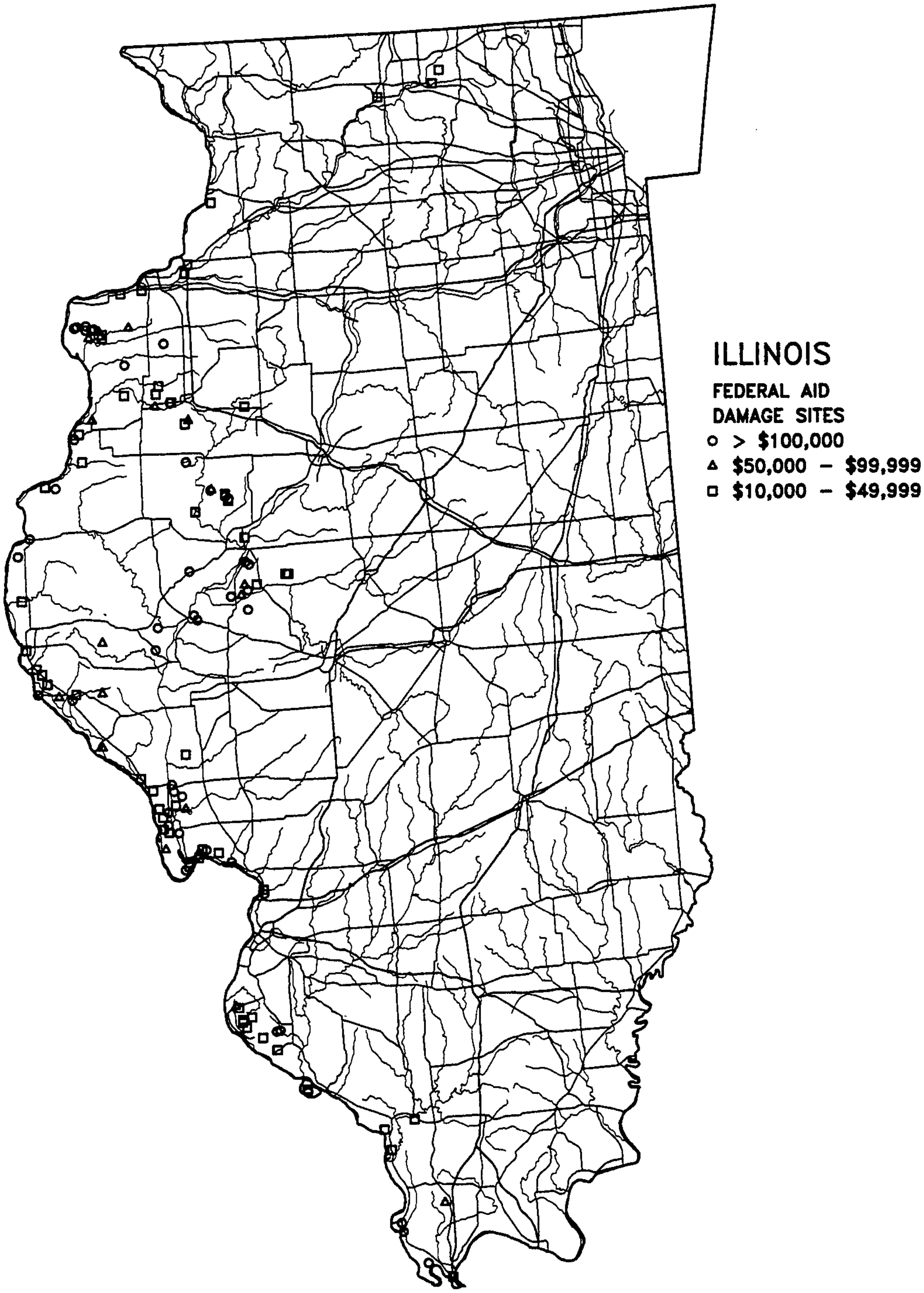
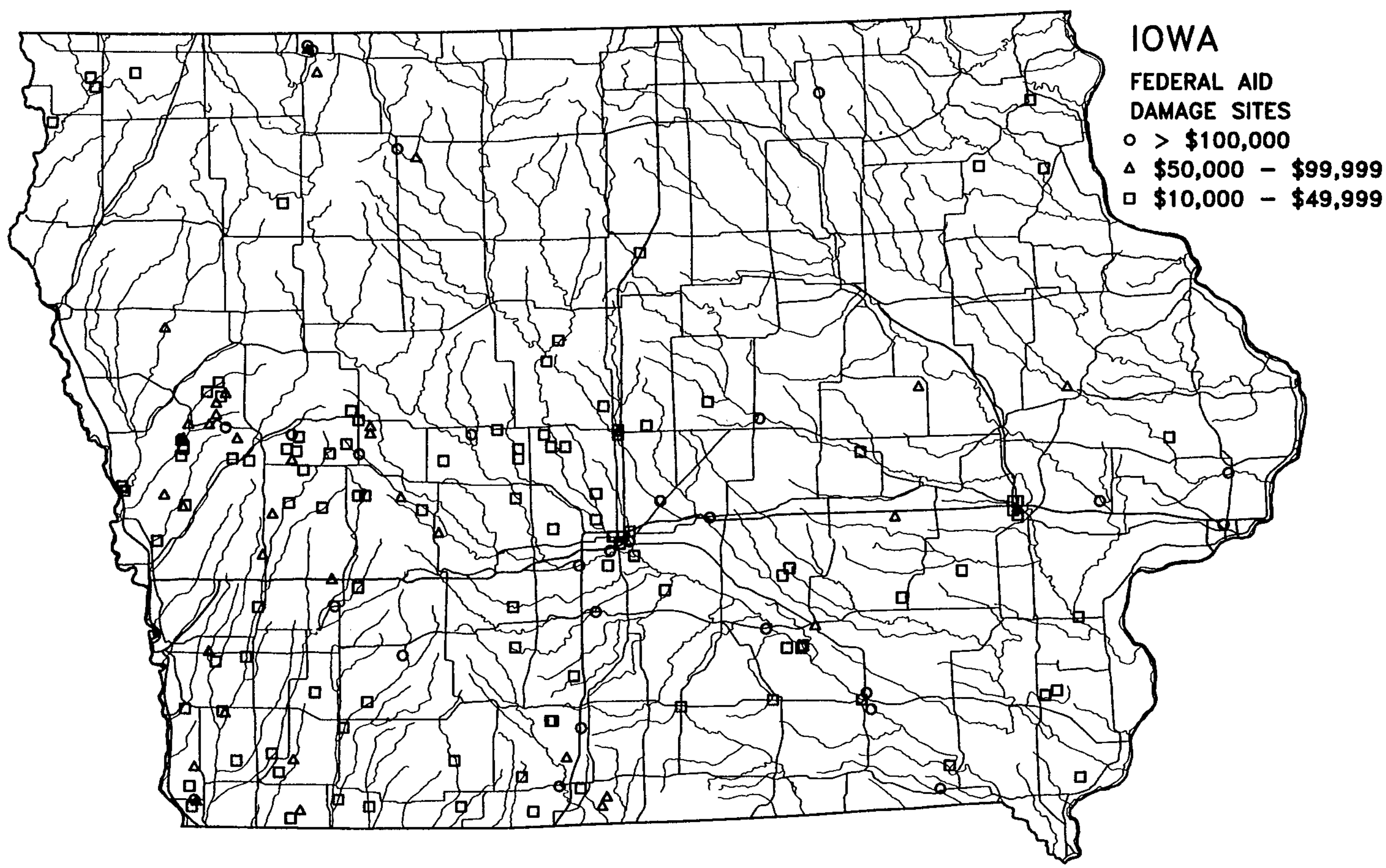
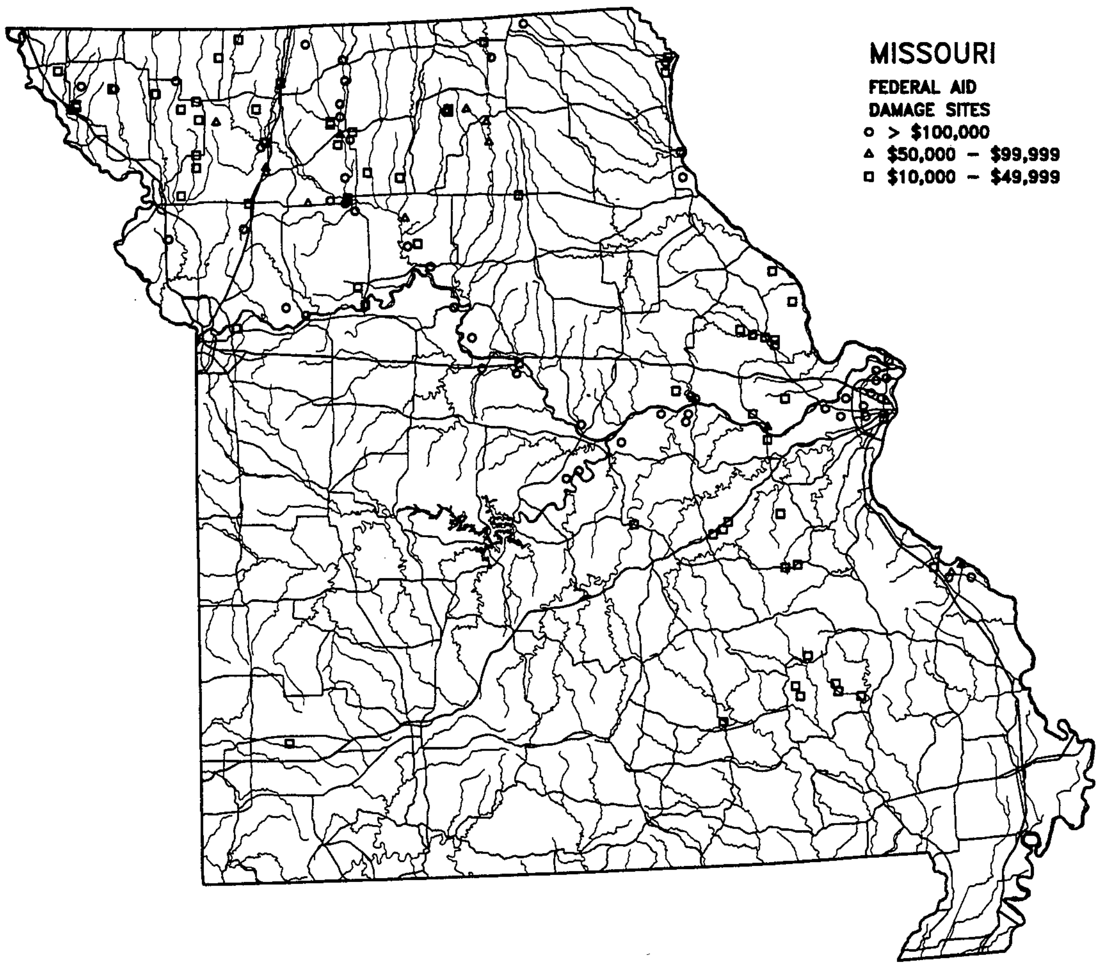
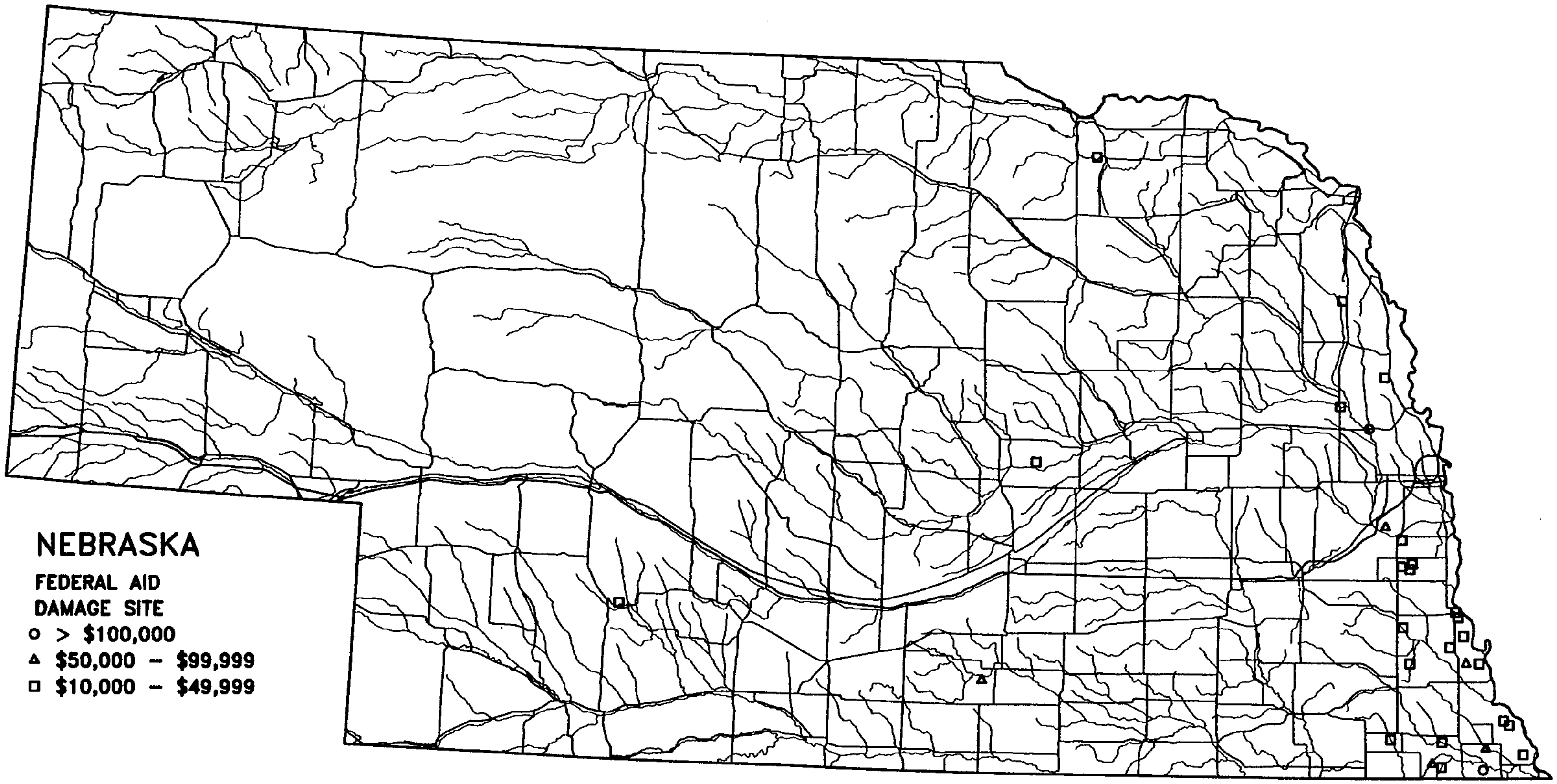
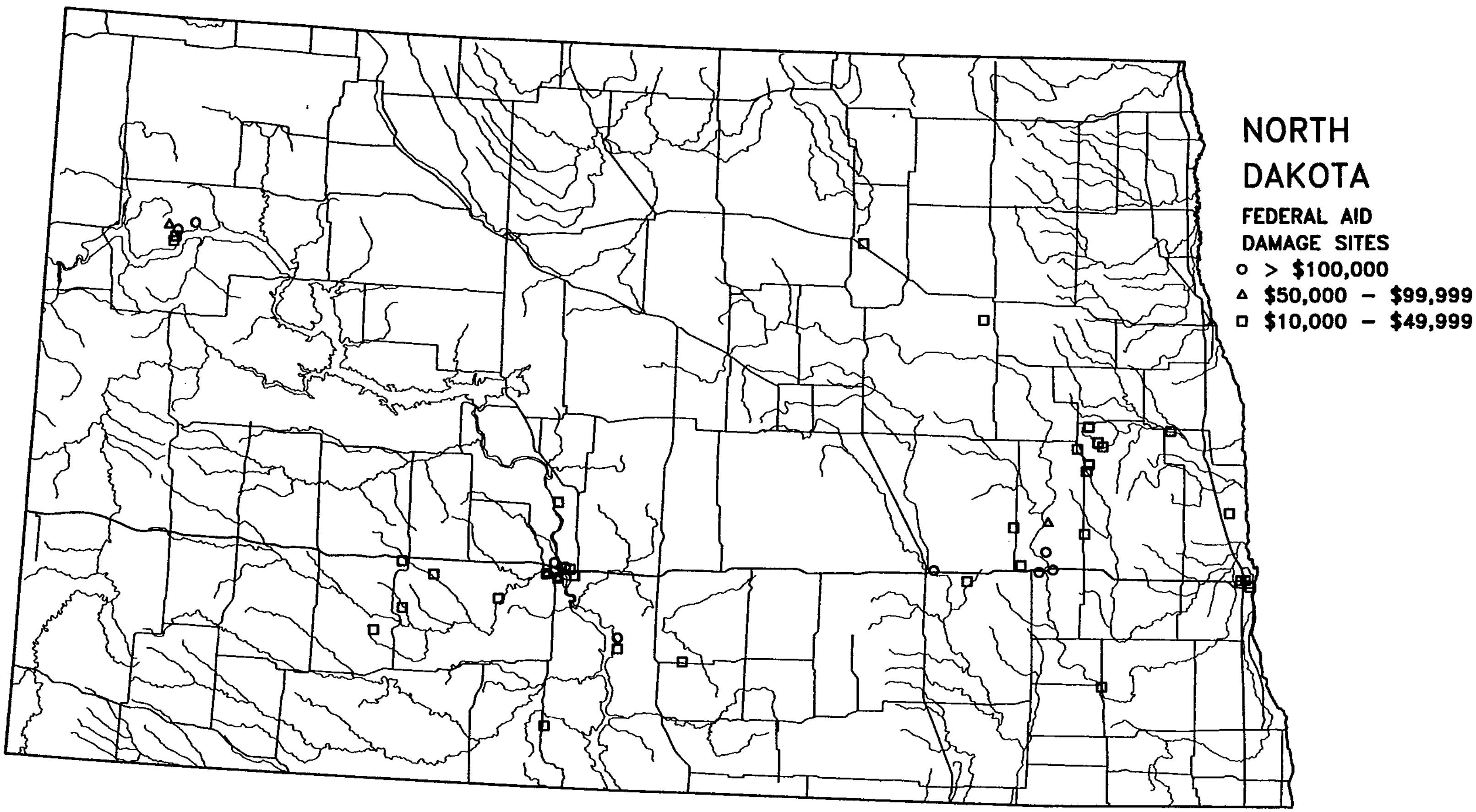
APPENDIX A
GEOGRAPHIC INFORMATION SYSTEM MAPS: SITES WITH DAMAGE IN EXCESS OF $10,000

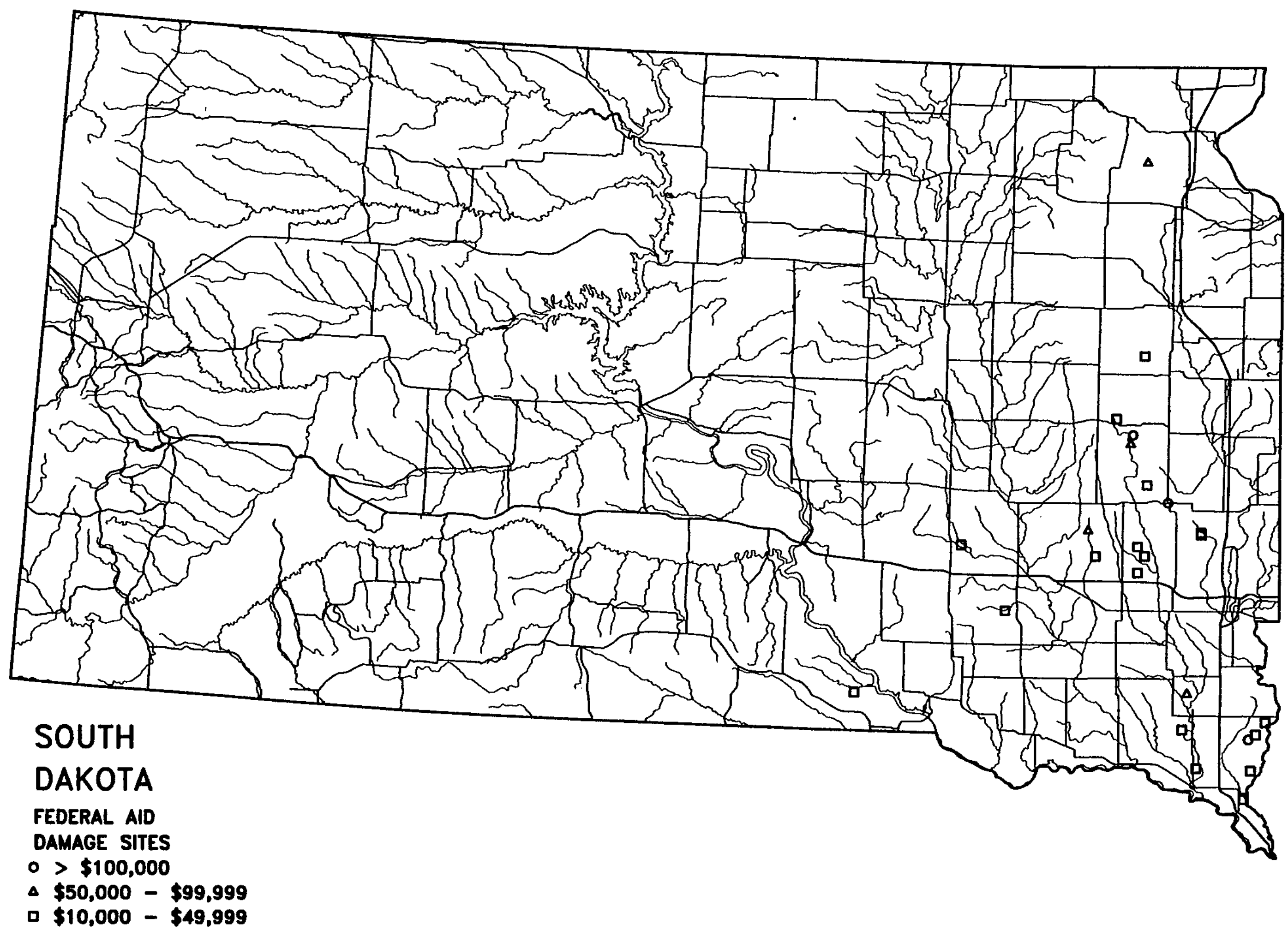

ILLINOIS
FEDERAL AID
DAMAGE SITES
○ > $100,000
△ $50,000 – $99,999
□ $10,000 – $49,999


IOWA
FEDERAL AID
DAMAGE SITES
○ > $100,000
△ $50,000 – $99,999
□ $10,000 – $49,999


MISSOURI
FEDERAL AID
DAMAGE SITES
o > $100,000
△ $50,000 – $99,999
□ $10,000 – $49,999


NEBRASKA
FEDERAL AID
DAMAGE SITE
○ > $100,000
△ $50,000 – $99,999
□ $10,000 – $49,999


NORTH
DAKOTA
FEDERAL AID
DAMAGE SITES
○ > $100,000
△ $50,000 – $99,999
□ $10,000 – $49,999


SOUTH
DAKOTA
FEDERAL AID
DAMAGE SITES
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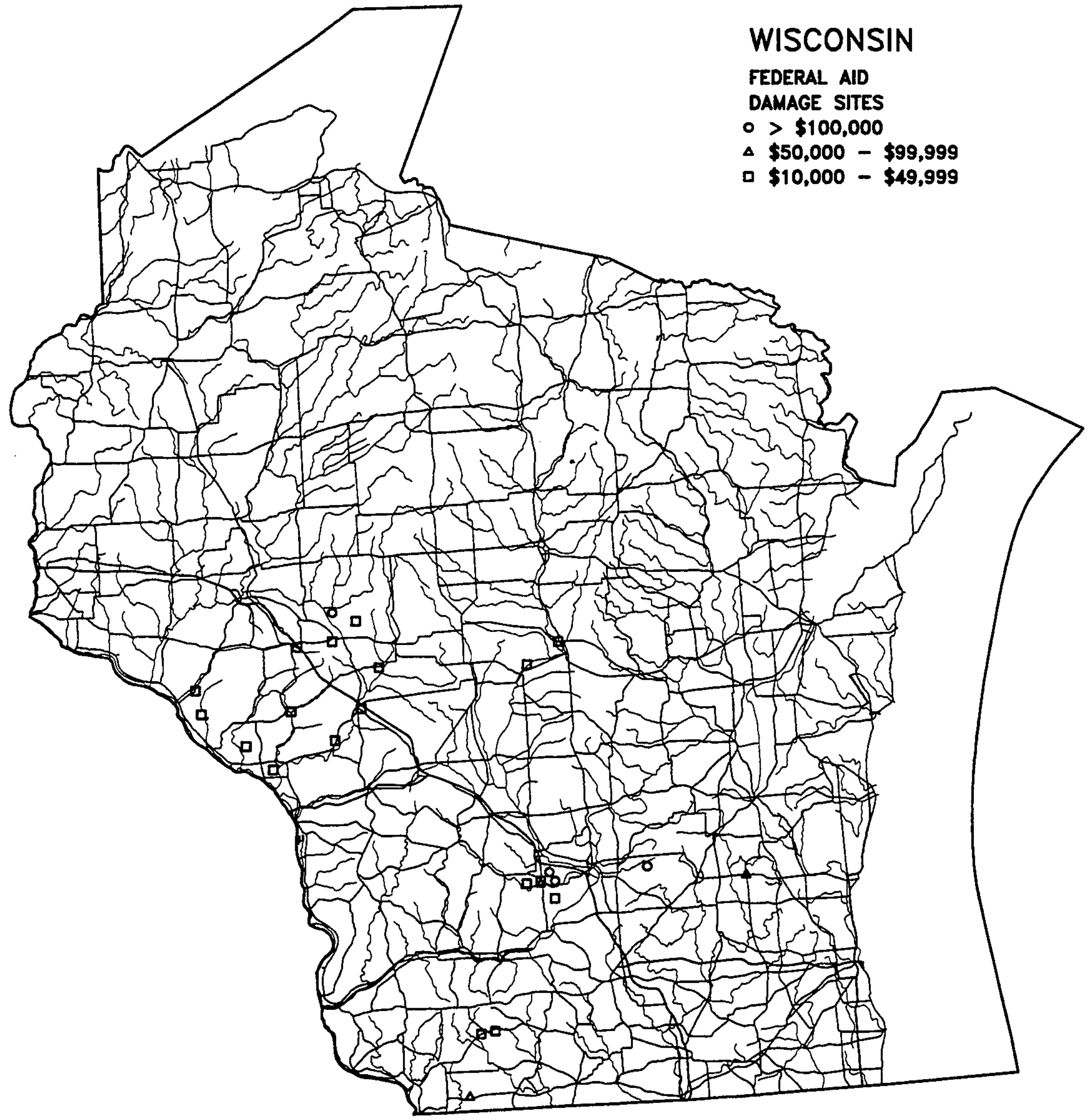
□ $10,000 – $49,999


WISCONSIN
FEDERAL AID
DAMAGE SITES
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APPENDIX B
SUMMARY OF HYDRODYNAMIC FORCE COMPUTATIONS

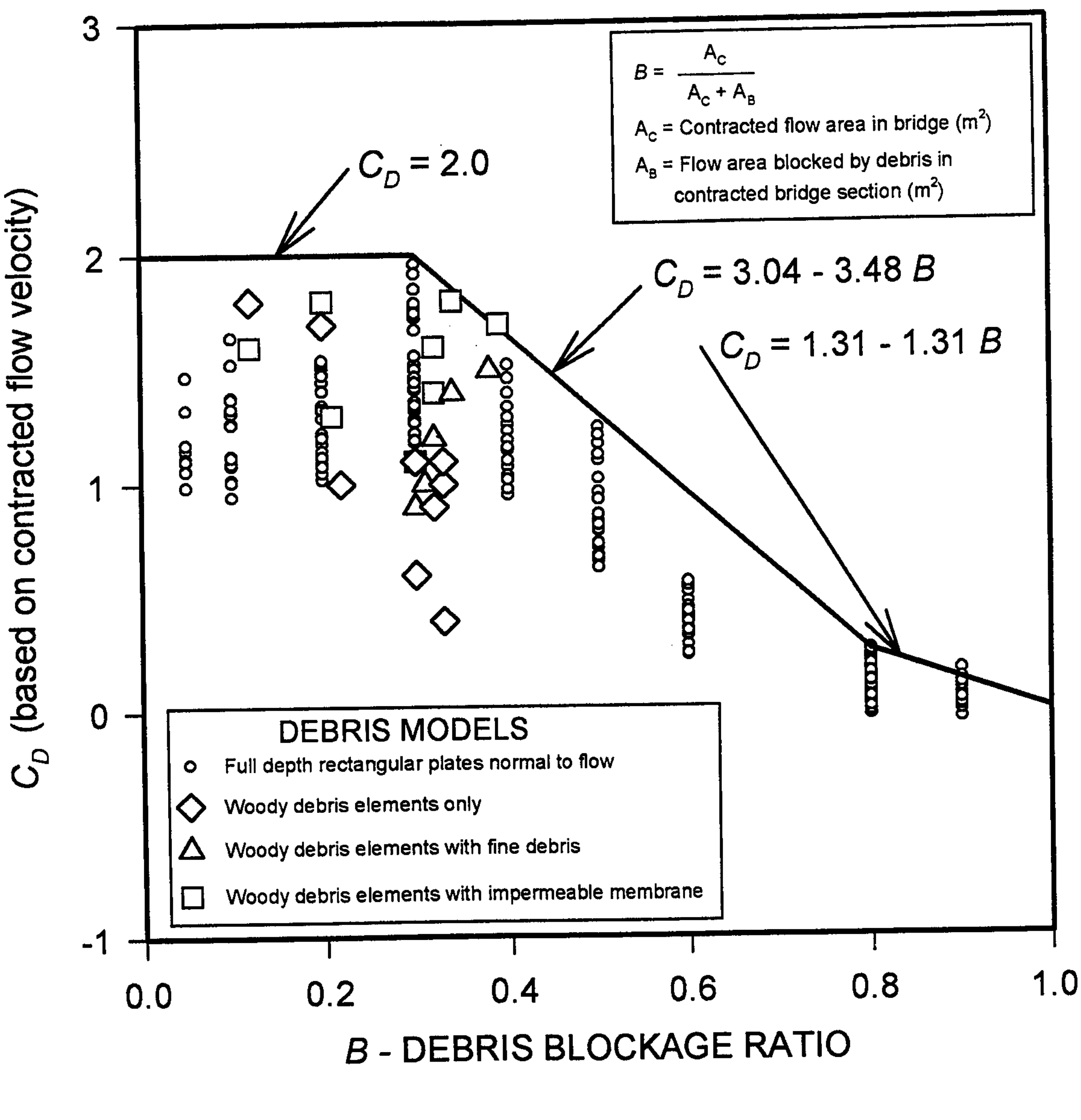

Figure B.1. Variation in drag coefficient for debris on piers (Parola, et al., NCHRP Project 12-39 unpublished interim findings, 1996).

Table B1. Hydrodynamic Force on Debris Accumulation
Missouri 113 over Florida Creek
Flow Rate 100 m^3/s and Large Debris Accumulation

Item No.	Debris Segment Number	0	1	2	3	4	5	6	7	8	9
1	WSE Upstream (m)	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23
2	WSE Downstream (m)	6.32	6.32	6.32	6.32	6.32	6.32	6.32	6.32	6.32	6.32
3	Bottom Elevation of Segment (m)	1.96	1.12	1.12	1.12	1.13	1.13	1.13	1.13	2.92	3.10
4	Edge of Segment, X (m)	13.9	15.3	16.2	22.8	28.4	33.7	34.1	34.7	35.9	36.2
5	Δ WSE (m)	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
6	Δ X (m)	---	1.4	0.8	6.6	5.6	5.3	0.4	0.7	1.2	0.3
7	A_{h1} (m^2)	---	1.3	0.8	6.0	5.1	4.8	0.3	0.6	1.0	0.3
8	A_{h2} (m^2)	---	6.8	4.3	34.4	29.3	27.5	1.9	3.4	4.9	1.1
9	h_c (m) for A_{h1}	---	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
10	F_{h1} (kN)	---	6	3	27	23	21	1	3	5	1
11	F_{h2} (kN)	---	60	38	306	261	245	17	30	44	10
12	$F_{h1} + F_{h2}$ (kN)	---	66	42	333	284	267	18	33	49	11
13	V_c (m/s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
14	A_D (m^2)	---	8	5	40	34	32	2	4	6	1
15	C_D from Figure B.1 and (23) below	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
16	F_D (kN)	---	12	8	61	52	49	3	6	9	2
17	Total Segment Force (kN)	---	**78**	**49**	**394**	**336**	**315**	**21**	**39**	**58**	**14**
18	X of Segment Resultant Force (m)		**14.6**	**15.7**	**19.5**	**25.6**	**31.1**	**33.9**	**34.4**	**35.3**	**36.0**
19	Elevation of Segment Resultant Force (m)		**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.8**	**5.0**

	Flow Condition Through Bridge			**Total Force On Debris Accumulation**	
20	Flow Rate (m^3/s)	100	24	Total Hydrostatic Force (kN)	1102
21	Total Flow Area in Contraction (m^2)	37	25	Total Drag Force (kN)	201
22	Total Blocked Area (m^2)	114	26	Total Hydrodynamic Force (kN)	1304
23	Percentage Blockage, (B x 100%)	75%	27	Hydrostatic Force Contribution	85%

APPENDIX C
HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

COLUMN NUMBER	COLUMN NAME	CODES	DESCRIPTION
1	**D.A.F.**	**#**	**Damage assessment form number**
2	**STATE**		**State of applicant**
3	**STRUCTURE ID.**	**#**	**Structure identification number**
4	**APPLICANT**		**The government responsible for the road**
		CO	County
		CY	City
		S	State
5	**COUNTY**		**Damage site county**
6	**A.R.**	**#**	**Applicant route number**
7	**MILE POST**	**#**	**Mile post number or adjacent routes**
8	**F.A.S.**	**#**	**Federal aided system number**
9	**STREAM**		**Stream or river in which the damage site lies**
10	**COST TYPE**		**Emergency relief funding**
		D	Damage to highway infrastructure
		M	Maintenance of highway infrastructure
		T	Temporary measures
11	**COST**	**$**	**Estimated amount of emergency relief**
12	**ROADWAY OVERTOPPING**		**Roadway inundation condition**

HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

COLUMN NUMBER	COLUMN NAME	CODES					DESCRIPTION
		NO					Water did not overtop the roadway
		YES					Water overtopped the roadway
13	**APPROPRIATION/CAUSE**						**Primary cause of damage/maintenance**
		DL					Debris loading
		L					Levee breach
		RO					Roadway overtopping
		S					Soil saturation slides
		SC					Scour or erosion
		SU					Submergence of structure
		W					Wind forces
		DRC					Debris removal from channel
		DRR					Debris removal from roadway
		DRS					Sediment deposit removal
		DT					Detouring the roadway
		G					Roadway grade change
		P					Pumping of water
		EM					Emergency measures
		O					Other maintenance/ temporary restoration
14	**STRUCTURE/FACILITY TYPE**						**Description**
	Bridge	**B**					Bridge
	Bridges (Super structure type)		**C**				Concrete
	Bridges (Super structure type)		**M**				Masonary
	Bridges (Super structure type)		**S**				Steel
	Bridges (Super structure type)		**T**				Timber
	Bridges (Pile/Pier type)			**A**			Arch
	Bridges (Pile/Pier type)			**P**			Concrete pier

HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

COLUMN NUMBER	COLUMN NAME	CODES					DESCRIPTION
	Bridges (Pile/Pier type)			C			Concrete pile bent
	Bridges (Pile/Pier type)			S			Steel pile bent
	Bridges (Pile/Pier type)			T			Timber pile bent
	Bridges (Pile/Pier type)			N			Not applicable for single span bridges
	Bridges (Foundation type)				F		Spread footing type
	Bridges (Foundation type)				C		Concrete pile
	Bridges (Foundation type)				S		Steel pile
	Bridges (Foundation type)				T		Timber pile
	Embankments	E					Embankment
	Embankment (Location type)		A				Approach embankment for bridges
	Embankment (Location type)		C				Located with a culvert for water passage
	Embankment (Location type)		F				Located on a flood plain
	Embankment (Location type)		N				Culvert does not exist
	Embankment (Pavement type)			B			Bituminous
	Embankment (Pavement type)			C			Concrete
	Embankment (Pavement type)			G			Gravel
	Embankment (Culvert shape type)				B		Box culvert
	Embankment (Culvert shape type)				C		Circular culvert
	Embankment (Culvert shape type)				A		Arch culvert
	Embankment (Culvert material type)					C	Concrete
	Embankment (Culvert material type)					M	Corrugated metal type
	Pavement Type	P					Road without embankment
			C				Concrete pavement
			B				Bituminous pavement
			G				Gravel pavement
	Levees	L					Levees
	Slopes	S					Type of slope
			C				Cut slope
			F				Fill slope

HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

COLUMN NUMBER	COLUMN NAME	CODES					DESCRIPTION
	Others	**O**					Other kind of structures
	Utilities	**U**					Rest areas, highway signs etc.
15	**SPANS/NUMBER OF BARRELS**						**Number of spans or barrels of the structure**
	Bridge Spans	**M**					Multiple span bridge
		S					Single span bridge
	Culvert (Barrels)	**#**					Number of barrels provided in the culvert
16	**CULVERT WIDTH/DIAMETER (m)**	**#**					**Width (meters)**
17	**CULVERT HEIGHT (m)**	**#**					**Height (meters)**
18	**DEBRIS LOCATION & TYPE**						**Location & type of debris accumulation**
		C					Woody debris in channel
		P					Debris accumulated on pier
		R					Debris on road
		N					No debris
19	**MODES OF DAMAGE**						**Damage Mechanism**
	Debris load	**D**					Debris loading
			F				Foundation overturning
			P				Pile bent buckling
			M				Minor structural damage
			S				Super structure, support shear
			U				Debris load, undefined damage mode
	Scour	**S**					Scour damages
			A				Around abutment
			B				At pile bent
			I				Culvert inlet

HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

COLUMN NUMBER	COLUMN NAME	CODES					DESCRIPTION
			O				Culvert outlet
			E				Approach embankment
			M				Lateral bank migration
			P				At pier
			U				Scour type unknown
				L			Long embankment
				S			Short embankment
				A			Abutment scour overlapped with pier
				U			Scour type undefined
	Overtopping	O					Overtopping damage
			C				Culvert damage
			E				Embankment damage
			P				Pavement damage
			S				Shoulder damage
				C			Culvert damage
				P			Pavement damage
	Slope damage	F					Slope damages
			C				Cut slope damage
			F				Fill slope damage
	Electrical	Q					Electrical damage
	Levee damage	B					Levee breach
		H					Pavement detoriation due to hauling of heavy loads
	Others	K					Other damages
20	**TRAFFIC EFFECTS**						**Effect on traffic movement**
		L					Long term closure
		S					Short term closure
		T					Temporary closure
		N					No closure

HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION KEY

COLUMN NUMBER	COLUMN NAME	CODES	DESCRIPTION
21	**DAMAGE CLASSIFICATION**		**Damage magnitude**
		F	Failure or collapse of structure
		I	Minor structural damage
		M	Major structural damage
		N	No damage to the structure
	NOTE:	**(--)**	Not applicable
		#	Number
		Z	Information not available
		VAR	Cases where sites were lumped into one data item
		2	In cases with 'SAS2' means both abutments

APPENDIX D
HIGHWAY INFRASTRUCTURE DAMAGE CLASSIFICATION

Illinois

Highway Infrastructure Damage Classification

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
D.A.F. #	STATE	STRUCTURE ID.#	APPLICANT	COUNTY	A.R. #	MILE POST #	F.A.S. #	STREAM	COST TYPE	COST $	ROADWAY OVER-TOPPING	APPROP-RIATION CAUSE	STRUCTURE/ FACILITY TYPE	SPANS/ NUMBER of BARRELS	CULVERT WIDTH/DIA-METER (m)	CULVERT HEIGHT (m)	DEBRIS LOCATION & TYPE	FAILURE MODES	TRAFFIC EFFECTS	DAMAGE CLASSIF-ICATION
1	IL	Z	S	Jersey	IL-16 & IL-100		304	Illinois R.	T	699144	YES	L	EAB	Z	--	--	N	OP	S	I
2	IL		S	Greene	IL-16 & IL-100		304	Illinois R.	T	13339	YES	DT	EFB	--	--	--	N	K	S	I
3	IL		S	Greene	IL-108		761		T	287555	YES	DT	EFB	--	--	--	N	K	S	I
4	IL	031-0001	S	Calhoun	IL-100		304	Illinois R.	M	4725	NO	O	BZZZ	Z	--	--	N	Q	N	I
5	IL		S	Calhoun	IL-100 & IL-16		304	Illinois R.	M	157799	NO	DT	EFB	--	--	--	N	K	S	I
6	IL		S	Calhoun	2		769		T	37886	NO	G	EFB	--	--	--	N	K	S	I
7	IL		S	Calhoun	1		754		T	46545	NO	G	EFB	--	--	--	N	K	S	I
8	IL		S	Jersey	IL-100 & IL-3		304		T	125895	NO	DT	EFB	--	--	--	N	K	S	I
9	IL		S	Jersey	IL-100 & IL-3		304		T	30537	NO	DT	EFB	--	--	--	N	K	S	I
10	IL		S	Jersey	TR 98A		304		T	51377	NO	DT	EZB	--	--	--	N	K	S	I
11	IL		S	Jersey	23		1752		T	12009	NO	DT	PB	--	--	--	N	K	S	I
12	IL		CO	Boone	4		37		D	13087	Z	SC	ECCBC	1	1.83	1.83	N	SO	N	I
13	IL	004-3001	CO	Boone	11		31	Piscasaw Cr.	D	15215	NO	SC	EAB	M	--	--	N	SE	N	I
14	IL		CO	Carroll	Benson Rd.		77		D	6259	YES	RO	ENB	--	--	--	N	OEP	N	I
15	IL	008-3808	CO	Carroll			2077		D	7898	YES	RO	BZZZ	S	--	--	N	SAS2	N	I
16	IL		S	Fulton	C		452		D	16215	YES	RO	ENB	--	--	--	N	OP	T	I
17	IL	029301	S	Fulton	27		1384		D	9218	NO	SC	EAB	Z	--	--	N	SE	N	I
18	IL		S	Fulton	US-24	45+10 to 63	317	Spoon R.	D	19305	YES	RO	EFB	--	--	--	R	OEP	N	I
19	IL		S	Fulton	US-24	339 & 336	317	Sugar Cr.	D	8888	NO	S	SC	--	--	--	N	FC	N	I
20	IL		S	Fulton	US-24	245-246+50	317		D	323376	NO	S	SF	--	--	--	N	FF	L	F
21	IL		S	Fulton	IL-97	481-485	622	Putt Cr.	D	210538	NO	S	SF	--	--	--	N	FF	L	F
22	IL		S	Fulton	IL-97		628		M	3810	NO	O	O	--	--	--	N	K	N	I
23	IL		S	Fulton	IL-9		685	Spoon R.	D	375000	NO	S	SC	--	--	--	N	FC	L	F
24	IL		S	Fulton	IL-9	105 to 177	685	Spoon R.	D	86107	YES	RO	EFB	--	--	--	N	OEP	S	M
25	IL		S	Fulton	IL-41		574	Cedar Cr.	D	4148	YES	RO	ENB	--	--	--	N	OS	N	I
26	IL		S	Henderson	Carman Rd.	167 - 239	522	Ellison Cr.	D	7299	YES	RO	EFB	--	--	--	N	OS	S	I
27	IL		S	Henderson	US-34		313		T	161000	NO	P	O	--	--	--	N	K	T	N
28	IL	1A	S	Henderson	US-34		313	Mississippi R.	T	35896	NO	EM	BZZZ	--	--	--	N	K	N	N
29	IL		S	Henderson	IL-164		657	Henederson Cr.	D	77213	YES	SC	EFB	--	--	--	N	OS	T	I
30	IL		S	Henderson	4		1423		D	13720	YES	RO	ENB	--	--	--	N	OEP	T	I
31	IL		S	Henderson	1		1422		D	11066	Z	SC	ECBBC	1	2.74	2.74	N	Z	N	I
32	IL		CO	JoDaviess			1067		D	7868	YES	SC	ECGCM	3	Z	--	N	OEC	N	I
33	IL		S	Knox	26		399		D	65205	Z	S	SF	--	--	--	N	FF	S	M
34	IL		S	Knox	7		399		D	23000	YES	RO	EFB	--	--	--	N	OEP	T	I
35	IL		S	Knox	US-150		--	Pennington Cr.	D	9110	NO	S	SF	--	--	--	N	FF	N	I
36	IL		S	Knox	IL-41		574		M	4329	YES	DRR	EZB	--	--	--	R	OP	T	I
37	IL		S	Knox	IL-41		574		D	11194	YES	SC	EZB	--	--	--	N	OS	T	I
38	IL		S	Knox	IL116		665		D	7146	YES	SC	EZB	--	--	--	N	OS	T	I
39	IL		S	Knox	IL-180		--		D	10185	YES	SC	EZB	--	--	--	N	OS	T	I
40	IL		S	Mercer	14		209		D	136549	YES	SC	ECBZZ	Z	Z	--	R	OEC	S	M
41	IL	066-3152	S	Mercer	14		209		D	24312	YES	RO	EAB	Z	--	--	N	SE	T	I
42	IL	066-3155	S	Mercer	14		209		D	14717	YES	RO	ECBCM	1	1.07	--	N	OEC	T	I
43	IL		S	Mercer	14		209		D	65654	YES	RO	ECBZZ	Z	Z	--	C	OEC	S	M
44	IL		S	Mercer			211		D	629784	YES	RO	EZZ	--	--	--	N	OE	L	F
45	IL	066-3150	S	Mercer	8		211		D	29534	NO	SC	BZZZ	Z	--	--	C	SM	N	M
46	IL		S	Mercer	8		211		D	196723	YES	RO	EZG	--	--	--	C	OEP	S	F
47	IL		S	Mercer	10		1210		D	61351	YES	RO	EFG	--	--	--	C	OEP	S	M

Illinois

Highway Infrastructure Damage Classification

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
D.A.F.	STATE	STRUCTURE	APPLICANT	COUNTY	A.R.	MILE POST	F.A.S.	STREAM	COST	COST	ROADWAY	APPROP-	STRUCTURE/	SPANS/	CULVERT	CULVERT	DEBRIS	FAILURE	TRAFFIC	DAMAGE
#		ID.#			#	#	#		TYPE	$	OVER-	RIATION	FACILITY	NUMBER	WIDTH/DIA-	HEIGHT	LOCATION	MODES	EFFECTS	CLASSIF-
											TOPPING	CAUSE	TYPE	of BARRELS	METER (m)	(m)	& TYPE			ICATION
48	IL		S	Mercer	10		1210		M	13864	NO	O	ECBBC	1	1.22	2.44	N	K	N	I
49	IL		S	Mercer	9		212		D	210641	YES	RO	ECGBC	1	0.91	3.05	R	OEC	S	F
50	IL		S	Mercer	13		214		D	157777	YES	RO	ECGCM	Z	Z	–	C	OEC	S	F
51	IL	066-3144	S	Mercer	13		214		D	145917	YES	RO	EAB	Z	–	–	R	SE	S	M
52	IL		S	Mercer	22		222		D	4204	YES	RO	ENG	–	–	–	N	OS	N	I
53	IL		S	Mercer	3		1216		D	117550	YES	RO	ENG	–	–	–	N	OP	S	M
54	IL	066-3012	S	Mercer	12		1405		D	156591	NO	SC	EAB	Z	–	–	N	SE	S	M
55	IL		S	Mercer	3		1216		D	57675	YES	RO	EZG	–	–	–	N	OEP	S	M
56	IL	066-3040	S	Mercer	13		214		D	54050	NO	SC	BCZZ	Z	–	–	P	SAS2	N	M
57	IL		S	Mercer	13		214		D	39896	YES	RO	EZG	–	–	–	C	OEP	T	M
58	IL		S	Mercer	6		217		D	130410	YES	RO	EZG	–	–	–	N	OEP	S	M
59	IL	066-6006	S	Mercer			1210		D	70909	NO	SC	O	–	–	–	N	SAS	N	M
60	IL		S	Mercer			206		D	6084	NO	SC	ECZZZ	1	Z	–	N	OC	N	I
61	IL		S	Peoria	IL-29		64		M	3639	YES	DRR	EFB	–	–	–	R	K	T	N
62	IL		S	Peoria			6659	Kickapoo Cr.	D	8873	YES	RO	EZB	–	–	–	N	OP	T	I
63	IL		S	Peoria	IL-8		–		M	11419	NO	DRR	EZB	–	–	–	R	K	T	N
64	IL		S	Peoria	US-24		317		D	9616	NO	S	SC	–	–	–	N	FC	N	I
65	IL		CO	Rock Island	4		2204		D	49659	YES	RO	EFB	–	–	–	N	OEP	S	M
66	IL		CO	Rock Island	9				D	41062	NO	S	SF	–	–	–	N	FF	S	M
67	IL		S	Rock Island	IL-192		599		T	20571	NO	G	ENB	–	–	–	N	K	T	N
68	IL		S	Warren	IL-135		546		D	32536	NO	S	SC	–	–	–	N	FC	S	M
69	IL		S	Warren	US-67	902- 924	310		D	12121	NO	SC	ENB	–	–	–	N	OS	T	I
70	IL		S	Warren	US-67	1042 - 1046	310	Henderson Cr.	D	7828	NO	SC	ENB	–	–	–	N	OS	N	I
71	IL		S	Warren	US-67		310		D	31446	YES	RO	EZB	–	–	–	N	OSP	S	M
72	IL		S	Warren	US-34	465 - 472	313		D	132325	NO	S	SF	–	–	–	N	FF	S	M
73	IL		S	Warren	US-34	733 - 743	313		M	18244	NO	O	O	–	–	–	N	K	N	I
74	IL		S	Warren	US-34	350 - 353	313		D	56038	NO	S	SC	–	–	–	N	FC	S	M
75	IL	0094-3001	S	Warren	2		1405	Henderson Cr.	D	7119	NO	SC	EAB	Z	–	–	N	SE	N	I
76	IL	094-3002	S	Warren	23		404	Cedar Cr.	D	317625	NO	SC	BCZZ	Z	–	–	N	SPA	L	F
77	IL		S	Warren	1		405		D	6246	YES	RO	EZB	–	–	–	N	OEP	N	I
78	IL		S	Whiteside	14th. Ave.		565		D	4662	YES	SU	PC	–	–	–	N	K	N	I
79	IL	1001-0059	S	Winnebago			301	Rock R.	D	37783	NO	SC	BZZZ	Z	–	–	N	SPA	N	M
80	IL		CO	Pike			596		D	83047	NO	O	EZB	–	–	–	N	H	S	M
81	IL		S	Brown	11		585		D	183600	NO	S	SF	–	–	–	N	FF	S	M
82	IL		S	Brown	12		582		D	167400	NO	S	SF	–	–	–	N	FF	S	M
83	IL		S	Brown	7		1584		D	648000	NO	S	SF	–	–	–	N	FF	L	F
84	IL		S	Hancock	12		1600		D	330450	NO	O	EFB	–	–	–	N	H	L	F
85	IL		S	Hancock	9		1424		D	166893	NO	O	EFB	–	–	–	N	H	S	M
86	IL		S	Cass	10		1576		D	4665	NO	SC	ECACM	1	0.76	–	N	SO	N	I
87	IL		S	Cass	10		1576		D	5031	YES	RO	ECACM	1	1.22	–	N	SI/SO	N	I
88	IL		S	Cass	4		576		D	7208	YES	RO	EFB	–	–	–	N	OP	T	I
89	IL		S	Cass	2		1577		D	224675	NO	S	SF	–	–	–	N	FF	L	F
90	IL		S	Cass	7		577		M	117362	NO	O	O	–	–	–	N	K	T	M
91	IL		S	Cass	7		577		M	110050	NO	O	O	–	–	–	N	K	T	M
92	IL		S	Mason	5		572		D	14647	NO	S	SF	–	–	–	N	FF	N	I
93	IL		S	Mason	19		1595		D	18451	NO	SC	ECBCM	Z	Z	–	N	SO	T	I
95	IL	Z	CO	Adams	8		1599	Jenking Cr.	D	18088	NO	SC	BZZZ	Z	–	–	P	SPA	N	I

Illinois

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER- TOPPING	13 APPROP- RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA- METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF- ICATION
96	IL		CO	Adams	14		432		D	59745	YES	RO	ECBCM	1	3.5	–	N	SI/SO	S	M
97	IL		S	Hancock	US-136				D	336977	YES	RO	EFB	–	–	–	R	OEP	L	F
98	IL	034-0050	S	Hancock	IL-9, IL-96				M	33488	YES	O	ECBZZ	Z	–	–	R	K	S	M
99	IL		S	Adams	IL-336				M	93810	YES	O	ECBZZ	2	0.61	–	R	K	L	M
100	IL	Z	S	Adams	US-24				T	43749	NO	EM	BZZZ	Z	–	–	N	K	L	I
101	IL		S	Adams	IL-57				T	46109	YES	EM	EFC	–	–	–	R	K	L	I
102	IL		S	Adams	IL-57				T	30498	YES	EM	EFB	–	–	–	R	K	S	I
103	IL		S	Pike	IL-36	10 &-6			D	141590	YES	O	EFC	–	–	–	R	K	L	M
104	IL		S	Pike	US-36	10			T	20486	YES	DT	EFC	–	–	–	R	K	T	I
105	IL		S	Pike	US-54				T	87946	YES	EM	EFC	–	–	–	R	K	S	M
106	IL		S	Madison	IL-100		304	Mississippi R.	D	703401	NO	S	SF	–	–	–	N	FF	T	F
107	IL		S	Jersey	IL-300		304		T	5561	YES	DT	O	–	–	–	N	K	L	I
108	IL		S	Jersey	IL-100			Mississippi R.	D	86240	YES	RO	EFB	–	–	–	N	OS	S	M
109	IL		S	Greene	IL-108				D	781700	YES	L	L	–	–	–	N	B	L	F
110	IL		S	Greene	OR-155		743	Illinois R.	D	255557	YES	RO	EFB	–	–	–	N	OP	L	M
111	IL		S	Calhoun	IL-100		754	Illinois R.	T	142713	YES	SU	EFB	–	–	–	N	K	L	I
112	IL		S	Calhoun	IL-100-CO-1		304		T	132374	YES	DT	O	–	–	–	N	K	L	I
113	IL		S	Calhoun	1		754		T	7598	YES	DT	O	–	–	–	N	K	T	I
114	IL		CO	Calhoun	2		755	Mississippi R.	M	8480	NO	O	EFB	–	–	–	N	K	T	N
115	IL		CO	Calhoun	1		754		M	14628	NO	O	O	–	–	–	N	K	T	I
116	IL		S	Calhoun			VAR		T	124095	YES	DT	O	–	–	–	N	K	L	I
117	IL		S	Madison	IL-3		O	Mississippi R.	D	144966	NO	O	EFB	–	–	–	N	K	L	M
118	IL		S	Madison	IL-3		8807	Mississippi R.	D	470450	YES	RO	EFB	–	–	–	N	H	L	F
119	IL		S	Madison			VAR		M	64390	YES	O	O	–	–	–	N	K	N	M
120	IL		S	Madison			VAR		M	50000	NO	P	O	–	–	–	N	K	N	M
121	IL		S	St. Louis			VAR		M	22000	NO	O	O	–	–	–	N	K	N	I
122	IL		S	Randolph	IL-3		312		M	6000	NO	O	O	–	–	–	N	K	N	I
123	IL		S	VAR			VAR	Mississippi R.	M	876680	YES	O	EFB	–	–	–	N	K	L	M
124	IL		S	VAR			VAR		T	98696	NO	EM	U	–	–	–	N	K	T	M
125	IL		S	VAR			VAR		M	161000	NO	O	O	–	–	–	N	K	N	M
126	IL		CO	Calhoun	2		755		T	39430	NO	DT	EFB	–	–	–	N	K	L	F
127	IL		CO	Calhoun	6		756		T	54950	NO	DT	EFB	–	–	–	N	K	S	M
128	IL		CO	Monroe	3		1857	Mississippi R.	D	25500	YES	RO	EFB	–	–	–	N	OP	S	M
129	IL		CO	Monroe	3		1857	Mississippi R.	M	12256	YES	DRR	EFB	–	–	–	R	OP	N	I
130	IL		CO	Monroe	3		1857	Mississippi R.	D	88000	YES	RO	EFB	–	–	–	N	OP	S	M
131	IL		CO	Monroe	3		1857	Mississippi R.	D	52925	YES	RO	EFB	–	–	–	N	OP	S	M
132	IL	087-3100	CO	Monroe	3		1857		D	22100	YES	SC	BZZZ	Z	–	–	N	SAS2	N	I
133	IL		CO	Monroe	5		857	Mississippi R.	D	214900	NO	SC	EFB	–	–	–	N	K	S	F
134	IL		S	Pike			336	Mississippi R.	D	27332	YES	RO	EFC	–	–	–	N	OP	S	M
135	IL		S	Pike	US-36		319	Mississippi R.	D	298894	YES	RO	EFC	–	–	–	R	OP	L	M
136	IL		S	Pike	IL-106		701	Mississippi R.	D	82611	YES	RO	EFB	–	–	–	R	OP	S	M
137	IL		S	Pike	Fall Cr. Rd.		502		M	16212	YES	O	O	–	–	–	N	K	S	I
138	IL		S	Mason	US-136		315	Illinois R.	D	2323875	YES	RO	EFB	–	–	–	N	OP	L	M
139	IL		S	Mason	IL-78			Illinois R.	D	684415	YES	RO	EFB	–	–	–	N	OEP	L	F
140	IL		S	Mason	IL-97			Illinois R.	D	747890	YES	RO	EFB	–	–	–	N	OEP	L	F
141	IL		CO	Adams	VAR			Mississippi R.	D	841175	YES	RO	EFB	–	–	–	R	OEP	L	F
142	IL	001-3310	S	Cass	VAR		VAR		D	188500	YES	RO	PB	–	–	–	N	K	L	F

Illinois

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
143	IL		S	Cass	VAR		VAR		D	1410337	YES	RO	PB	--	--	--	N	K	L	F
144	IL		S	Mason	2		1587	Illinois R.	D	155586	YES	RO	EFB	--	--	--	N	OP	L	F
145	IL		S	Mason	1		1586	Illinois R.	D	38349	YES	RO	EFB	--	--	--	N	OEP	S	M
146	IL		S	Mason	2		1587		D	75375	NO	SC	ECBAM	1	3.05	--	N	SAS	T	M
147	IL		S	Mason	2		1587		D	68269	NO	SC	ECBAM	Z	Z	--	N	SO	T	M
148	IL		S	Calhoun	IL-96		304		T	13216	NO	G	EZZ	--	--	--	N	K	T	I
149	IL	072-0102	S	Peoria	US-24		63		D	7179	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
150	IL		S	Fulton	IL-95	426 & 608	687	Spoon R.	D	23090	NO	S	SF	--	--	--	N	FF	T	I
151	IL		S	Fulton	IL-97	481 & 485	622	Putt Cr.	D	625000	NO	S	SF	--	--	--	N	FF	S	F
152	IL		S	Fulton	IL-97	548 +75& 550	622		D	19673	NO	S	SF	--	--	--	N	FF	T	I
153	IL		S	Fulton	IL-97	526	622		D	18831	NO	S	SF	--	--	--	N	FF	T	I
154	IL		S	Fulton	IL-9	203 to 206	689		D	721500	NO	S	SF	--	--	--	N	FF	L	F
155	IL		S	Fulton	IL-41		574	Cedar Cr.	D	110828	NO	S	SF	--	--	--	N	FF	S	M
156	IL		S	Henderson			522		M	8500	YES	S	O	--	--	--	N	K	N	I
157	IL		S	Knox	IL-97		626		D	4676	NO	S	SF	--	--	--	N	FF	N	I
158	IL	094-0006	S	Warren	US-67	944 +12	10		D	9697	NO	SC	BZZZ	S	--	--	N	SAS	N	I
159	IL		S	Warren	US-67		310		D	53506	YES	RO	EZB	--	--	--	N	OP	S	M
160	IL		S	Warren	US-34	494 - 498	313		D	22175	NO	S	SF	--	--	--	N	FF	N	I
161	IL	Z	S	Warren	1		405	Middle Henderson Cr.	D	12888	NO	SC	BZZZ	M	--	--	N	SP	N	F
162	IL		S	Whiteside	IL-84		18		T	43167	NO	DT	EFB	--	--	--	N	K	S	M
163	IL		S	Rock Island	I-88				M	25205	YES	SU	O	--	--	--	N	K	L	I
164	IL		S	Rock Island	IL-280-IL-92		280		M	18572	YES	SU	O	--	--	--	N	K	L	I
165	IL		CO	Calhoun	1		754		T	170510	NO	DT	EFB	--	--	--	N	K	L	M
166	IL		CO	Calhoun	1		754	Mississippi R.	M	6000	YES	DRR	EFB	--	--	--	R	K	T	I
167	IL		CO	Greene	10		738	Illinois R.	M	25802	YES	DRR	EFB	--	--	--	R	K	T	I
168	IL		S	Jackson			912	Mississippi R.	D	3745	NO	O	EFB	--	--	--	N	H	N	I
169	IL		CO	Calhoun	1		734		T	39850	NO	G	EFB	--	--	--	R	K	S	I
170	IL		S	Jackson	1		1923	Mississippi R.	D	7072	YES	RO	EFG	--	--	--	R	OP	T	I
171	IL		S	Union	9		925	Mississippi R.	M	56655	YES	DRR	EFB	--	--	--	R	K	T	I
172	IL		S	Jackson			914		D	4435	YES	SC	EFB	--	--	--	N	OP	N	I
173	IL		S	Jackson	9		912		D	23825	YES	RO	ECBCC	1	0.91	--	N	OEC	S	M
174	IL		S	Jackson	5		917		D	16008	YES	RO	ECBZZ	Z	Z	--	R	OEC	T	I
175	IL		S	Alexander	2		946		D	4468229	YES	RO	ECBCC	2	1.52	--	R	OEP	L	F
176	IL		S	Alexander	IL-146		312	Mississippi R.	D	9912	NO	SC	EFB	--	--	--	N	K	N	I
177	IL		S	Alexander	IL-3		312	Mississippi R.	D	112734	YES	RO	EFB	--	--	--	N	OP	S	M
178	IL		CO	Randolph	6		861		M	9110	YES	DRR	ECBCM	1	0.45	--	R	K	T	I
179	IL		CO	Randolph	6		861		M	10850	YES	DRR	EFB	--	--	--	R	K	T	I
180	IL	079-3153	CO	Randolph	15		860	Mississippi R.	D	18225	YES	RO	EFB	--	--	--	R	OP	T	I
181	IL		CO	Randolph	15		860	Mississippi R.	D	139050	YES	RO	EFB	--	--	--	N	OP	L	F
182	IL		CO	Monroe	5		857		D	201400	YES	S	EFB	--	--	--	N	OEP	L	F
185	IL		CO	Monroe	3		1857		T	15000	NO	G	EFB	--	--	--	N	K	T	I
186	IL		CO	Monroe	3		1857		D	42000	YES	RO	ECBZZ	Z	Z	--	R	OEP	S	M
187	IL		CO	Monroe	3		1857		T	22000	YES	G	EZB	--	--	--	N	OP	T	I
188	IL		CO	Monroe	3		1857		D	20125	YES	RO	EFB	--	--	--	N	OEP	T	I
189	IL		CO	Calhoun	2		755	Illinois R.	D	10760	YES	RO	EFB	--	--	--	N	OE	T	I
190	IL		CO	Calhoun	2		755		M	6700	NO	SC	O	--	--	--	N	K	N	I
191	IL	007-3003	CO	Calhoun	2		755	Indian Cr.	D	3792	NO	SC	BSTT	--	--	--	N	SAS	N	I

Illinois

Highway Infrastructure Damage Classification

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
D.A.F.	STATE	STRUCTURE	APPLICANT	COUNTY	A.R.	MILE POST	F.A.S.	STREAM	COST	COST	ROADWAY	APPROP-	STRUCTURE/	SPANS/	CULVERT	CULVERT	DEBRIS	FAILURE	TRAFFIC	DAMAGE
#		ID.#			#	#	#		TYPE	$	OVER-	RIATION	FACILITY	NUMBER	WIDTH/DIA-	HEIGHT	LOCATION	MODES	EFFECTS	CLASSIF-
											TOPPING	CAUSE	TYPE	of BARRELS	METER (m)	(m)	& TYPE			ICATION
192	IL		CY	Calhoun	2		755		D	45350	NO	O	EFB	--	--	--	N	H	S	M
193	IL		CY	Calhoun	6		756	Illinois R.	D	8500	NO	O	EFB	--	--	--	N	H	T	I
194	IL	8002-0030	S	Jackson	IL-3		312		M	10000	NO	DRS	BZZZ	Z	--	--	R	K	N	I
195	IL	002-0030	S	Alexander	IL-3		14		D	5072	NO	SC	BSPZ	Z	--	--	N	SP	N	I
196	IL	002-0022	S	Alexander	I-57		57	Mississippi R.	D	12400	NO	SC	BSCZ	Z	--	--	N	SP	N	I
197	IL		S	Jackson	IL-3		312	Mississippi R.	M	7352	NO	O	EFB	--	--	--	N	K	N	I
198	IL		S	VAR	VAR				M	202974	NO	DRR	EZB	--	--	--	R	K	S	M
199	IL	042-0009	S	Jersey			743	Macoupin Cr.	D	70000	NO	S	SF	--	--	--	N	FF	T	I
200	IL	060-0067	S	Madison	US-67		304	Mississippi R.	M	6000	NO	O	U	--	--	--	N	K	N	I
201	IL		S	Madison	3	21.7	8807	Mississippi R.	T	40234	YES	RO	EFC	--	--	--	N	K	S	M
202	IL		S	Randolph	IL-3		312	Nine Mile Cr.	M	10780	NO	O	O	--	--	--	N	K	N	I
203	IL		S	Randolph			9416		T	15000	YES	DT	O	--	--	--	R	K	T	I
204	IL		S	Saint Clair	IL-3		9206		T	3600	NO	O	O	--	--	--	N	K	N	I
205	IL		S	Alexander	IL-3				M	6717467	YES	G	EFB	--	--	--	N	K	L	M
206	IL		S	Alexander	IL-146		312	Mississippi R.	D	9912	NO	S	SF	--	--	--	N	FF	N	I
207	IL		S	VAR	VAR				D	50598	YES	RO	O	--	--	--	N	K	S	M
208	IL		S	VAR	VAR				T	329226	NO	O	BZZZ	--	--	--	N	K	N	N
209	IL		S	VAR	VAR				T	16145	NO	O	O	--	--	--	N	K	N	N
210	IL		CO	Randolph	7		1857		M	14900	YES	DRR	EFB	--	--	--	R	K	T	I

Iowa

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
1	IA		CO	Greene	E-53				D	189091	YES	RO	ECCCC	1	1.37	--	N	OPC	L	F
2	IA		CO	Boone	E-57			Beaver Cr.	D	18446	YES	RO	Z	--	--	--	N	OEP	T	I
3	IA	243770	CO	Marshall	S-52				D	23512	YES	RO	EAB	M	--	--	N	SM	T	I
4	IA		CO	Tama	V-18				D	30668	YES	SU	Z	--	--	--	N	OP	S	I
5	IA		CO	Boone	E-57			Des Moines R.	D	23390	NO	S	SF	--	--	--	N	FF	S	I
6	IA		CO	Boone	E-26			Des Moines R.	D	8153	NO	S	SF	--	--	--	N	FF	T	I
7	IA		CO	Boone	E-26			Des Moines R.	D	9822	NO	S	SC	--	--	--	R	FC	T	I
8	IA		CO	Boone	E-41			Des Moines R.	M	3244	NO	DRC	BZZZ	Z	--	--	C	K	N	I
9	IA		CO	Boone	R23/E52			Des Moines R.	M	10000	YES	DRR	EFB	--	--	--	R	K	S	I
10	IA		CO	Boone	R-18				M	3575	NO	S	SF	--	--	--	N	FF	T	I
11	IA		CO	Boone	E-57			Des Moines R.	D	24892	NO	SC	ECBBC	Z	Z	Z	C	SO	T	I
12	IA		CO	Boone	R-23				D	11618	NO	SC	ECBBC	Z	Z	Z	N	SO	T	I
13	IA		CO	Boone	R-21				D	12607	NO	SC	SF	--	--	--	N	FF	N	I
14	IA		CO	Boone	R-21				D	8132	NO	S	SF	--	--	--	N	FF	N	I
15	IA		CO	Boone	E-18			Squaw creek	D	4413	YES	RO	ENB	--	--	--	N	OSP	N	I
16	IA		CO	Boone	P-54			Beaver creek	D	14800	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
17	IA		CO	Boone	R-18				D	3171	NO	S	ECZBC	1	Z	Z	C	SO	N	I
18	IA		CO	Greene	E-57				D	11874	YES	RO	EAB	Z	--	--	N	SE	T	I
19	IA		CO	Story	E-29				D	3244	NO	SC	ECBCM	2	Z	Z	N	SO	N	I
20	IA		CO	Story	E-23				D	13095	YES	RO	EAB	--	--	--	N	SE	T	I
21	IA		CO	Story	E-41				D	6275	NO	S	SF	--	--	--	N	FF	N	I
22	IA		CO	Story	Riverside Rd.			Skunk river	D	7000	NO	SC	BZZZ	Z	--	--	N	SM	N	I
23	IA		CO	Story	S-27			E. Indian creek	D	3550	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
24	IA		CO	Marshall	E-27				D	4477	YES	SU	ENB	--	--	--	N	OS	N	I
25	IA		CO	Marshall	T-29				D	3232	YES	RO	ECBCM	1	0.91	--	N	OEC	S	I
26	IA		CO	Marshall	E-35			Iowa R.	D	8325	NO	SC	EAB	--	--	--	N	SE	N	I
27	IA		CO	Tama	V-37				D	3011	NO	S	SF	--	--	--	N	FF	N	I
28	IA		CO	Tama	V-37			Wolf Cr.	D	4741	NO	S	SF	--	--	--	N	FF	N	I
29	IA		CO	Tama	E-29			Salt Cr.	D	5000	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
30	IA		CO	Tama	E-44			Salt Cr.	D	5815	YES	SC	EAB	--	--	--	N	OS	N	I
31	IA		CO	Tama	E-64			Richland Cr.	D	3039	NO	SC	BZZZ	Z	--	--	N	SAS	N	F
32	IA		CO	Tama	E-49			Iowa R.	D	5518	YES	SC	EAB	--	--	--	N	OS	N	I
33	IA		CO	Tama	T-47				D	3177	YES	SC	EZB	--	--	--	N	OS	N	I
34	IA		CO	Tama	E-27				D	3728	YES	SC	EZB	--	--	--	N	OS	N	I
35	IA		CO	Tama	E-66				D	3295	YES	SC	EZB	--	--	--	N	OS	N	I
36	IA		CO	Polk	NW-66/NW-26				D	8639	YES	SC	EFB	--	--	--	N	OS	N	I
37	IA		CO	Polk	Vandalia				D	3861	YES	SC	EFB	--	--	--	N	OS	N	I
38	IA		CO	Polk	NW-150			Big creek lake	D	18796	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
39	IA		CO	Polk	NW-70			Beaver Cr.	D	6900	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
40	IA		CO	Polk	112				D	27280	YES	RO	EAB	Z	--	--	N	SE	S	I
41	IA		CO	Polk	66 Ave.			D. Moines river	D	114550	NO	SC	BZZZ	M	--	--	N	SP	S	M
42	IA		CO	Polk				Old Skunk river	D	155406	NO	SC	EAB	Z	--	--	N	SE	S	M
43	IA		CO	Hamilton	D-54				D	35000	NO	S	SC	--	--	--	C	FC	T	I
44	IA		CO	Hamilton	R-21			Prairie Cr.	D	16000	NO	S	SF	--	--	--	N	FF	T	I
45	IA		CO	Polk				Big creek	D	33925	NO	SU	BZZZ	--	--	--	N	SM	N	I
46	IA		CO	Polk	NW-66				D	8626	YES	SC	EFB	--	--	--	N	OS	N	I
47	IA		CO	Tama	V-18				D	14326	YES	SC	O	--	--	--	N	K	N	I
48	IA		S	Howard	V-36				D	1799	YES	SC	ENB	--	--	--	N	OS	N	I
49	IA		S	Howard	V-18				D	1878	YES	RO	ECBBC	1	3.05	3.05	N	OEC	N	I
50	IA		S	Howard	A-46			Little Wapsipinicon	D	4396	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
51	IA		S	Howard	A-46			Little Wapsipinicon	D	9173	NO	SC	BCNZ	S	--	--	N	SAS2	N	I

Iowa

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
52	IA		S	Howard	A-46				D	1812	YES	RO	ENC	--	--	--	R	OE	N	I
53	IA		S	Howard	B-17			Little Wapsipinicon	D	156250	YES	RO	EAB	M	--	--	N	SE	L	M
54	IA		S	Howard	V-46			Little Turkey Cr.	D	5600	YES	RO	BZZZ	Z	--	--	N	SAS	N	I
55	IA		S	Howard	V-58				D	5060	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
56	IA		S	Allamakee	X-16				D	22989	YES	RO	ECBBC	--	--	--	N	OEP	T	I
57	IA		S	Fayette	B-64				D	43740	YES	L	L	--	--	--	N	B	N	I
58	IA	151550	S	Fayette	W-14				D	12590	NO	SC	BSSS	M	--	--	N	SBA	N	I
59	IA		S	Clayton	X-3C				M	1955	NO	DRC	ECBBC	2	Z	Z	C	K	N	N
60	IA		S	Clayton	S-28				D	192023	YES	S	SF	--	--	--	N	FF	S	M
61	IA		S	Clayton	X3C				M	5865	NO	DRC	BZZZ	Z	--	--	C	K	N	N
62	IA		S	Clayton	C7X				M	5865	NO	DRC	BZZZ	Z	--	--	C	K	N	N
63	IA		S	Clayton	C7X				D	5738	YES	RO	ENB	--	--	--	R	OE	N	I
64	IA		S	Clayton	X47				M	5865	NO	DRC	BSPZ	M	--	--	C	K	N	N
65	IA		S	Clayton	C9Y				D	10000	NO	S	SC	--	--	--	N	FC	N	I
68	IA		S	Clayton	Ferry road				M	68375	YES	DRR	EFG	--	--	--	R	K	L	M
69	IA		S	Franklin	C-47				D	10392	YES	RO	EFB	--	--	--	N	K	T	I
70	IA		S	Clayton	C9Y			Turkey R.	M	67500	NO	SC	ECCCM	1	Z	--	N	SM	N	N
71	IA		S	Clayton	X-28			Roberts Cr.	M	31894	NO	SC	ENB	--	--	--	N	SM	N	N
72	IA	126951	S	Crawford	M-14			Boyer R	D	298025	NO	SC	EAB	M	--	--	N	SM	L	M
73	IA		S	Palo Alto	B-55				D	19393	YES	RO	EFG	--	--	--	N	OP	T	I
74	IA		S	Bue -- Vista	M-36				D	30000	NO	SC	PB	--	--	--	N	OS	T	I
75	IA		S	Dickinson	A-34				M	93538	NO	O	ECBBC	Z	Z	Z	N	K	S	M
76	IA		S	Sioux	K-18				D	14250	NO	SC	ECCCM	2	1.07	--	N	SO	T	I
77	IA		S	Mono --	E-54				D	16875	NO	SC	ECCZZ	1	Z	--	N	SO	T	I
78	IA		S	Harrison	L-16				D	53750	NO	SC	Z	1	Z	--	N	SO	T	M
79	IA	128121	S	Crawford	M-14				D	82625	YES	RO	EAB	Z	--	--	N	SE	M	F
80	IA		S	Palo Alto	B-53				D	3450	YES	RO	ECCCC	1	1.06	--	N	OPC	T	I
81	IA		S	Palo Alto	B-63				D	4140	YES	RO	EZC	--	--	--	N	OP	T	I
82	IA		S	Carroll	N-20			Maple R.	D	28408	YES	RO	BSZZ	M	--	--	N	SAS2	T	I
83	IA		S	Carroll	E-46			Brushy Creek	D	31055	YES	RO	BSTT	S	--	--	N	SAS	T	I
84	IA		S	Mono --	L-16			Brushy Cr.	D	4025	YES	RO	ENC	--	--	--	N	OS	T	I
85	IA		S	Mono --	E-34			Soldier R.	D	62500	YES	RO	EAB	S	--	--	N	SE	T	M
86	IA		S	Mono --	E-16				D	4025	NO	S	SF	--	--	--	N	FF	N	I
87	IA	251130	S	Mono --	E-16				D	6325	NO	S	SF	--	--	--	N	FF	N	I
88	IA	129660	S	Crawford	L-51				D	50000	NO	SC	BSCC	M	--	--	N	SAS2	N	M
89	IA	9910	S	Crawford	L-51				D	50000	NO	SC	BSNT	S	--	--	N	SAS2	N	M
90	IA	130940	S	Crawford	E-16				D	68750	NO	SC	BCCC	M	--	--	N	SAS2	N	M
91	IA	130791	S	Crawford	E-16				D	25000	NO	SC	BSCC	M	--	--	N	SAS2	N	I
92	IA	128945	S	Crawford	E-59				D	5750	NO	SC	ECCBC	2	3.048	3.048	N	SO	N	I
93	IA	126680	S	Crawford	E-59				D	12500	NO	SC	BCCC	M	--	--	N	SAS2	N	I
94	IA	126690	S	Crawford	E-59				D	5750	NO	SC	BCCC	M	--	--	N	SAS2	N	I
95	IA	126420	S	Crawford	M-55				D	50000	NO	SC	BCCC	M	--	--	N	SAS2	N	M
96	IA	126340	S	Crawford	E-53				D	30750	NO	SC	BSNZ	S	--	--	N	SAS2	N	M
97	IA	127470	S	Crawford	M-55				D	25000	NO	SC	BZZZ	M	--	--	N	SAS2	N	I
98	IA	127321	S	Crawford	M-55				D	25000	NO	SC	BZCC	M	--	--	N	SAS2	N	I
99	IA	126850	S	Crawford	M-55				D	5750	NO	SC	BCNS	S	--	--	N	SAS	N	I
100	IA	11480	S	Crawford	M-55				D	100000	NO	SC	BCCC	M	--	--	N	SAS2	N	M
101	IA	130240	S	Crawford	M-40				D	5750	NO	SC	BCNT	S	--	--	N	SAS2	N	I
102	IA	130791	S	Crawford	L-51				D	12500	NO	SC	BSCC	M	--	--	N	SAS2	N	I
103	IA		S	Harrison	F-58				M	5750	NO	O	ENC	--	--	--	N	K	N	I
105	IA		S	Harrison	L-66				M	31150	NO	O	EFG	--	--	--	N	SM	T	M

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1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
106	IA		S	Harrison	F-66				M	12500	NO	SC	ECGCM	1	0.46	--	N	SO	N	I
107	IA		S	Harrison	F-66				M	12500	NO	SC	BZCC	M	--	--	N	SAS2	N	N
108	IA		S	Harrison	F-66				M	6250	NO	DRC	BZZZ	Z	--	--	P	K	N	N
109	IA		S	Harrison	F-50				D	25000	NO	SC	BZZZ	Z	--	--	P	SAS2	N	I
110	IA		S	Harrison	K-45				D	12500	NO	SC	EAB	Z	--	--	C	SE	N	I
111	IA		S	Harrison	K-45				D	20125	YES	RO	EAB	M	--	--	N	SE	N	I
112	IA		S	Harrison	F-20				D	50000	NO	SC	EAB	S	--	--	C	SE	N	M
113	IA		S	Harrison	F-20				M	18750	NO	SC	O	--	--	--	N	K	N	N
114	IA		S	Harrison	L-16				D	31875	NO	S	SF	--	MA	--	N	FF	T	M
115	IA		S	Dickinson	A-31			Lower Gar L.	D	56825	YES	RO	EFB	--	--	--	N	OE	T	M
116	IA		S	Carroll	M-68				D	23000	NO	SC	BCPT	M	--	--	N	SAS2	N	I
117	IA		S	Crawford	E-16			Otter Cr.	D	17350	YES	RO	ECCCM	1	1.37	--	N	OEP	T	I
118	IA	117390	S	Clay	B-17				D	5750	NO	SC	BCCC	M	--	--	N	SAS2	N	I
119	IA	117041	S	Clay	M-27				D	3680	NO	SC	BCZZ	Z	--	--	N	SAS	N	I
120	IA	116900	S	Clay	M-38				D	8625	NO	SC	BSPZ	M	--	--	N	SAS2	N	I
121	IA	20450	S	Clay	B-63				D	4025	NO	SC	BZNZ	S	--	--	N	SAS	N	I
122	IA		S	Lyon	L-14				D	31250	NO	SC	BSCZ	M	--	--	N	SAS2	N	I
123	IA		S	Lyon	K-42				D	18750	NO	SC	BSPZ	M	--	--	N	SAS	N	I
124	IA		S	Lyon	K-42				D	12500	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
125	IA		S	Woodbury	L-36				D	3600	NO	L	L	--	--	--	N	K	N	N
126	IA		S	Palo Alto	B-55			Des Moines R.	D	62500	NO	SC	O	--	--	--	N	SM	N	N
127	IA		S	Crawford	M-56				D	23125	YES	RO	ENG	--	--	--	N	OE	T	I
128	IA		S	Crawford	E-53				D	10000	YES	RO	ECCCC	1	1.22	--	N	OEC	N	I
129	IA		S	Crawford	E-53				D	10000	YES	RO	ECCCM	1	1.22	--	N	OEC	N	I
130	IA		S	Crawford	E-59				D	5000	YES	RO	ECCCC	1	1.22	--	N	OEC	N	I
131	IA		S	Adair	N-54				D	4575	YES	RO	ECZCM	1	1.07	--	N	OEC	N	I
132	IA	232910	CO	Madison	G-50			Clanton Cr.	D	15811	NO	SC	BSZZ	Z	--	--	N	SBA	N	I
133	IA	321420	S	Taylor	J-55			W. 102 R.	D	23934	NO	SC	BSNT	S	--	--	N	SAS2	N	I
134	IA	294841	S	Ringgold	J-55				D	106825	NO	SC	BCCC	M	--	--	N	SPA	L	F
135	IA		S	Fremont	L-44				D	23063	NO	S	SC	--	--	--	R	FC	T	I
136	IA		S	Page	J-52				D	78121	YES	RO	ECZZZ	1	Z	--	N	OEC	S	F
137	IA	11520	S	Montgomery	H-54			M Nodaway R.	D	34746	NO	SC	BSPZ	M	--	--	N	SAS	N	M
138	IA	284520	S	Pottawattamie	G-66			Silver Cr.	D	23187	NO	SC	BSZZ	Z	--	--	N	SAS	N	I
139	IA		S	Adair	N-54				D	4038	NO	SC	ECGCM	1	1.06	--	N	SI	N	I
140	IA	58440	S	Adair	G-15				D	14217	NO	SC	BTNZ	S	--	--	N	SAS	N	F
141	IA	306246	S	Shelby	F-32				D	73589	NO	SC	BSPZ	M	--	--	N	SAS2	N	M
142	IA	47890	S	Shelby	F-24				D	20394	NO	SC	BSCZ	M	--	--	N	SAS	N	I
143	IA	307695	S	Shelby	Old US-59				D	231250	YES	RO	BSPZ	M	--	--	N	SAS	S	M
144	IA	362640	S	Shelby	F-32				D	5651	NO	SC	BSPZ	M	--	--	N	SAS	N	I
145	IA	68720	S	Audubon	F-32				D	38750	NO	SC	BSZZ	Z	--	--	N	K	N	M
146	IA		S	Audubon	F-16				D	22033	YES	RO	ECGCM	1	Z	--	N	OEC	L	F
147	IA		S	Audubon	F-16				D	25257	YES	RO	ECGCM	1	Z	--	N	OEC	L	F
148	IA		S	Fremont	L-68				D	5750	YES	RO	EFC	--	--	--	N	OE	N	I
149	IA		S	Fremont	M-16				D	12970	YES	RO	ECBBC	1	0.61	1.52	N	OEC	S	M
150	IA		S	Fremont	J-34				D	15671	YES	RO	ENB	--	--	--	N	OEP	T	I
151	IA		S	Mills	L-45				D	21650	NO	SC	ECGCM	1	1.52	--	N	OE	N	I
152	IA		S	Mills	L-68				D	11375	NO	SC	ENB	--	--	--	N	OE	N	I
153	IA	246000	S	Mills	H-38			Nish --bot -- R.	D	67875	NO	SC	BSZZ	Z	--	--	N	SM	N	M
154	IA		S	Cass	N-28				D	8477	YES	RO	ECCCM	1	0.91	--	N	OEC	N	M
155	IA		S	Cass	N-28				D	9087	NO	S	SF	1	1.52	--	N	FF	N	I
156	IA	55330	S	Adair	N-51				D	123818	YES	RO	BSNZ	S	--	--	N	SAS	T	F

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Highway Infrastructure Damage Classification

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157	IA	265460	S	Page	J-53			Nodaway R.	D	31510	NO	SC	BSNZ	S	--	--	N	SM	N	I
158	IA	268040	S	Page	J-20			E. Tarkio R.	D	6394	NO	SC	BSSS	M	--	--	N	SM	N	I
159	IA	268530	S	Page	M-41			Nish --bot -- R.	D	24737	NO	SC	BSZZ	Z	--	--	C	SAS	N	I
160	IA	256360	S	Montgomery	M-63			Tarkio Cr.	D	23178	NO	SC	BSNZ	S	--	--	N	SAS	N	M
161	IA		S	Page	J-20				D	76000	YES	RO	ECCCC	1	1.22	1.22	N	OEC	N	M
162	IA		S	Page	J-28				D	42555	YES	RO	ECBBC	1	1.22	1.52	N	OEC	S	M
163	IA		S	Shelby	F-58				D	39819	NO	DT	EFB	--	--	--	N	H	T	I
164	IA	930	S	Adams	N-28			M. Nodaway R.	D	30625	NO	SC	BSZZ	Z	--	--	N	SM	N	I
165	IA		S	Ringgold	J-23			W. Fork Grand R.	D	25062	NO	SC	BCZZ	Z	--	--	N	SM	N	I
166	IA		S	Madison	P-71				D	9488	NO	S	SF	--	--	--	N	FF	N	I
167	IA		S	Madison	G-61				D	6250	NO	S	SF	--	--	--	N	FF	N	I
168	IA		S	Madison	G-61				D	11875	NO	S	SF	--	--	--	N	FF	N	I
169	IA		S	Madison	P-57				D	23500	NO	SC	BSZZ	Z	--	--	N	SM	N	I
170	IA	169200	S	Guthrie	N-70			Brushy Cr.	D	15813	NO	SC	BSPZ	M	--	--	N	SAS	N	I
171	IA	170475	S	Guthrie	N-46			Brushy Cr.	D	85243	NO	SC	BSPZ	M	--	--	N	SM	N	M
172	IA		S	Dallas	R-22				D	14176	YES	RO	ENC	--	--	--	N	OEP	T	I
173	IA		S	Dallas	R-22 & F-90				M	21704	NO	DT	EZC	--	--	--	N	K	T	I
174	IA		S	Dallas	R-16			Racoon R.	M	5625	NO	DRC	BSPZ	M	--	--	P	K	N	N
175	IA		S	Dallas	P-58			Racoon R.	D	17125	NO	SC	BSPZ	M	--	--	P	SM	N	I
176	IA		S	Taylor	H-26				D	4025	YES	RO	ECBCM	1	0.61	--	N	OEC	N	I
177	IA		S	Taylor	P-14				D	50763	YES	RO	ECBCM	1	1.22	--	N	OEC	S	M
178	IA		S	Taylor	P-14				D	48425	YES	RO	ECBZZ	1	Z	--	N	OEC	S	M
179	IA	295511	S	Ringgold	P-27			Grand R.	D	10902	NO	SC	BSPZ	M	--	--	N	SM	N	N
180	IA		S	Ringgold	J-55			Grand R.	D	8584	NO	SC	BZZZ	Z	--	--	N	SPA	N	I
181	IA	295130	S	Ringgold	P-46			E. Fork Grand R.	D	12075	NO	SC	BZZZ	Z	--	--	N	SM	N	I
182	IA	295081	S	Ringgold	J-55			E. Fork Grand R.	D	4688	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
183	IA	295091	S	Ringgold	J-55			Lotts Cr.	D	4688	NO	SC	BCCC	M	--	--	N	SM	N	I
184	IA		S	Pottawattamie	M-16			Nish --bot -- R.	D	20562	NO	S	ECBCM	1	Z	--	C	SM	T	I
185	IA		S	Pottawattamie	M-21			Nish --bot -- R.	D	44120	NO	SC	BSNT	S	--	--	N	SAS	L	F
186	IA		S	Madison	P-71				D	7500	NO	S	SF	--	--	--	N	FF	N	I
187	IA		S	Madison	P-57				D	4375	NO	S	SF	--	--	--	N	FF	N	I
188	IA		S	Ringgold	J-13			W. Fork Grand R.	D	127625	NO	SC	BCCC	M	--	--	N	SBA	N	M
189	IA		S	Page	J-64			W. Fork Grand R.	D	43680	NO	SC	BCCC	M	--	--	N	SM	N	M
190	IA		S	Taylor	J-20			Mill Cr.	D	18750	NO	S	SF	--	--	--	N	FF	N	I
191	IA	100740	S	Cass	N-28			Troublesome Cr.	D	48553	NO	SC	BCCC	M	--	--	N	SM	N	I
192	IA		S	Clark	R-35				D	13650	NO	S	SF	--	--	--	N	FF	T	I
193	IA		S	Decatur	R-34			Long Cr.	D	66902	NO	SC	BSCC	M	--	--	N	SM	N	I
194	IA		S	Washington	W-61				D	6486	YES	SC	ENC	--	--	--	N	OS	T	I
195	IA		S	Louisa	G-28				D	17147	NO	SC	BZZZ	Z	--	--	N	SAS	T	I
196	IA		S	Henry	J-20				D	2035	NO	SC	EAB	S	--	--	N	SE	N	I
197	IA		S	Des Moines	X-30				D	5213	YES	RO	ENG	--	--	--	N	OEP	N	I
198	IA		S	Van Buren	J-40				D	376875	YES	RO	ENC	--	--	--	N	OEP	T	M
199	IA		S	Wapello	H-21				D	351475	NO	S	SF	--	--	--	N	FF	T	M
200	IA		S	Mahaska	G-71				D	280100	YES	RO	EFC	--	--	--	N	OEP	L	F
201	IA		S	Wapello				Des Moines R.	M	11250	NO	DRC	BSCZ	M	--	--	C	K	N	N
202	IA		S	Des Moines	X-40				D	9373	YES	RO	ECGZZ	--	--	--	C	OE	N	I
203	IA		S	Henry	W-55				D	50488	NO	S	SF	--	--	--	N	FF	S	M
204	IA		S	Henry	W-55				D	48338	NO	S	SF	--	--	--	N	FF	S	M
205	IA		S	Louisa	X-61				D	14062	NO	S	SF	--	--	--	N	FF	T	I
206	IA		S	Louisa	X-61				D	4131	YES	RO	ECGCM	1	0.76	--	N	OEC	N	I
207	IA		S	Wapello				Des Moines R.	M	25625	NO	DRC	BSPZ	M	--	--	P	K	N	N

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208	IA		S	Henry	H-38				D	20728	YES	S	SF	--	--	--	N	FF	T	I
209	IA		S	Henry	H-38				D	10771	NO	O	BTNZ	S	--	--	N	K	L	I
210	IA		S	Henry	X-23				D	22350	NO	S	SF	--	--	--	N	FF	T	M
211	IA		S	Wapello	J-12				D	448600	YES	RO	ENG	--	--	--	N	OEP	L	F
212	IA		S	Wapello	J-12				D	86600	YES	RO	BCNZ	S	--	--	N	OEP	L	F
213	IA		S	Wapello	J-12				D	4592	YES	RO	ENG	--	--	--	N	OEP	T	I
214	IA		S	Van Buren	J-40			Des Moines R.	M	15625	NO	DRC	BSPZ	M	--	--	P	K	N	N
215	IA		S	Van Buren	J-40				D	16338	NO	S	SF	--	--	--	N	FF	T	I
216	IA		S	Van Buren	V-64				D	7738	NO	S	SF	--	--	--	N	FF	N	I
217	IA		S	Van Buren				Des Moines R.	M	8429	YES	DRR	EFG	--	--	--	R	OEP	T	I
218	IA	350350	S	Van Buren	J-40				M	5625	NO	DRC	BSPZ	M	--	--	P	K	N	I
219	IA		S	Lee	X-38				D	47500	NO	S	SF	--	--	--	N	FF	S	M
220	IA	238401	S	Mahaska	T-33				D	8234	NO	SC	BCCC	M	--	--	N	SM	N	I
221	IA	50200	S	Mahaska	T-33				D	47232	NO	SC	BSZZ	Z	--	--	N	SAS	T	M
222	IA		S	Mahaska	T-33				D	16003	NO	S	SF	--	--	--	N	FF	T	M
223	IA		S	Mahaska	T-39			Des Moines R.	D	22101	YES	RO	EFB	--	--	--	N	OS	T	I
224	IA	235630	S	Mahaska	T-39				M	4278	NO	DRC	BSPZ	M	--	--	P	K	N	N
225	IA		S	Mahaska	G-71				D	13222	NO	S	SF	--	--	--	N	FF	T	I
226	IA	332850	S	Warren	S-23				D	8725	NO	SC	BCZZ	Z	--	--	N	SM	N	I
230	IA		S	Lucas	S-23				D	14325	NO	S	SF	--	--	--	N	FF	T	I
231	IA		S	Lucas	S-23				D	4450	NO	S	SF	--	--	--	N	FF	N	I
232	IA		S	Lucas	S-23				D	13875	NO	S	SF	--	--	--	N	FF	T	I
233	IA		S	Monroe	S-65				M	50500	NO	SC	ENC	--	--	--	N	SM	T	M
234	IA		S	Washington	W-21				D	33580	YES	RO	ENC	--	--	--	N	OS	S	M
235	IA		S	Wapello				Des Moines R.	M	6875	NO	DRC	BSPZ	M	--	--	P	K	N	N
236	IA		S	Keokuk	J-45				D	9875	NO	SC	BSCC	M	--	--	N	SM	N	I
237	IA		S	Monroe	S-65				D	6688	NO	S	SF	--	--	--	N	FF	N	I
238	IA		S	Keokuk	V-45				D	14812	NO	S	SF	--	--	--	N	FF	T	I
239	IA		S	Clark	H-45				D	100000	NO	SC	ECGBC	2	1.83	1.83	N	SO	S	M
240	IA		S	Clark	H-45				D	15062	NO	S	SF	--	--	--	N	FF	T	I
241	IA		S	Clark	H-45				D	11312	NO	S	SF	--	--	--	N	FF	T	I
242	IA		S	Davis	V-20				D	3853	NO	SC	ECGBC	1	--	--	N	SO	N	I
243	IA		S	Keokuk	V-44				D	15625	NO	SC	BSZZ	Z	--	--	P	SAS	N	I
244	IA		S	Lucas	H-16				D	5282	NO	SC	ECGCM	3	0.61	--	N	SO	N	I
245	IA		S	Mahaska	G-71			Des Moines R.	D	125000	NO	SC	BCZZ	Z	--	--	N	SM	T	M
246	IA	235490	S	Mahaska	G-63				D	4359	NO	SC	BCZZ	Z	--	--	N	SAS2	N	I
247	IA		S	Marion	S-71				D	204625	NO	S	SF	--	--	--	N	FF	T	M
248	IA		S	Marion	G-76				D	16818	NO	S	SF	--	--	--	N	FF	N	I
249	IA		S	Clark	R-45				D	5000	YES	RO	ECCCM	4	Z	--	N	OEC	S	F
250	IA	136040	S	Decatur	R-52				D	43415	NO	SC	BSPZ	M	--	--	N	SM	N	I
251	IA	136130	S	Decatur	J-66				D	9444	NO	SC	BSZZ	Z	--	--	N	SAS	N	I
252	IA	136250	S	Decatur	J-66				D	53785	NO	SC	BSNZ	S	--	--	N	SM	T	M
253	IA	137370	S	Decatur	R-30				D	32197	NO	SC	BSPZ	M	--	--	N	SM	N	I
254	IA	136470	S	Decatur	R-18				D	54617	NO	SC	BSZZ	Z	--	--	N	SAS	T	I
255	IA		S	Clark	R-45				D	9795	NO	SC	O	--	--	--	N	K	N	N
256	IA		S	Benton					D	6080	NO	SC	BSZT	Z	--	--	N	SAS	N	I
257	IA	22123	S	Linn	E-34				D	26525	NO	SC	BSSS	M	--	--	N	SAS2	N	I
258	IA		S	Johnson	F-28				D	2213	NO	SC	ECBCM	1	0.61	--	N	SO	N	I
259	IA	031-2	S	Johnson	F-52				D	5750	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
260	IA		S	Johnson	F-28				D	4672	YES	RO	ECBZZ	1	Z	--	N	OEP	N	I
261	IA		S	Johnson	F-62				D	8192	YES	RO	EFB	--	--	--	N	OS	N	I

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Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
262	IA	P-23	S	Johnson	Yoder Tpk.				D	11500	NO	SC	BSCZ	M	--	--	N	SAS	N	I
263	IA		S	Johnson	F-12				D	13627	YES	RO	ECBCM	1	0.61	--	N	OEC	T	I
264	IA		S	Johnson	F-20				D	16001	YES	RO	EFG	--	--	--	R	OS	T	I
265	IA		S	Johnson	F-20				D	19723	YES	RO	ECGCM	1	0.61	--	R	OEC	S	M
266	IA		S	Johnson	W-38				D	62675	NO	SC	BZZZ	Z	--	--	C	SAS	T	M
267	IA	S23-2	S	Johnson	F-62			Iowa R.	D	8280	NO	SC	BSPZ	M	--	--	P	SAS2	N	I
268	IA		S	Jones	X-31				D	7378	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
270	IA		S	Johnson	X-14				D	5125	YES	RO	ENB	--	--	--	N	OS	N	I
271	IA		S	Johnson	F-12				D	6822	YES	RO	EFB	--	--	--	N	OS	N	I
272	IA	M-17-1	S	Johnson	F-46			Old Womans Cr.	D	8125	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
273	IA	F-2970	S	Clinton	E-50				D	7500	NO	SC	BCCC	Z	--	--	N	SM	N	I
275	IA		S	Clinton	E-63				D	12500	NO	SC	BSCC	M	--	--	N	SAS2	N	I
276	IA		S	Benton	E-22			Hinkle Cr.	D	53391	YES	RO	BTNZ	S	--	--	N	SAS	L	F
277	IA		S	Jones	E-28				D	72697	YES	RO	ENB	--	--	--	N	OEP	S	M
278	IA	1412700	S	Delaware	C-64			Bear Cr.	D	3950	NO	SC	BSZZ	Z	--	--	N	SAS	N	I
279	IA		S	Dubuque	Y-13				D	5437	YES	RO	EZB	--	--	--	N	OP	N	I
280	IA	18490	S	Cedar	F-44				D	181250	NO	SC	BSPZ	M	--	--	P	SP	N	M
281	IA		S	Iowa	V-44			Iowa R.	D	42111	YES	RO	EFG	--	--	--	N	OEP	S	M
282	IA		CO	Benton	V-66				D	2141	YES	RO	ECBCM	1	1.52	--	N	OEC	N	I
283	IA		CO	Benton	V-66				D	3197	YES	RO	ECBCM	1	1.37	--	N	OEC	N	I
285	IA		CO	Benton	E-44				D	8326	YES	RO	EAB	S	--	--	N	SE	S	M
286	IA		CO	Benton	E-66				D	14800	NO	SC	ECBBC	1	Z	Z	N	SO	N	I
288	IA		CO	Benton	E-24				D	11797	NO	SC	ECBBC	1	3.05	2.44	N	SO	N	I
289	IA		CO	Dubuque	Washington Mills Rd.				D	6630	YES	RO	ECGCM	1	0.61	--	N	OEC	N	I
290	IA		CO	Dubuque	Skyline Rd.				D	5000	NO	S	SF	--	--	--	N	FF	N	I
291	IA		CO	Dubuque	Old Davenport Rd.				D	2926	YES	RO	ECGCM	1	0.61	--	N	OEC	N	I
292	IA		CO	Dubuque	Schueller heights Rd.				D	8512	NO	SC	ECBCC	1	0.61	--	N	OEC	N	I
293	IA		CO	Jones					D	3529	NO	SC	ECBBC	1	Z	--	N	SO	N	I
294	IA		CO	Iowa					M	16843	NO	DT	EZG	--	--	--	N	K	T	I
295	IA		S	Iowa					D	.11500	NO	SC	BSZZ	S	--	--	N	SM	N	I
296	IA		S	Iowa					D	5750	NO	SC	BCNZ	S	--	--	N	SAS	N	I
299	IA		S	Iowa					D	13800	NO	SC	BSZZ	M	--	--	N	SAS2	N	I
300	IA		S	Iowa					D	4250	NO	SC	BSNZ	Z	--	--	N	SAS	T	I
301	IA		S	Iowa					D	14500	NO	SC	BSNZ	Z	--	--	N	SAS2	N	I
302	IA		S	Iowa					D	11500	NO	SC	BCNZ	Z	--	--	N	SAS	N	I
303	IA		S	Iowa					D	19668	NO	S	SF	--	--	--	N	FF	T	I
304	IA		S	Iowa					D	10810	NO	SC	BSNZ	Z	--	--	N	SAS2	N	I
305	IA		CO	Iowa					D	4232	NO	SC	ECBCC	1	1.07	--	N	SO	N	I
306	IA		CO	Iowa					D	3875	YES	RO	ECCCM	1	0.91	--	N	SO	N	I
307	IA		CO	Iowa					D	26750	NO	S	SF	--	--	--	N	FF	S	M
308	IA		CO	Iowa					D	5845	NO	SC	ECCCC	1	0.76	--	N	SO	N	I
309	IA		CO	Iowa					D	11500	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
310	IA		CO	Iowa					D	17250	YES	RO	ENG	--	--	--	N	OEP	T	I
311	IA		S	Iowa					M	3163	YES	RO	BSZZ	--	--	--	N	K	N	I
312	IA		S	Iowa					D	4230	NO	SC	ECCCC	1	1.07	--	N	SO	N	I
313	IA		S	Iowa					D	15317	NO	SC	BSSZ	M	--	--	N	SAS	N	I
315	IA		CO	Iowa	F-46				D	44562	YES	RO	ENG	--	--	--	N	OE	T	M
316	IA		CO	Iowa	V-66				D	11801	YES	RO	ECCZZ	Z	Z	--	N	OS	T	I
317	IA		CY	Johnson					D	17485	YES	RO	PC	--	--	--	N	K	T	I
318	IA		S	VAR					T	5000	YES	EM	O	--	--	--	N	K	T	I
319	IA		S	VAR					T	500000	YES	EM	O	--	--	--	N	K	S	I

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320	IA		S	VAR					T	27841	NO	O	O	--	--	--	N	K	--	--
321	IA		CY	Story	S. 4th St.				D	3638	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
322	IA		CY	Story	Airport Rd.				D	3050	NO	SC	Z	--	--	--	N	SO	N	I
323	IA		CY	Story	N. Dakota Ave.				D	11000	NO	S	O	--	--	--	N	K	N	I
324	IA		CY	Story	St. 6th.			Squaw creek	D	3638	NO	SC	BZZZ	Z	--	--	N	SPA	N	I
325	IA		CY	Story	E. Ave.			W. Indian creek	D	33745	YES	RO	PB	--	--	--	N	OP	S	M
326	IA		CY	Polk	Vandalia Rd.				T	4682	YES	O	O	--	--	--	N	K	T	I
327	IA		CY	Polk	Grand Av.			Racoon R.	D	18035	YES	RO	EFC	--	--	--	N	OP	S	I
328	IA		CY	Polk	Grand Av.				D	3954	YES	RO	EFB	--	--	--	N	OP	T	I
329	IA		CY	Polk	Fleur Dr.			Racoon R.	D	37500	YES	RO	EFC	--	--	--	N	OP	S	M
330	IA		CY	Polk	SW 7th St.			Racoon R.	D	699500	NO	SC	BZZZ	M	--	--	N	SP	L	M
331	IA		CY	Polk					M	92100	NO	O	O	--	--	--	N	Q	T	M
332	IA		CY	Polk	Court Av.				D	19825	YES	RO	EFC	--	--	--	N	OEP	T	I
333	IA		CY	Clayton	Keystone Arch				M	6375	NO	DRC	BCPZ	M	--	--	P	K	N	N
334	IA		S	Crawford	US-30				M	9775	YES	SU	PC	--	--	--	R	OP	T	I
335	IA		S	Crawford	Av. C				D	5980	YES	SU	PB	--	--	--	N	OP	T	I
336	IA		S	Carroll	Main St.			Middle Racoon R.	D	10753	YES	RO	BSSZ	M	--	--	P	SAS2	T	I
337	IA		S	Dallas	Bridge St.			Racoon R.	D	27562	YES	RO	BSCZ	M	--	--	C	SAS2	T	I
338	IA		S	Wapello	Madison				D	10394	YES	RO	PC	--	--	--	N	K	T	I
339	IA	93400	S	Wapello	Market St.			Des Moines R	D	18402	NO	SC	BSSZ	M	--	--	C	SAS	T	I
340	IA		S	Wapello	Jefferson St.				D	10781	YES	RO	ECBCC	1	0.61	--	N	OEP	T	I
341	IA		S	Johnson	HWY-1				T	19212	NO	O	O	--	--	--	N	K	N	I
342	IA		S	Johnson	Morman Track Blvd.				M	430	YES	RO	ENC	--	--	--	N	K	N	N
343	IA		S	Johnson	Hwy-6				D	2116	YES	RO	ENC	--	--	--	N	OP	T	I
344	IA		S	Johnson	Dubuque St.				D	6006	YES	RO	ENC	--	--	--	N	OP	T	I
345	IA		S	Johnson	Park St.				M	4670	NO	DRC	BZZZ	Z	--	--	C	K	N	I
346	IA		S	Johnson	N Riverside Dr.				M	4600	YES	DRR	ENC	--	--	--	R	K	T	I
347	IA		S	Johnson	Gilbert St.				T	11939	NO	P	O	--	--	--	R	K	N	N
348	IA		S	Johnson	Hwy-6				T	449	NO	O	O	--	--	--	R	K	N	N
349	IA		S	Johnson	S. Gilbert St.				D	4207	YES	RO	ENC	--	--	--	R	OEP	N	I
350	IA		S	Johnson	Kirkwood				D	5270	YES	SU	PC	--	--	--	R	OP	T	I
351	IA		S	Johnson	Iowa Ave.				T	1119	YES	SU	PC	--	--	--	R	K	T	N
352	IA		S	Johnson	Riverside Dr.				D	20497	YES	SU	PC	--	--	--	R	K	S	I
353	IA		S	Johnson	Iowa Ave.				M	1823	NO	DRC	ENC	--	--	--	R	OEP	N	N
354	IA		S	Johnson	VAR				T	23328	NO	O	O	--	--	--	N	K	N	N
355	IA		S	Scott					M	15689	NO	O	O	--	--	--	N	Q	N	N
356	IA		S	Johnson					T	56841	NO	O	O	--	--	--	N	K	N	N
357	IA		S	Johnson				Clear creek	D	56485	YES	SC	BSCZ	M	--	--	N	SAS2	S	M
358	IA		S	Johnson	Av. 1				D	10537	YES	RO	PC	--	--	--	N	OEP	T	I
359	IA		S	Johnson	Av. 1				T	11500	NO	O	O	--	--	--	N	K	N	N
360	IA		S	Scott					T	137258	NO	DT	O	--	--	--	N	K	L	F
361	IA	77200	S	Linn	St. 10			Indian creek	D	3845	NO	SC	BZZZ	Z	--	--	C	SAS	N	I
362	IA		S	Scott	River Dr.				T	11615	SU	O	O	--	--	--	N	Q	T	M
363	IA		S	Scott	River Dr.				T	6941	SU	O	O	--	--	--	N	Q	N	I
364	IA		S	Scott	River Dr.				T	9721	SU	O	O	--	--	--	N	Q	N	I
365	IA		S	Scott	River Dr.				T	17229	SU	O	O	--	--	--	N	Q	N	I
366	IA		S	Johnson	Benton St				D	29375	YES	RO	PC	--	--	--	N	K	S	M
367	IA		S	Polk	US-65				D	185229	YES	RO	EFC	--	--	--	N	OEP	L	F
368	IA		S	Polk	HWY-46				D	34512	YES	RO	EFC	--	--	--	N	OS	S	M
369	IA	48990	S	Story	US-69			Kegley Cr.	D	5400	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
370	IA		S	Story	US-30				D	42364	YES	RO	ENC	--	--	--	N	OEP	S	M

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371	IA		S	Jasper	I-80				D	100875	YES	RO	ECCZZ	--	--	--	N	OEC	S	M
372	IA		S	Grundy	US-175			Blackhawk R.	D	5269	NO	SC	BZZZ	Z	--	--	N	SM	N	I
373	IA		S	Grundy	IA-14			Wolf Cr.	D	3621	NO	SC	BZZZ	Z	--	--	N	SM	N	I
374	IA		S	Polk	St. 63				D	3893	NO	SC	ECBBC	Z	--	--	N	OEC	N	I
375	IA		S	Polk	SW 63			Racoon R.	T	15000	YES	SU	O	--	--	--	N	Q	N	I
376	IA	3718.7S030	S	Greene	US-30			Little Beaver Creek	D	10500	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
377	IA		S	Boone	US-30			Des Moines R	M	9201	YES	SU	EFB	--	--	--	R	K	T	I
378	IA		S	Warren	IA-316			Lake Red Rock	M	13500	NO	SC	O	--	--	--	N	K	N	N
379	IA		S	Warren	IA-5				D	19500	NO	S	SF	--	--	--	N	FF	N	I
380	IA		S	Polk	I-235				D	13800	NO	S	SF	--	--	--	N	FF	N	I
381	IA		S	Polk	I-235				D	10800	NO	S	SF	--	--	--	N	FF	N	I
382	IA		S	Polk	I-235				D	15500	NO	S	SF	--	--	--	N	FF	N	I
383	IA		S	Polk	I-235				D	16500	NO	S	SF	--	--	--	N	FF	N	I
384	IA		S	Story	US-30			S. Skunk river	D	51000	NO	SC	BZZZ	--	--	--	N	SM	T	M
385	IA		S	Story	E-63			S. Skunk river	D	4000	YES	RO	ECBZZ	--	--	--	N	OS	N	I
386	IA	8509.2L&R035	S	Story	I-35			S. Skunk river	M	6000	NO	DRC	BZZZ	Z	--	--	C	K	N	N
387	IA	8523.1S210	S	Story	IA-210			S. Skunk river	D	23000	NO	SC	EAB	Z	--	--	N	SE	T	I
388	IA		S	Marshall	IA-14			Iowa river	D	222119	YES	RO	EFB	--	--	--	N	OEP	L	F
389	IA		S	Marshall	IA-330				D	3500	YES	SC	ENB	--	--	--	N	OS	N	I
390	IA		S	Polk	IA-46				D	9700	NO	S	SF	--	--	--	N	FF	N	I
391	IA		S	Polk	I-35				M	14530	NO	DRC	BZZZ	Z	--	--	P	SP	N	N
392	IA		S	Polk	US-65				D	19550	NO	SC	EAB	Z	--	--	N	SE	N	I
393	IA		S	Jasper	US-14				D	4025	NO	S	SF	--	--	--	N	FF	N	I
394	IA		S	Jasper	US-117			Skunk R.	D	15516	YES	RO	EFC	--	--	--	N	OEP	T	I
395	IA		S	Tama	US-63				D	235829	YES	RO	ENC	--	--	--	N	OEP	L	F
396	IA		S	Poweshiek	US-63				D	97500	NO	S	SF	--	--	--	N	FF	S	M
397	IA	41540	S	Polk	I-35				D	5350	NO	SC	BCZZ	Z	--	--	N	SAS	N	I
398	IA	41140	S	Polk	I-35				D	132500	NO	SC	BZZZ	Z	--	--	P	SP	S	M
399	IA		S	Polk	I-35				D	133112	NO	L	L	--	--	--	R	K	N	M
400	IA		S	Polk	SW-63				T	17250	YES	SU	O	--	--	--	N	Q	N	I
401	IA		S	Hardin	IA-289				D	4987	NO	SC	EAB	Z	--	--	N	SE	N	I
402	IA		S	Greene	E-63			Greenbrier creek	T	8687	NO	DT	O	--	--	--	N	K	N	I
403	IA		S	Black Hawk	IA-58			Cedar river	D	30000	YES	RO	EAB	--	--	--	N	OEP	S	M
404	IA		S	Bremer				Cedar river	D	34600	NO	SC	BSCZ	M	--	--	N	SM	N	I
405	IA		S	Black Hawk	IA-57			Cedar river	D	21592	YES	RO	EAB	--	--	--	N	OEP	S	M
406	IA		S	Black Hawk	IX-58-1				D	284500	YES	RO	ECBCM	1	--	--	N	OEC	L	F
407	IA		S	Black Hawk	IX-58-1				D	32775	NO	SC	BZZZ	--	--	--	N	SM	T	M
408	IA		S	Black Hawk	IX-218-7				M	8280	NO	O	O	--	--	--	N	K	N	N
409	IA		S	Chicksaw	US-18				D	41848	NO	S	SF	--	--	--	N	FF	T	M
410	IA		S	Chicksaw	IA-24				D	6391	NO	S	SF	--	--	--	N	FF	T	I
411	IA		S	Black Hawk	IA-281				D	24094	NO	SC	BSNZ	S	--	--	N	SAS2	N	I
412	IA		S	Butler	IA-14				D	11500	NO	SC	BZZZ	M	--	--	N	SAS2	N	I
413	IA		S	Emmet	IA-9				D	5315	YES	RO	ENB	--	--	--	N	OEP	N	I
414	IA		S	Emmet	IA-4				D	9172	NO	SC	EFB	--	--	--	N	SM	N	I
415	IA		S	Emmet	IA-4				D	25000	NO	SC	ECCBC	1	3.05	3.05	N	SI	T	M
416	IA		S	Carroll	US-71			Brushy Cr.	D	1144400	NO	DT	BCCC	M	--	--	N	SPA	L	F
417	IA		S	Palo Alto	IA-4				D	284720	YES	RO	EFC	--	--	--	N	OS	L	F
418	IA		S	Harrison	I-29				M	13760	YES	SU	O	--	--	--	N	K	N	I
419	IA		S	Harrison	IA-183				M	7125	NO	L	L	--	--	--	N	K	N	N
420	IA		S	Crawford	IA-141				D	4200	NO	SC	ECBZZ	Z	Z	--	N	SO	N	I
421	IA		S	Crawford	IA-141				D	30438	NO	SC	ECBCM	1	Z	--	N	SO	N	M

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Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
422	IA		S	Mono --	IA-183				D	18250	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
423	IA	6756.2S183	S	Mono --	IA-183				D	4600	NO	SC	BZZZ	Z	Z	--	N	K	N	I
424	IA		S	Mono --	IA-183			Soldier R.	D	95625	NO	SC	EFB	--	--	--	N	OE	N	M
425	IA		S	Mono --	IA-183			Soldier R.	D	98821	NO	SC	O	--	--	--	N	K	N	M
426	IA		S	Mono --	IA-183				D	112075	NO	SC	O	--	--	--	N	K	N	M
427	IA		S	Mono --	IA-183				D	103312	NO	SC	O	--	--	--	N	K	N	M
428	IA		S	Mono --	IA-183				D	81250	NO	SC	O	--	--	--	N	K	N	M
429	IA		S	Dickinson	IA-327			Big Spirit Lake	D	81812	NO	--	--	--	--	--	N	Z	N	--
430	IA		S	Dickinson	IA-276			Big Spirit Lake	D	103500	YES	RO	EFB	--	--	--	N	OEP	S	F
431	IA		S	Dickinson	IA-276			Big Spirit Lake	D	200000	YES	RO	EFB	--	--	--	N	OEP	S	F
432	IA		S	Dickinson	IA-276			East Obokoji L.	D	26000	YES	RO	EFB	--	--	--	N	OEP	N	M
433	IA		S	Dickinson	T-23				M	17250	NO	O	O	--	--	--	N	K	N	N
434	IA		S	Dickinson	US-71				M	30556	NO	O	O	--	--	--	N	K	N	I
435	IA		S	Carroll	N-33				D	65000	NO	SC	BSCZ	M	--	--	N	SAS2	N	M
436	IA		S	Carroll	N-33				D	59800	NO	SC	BCNZ	S	--	--	N	SAS2	N	M
437	IA		S	Carroll	N-33				D	10350	NO	SC	BSNZ	S	--	--	N	SAS2	N	I
438	IA	4345.1S183	S	Harrison	IA-183				D	17250	NO	SC	BZZZ	Z	--	--	N	SM	N	I
439	IA	2466.6S030	S	Crawford	US-30				D	70055	NO	SC	BSCZ	M	--	--	N	SAS2	N	I
440	IA		S	Crawford	IA-141				D	535250	NO	S	SF	--	--	--	R	FF	N	M
441	IA		S	Crawford	US-59				D	21875	YES	S	SF	--	--	--	N	FF	N	M
442	IA	S141	S	Crawford	IA-141				D	97804	NO	SC	BSPZ	M	--	--	N	SAS2	N	M
443	IA	S059	S	Crawford	US-59				D	55750	NO	SC	BSNZ	S	--	--	N	SM	N	M
444	IA	S012	S	Plymouth	IA-12				D	64182	NO	SC	BSPZ	M	--	--	N	SAS	N	M
445	IA	603910	S	Plymouth	IA-403			Big Sioux R	D	38250	NO	SC	BZZZ	Z	--	--	N	SP	N	I
446	IA	19340	S	Cherokee	US-59			Little Sioux R	D	31250	NO	SC	BSPZ	M	--	--	P	SAS2	N	I
447	IA	19331	S	Cherokee	US-59			Little Sioux R	D	12500	NO	SC	BSCC	M	--	--	N	SAS2	N	I
448	IA	19561	S	Cherokee	IA-977			Little Sioux R	D	13750	NO	SC	BSPZ	M	--	--	N	SM	N	I
449	IA	52950	S	Woodbury	US-20			Little Sioux R	D	13750	NO	SC	BSPZ	M	--	--	N	SM	N	I
450	IA		S	Woodbury	IA-31			Little Sioux R	D	87500	NO	SC	EFB	--	--	--	N	SM	N	I
451	IA	94160	S	Carroll	N-33				D	8582	NO	EM	BSCZ	M	--	--	N	K	N	I
452	IA		S	Plymouth	IA-403				M	1150	NO	O	O	--	--	--	N	K	N	I
453	IA	S030	S	Carroll	US-30			M. Racoon R	D	16880	NO	SC	BCCC	M	--	--	N	SAS	N	I
454	IA	S175	S	Calhoun	IA-175			Prairie creek	D	14525	NO	SC	BSZC	M	--	--	N	SM	N	I
455	IA	S141	S	Carroll	IA-141			Bushy creek	D	25000	NO	SC	BCCC	M	--	--	N	SAS	N	I
456	IA	S003	S	Plymouth	IA-3			Big Sioux river	D	11719	NO	SC	BCCC	M	--	--	N	SAS2	N	I
457	IA	S018	S	Sioux	US-18			Rock river	D	37500	NO	L	L	--	--	--	N	B	N	N
458	IA		S	Cherokee	IA-3	62.4 & 62.7			D	10625	NO	S	SC	--	--	--	N	FC	T	I
459	IA	14201	S	Audubon	IA-44			E. Nish --bot --	D	30000	NO	SC	BSCZ	M	--	--	N	SM	N	I
460	IA	26201	S	Guthrie	IA-44			Bushy creek	D	72400	NO	SC	BCCC	M	--	--	N	SPA	N	M
461	IA	38691	S	Page	US-71			Nodaway river	D	27814	NO	SC	BSSS	Z	--	--	N	SBA	N	I
462	IA		S	Mills	US-54				D	10866	YES	RO	EFC	--	--	--	N	OS	T	I
463	IA		S	Fremont	IA-333				M	37500	NO	SC	O	--	--	--	N	K	N	I
464	IA		S	Fremont	IA-184				M	13742	NO	SC	O	--	--	--	N	K	N	N
465	IA		S	Fremont	IA-2				D	50000	NO	S	SF	--	--	--	N	FF	S	M
466	IA		S	Fremont	IA-2				D	225250	NO	S	SF	--	--	--	N	FF	L	F
467	IA		S	Cass	I-80				D	71455	NO	S	SF	--	--	--	N	FF	S	M
468	IA		S	Fremont	IA-145				D	52495	NO	S	SF	--	--	--	N	FF	S	M
469	IA	43820	S	Pottawattamie	IA-92			Mid Silver creek	D	97100	NO	SC	BSPZ	M	--	--	N	SAS	N	M
470	IA	131900	S	Adair	I-80				D	41425	NO	SC	BCCC	M	--	--	N	SAS	N	I
471	IA	49990	S	Taylor	IA-148				D	18450	NO	SC	BCCC	M	--	--	N	SPA	N	I
472	IA	17800	S	Cass	IA-83			E. Nish --bot --	D	125000	NO	SC	BZZZ	--	--	--	N	SM	S	M

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Highway Infrastructure Damage Classification

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473	IA	47950	S	Shelby	IA-14			Mosquito creek	D	34500	NO	SC	BSCZ	M	--	--	N	SM	N	I
474	IA		S	Shelby	US-59				D	50140	YES	RO	EFB	--	--	--	N	OS	S	M
475	IA	28121	S	Guthrie	IA-25			Brushy creek	D	40088	NO	SC	BCCC	M	--	--	N	SAS	N	I
476	IA	28111	S	Guthrie	IA-25			S. Racoon river	D	21827	NO	SC	BCCC	M	--	--	N	SAS2	N	I
477	IA	46520	S	Ringgold	IA-66			Grand river	D	8375	NO	SC	BSCZ	M	--	--	C	SPA	N	I
478	IA	46371	S	Ringgold	IA-2			Grand river	D	10237	NO	SC	BCCC	M	--	--	N	SP	N	I
479	IA	13430	S	Adams	IA-148			M. Nodaway river	D	20906	NO	SC	BSCZ	M	--	--	N	SP	N	I
480	IA		S	Marion	IA-92				D	4375	NO	S	SC	--	--	--	N	FC	N	I
481	IA	51111	S	Warren	IA-92			Middle river	D	145000	NO	SC	BSCZ	Z	--	--	P	SAS2	N	M
482	IA		S	Warren	IA-92				D	20750	NO	S	SF	--	--	--	N	FF	T	I
483	IA	51310	S	Warren	I-35			Clanton creek	M	3450	NO	DRC	BSCZ	Z	--	--	P	K	N	N
484	IA		S	Lee	St. 20				D	6889	YES	RO	PB	--	--	--	N	OP	T	I
485	IA	20040	S	Clark	US-34				D	35750	NO	S	SF	--	--	--	N	FF	S	M
486	IA		S	Monroe	IA-5				D	6125	NO	S	SF	--	--	--	N	FF	N	I
487	IA		S	Lucas	IA-14				D	13789	YES	SC	ENC	--	--	--	N	OS	T	I
488	IA	50540	S	Wapello	US-34			Des Moines R	M	4624	NO	SC	BSZZ	--	--	--	N	K	N	N
489	IA		S	Jefferson	US-34				D	3125	NO	S	SF	--	--	--	N	FF	N	N
490	IA		S	Van Buren	IA-2				D	15337	NO	S	SF	--	--	--	N	FF	T	I
491	IA		S	Henry	US-218				D	10688	NO	S	SF	--	--	--	N	FF	T	I
492	IA	S032	S	Louisa	IA-99			Iowa river	D	180550	NO	SC	BSCZ	M	--	--	N	SP	N	M
493	IA		S	Henry	US-34				D	5625	NO	S	SF	--	--	--	N	FF	N	I
494	IA		S	Van Buren	IA-16				D	4375	NO	S	SF	--	--	--	N	FF	N	I
495	IA		S	Wayne	IA-2				D	16969	NO	S	SF	--	--	--	N	FF	N	I
496	IA		S	Appanoose	IA-2				D	39000	NO	S	SF	--	--	--	N	FF	N	I
497	IA		S	Appanoose	IA-5				D	3794	NO	S	SF	--	--	--	N	FF	N	I
498	IA		S	Wapello	US-34				D	19500	NO	S	SF	--	--	--	N	FF	T	I
499	IA		S	Henry	US-218				D	26375	NO	S	SF	--	--	--	N	FF	T	M
500	IA		S	Davis	IA-2				D	9459	NO	S	SC	--	--	--	N	FC	N	I
501	IA		S	Washington	IA-92				D	37000	NO	S	SF	--	--	--	N	FF	T	M
502	IA		S	Washington	IA-22				D	4375	NO	S	SC	--	--	--	N	FC	N	I
503	IA		S	Keokuk	IA-22				D	18750	NO	SC	ECBBC	1	3.65	4.57	N	SI	T	I
504	IA		S	Lee	St. 20				M	25000	YES	SU	O	--	--	--	N	Q	T	M
505	IA		S	Washington	IA-1			English R.	D	12882	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
506	IA		S	Washington	HWY-92				D	4542	NO	S	SC	--	--	--	N	FC	N	I
507	IA		S	Keokuk	IA-149				D	6080	YES	RO	EFC	--	--	--	N	OS	T	I
508	IA		S	Keokuk	IA-149				D	5200	YES	RO	EFC	--	--	--	N	OS	T	I
509	IA		S	Keokuk	IA-92				D	18400	NO	S	SF	--	--	--	N	FF	T	I
510	IA		S	Keokuk	IA-149				D	4437	NO	S	SF	--	--	--	N	FF	N	I
511	IA		S	Keokuk	IA-92				D	4198	NO	S	SF	--	--	--	N	FF	N	I
512	IA		S	Keokuk	IA-92				D	18285	NO	S	SF	--	--	--	N	FF	T	I
513	IA		S	Keokuk	IA-21				D	5577	NO	S	SF	--	--	--	N	FF	N	I
514	IA		S	Mahaska	IA-163				D	97250	NO	S	SF	--	--	--	N	FF	S	M
515	IA		S	Wapello	US-63				D	169000	NO	S	SF	--	--	--	N	FF	L	M
516	IA		S	Wapello	US-34				D	51625	NO	S	SF	--	--	--	N	FF	S	M
517	IA		S	Wapello	US-63				D	20125	NO	S	SF	--	--	--	N	FF	T	I
518	IA		S	Davis	IA-2				D	61500	NO	S	SF	--	--	--	N	FF	T	M
519	IA		S	Davis	US-63				D	4192	NO	S	SF	--	--	--	N	FF	N	I
520	IA		S	Lee	US-61				D	8378	NO	S	SF	--	--	--	N	FF	N	I
521	IA		S	Lee	US-61				D	10453	NO	S	SF	--	--	--	N	FF	T	I
522	IA		S	Henry	US-218				D	115625	NO	S	SF	--	--	--	N	FF	S	M
523	IA		S	Henry	US-218				D	92813	NO	S	SF	--	--	--	N	FF	S	M

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524	IA		S	Wapello	IA-23				D	8338	NO	SC	BSCZ	M	--	--	N	SAS	N	I
525	IA		S	Monroe	IA-137				D	39466	NO	S	SF	--	--	--	N	FF	S	M
526	IA		S	Monroe	IA-5				D	26188	NO	S	SF	--	--	--	N	FF	T	M
527	IA		S	Marion	IA-14				D	10580	NO	S	SF	--	--	--	N	FF	T	I
528	IA		S	Marion	IA-14				D	4404	NO	S	SF	--	--	--	N	FF	N	I
529	IA		S	Marion	IA-181				D	15840	NO	S	SF	--	--	--	N	FF	T	I
530	IA		S	Marion	IA-181				D	17487	NO	S	SF	--	--	--	N	FF	T	I
531	IA		S	Mahaska	IA-137				D	28875	NO	S	SC	--	--	--	N	FC	S	M
532	IA		S	Lee	US-218			Des Moines R.	D	42550	YES	RO	BSCZ	M	--	--	P	K	T	M
533	IA		S	Marion	IA-5				D	20934	YES	RO	ENC	--	--	--	N	OEP	T	I
534	IA	602850	S	Marion	IA-92			Des Moines R.	D	321875	NO	SC	BCCC	M	--	--	P	SAS2	N	M
535	IA		S	Lucas	IA-14				D	12812	NO	SC	ECCBC	1	Z	Z	N	SO	N	I
536	IA		S	Lucas	US-34				D	23312	NO	S	SF	--	--	--	N	FF	T	I
537	IA		S	Lucas	IA-14				D	4125	NO	S	SF	--	--	--	N	FF	N	I
538	IA		S	Lucas	IA-14				D	6400	NO	S	SF	--	--	--	N	FF	N	I
539	IA		S	Lucas	IA-14				D	9125	NO	S	SF	--	--	--	N	FF	N	I
540	IA		S	Wayne	US-65				D	17850	NO	S	SF	--	--	--	N	FF	T	I
541	IA		S	Wayne	US-65				D	18975	NO	S	SF	--	--	--	N	FF	N	I
542	IA		S	Wayne	US-65				D	4437	NO	S	SF	--	--	--	N	FF	N	I
543	IA		S	Wayne	US-65				D	3694	NO	S	SF	--	--	--	N	FF	N	I
544	IA		S	Warren	US-65				D	3488	NO	S	SF	--	--	--	N	FF	N	I
545	IA		S	Warren	US-65				D	4455	NO	SC	ECBCC	1	0.91	--	N	SO	N	I
546	IA		S	Warren	IA-5				D	5636	NO	S	SF	--	--	--	N	FF	N	I
547	IA		S	Decatur	I-35				T	14237	NO	SU	O	--	--	--	N	K	N	N
548	IA		S	Davis	US-63				D	30813	NO	S	SF	--	--	--	N	FF	S	M
549	IA		S	Clark	I-35				M	100000	YES	SU	O	--	--	--	N	K	N	M
550	IA		S	Decatur	US-69				D	5750	NO	SC	BCZZ	--	--	--	N	SM	N	I
551	IA		S	Decatur	IA-2				D	110000	NO	S	SF	--	--	--	N	FF	S	M
552	IA		S	Decatur	I-35				D	5000	NO	S	SF	--	--	--	N	FF	N	I
553	IA		S	Warren	I-35				D	4375	NO	S	SF	--	--	--	N	FF	N	I
554	IA		S	Warren	IA-92				D	3500	NO	S	SF	--	--	--	N	FF	N	I
555	IA		S	Warren	US-65				D	5000	NO	S	SF	--	--	--	N	FF	N	I
556	IA		S	Wayne	IA-2				D	6250	NO	S	SF	--	--	--	N	FF	N	I
557	IA		S	Linn	IA-151				D	22965	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
558	IA		S	Iowa	US-151				M	11500	YES	SU	O	--	--	--	N	K	N	N
559	IA		S	Linn	I-380				D	7591	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
560	IA		S	Linn	I-380				M	5031	YES	SU	O	--	--	--	N	Q	N	N
561	IA		S	Linn	US-151				D	9329	NO	SC	SF	--	--	--	N	FF	N	I
562	IA		S	Iowa	US-151				D	14460	NO	SC	BCZZ	Z	--	--	N	SAS	N	I
563	IA		S	Johnson	US-923				D	5215	NO	SC	ECBCM	1	0.61	--	N	SO	N	I
564	IA		S	Muscatine	US-6				D	7881	YES	RO	EFB	--	--	--	N	OEP	T	I
565	IA		S	Linn	I-380				M	8777	YES	O	O	--	--	--	N	K	S	I
566	IA		S	Johnson	IA-1				D	140913	NO	S	SF	--	--	--	N	FF	S	M
567	IA		S	Johnson					T	153228	NO	O	O	--	--	--	N	K	N	N
568	IA		S	Bucha --n	IA-150				D	18532	YES	RO	ECCBC	1	Z	Z	N	OE	T	I
569	IA		S	Delaware					D	6027	YES	RO	ENB	--	--	--	N	OS	N	I
570	IA		S	Dubuque	US-20				D	6368	NO	SC	BSCZ	M	--	--	N	SM	N	I
571	IA		S	Dubuque	US-20				M	8880	YES	SU	O	--	--	--	N	K	N	I
572	IA	S006	S	Iowa	US-6				D	4279	NO	SC	BCZZ	Z	--	--	N	SM	N	I
573	IA	S218	S	Benton	US-218				D	18587	NO	SC	BCZZ	M	--	--	N	SM	N	I
574	IA	S136	S	Dubuque	IA-136				D	6607	NO	SC	BCCC	M	--	--	N	SAS	N	I

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575	IA		S	Scott	US-61				M	4375	NO	SU	O	--	--	--	N	K	N	N
576	IA	S220	S	Iowa	IA-220				D	7100	NO	SC	BCZC	M	--	--	N	SAS	N	I
577	IA	30170	S	Jackson	US-61			Maquoketo R.	M	3456	NO	DRC	BSCZ	M	--	--	C	K	N	N
578	IA	3157.8	S	Dubuque	US-52				D	5500	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
579	IA		S	Dubuque	US-20				D	31250	NO	S	SC	--	--	--	N	FC	T	M
580	IA		S	Scott	IA-22				T	9614	YES	SU	ENC	--	--	--	R	K	T	I
581	IA		S	Scott	US-61				M	12328	YES	SU	PC	--	--	--	R	K	T	I
582	IA		S	Scott	US-67				M	14714	YES	SU	EFC	--	--	--	N	OE	T	I
583	IA		S	Scott	IA-956			Illinois R.	M	4543	YES	SU	EFC	--	--	--	N	K	T	I
584	IA		S	Iowa	IA-21				D	82317	YES	RO	EFC	--	--	--	N	OEP	S	M
585	IA		S	Iowa	IA-151				D	12765	NO	SC	BZZZ	Z	--	--	N	SAS2	T	I
586	IA		S	Marion	IA-156				D	8157	YES	S	SF	--	--	--	N	FF	T	I
587	IA		S	Clinton	US-61				D	160000	NO	SC	BSPZ	M	--	--	N	SPA	N	M
588	IA		S	Benton	IA-21				D	82317	YES	RO	ENC	--	--	--	N	OEP	T	M
589	IA		S	Iowa	I-80			Wapsipinioon R.	D	13563	NO	S	SF	--	--	--	N	FF	T	I

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1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
1	KS		S	Cherokee	US-166			Willard & Spring Cr.	D	89000	YES	RO	EAB	Z	–	–	N	OEP	S	M
2	KS	C-62	S	Cherokee	96			Spring R.	D	575000	NO	SC	BCCC	M	–	–	N	SPA	L	F
3	KS		S	Cherokee	66				D	127000	YES	RO	ENB	–	–	–	N	OEP	L	F
4	KS			Cherokee	101				D	3109	YES	RO	E	–	–	–	N	OE	N	I
5	KS			Cherokee	1171				D	3712	YES	RO	E	–	–	–	N	OE	N	I
6	KS			Cherokee	16				D	10406	YES	RO	E	–	–	–	N	OE	N	I
7	KS			Cherokee	1169				D	3029	YES	RO	E	–	–	–	N	OS	N	I
8	KS			Cherokee	101				D	3383	YES	RO	E	–	–	–	N	OE	N	I
9	KS			Cherokee	1170				D	7118	YES	RO	E	–	–	–	N	OS	N	I
10	KS			Cherokee	2106				D	6262	YES	RO	E	–	–	–	N	OE	N	I
11	KS			Cherokee	102				D	4828	YES	RO	E	–	–	–	N	OE	N	I
12	KS			Jackson	US-75	185.4			D	116000	NO	Z	Z	–	–	–	N	OS	L	F
13	KS			Cherokee	1167				D	4445	YES	RO	E	–	–	–	N	OS	N	I
14	KS			Crawford	171				D	3250	YES	RO	E	–	–	–	N	OP	N	I
15	KS			Crawford	1184				D	3500	YES	RO	E	–	–	–	N	OE	N	I
16	KS			Crawford	1180				D	3000	NO	SC	Z	–	–	–	N	SO	N	I
17	KS			Neosho	168				D	4000	NO	SC	ECZZZ	–	–	–	N	SO	N	I
18	KS			Cherokee	166				D	3000	YES	RO	E	–	–	–	N	OEP	N	I
19	KS			Cherokee	103				D	3741	YES	RO	E	–	–	–	N	OEP	N	I
20	KS			Cherokee	107				D	75000	YES	RO	O	–	–	–	N	OEP	N	M
21	KS			Ellis	US-183	166 - 167.3			D	290000	NO	S	SF	–	–	–	N	Z	S	F
22	KS			Ellis	US-183	168.2			D	6000	NO	Z	BCCZ	–	–	–	N	Z	N	I
23	KS			Ellis	US-183	170.5			D	12000	NO	O	O	–	–	–	N	K	N	I
24	KS			Ellis	US-183	170.4 - 170.6			D	104000	NO	S	SF	–	–	–	N	Z	T	M
25	KS			Russell	US-281	147.1			D	4000	YES	RO	E	–	–	–	N	OE	N	I
26	KS			Russell	US-281	147.6			D	9000	YES	RO	E	–	–	–	N	OE	N	I
27	KS			Osborne	US-281	180 - 180.1			D	120000	YES	RO	E	–	–	–	N	OE	S	M
28	KS			Russell	US-281				D	25000	YES	RO	E	–	–	–	N	OE	T	I
29	KS			Russell	US-281	150.2			D	150000	YES	RO	E	–	–	–	N	OE	T	M
30	KS			Osborne	US-281	190.1			D	16000	YES	RO	E	–	–	–	N	OE	T	I
31	KS	28		Mitchell	14	210.2			D	65000	YES	RO	E	–	–	–	N	OE	S	M
32	KS			Jewell	US-36	219.2			D	3000	YES	RO	E	–	–	–	N	OE	N	I
33	KS			Jewell	US-36	221.8			D	3000	YES	RO	E	–	–	–	N	OE	N	I
34	KS			Jewell	28	43.5			D	6000	YES	RO	ECZZZ	–	–	–	N	OE	N	I
35	KS	42		Republic	148	7.6			D	4000	YES	RO	E	–	–	–	N	OEC	N	I
36	KS			Republic	148	19.2			D	4000	YES	RO	ECZZZ	–	–	–	N	OE	N	I
37	KS			Republic	148	33.3			D	8000	YES	RO	E	–	–	–	N	OEC	N	I
38	KS			Cloud	28	60.1			D	10000	NO	SC	E	–	–	–	N	Z	N	I
39	KS			Cloud	28	60.1			D	7000	YES	RO	O	–	–	–	N	OE	N	I
40	KS			Cloud	9	155.5			D	10000	NO	SC	E	–	–	–	N	Z	N	I
41	KS			Cloud	81	199.5			D	10000	NO	SC	E	–	–	–	N	Z	N	I
42	KS			Cloud	24	201.3			D	500000	YES	RO	E	–	–	–	N	OEP	L	F
43	KS			Cloud	24	247.8			D	3000	YES	RO	E	–	–	–	N	OE	N	I
44	KS			Cloud	24	242.8			D	3000	YES	RO	E	–	–	–	N	OE	N	I
45	KS	23		Washington	15	237.1			D	4000	YES	RO	E	–	–	–	N	OE	N	I
46	KS			Washington	US-36	270.3			D	300000	YES	RO	E	–	–	–	N	OP	L	F
47	KS	25		Washington	15	246.4			D	4000	YES	RO	E	–	–	–	N	OE	N	I

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48	KS			Washington	15	251.8			D	8000	YES	RO	ECZZZ	--	--	--	N	OEC	N	I
49	KS			Washington	US-36	271.4			D	7000	YES	RO	E	--	--	--	N	OE	N	I
50	KS			Washington	US-36	272			D	6000	NO	SC	SF	--	--	--	N	FF	N	I
51	KS			Washington	US-36	278.5			D	3000	YES	RO	E	--	--	--	N	OE	N	I
52	KS			Washington	148	71.1			D	500000	NO	SC	E	--	--	--	N	OE	S	F
53	KS			Washington	148	68.7			D	50000	YES	RO	ECZZZ	--	--	--	N	OEC	S	M
54	KS	29		Clay	9				D	5000	YES	RO	E	--	--	--	N	OE	S	I
55	KS			Clay	US-24	273.9			D	15000	YES	RO	E	--	--	--	N	OE	S	I
56	KS	14		Clay	82	7.5			D	5000	YES	RO	E	--	--	--	N	OS	S	I
57	KS			Ellsworth	156	158.3			D	100000	NO	S	E	--	--	--	N	Z	T	M
58	KS			Ellsworth	156	159			D	30000	NO	S	E	--	--	--	N	Z	N	I
59	KS			Ellsworth	156	159.1			D	8000	YES	RO	ECZZZ	--	--	--	N	OEC	N	I
60	KS			Mitchell	181	24.2			D	400000	NO	S	E	--	--	--	N	OE	L	F
61	KS			Mitchell	181	24.5			D	200000	NO	S	E	--	--	--	N	OE	L	F
62	KS			Mitchell	181	25.3			D	400000	NO	S	E	--	--	--	N	OE	L	F
63	KS			Mitchell	181	34.9			D	41000	NO	RO	ECZZZ	--	--	--	N	OEC	S	M
64	KS			Lincoln	284	2.75			D	20000	NO	S	E	--	--	--	N	Z	N	I
65	KS			Lincoln	I-70	229.1			D	10000	NO	S	E	--	--	--	N	Z	N	I
66	KS			Ellsworth	156	175			D	50000	NO	S	SF	--	--	--	N	FC	T	I
67	KS			Ellsworth	156	171.5			D	10000	NO	S	E	--	--	--	N	Z	N	I
68	KS			Dickinson	209	1.4			D	3000	NO	SC	BZZZ	--	--	--	N	SAS	N	I
69	KS			Saline	I-70	264.5			M	5000	NO	O	O	--	--	--	N	K	N	I
70	KS			Geary	244	0.6			D	800000	YES	RO	E	--	--	--	N	OEP	L	F
71	KS			Geary	57	4.4			D	1200000	YES	RO	ECZBC	Z	--	--	N	OEC	L	F
72	KS			Wyandotte	5	16.1			D	150000	YES	RO	E	--	--	--	N	OEP	L	F
73	KS			Wyandotte	I-435				T	4500	YES	O	O	--	--	--	N	K	N	I
74	KS			Wyandotte	5	18.2			D	3000	YES	RO	E	--	--	--	N	OS	N	I
75	KS			Pottawatomie	US-24	324.5		Black Jack Cr.	D	110000	NO	SC	O	--	--	--	N	SM	N	M
76	KS			Ottawa	106	7.2		Solomon R.	D	460000	NO	SC	O	--	--	--	N	SM	N	M
77	KS			Morris	US-56				D	5000	YES	RO	E	--	--	--	N	OE	N	I
78	KS			Saline	I-135	94.3			D	1250000	NO	S	SF	--	--	--	N	Z	L	F
79	KS			Saline	140	27			D	6750	NO	SC	O	--	--	--	N	K	N	I
80	KS			Brown	20	3.8		Delware R.	D	20700	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
81	KS	51		Brown	20	9.8			D	6000	NO	SC	BZZZ	Z	--	--	N	SP	N	I
82	KS			Marshall	9	248.5- 248.7			D	10000	YES	RO	E	--	--	--	N	OS	N	I
83	KS	046-049		Harvey	US-50				T	21250	YES	O	O	--	--	--	N	K	N	I
84	KS			Doniphan	7	229.4- 247.9			T	100000	YES	O	O	--	--	--	R	K	N	M
85	KS			Nemaha	US-36	335.2			D	5760	YES	RO	E	--	--	--	N	OS	N	I
86	KS			Doniphan	US-36	385.9- 390.3			T	312500	YES	O	O	--	--	--	N	K	N	M
87	KS			Wabaunsee	99			Kansas R.	D	210000	YES	RO	EFB	--	--	--	N	OS	L	F
88	KS			Atchison	116	9.7 - 11.5			D	6000	YES	RO	E	--	--	--	N	OS	N	I
89	KS			Jefferson	92	8 - 8.6			D	6800	YES	RO	E	--	--	--	N	OS	N	I
90	KS	46		Atchison	116				D	50000	YES	RO	E	--	--	--	N	OE	N	M
91	KS	45		Atchison	116				D	50000	YES	RO	E	--	--	--	N	OE	N	M
92	KS			McPherson	US-81	4			D	1545000	YES	RO	O	--	--	--	N	K	L	F
93	KS			Saline	I-70	258.4			D	93750	NO	S	E	--	--	--	N	Z	N	M
94	KS	2		Saline	I-135				D	3000	NO	SC	BZZZ	Z	--	--	N	Z	N	I

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95	KS			Jefferson	US-24	386.27			D	102400	NO	SC	BZZZ	Z	--	--	N	SP	T	M
96	KS			Osage	US-75				D	7943	YES	SU	BZZZ	--	--	--	N	OP	N	I
97	KS			Jewell	US-36	218.3			D	150000	NO	S	E	--	--	--	N	Z	T	M
98	KS			McPherson	I-135	49.5			D	30000	NO	SC	Z	Z	--	--	N	Z	N	M
99	KS			Osborne	18				D	78000	NO	SC	Z	--	--	--	N	K	N	M
100	KS			Chase	I-70	308.9			D	3000	NO	SC	ECZBC	Z	Z	Z	N	SO	N	I
101	KS			Atchison	RS-28				D	102000	NO	SC	BZZZ	Z	--	--	N	SAS	L	F
102	KS			Nemaha	RS-687				D	3600	NO	SC	E	--	--	--	N	K	N	I
103	KS			Nemaha	RS-1228				D	3510	YES	RO	Z	--	--	--	N	OEP	N	I
104	KS			Nemaha	RS-489				D	161500	YES	RO	Z	--	--	--	N	OEP	L	F
105	KS			Nemaha	RS-1228				D	15690	YES	RO	Z	--	--	--	N	OEP	T	I
106	KS			Nemaha	RS-1757				D	3750	YES	RO	Z	--	--	--	N	Z	N	I
107	KS			Washington	RS1100				D	4700	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
108	KS			Washington	RS1100				D	25000	NO	S	SF	--	--	--	N	FF	N	I
109	KS			Washington	RS1493				D	2722	NO	SC	BZZZ	Z	--	--	N	SP	N	I
110	KS			Washington	RS1100				D	3600	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
111	KS			Washington	RS1106				D	4800	NO	SC	E	--	--	--	N	SAS	N	I
112	KS			Doniphan	RS67				D	60080	YES	RO	E	--	--	--	N	OP	S	M
113	KS			Doniphan	RS201				D	6830	YES	RO	E	--	--	--	N	OEP	N	I
114	KS			Doniphan	RS2128				M	8888	NO	DRC	BZZZ	Z	--	--	C	K	N	I
115	KS			Doniphan	RS1665				D	3555	YES	RO	E	--	--	--	N	OP	N	I
116	KS			Doniphan	RS5046				D	7048	NO	S	SC	--	--	--	R	FC	T	I
117	KS			Doniphan	RS827				M	3732	YES	DRR	PZ	--	--	--	R	Z	N	I
118	KS			Doniphan	RS827				D	28000	NO	SC	BZZZ	Z	--	--	C	Z	L	F
119	KS			Doniphan	RS828				D	8600	YES	RO	E	--	--	--	N	OEP	N	I
120	KS			Doniphan	RS28				D	3570	YES	Z	ECZZZ	Z	Z	--	C	Z	N	I
121	KS			Doniphan	RS28				D	5160	NO	S	E	--	--	--	R	OEP	N	I
122	KS			Doniphan	RS28				D	2243	YES	RO	E	--	--	--	R	OEP	N	I
123	KS			Wabaunsee	RS2121				D	7543	Z	Z	ECZBC	Z	Z	Z	N	Z	N	I
124	KS			Doniphan	RS28				D	4946	Z	Z	E	--	--	--	N	Z	Z	I
125	KS			Wyandotte	RS128				D	290000	YES	RO	E	--	--	--	N	OEP	L	F
126	KS			Douglas	RS1055				D	57000	NO	S	SF	--	--	--	N	FF	N	I
127	KS			Wyandotte	S.W.Blvd.				D	673000	NO	SC	BZZZ	Z	--	--	N	SAS	L	F
128	KS			Wyandotte	2574				D	100000	Z	Z	BZZZ	Z	--	--	N	Z	L	M
129	KS			Wyandotte	KS.Ave.				D	3342	YES	RO	E	--	--	--	N	OS	N	I
130	KS			Washington	RS125				D	5250	NO	SC	Z	--	--	--	N	SAS	N	I
131	KS			Mitchell	RS236				D	160000	YES	RO	ENB	--	--	--	N	OEP	L	F
132	KS			Clay	RS128				D	4785	YES	RO	E	--	--	--	N	OP	N	I
133	KS			Clay	RS128				D	8182	YES	RO	Z	Z	--	--	N	OE	N	I
134	KS			Dickinson	RS124				D	19708	YES	RO	E	--	--	--	N	OS	T	I
135	KS			Dickinson	RS185				D	20862	YES	RO	E	--	--	--	N	OS	T	I
136	KS			Marshall	RS1235				D	6031	YES	RO	PZ	--	--	--	N	OP	T	I
137	KS			Marshall	RS1236				D	2228	NO	SC	BZZZ	Z	--	--	C	SAS	N	I
138	KS			Republic	RS1035				D	5635	YES	RO	PZ	--	--	--	N	OEP	T	I
139	KS			Republic	RS1041				D	3084	YES	RO	EZG	--	--	--	N	OP	T	I
140	KS			Republic	RS1041				D	3048	YES	RO	EZG	--	--	--	N	OP	T	I
141	KS			Republic	RS1041				D	4643	YES	RO	EZG	--	--	--	N	OP	T	I

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142	KS			Republic	RS566				D	4608	YES	RO	EZG	--	--	--	N	OP	T	I
143	KS			Lyon	RS418				D	8045	YES	RO	EZG	--	--	--	N	OP	T	I
144	KS			Clay	RS126				D	12280	YES	RO	EZG	--	--	--	N	OP	T	I
145	KS			Wabaunsee	RS680				D	4186	NO	SC	Z	Z	--	--	N	Z	N	I
146	KS			Pottawatomie	RS1872				D	3225	YES	RO	EZG	--	--	--	N	OP	N	I
147	KS			Marshall	RS1108				M	7282	YES	DRS	E	--	--	--	R	OP	T	I
148	KS			Marshall	RS1231				D	24580	NO	SC	Z	Z	--	--	N	SAS	N	I
149	KS			Marshall	RS1108				D	17883	NO	SC	BZZZ	Z	--	--	P	SAS	N	I
150	KS			Cloud	RS566				D	4640	YES	RO	E	--	--	--	N	OP	T	I
151	KS			Marshall	RS442				D	3000	YES	RO	PZ	--	--	--	N	OEP	N	I
152	KS			Marshall	RS1239				D	6000	NO	SC	Z	Z	--	--	N	SAS	T	I
153	KS			Jefferson	RS330				D	15000	YES	RO	E	--	--	--	N	OEP	T	I
154	KS			Jefferson	RS330				D	20400	YES	RO	E	--	--	--	N	OE	N	I
155	KS			Jewell	RS1723				D	21199	YES	RO	ECZZZ	Z	Z	--	N	OEC	T	I
156	KS			Marion	RS426				M	3640	NO	DRC	BZZZ	Z	--	--	P	K	N	I
157	KS			Saline	RS304				M	11730	YES	DRS	Z	Z	--	--	R	K	N	I
158	KS			Saline	RS1450				M	18770	YES	DRS	Z	Z	--	--	R	K	N	I
159	KS			Marion	RS426				D	215000	YES	SC	E	--	--	--	N	OEP	L	F
160	KS			Brown	RS67				D	78137	NO	SC	BZZZ	Z	--	--	N	SAS	S	M
161	KS			Marshall	RS1233				M	3402	Z	Z	Z	--	--	--	Z	K	N	I
162	KS			Riley	RS536				D	100000	YES	RO	E	--	--	--	N	OEP	L	F
163	KS			Saline	RS1050				D	11300	YES	RO	PZ	--	--	--	R	Z	T	I
164	KS			Russell	RS1897				D	5778	YES	RO	E	--	--	--	N	OEP	N	I
165	KS			Osborne	RS515				D	4560	NO	S	ENZ	--	--	--	R	Z	N	I
166	KS			Saline	RS523				D	6353	YES	RO	E	--	--	--	N	OE	N	I
167	KS			Saline	RS304				M	11733	YES	DRS	O	--	--	--	C	K	N	I
168	KS			Saline	RS191				D	8235	YES	RO	E	--	--	--	N	OE	N	I
169	KS			Russell	RS917				D	4527	YES	RO	PB	--	--	--	R	OP	T	I
170	KS			Ellis	RS231				D	3839	NO	S	SF	--	--	--	R	FF	N	I
171	KS			Ellis	RS235				D	17553	YES	RO	EAB	--	--	--	N	SE	T	I
172	KS			Ellis	RS1911				D	5291	YES	RO	EAB	--	--	--	N	SE	T	I
173	KS			Russell	RS2021				D	4763	YES	RO	E	--	--	--	N	OE	N	I
174	KS			Russell	RS2021				D	5552	YES	RO	E	--	--	--	N	OE	N	I
175	KS			Russell	RS918				D	10160	YES	RO	E	--	--	--	N	OEP	N	I
176	KS			Russell	RS918				D	309450	YES	RO	E	--	--	--	N	OEP	L	F
177	KS			Russell	RS1697				D	4171	YES	RO	ECZCM	Z	Z	--	N	OEC	N	I
178	KS			Russell	RS1457				D	5328	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
179	KS			Russell	RS515				D	5841	YES	RO	ECZBC	Z	Z	Z	N	OEC	N	I
180	KS			Russell	RS515				D	12008	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
181	KS			Chase	RS856				D	5570	YES	RO	E	--	--	--	N	OEP	N	I
182	KS			Chase	RS1918				D	5570	YES	RO	E	--	--	--	N	OEP	N	I
183	KS			Chase	RS90				Z	5365	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
184	KS			Chase	RS92				Z	33000	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
185	KS			Russell	RS515				D	4673	YES	RO	PB	--	--	--	N	OP	T	I
186	KS			Lincoln	RS1004				D	4275	YES	RO	EZG	--	--	--	N	OP	T	I
187	KS			Lincoln	RS2036				D	7900	YES	RO	EZZ	--	--	--	N	OEP	T	I
188	KS			Lincoln	RS2036				D	3240	YES	RO	BZZZ	Z	--	--	N	OEP	N	I

Kansas

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
189	KS			Lincoln	RS394				D	4540	YES	RO	EZZ	--	--	--	N	OEP	N	I
190	KS			Lincoln	RS394				D	3700	NO	S	SF	--	--	--	N	OEP	N	I
191	KS			Lincoln	RS394				D	4590	YES	RO	EZG	--	--	--	N	OEP	T	I
192	KS			Lincoln	RS2036				D	3600	YES	RO	EZG	--	--	--	N	OEP	T	I
193	KS			Rooks	RS912				D	4521	YES	RO	EZG	--	--	--	N	OEP	T	I
194	KS			Rooks	RS916				D	4099	YES	RO	ECZZZ	Z	Z	Z	N	OEC	T	I
195	KS			Rooks	RS912				D	4352	YES	RO	EZZ	--	--	--	N	OEP	T	I
196	KS			Washington	RS1420				D	4000	YES	RO	E	--	--	--	N	OP	T	I
197	KS			Reno	RS2031				D	6919	YES	RO	E	--	--	--	N	OP	T	I
198	KS			Reno	RS2026				D	3625	YES	RO	PZ	--	--	--	N	OS	N	I
199	KS			Reno	RS507				D	3710	YES	RO	PZ	--	--	--	N	OS	N	I
200	KS			Reno	RS554				D	18384	NO	SC	Z	Z	--	--	N	SP	N	I
201	KS			Reno	RS506				D	5300	YES	RO	ECZZZ	Z	Z	--	N	OEC	T	I
202	KS			Thomas	RS1513				D	4000	YES	RO	Z	--	--	--	N	OE	N	I
203	KS			Sheridan	RS1487				D	13049	YES	RO	PZ	--	--	--	N	OEP	N	I
204	KS			Sheridan	RS628				D	5122	YES	RO	PZ	--	--	--	N	OEP	N	I

Missouri

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER- TOPPING	13 APPROP- RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA- METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF- ICATION
1	MO		S	Bucha --n	59	17.7 - 21		Missouri R.	D	267835	YES	RO	EFB	--	--	--	N	OS	L	F
2	MO		S	District 1	*				M	509755	NO	O	Z	--	--	--	R	K	Z	Z
3	MO	S-918	S	Nodaway	46	5			D	146625	YES	RO	EAB	Z	--	--	C	SE	S	M
4	MO		S	Atchison	J	8 - 8.5			D	168765	YES	RO	EFB	--	--	--	N	OEP	L	F
5	MO		S	Atchison	N	11			D	123743	YES	RO	ECBCM	1	1.52	--	N	OEC	L	F
7	MO		S	Harrison	H	0.2			D	135760	NO	S	SF	--	--	--	N	FF	S	F
8	MO	A-2227	S	Daviess	Z	0.3			D	132000	YES	RO	EAB	Z	--	--	N	SE	L	M
9	MO		S	Bucha --n	29				D	146330	NO	S	SF	--	--	--	N	FF	L	F
10	MO		S	Daviess	I - 35	18.4			D	148239	NO	S	SF	--	--	--	N	FF	L	F
11	MO		S	Daviess	I - 35	17.4			D	325260	NO	S	SF	--	--	--	N	FF	L	F
12	MO		S	Daviess	I - 35	14.3			D	110698	NO	S	SF	--	--	--	N	FF	L	F
13	MO		S	Caldwell	US - 36	3.6			D	317421	NO	S	SF	--	--	--	N	FF	L	F
14	MO		S	Caldwell	US - 36	8.5			D	180180	NO	S	SF	--	--	--	N	FF	L	F
15	MO		S	Clinton	H	8.9			D	290500	NO	S	SF	--	--	--	N	FF	L	F
16	MO		S	Holt	59	5.37- 5.53			D	126500	YES	RO	EFB	--	--	--	N	OEP	L	F
17	MO	P-76	S	Harrison	O	7.4			M	110000	NO	O	O	--	--	--	N	SM	N	N
18	MO		S	District 1	VAR				Z	2644386	Z	Z	Z	--	--	--	N	Z	Z	Z
19	MO		S	District 1	VAR				Z	1518221	Z	Z	Z	--	--	--	N	Z	Z	Z
20	MO	N-317	S	Andrew	I - 29	11.1			M	12000	NO	O	O	--	--	--	N	SM	N	I
21	MO		S	District 1	VAR				Z	1684221	Z	Z	Z	--	--	--	N	Z	Z	Z
22	MO	J-23	S	Atchison	136	26.8			M	10000	NO	O	O	--	--	--	N	FF	N	I
23	MO		S	Gentry		0.3			D	90000	NO	SC	ECBBC	S	Z	--	N	OEC	N	I
24	MO	A-4520	S	Gentry	136	8.9			D	38400	NO	SC	BZZZ	Z	--	--	N	SU	Z	M
25	MO	T-332	S	Gentry	H	1.7			D	24000	NO	SC	BZZZ	Z	--	--	N	SU	Z	M
26	MO	N-162	S	Gentry	H	14.3			D	24000	NO	SC	BZZZ	Z	--	--	N	SU	Z	M
27	MO	X-725	S	Gentry	H	4.4			D	14400	NO	SC	BZZZ	Z	--	--	N	SU	Z	M
28	MO		S	Gentry	UU	3.1			D	30000	YES	RO	ECBCM	1	1.52	--	N	OEC	S	M
29	MO	X-848	S	Gentry	48	VAR			D	27000	YES	RO	EAB	Z	--	--	N	SE	S	M
30	MO		S	Dekalb	36	19.1			D	10000	NO	SC	ECBCM	1	Z	--	N	SO	T	I
31	MO		S	Dekalb	EE	6.5			D	56000	NO	S	SF	--	--	--	N	FF	S	M
32	MO	N-215	S	Dekalb	V	1			D	8200	NO	SC	EAB	Z	--	--	N	SE	N	I
33	MO	J-605	S	Dekalb	169	1			D	13000	NO	SC	EAB	Z	--	--	N	SE	N	I
34	MO		S	Daviess	6	17.6- 17.3			D	4800	NO	SC	ECBCM	Z	Z	--	N	SO	N	I
35	MO		S	Daviess	I - 35	17.8			D	67275	NO	S	SF	--	--	--	N	FF	S	M
36	MO		S	Daviess	69	6.4 - 10			D	10000	YES	RO	ENB	--	--	--	N	OE	T	I
37	MO		S	Daviess	69	15- 17			D	6000	NO	SC	ECBCM	Z	Z	--	N	SM	N	I
38	MO	A-1756	S	Daviess	I - 35	8.2			D	48000	NO	SC	BZZZ	Z	--	--	N	SU	S	M
39	MO		S	Daviess	US - 69	13.7			D	82000	NO	S	SF	--	--	--	N	FF	L	M
40	MO	P-429	S	Caldwell	D	8.2			D	19000	NO	SC	BZZZ	Z	--	--	N	SU	N	I
41	MO	P-27	S	Caldwell	HH	4.6			D	18000	NO	SC	BZZZ	Z	--	--	N	SU	N	I
42	MO	A-3014	S	Caldwell	13	10.2			D	14400	NO	SC	BZZZ	Z	--	--	N	SU	N	I
43	MO	T-844R	S	Caldwell	KK	0.1			D	19000	NO	SC	BZZZ	Z	--	--	N	SU	N	I
44	MO	N-319R	S	Caldwell	U	4.1			D	7200	NO	SC	BZZZ	Z	--	--	N	SU	N	I
45	MO		S	Caldwell	36	22.2			D	86903	NO	S	SF	--	--	--	N	FF	S	M
46	MO		S	Caldwell	36	5.8			D	94243	NO	S	SF	--	--	--	N	FF	S	M
47	MO	A-4465	S	Bucha --n	6	9.2 -9.6			D	22700	NO	SC	EAB	Z	--	--	N	SE	N	I
48	MO	T-233	S	Bucha --n	P	4.3			D	6600	NO	SC	BZZZ	Z	--	--	N	SU	N	I
49	MO		S	Gentry	Z.H.E	VAR			D	56000	YES	RO	ECBBC	1	Z	Z	N	SO	S	M
50	MO		S	Gentry	M	1 - 2.1			D	20000	NO	SC	ECGCM	Z	Z	Z	N	SO	S	M
51	MO		S	Gentry	F	2.6			D	50000	NO	SC	ECGCM	Z	Z	Z	N	SO	L	M
52	MO		S	Gentry	136	10.2			D	61600	NO	S	SF	--	--	--	N	FF	T	M
53	MO	J-840	S	Worth	246	1.7			D	45000	NO	SC	BZZZ	Z	--	--	N	SU	T	M
54	MO	X-112	S	Worth	T	4.6			D	14000	NO	SC	BZZZ	Z	--	--	N	SU	N	I
55	MO	X-142	S	Worth	W	2.9			D	42000	NO	SC	BZZZ	Z	--	--	N	SU	S	M
56	MO	H-617	S	Worth	YY	2.4			D	24000	NO	SC	BZZZ	Z	--	--	N	SU	T	I
57	MO	K-888	S	Nodaway	J	1.6			D	12000	NO	SC	BZZZ	Z	--	--	N	SU	N	I
58	MO	A-4330	S	Nodaway	DD	5.7			D	49000	NO	SC	EAB	Z	--	--	N	SE	T	M
59	MO		S	Nodaway	U	2		River 102	D	25000	NO	SC	EAB	Z	--	--	N	SE	T	I
60	MO		S	Nodaway	M	1.7		River 102	M	3300	NO	O	O	--	--	--	N	SM	N	I

Missouri

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
61	MO	J-376	S	Nodaway	136	18.2			D	37000	NO	O	BZZZ	Z	–	–	N	SM	N	I
62	MO	S-511	S	Nodaway	113	13.1			D	51000	NO	O	BZZZ	Z	–	–	N	SAS2	N	I
63	MO	T-48	S	Nodaway	113	0.5			D	13000	NO	O	BZZZ	Z	–	–	N	SM	N	I
64	MO	X-266	S	Holt	N	4.8			D	13000	NO	S	BZZZ	Z	–	–	N	SAS2	N	I
65	MO	X-265	S	Holt	N	3.3			D	14000	NO	O	BZZZ	Z	–	–	N	SAS	N	I
66	MO		S	Holt	B	0.8			D	29000	NO	S	SF	1	Z	–	N	FF	T	I
67	MO	A-2706	S	Holt	I - 29	2.4		Tarkio R.	D	17000	NO	O	BZZZ	Z	–	–	N	SAS2	N	I
68	MO	X-132	S	Harrison	46	11.4			D	12000	NO	SC	BZZZ	Z	–	–	N	SU	N	I
69	MO		S	Harrison	I - 35	18.9			D	17600	NO	S	SF	–	–	–	N	FF	N	I
70	MO	P-716	S	Harrison	ZZ	8.3			D	24000	NO	SC	BZZZ	Z	–	–	N	SU	N	I
71	MO	A-3779	S	Chariton	24			Chariton R.	D	61560	NO	O	BZZZ	Z	–	–	N	SM	N	M
72	MO	A-2867	S	Chariton	M			Grand R.	D	42880	NO	O	BZZZ	Z	–	–	N	SM	N	M
73	MO	R-419	S	Chariton	139			Grand R.	D	68400	NO	O	BZZZ	Z	–	–	N	SM	N	M
74	MO	L-344	S	Chariton	129				D	5100	NO	O	BZZZ	Z	–	–	N	SM	N	I
75	MO		S	Chariton	139	5.97 -8.81			D	59056	NO	S	SF	–	–	–	N	FF	S	M
76	MO	A-1190	S	Chariton	M	5.55 - 6.85			D	15344	YES	RO	EAB	M	–	–	N	SE	N	I
77	MO	A-4613	S	Carroll	24			Grand R.	D	68400	NO	O	BZZZ	Z	–	–	N	SM	N	M
78	MO		S	Carroll	41	1.6 - 1.8		Missouri R.	D	41550	YES	RO	EFC	–	–	–	R	OEP	L	F
79	MO	A-4120	S	Adair	N			Chariton R.	D	51840	NO	SC	BZZZ	Z	–	–	N	SM	T	M
80	MO	X-897	S	Adair	149	6			D	7890	YES	RO	ECBBC	1	Z	Z	N	OEC	T	I
81	MO		S	Adair	BB	.7 - .1			D	65150	YES	RO	ECBCM	1	7	–	N	OEC	L	F
82	MO		S	VAR	Z			Z	Z	1270504	Z	Z	Z	Z	–	–	N	Z	Z	Z
83	MO	P-203	S	Grundy	W	8			D	12720	NO	SC	BZZZ	Z	–	–	N	SU	N	I
84	MO	A-2875	S	Grundy	65	20.1			D	17000	NO	SC	BZZZ	Z	–	–	N	SAS	N	I
85	MO	A-2413	S	Grundy	146	3.1			D	18000	NO	SC	BZZZ	Z	–	–	N	SM	N	I
86	MO	A-1217	S	Grundy	146	1.7			D	28000	NO	SC	BZZZ	Z	–	–	N	SM	N	I
87	MO	A-906	S	Grundy	6			Thomson R.	D	57825	NO	SC	BZZZ	Z	–	–	N	SM	T	M
88	MO		S	Grundy	Y	6.9			D	6805	YES	RO	ECBCM	1	3.5	–	N	OEC	N	I
89	MO	A-4669	S	Grundy	6	10.7			D	24700	NO	SC	BCNZ	M	–	–	N	SM	N	I
90	MO	R-47	S	Grundy	O			Honey Cr.	D	95232	NO	SC	BZZZ	Z	–	–	N	SAS	T	M
91	MO	N-701	S	Grundy	O	1.6		Muddy Cr.	D	8960	NO	S	BSNZ	Z		–	N	SAS2	N	I
92	MO		S	Grundy	A	10.7			D	7800	YES	RO	ECBCM	4	0.76	–	N	OEC	S	F
93	MO		S	Sullivan	U	1.2			D	4230	NO	SC	ECBCM	1	Z	–	N	SO	N	I
94	MO		S	Sullivan	C	5.9			D	6510	YES	RO	ECBBC	1	Z	Z	N	OC	N	I
95	MO	K-26	S	Schuyler	136			Chariton R.	D	15000	NO	SC	BZZZ	Z	–	–	N	SM	N	I
96	MO		S	Mercer	65	11.4			D	8475	NO	S	SF	–	–	–	N	FF	N	I
97	MO		S	Mercer	65	10.3			D	9915	NO	S	SF	–	–	–	N	FF	N	I
98	MO		S	Mercer	65	9.6			D	7650	NO	S	SF	–	–	–	N	FF	N	I
99	MO		S	Mercer	65	7.8			D	7430	NO	S	SF	–	–	–	N	FF	N	I
100	MO		S	Mercer	136	12.5			D	13890	NO	S	SF	–	–	–	N	FF	N	I
101	MO		S	Mercer	136	12.1			D	11705	NO	S	SF	–	–	–	N	FF	N	I
102	MO	A-4508	S	Macon	156			Chariton R.	D	54600	NO	SC	BZZZ	–	–	–	N	SAS	N	M
103	MO		S	Livingston	C				D	10720	YES	RO	EFB	–	–	–	N	OP	T	I
104	MO	L-557, L-559	S	Livingston	36	8 -4.5		Grand R.	D	1051191	YES	RO	EFB	–	–	–	N	OEP	L	F
105	MO	A-2078	S	Livingston	K	4.2		Medicine Cr.	D	30400	NO	SC	BZZZ	Z	–	–	N	SM	N	I
106	MO	L-156R	S	Livingston	36	18.6			M	12670	NO	DRC	BCCZ	M	–	–	C	K	N	N
107	MO	G-614R	S	Livingston	36	18.6			D	28332	YES	RO	BCCZ	M	–	–	C	DP	N	I
108	MO	X-408	S	Linn	B	7.31			M	25500	NO	SC	BZZZ	Z	–	–	N	SAS2	N	I
109	MO		S	Howard	5	24.05 - 26.45		Missouri R.	D	42029	YES	RO	EFB	–	–	–	N	OEP	S	M
110	MO	L-119	S	Howard	40	1.19			D	46471	YES	RO	EAB	M	–	–	N	SE	S	M
111	MO	P-205	S	Sullivan	C	4 -9.8			D	3790	NO	SC	EAB	Z	–	–	N	SE	N	I
112	MO		S	Sullivan	129	18.9			D	13935	YES	RO	ECBCM	1	Z	–	N	OEC	T	I
113	MO		S	Sullivan	129	18.7			D	32180	YES	RO	ECBCM	3	1.07	–	N	OEC	S	F
114	MO		S	Sullivan	U	1.2			D	1511136	NO	SC	ECBCM	1	Z	NZ	N	SO	N	I
115	MO	T-44	S	Nodaway	113	10.42		Florida Cr.	D	1511136	YES	RO	BSTT	M	–	–	C	DF	L	F
116	MO		S	Holt	159	0 - 5.8		Missouri R.	D	933110	YES	RO	BZZZ	Z	–	–	N	SAS	L	M
117	MO	A-1020	S	Atchison	136	.3 - 4.7			D	130900	YES	RO	BCZZ	Z	–	–	R	SAS2	L	M
118	MO		S	Carroll	24	18 - 19		Missouri R.	D	868226	YES	RO	EFC	–	–	–	R	OEP	L	F
119	MO		S	Carroll	65	16.92 - 16.94		Missouri R.	D	147391	YES	RO	EFC	–	–	–	R	OEP	L	F

Missouri

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
120	MO		S	Howard	87	18.44 - 19.74		Missouri R.	D	707700	YES	RO	EFC	--	--	--	R	OEP	L	F
121	MO		S	Howard	J, 87			Missouri R.	D	857210	NO	O	EFB	--	--	--	N	H	T	F
122	MO		S	Saline	240	16 - 16.5		Missouri R.	D	2877600	YES	RO	EFB	--	--	--	R	OEP	L	F
123	MO	N-706	S	Schuyler	C			N. Fabius R.	D	107309	NO	SC	BZZZ	Z	--	--	N	SM	S	M
124	MO		S	Adair	V	0 -4.2			D	191640	NO	O	ENB	--	--	--	N	H	T	F
125	MO		S	Chariton	M	0 -7.24			D	433620	NO	O	ENB	--	--	--	N	H	T	F
126	MO	A-2634	S	Mercer	136			Grand R.	D	191560	NO	SC	BZZZ	Z	--	--	N	SAS2	L	M
127	MO	A-1376	S	Livingston	190			Grand R.	D	103200	NO	SC	BZZZ	Z	--	--	N	SM	S	M
128	MO	L-340	S	Grundy	A			Weldon F.	D	115920	NO	SC	BZZZ	Z	--	--	N	SM	S	M
129	MO	T-899	S	Grundy	C			Weldon F.	D	150848	NO	SC	BZZZ	Z	--	--	N	SM	N	M
130	MO		S	Carroll	VAR				D	3682265	NO	O	EFB	--	--	--	N	H	T	M
131	MO		S	Grundy	6	8.68			D	24420	NO	S	SF	--	--	--	N	FF	N	I
132	MO		S	Grundy	6				D	54200	NO	S	SF	--	--	--	N	FF	T	M
133	MO		S	Chariton	US - 24	2.2			M	3165	NO	O	U	--	--	--	N	K	N	I
134	MO		S	Carroll	BUS - 65	0 - .63		Missouri R.	D	35275	YES	RO	EFC	--	--	--	N	OP	T	I
135	MO		S	Carroll	US - 65	14.54			D	12830	NO	S	SF	--	--	--	N	FF	T	I
136	MO		S	Carroll	US - 24	18.6 - 18.8		Missouri R.	D	30965	YES	RO	EFC	--	--	--	N	OEP	S	I
137	MO		S	Crawford	I - 44	MP 214			D	239200	NO	S	SF	--	--	--	N	FF	L	F
138	MO	*	S	VAR	Z			Z	Z	226005	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
139	MO	*	S	DISTRICT 2	Z			Z	Z	1698098	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
140	MO	R-308	S	Schuyler	W			Chariton R.	D	109440	NO	SC	BZZZ	Z	--	--	N	SM	T	M
141	MO	R-499	S	Mercer	D			Grand river	D	198660	NO	SC	BZZZ	Z	--	--	N	SM	N	M
142	MO	A-2571	S	Grundy	US - 65	13.6		Muddy creek	D	135600	NO	SC	BZZZ	Z	--	--	N	SAS2	N	M
143	MO	A-2619R	S	Carroll	US - 65	24.2 - 26.4		Missouri R.	D	103710	YES	RO	EFC	--	--	--	N	OS	S	M
144	MO	K - 518	S	Livingston	US - 65	15.3 - 1.6		Grand R.	D	284550	YES	RO	EFC	--	--	--	N	OS	L	F
145	MO		S	Carroll	US - 65	23.2 - 23.36		Missouri R.	D	389480	YES	RO	EFC	--	--	--	N	OEP	L	F
146	MO		S	Carroll	US - 65	19.43 - 19.58		Missouri R.	D	180449	YES	RO	EFC	--	--	--	N	OEP	L	F
147	MO		S	Carroll	US - 65	19.1 - 19.35		Missouri R.	D	332909	YES	RO	EFC	--	--	--	N	OEP	L	F
148	MO	E-755R	S	Macon	36			Chariton river	D	216000	NO	SC	BZZZ	Z	--	--	N	SM	N	M
149	MO	L-555R	S	Livingston	36			Grand river	D	464592	NO	SC	BSCZ	M	--	--	C	SM	N	M
150	MO		S	Crawford	I - 44	VAR			T	369700	YES	EM	EFB	--	--	--	N	K	T	I
151	MO		S	Chariton	US - 24				D	555000	NO	O	EFC	--	--	--	N	H	T	M
152	MO		S	Pike	79	VAR		Mississippi R.	M	58600	NO	O	EFB	--	--	--	R	K	T	I
153	MO		S	Pike	N	5.3 -5.7			M	3100	YES	DRR	ENB	--	--	--	R	K	T	N
154	MO		S	Pike	H	9.6 - 10.2			M	3500	YES	DRR	EFB	--	--	--	R	K	T	N
155	MO		S	Pike	P	0 - 1.3		Mississippi R.	M	5000	YES	DRS	EFB	--	--	--	R	K	T	N
156	MO		S	Ralls	79	0 -1.1		Mississippi R.	M	3500	YES	DRS	EFC	--	--	--	R	K	T	N
157	MO		S	Ralls	E	.3 - 1.6			M	3200	YES	DRS	EFB	--	--	--	R	K	T	N
158	MO		S	Shelby	36	VAR			D	20000	YES	RO	EZB	--	--	--	N	OE	N	I
159	MO		S	Warren	47	VAR		Missouri R.	M	22000	YES	DRR	EFB	--	--	--	R	K	T	N
160	MO		S	Warren	47	25.2		Missouri R.	D	68700	YES	RO	EFB	--	--	--	N	OEP	S	M
161	MO		S	Warren	94	VAR		Missouri R.	M	73600	YES	DRS	EFB	--	--	--	R	OS	T	N
162	MO		S	Warren	D	1.8		Missouri R.	M	3100	YES	DRS	EFB	--	--	--	R	OS	T	N
163	MO		S	Lincoln	N	1.9			M	8500	YES	DRS	EFB	--	--	--	R	K	T	N
164	MO		S	Macon	61	0 - .3		Mississippi R.	T	3500	NO	O	EFC	--	--	--	N	K	T	N
165	MO		S	Marion	JJ	0 - .7			M	5000	YES	DRS	EFC	--	--	--	R	K	T	N
166	MO		S	Marion	79	2.1 - 2.3			M	3500	YES	DRS	EFC	--	--	--	R	K	T	N
167	MO		S	Marion	B	0 - 1.5			M	5000	YES	DRS	EFG	--	--	--	R	K	T	N
168	MO		S	Montgomery	94	6.9 - 13.3		Missouri R.	M	31500	YES	DRS	EFB	--	--	--	R	K	T	N
169	MO		S	Montgomery	19	32.7			D	99000	YES	RO	EFB	--	--	--	N	OE	S	M
170	MO		S	Montgomery	K	8.8 - 9.6			D	5000	YES	RO	EFB	--	--	--	N	OE	T	I
171	MO		S	Montgomery	HH	0.8			D	12000	YES	RO	EFB	--	--	--	N	OE	T	I
172	MO		S	Clark	136	22.3 - 27.9			M	33000	YES	RO	EFB	--	--	--	R	K	T	N
173	MO		S	Clark	F	.2 - 3.7			M	10500	YES	RO	EFB	--	--	--	R	K	T	N
174	MO		S	Clark	P	0 - 2.3			D	10000	YES	S	SF	--	--	--	R	FF	T	I
175	MO		S	Lewis	BUS 61	.6 - 2.2		Mississippi R.	M	3500	YES	RO	EFC	--	--	--	R	K	T	N
176	MO		S	Lewis	B	4.6 - 12.7		Mississippi R.	M	3500	YES	RO	EFB	--	--	--	R	K	T	N
177	MO		S	Lewis	V	5.4 - 5.5			D	7500	NO	S	SF	--	--	--	N	FF	N	I
178	MO		S	Lewis	Z	7.2- 10.8			D	8000	NO	S	SF	--	--	--	N	FF	N	I

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Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
179	MO		S	Lincoln	79	VAR		Mississippi R.	D	68500	YES	RO	EFC	--	--	--	R	OEP	T	I
180	MO		S	Lincoln	47	11.6 - 12.8			D	11000	YES	RO	EFB	--	--	--	N	OE	N	I
181	MO		S	Lincoln	P	0 - 4.3			D	15000	YES	RO	EFB	--	--	--	R	OP	T	I
182	MO		S	Lincoln	M	.8 - 2.9			D	7000	YES	RO	EFB	--	--	--	R	OP	T	I
183	MO		S	Clark	61	2.2 - 7.3			D	31500	YES	RO	EFC	--	--	--	R	OE	T	I
184	MO		S	VAR					D	608100	YES	RO	Z	--	--	--	R	OEP	T	I
185	MO		S	DISTRICT 3					M	1200000	YES	RO	Z	--	--	--	R	OP	T	I
186	MO		S	Pike	79	27.6 - 28.6			D	750000	NO	S	SF	--	--	--	N	FF	L	F
187	MO		S	Montgomery	I - 70	2.6 - 19.5			D	100000	NO	S	SF	--	--	--	N	FF	L	F
188	MO		S	Clark	61	0 - 2.2		Mississippi R.	D	126000	YES	RO	EFC	--	--	--	R	OEP	L	F
189	MO		S	Warren	47	27.8 - 30.4		Missouri R.	D	264000	YES	RO	EFB	--	--	--	N	OEP	L	F
190	MO		S	Marion	24	3.8 - 9.6		Mississippi R.	D	1527500	YES	RO	EFB	--	--	--	R	OEP	L	F
191	MO		S	Marion	24	4.2 - 9.6		Mississippi R.	T	191916	NO	O	O	--	--	--	N	K	O	O
192	MO		S	Montgomery	19	32.4 - 32.6			D	250000	YES	RO	EFB	--	--	--	N	OEP	L	F
193	MO		S	Montgomery	19	31.5 - 32.9		Missouri R.	D	1250000	YES	RO	EFB	--	--	--	N	OEP	L	F
194	MO	P-111	S	Lincoln	H	10.7 - 10.8		Cuivre R.	D	400000	NO	SC	EAB	Z	--	--	N	SE	L	M
195	MO		S	Marion	168	24.6 - 29			D	147000	YES	RO	EFB	--	--	--	N	OEP	L	F
196	MO		S	Warren	47	25.2 - 25.4			D	10000	YES	RO	EFB	--	--	--	N	OEP	N	I
197	MO		S	Lincoln	47	11.6 - 12.8			D	12000	NO	S	SF	--	--	--	N	FF	T	I
198	MO		S	Lincoln	D	7.1 - 7.3			D	10000	NO	S	SF	--	--	--	N	FF	T	I
199	MO		S	Lincoln	H	10.7 - 10.8			D	10000	NO	SC	BZZZ	Z	--	--	N	SP	N	I
200	MO		S	Lincoln	61	15.3 - 15.5		Cuivre R.	D	11000	NO	SC	BZZZ	Z	--	--	N	SM	N	I
201	MO		S	DISTRICT 3		VAR			M	295000	YES	RO	O	--	--	--	N	K	T	I
202	MO		S	Jackson					D	40501	NO	S	SF	--	--	--	N	FF	T	I
203	MO		S	Jackson	I - 635	2.4			D	891100	YES	RO	EFC	--	--	--	N	OEP	L	F
204	MO		S	Ray	EE	0 - 6.93	ERS-351,4		D	323300	NO	O	EFB	--	--	--	N	H	T	F
205	MO		S	Ray	K	0 - 7.5	ERS-310,4		D	350050	NO	O	ENB	--	--	--	N	H	T	F
206	MO	L-646	S	Ray	K	9.31 - 14.42			D	234500	NO	O	EFB	--	--	--	N	H	T	F
207	MO		S	Ray	A	4.61 - 7.62	ERS-113, 4		D	141500	NO	O	EFB	--	--	--	N	H	T	F
208	MO		S	DISTRICT 9	VAR				T	69120	NO	O	Z	--	--	--	N	K	T	I
209	MO		S	Jackson	A	7.62 - 19.14			D	509000	NO	O	ENB	--	--	--	N	H	T	F
210	MO		S	Jackson	69	1.1			M	3780	NO	O	U	--	--	--	N	Q	N	I
211	MO		S	Jackson	US - 24, 65	0.25			D	7600	NO	S	SF	--	--	--	N	FF	N	I
212	MO		S	Jackson	I - 635	2.85			D	79675	NO	SC	BZZZ	Z	--	--	N	SAS	N	M
213	MO		S	Jackson	9	VAR			M	4000	NO	DRR	EFB	--	--	--	R	K	T	N
214	MO		S	Jackson	I -435				D	20835	NO	S	SF	--	--	--	N	FF	T	I
215	MO		S	Jackson	291	1.29 - 1.8		Missouri R.	D	14346	YES	RO	EFB	--	--	--	N	OS	T	I
216	MO		S	Jackson	45	22.92 - 23.73			D	24200	YES	RO	BZZZ	Z	--	--	R	OP	T	I
217	MO		S	Jackson	E	5.73			M	8800	YES	DRS	ENB	--	--	--	R	K	T	I
218	MO		S	Jackson	210	16.31 - 16.7		Missouri R.	M	6380	YES	DRS	EFB	--	--	--	R	K	T	I
219	MO		S	Jackson	92	10.12			D	33675	YES	RO	ECBBC	1	Z	Z	N	OEC	S	F
220	MO		S	Jackson	210	1.78		Missouri R.	D	12775	YES	RO	EFB	--	--	--	N	OP	T	I
221	MO		S	Jackson	210	3.98 - 4.65			D	16000	YES	RO	EZC	--	--	--	N	OE	T	I
222	MO		S	Jackson	J	6.93 - 7.12		Missouri R.	M	5950	YES	DRR	EFB	--	--	--	R	OP	T	I
223	MO		S	Jackson	Z	7.16 - 7.67		Missouri R.	M	7400	YES	DRR	EFB	--	--	--	R	OP	T	I
224	MO		S	Jackson	I - 635	0 - 2.9		Missouri R.	D	1041750	YES	RO	EAB	--	--	--	N	SE	L	F
225	MO		S	Jackson	I - 635	1.82			D	57025	NO	S	SF	--	--	--	R	FF	S	M
226	MO		S	Jackson	I - 635	1.93			D	8600	YES	RO	ECBCZ	Z	Z	--	N	OEC	T	I
227	MO		S	Jackson	I - 635	2.06			D	5350	YES	RO	ENB	--	--	--	N	OE	T	I
228	MO		S	DISTRICT 4	VAR		Z	Z	Z	144961	Z	Z	*	*	*	*	*	*	*	*
229	MO		S	DISTRICT 4	VAR			Missouri R.	D	804891	YES	RO	EFB	--	--	--	R	OEP	S	M
230	MO		S	Ray	13	24.3 - 25.5	ERF-13-4, 14		D	179000	NO	S	SF	--	--	--	N	FF	L	F
231	MO		S	Jackson	10				D	598210	YES	RO	EFC	--	--	--	N	OEP	L	F
232	MO	A-3552	S	Callaway	US - 54	0 - 2.		Missouri	D	1032587	YES	RO	EAB	M	MA	--	C	SE	L	M
233	MO		S	Callaway	US - 63			Missouri R.	D	705000	YES	RO	EAB	--	--	--	R	SE	L	F
234	MO		S	Osage	100	12.5 - 25.87			M	548715	YES	O	O	--	--	--	C	K	L	M
235	MO		S	Gasco --de	100	0 - 20.5			D	823387	YES	RO	ECBZZ1	Z	Z	--	N	OEP	L	F
236	MO		S	Montgomery	94	1.8 - 6.87		Missouri R.	D	199926	YES	RO	BZZZ	--	--	--	R	OEP	L	F
237	MO		S	Callaway	94	12.2 - 26.2			D	516748	YES	RO	EFB	--	--	--	N	OEP	L	F

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Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
238	MO	P-969	S	Cole	D				D	60000	NO	SC	BZZZ	Z	--	--	N	SU	N	I
239	MO		S	Boone	63	22.1 - 22.3			D	18000	NO	S	SF	--	--	--	N	FF	N	I
240	MO		S	DISTRICT 5	VAR				D	140150	NO	O	EZB	--	--	--	N	H	T	M
241	MO		S	DISTRICT 5	VAR				T	422510	NO	O	O	--	--	--	N	K	T	M
242	MO		S	Maries	63	13.7 - 15.5		Gasco --de	D	20510	YES	RO	EFB	--	--	--	N	OEP	T	I
243	MO		S	DISTRICT 5	VAR				M	518338	YES	O	O	--	--	--	R	K	S	F
244	MO		S	Cooper	I - 70	15.3 - 15.4			D	411458	NO	S	SF	--	--	--	N	FF	S	F
245	MO		S	Cooper	I - 70	17.2 - 17.3			D	202700	NO	S	SF	--	--	--	N	FF	S	F
246	MO		S	Cooper	I - 70	24.76 - 28.04		Missouri	D	540000	NO	SC	BZZZ	M	--	--	N	SPA	N	M
247	MO	A-3534	S	Callaway	63	0 - 4.6		Missouri R.	D	874394	YES	RO	EAB	--	--	--	N	SE	S	M
248	MO		S	DISTRICT 6					Z	285355	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
249	MO		S	St. Charles	D	6.08			D	36000	YES	RO	ECBZZ1	Z	Z	--	N	OC	S	M
250	MO	A-3047	S	St. Charles	US - 67	4.1		Missouri	D	33000	NO	SC	BZZZ	Z	--	--	N	SBA	N	I
251	MO	A-4229	S	Franklin	Y	2.2			D	49500	NO	SC	BZZZ	Z	--	--	N	SBA	N	M
252	MO		S	DISTRICT 6	Z			Z	D	579200	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
253	MO		S	St. Louis	40	.5 - 5.4		Missouri R.	M	148380	YES	O	EFB	--	--	--	N	K	T	M
254	MO		CY	Pettis	Adams Rd.			Missouri R.	D	12289	YES	RO	ENB	--	--	--	N	OEP	T	I
255	MO		S	Osage	89	18.16 - 24.83	ERS-605, 6		T	310500	YES	DT	EFB	--	--	--	N	OEP	L	F
256	MO		CY	Cole	High St.				M	40000	NO	O	O	--	--	--	N	K	S	M
257	MO		S	Osage	A	0 - 6.3		Missouri R.	D	396900	NO	RO	EFB	--	--	--	N	K	L	F
258	MO		S	Cole	W	0 - 6.58			M	239760	NO	O	EFB	--	--	--	N	K	L	F
259	MO		S	Cooper	179	0 - 8.06			D	298696	YES	SU	EFB	--	--	--	N	H	L	F
260	MO		S	Moniteau	87	0 - 17.9			D	644879	NO	O	EFB	--	--	--	N	H	L	F
261	MO	X-417	S	Gasco --de	J	0 - 8.2		Gasco --de R.	D	298336	NO	RO	EFB	--	--	--	N	OEP	L	F
262	MO		S	Cole	M	0 - 8.1			D	510300	NO	RO	EFB	--	--	--	N	H	L	F
263	MO		CY	St. Louis			E-5600,611		D	36800	YES	RO	PB	--	--	--	R	K	T	I
264	MO	O96-802	CO	St. Louis	Strecker Rd.			Caulks Cr.	D	15095	YES	RO	BZZZ	Z	--	--	N	SAS	N	I
265	MO		CO	St. Louis			ER-5600, 610		D	51000	YES	RO	PB	--	--	--	R	OP	S	M
266	MO		CO	St. Louis			ER-5600,609		M	515412	NO	O	O	--	--	--	R	K	T	M
267	MO		CY	St. Louis					M	180000	NO	O	O	--	--	--	R	K	T	I
268	MO		CY	St. Louis					T	6678	YES	O	O	--	--	--	N	K	T	I
269	MO		CY	St. Louis					T	3377	YES	O	O	--	--	--	N	K	T	I
270	MO		CY	St. Louis					T	39572	YES	O	O	--	--	--	N	K	T	I
271	MO		CY	St. Louis					T	45233	NO	O	O	--	--	--	N	K	T	I
272	MO		CY	St. Louis					T	21928	NO	O	O	--	--	--	N	K	T	I
273	MO		CY	St. Louis					M	146251	NO	L	L	--	--	--	N	K	N	I
274	MO		CY	St. Louis					T	151200	NO	O	O	--	--	--	N	K	N	I
275	MO		CY	St. Louis					T	4139	NO	O	O	--	--	--	N	K	N	I
276	MO		CY	St. Louis					T	1003	NO	O	O	--	--	--	N	K	N	I
277	MO		CY	St. Louis					T	242608	NO	O	O	--	--	--	N	K	N	I
278	MO		CY	St. Louis					T	18958	YES	O	O	--	--	--	N	K	N	I
279	MO		CY	St. Louis					T	15432	NO	O	O	--	--	--	N	K	N	I
280	MO		CY	St. Louis					T	1935	NO	O	O	--	--	--	N	K	N	I
281	MO		CY	St. Louis					T	323516	NO	O	O	--	--	--	N	K	N	I
282	MO		CY	St. Louis					T	1015285	NO	O	O	--	--	--	N	K	N	I
283	MO		CY	St. Louis					T	28250	NO	O	O	--	--	--	N	K	N	I
284	MO		CY	St. Louis					T	127535	NO	O	O	--	--	--	N	K	N	I
285	MO		CY	St. Louis					T	1998	YES	O	O	--	--	--	N	K	N	I
286	MO		CY	St. Louis					T	13188	YES	O	O	--	--	--	N	K	N	I
287	MO		CY	St. Louis					T	15024	YES	O	O	--	--	--	N	K	N	I
288	MO		CY	St. Louis					T	62945	YES	O	O	--	--	--	N	K	N	I
289	MO		CY	St. Louis					T	10466	NO	O	O	--	--	--	N	K	N	I
290	MO		CY	St. Louis					T	73643	NO	O	O	--	--	--	N	K	N	I
291	MO		CY	St. Louis					T	411710	NO	O	O	--	--	--	N	K	N	I
292	MO		CY	St. Louis					T	160181	NO	O	O	--	--	--	N	K	N	I
293	MO		CY	St. Louis					T	3377	NO	O	O	--	--	--	N	K	N	I
294	MO		CY	St. Louis					T	12055	NO	O	O	--	--	--	N	K	N	I
295	MO		CY	St. Louis					T	948921	NO	O	O	--	--	--	N	K	N	I
296	MO		CY	St. Louis					T	38225	YES	O	O	--	--	--	N	K	N	I

Missouri

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
297	MO		CY	St. Louis					T	73889	YES	O	O	--	--	--	N	K	N	I
298	MO		CY	St. Louis					T	21540	YES	O	O	--	--	--	N	K	N	I
300	MO		CY	St. Louis					T	210200	NO	O	O	--	--	--	N	K	N	I
301	MO		CY	St. Louis					T	501	NO	O	O	--	--	--	N	K	N	I
302	MO		CY	St. Louis					T	1212	NO	O	O	--	--	--	N	K	N	I
303	MO		CY	St. Louis			ER-5600,607		M	4629	NO	O	O	--	--	--	N	K	--	I
304	MO		CY	St. Louis				Meramac	D	278000	YES	RO	EFB	--	--	--	N	OEP	L	F
305	MO		CY	St. Louis			ER-5455,603		D	178061	YES	RO	O	--	--	--	N	K	N	I
306	MO		CY	St. Louis			ER-5424,605	Des Peres	D	435463	YES	RO	EFB	--	--	--	R	K	L	F
307	MO		CY	St. Louis			ER-5420,604	Des Peres	D	133852	YES	RO	EFB	--	--	--	R	K	L	F
308	MO		CY	St. Louis			ER-5420,603	Des Peres	D	476229	YES	RO	EFB	--	--	--	R	K	L	F
309	MO		CO	Jefferson				Mississippi R.	D	185000	YES	RO	EFB	--	--	--	R	SM	L	F
310	MO		CO	St. Louis					D	556000	YES	O	O	--	--	--	N	K	--	F
311	MO	O96-B614	CO	St. Louis	Kehrs Mill Rd.				D	1412482	NO	SC	BSZZ	Z	--	--	N	SAS	L	F
313	MO	A-188R	S	Jasper	JJ	1.35			D	4450	YES	RO	EFB	--	--	--	N	OE	N	I
314	MO	T-112	S	Iron	K	3.3 - 3.4			D	5000	YES	RO	EAB	Z	--	--	N	SE	N	I
315	MO	R-433	S	Lawrence	AA	5.97			D	5400	NO	SC	EAB	Z	--	--	N	SE	N	I
316	MO		S	Vernon					D	32500	Z	Z	Z	Z	--	--	N	Z	Z	Z
317	MO		S	Vernon	FF	3.4			D	5400	NO	SC	ENB	Z	--	--	N	Z	N	I
318	MO	X-520	S	Vernon	M	11.6			D	5000	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
319	MO	A-4049	S	Vernon	US - 54	6.8			D	7600	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
320	MO	A-4051	S	Vernon	US - 54	7.1			D	5100	NO	SC	BSCZ	M	--	--	N	SAS	N	I
321	MO	A-2614	S	Vernon	US - 71	8.3		Douglas Branch	D	5000	NO	SC	BSCZ	M	--	--	N	SAS	N	I
322	MO	A-2615	S	Vernon	US- 71	9.8		Marmaton R.	D	4400	NO	SC	BSCZ	M	--	--	N	SAS2	N	I
323	MO		S	Dade					D	9500	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
324	MO		S	Dade	A	2.69			D	5100	NO	SC	BSCZ	M	--	--	N	SAS	N	I
325	MO	R-285	S	Dade	Z	3.89			D	4400	NO	SC	BSCZ	M	--	--	N	SAS	N	I
326	MO		S	Jasper					D	25150	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
327	MO	A-1963	S	Jasper	U	3.05			D	16500	NO	SC	BSCZ	M	--	--	N	SAS	N	I
328	MO	A-1886	S	Jasper	BB	3.69			D	4200	NO	SC	BSCZ	M	--	--	N	SAS	N	I
329	MO		S	DISTRICT 7					D	97350	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
330	MO	R-532	S	Iron	E	9.2			D	20000	NO	SC	BSCZ	Z	--	--	N	SAS	N	I
331	MO	J-382	S	Barry	248	3.5		Flat Cr.	D	9000	NO	SC	BSCZ	Z	--	--	N	SM	N	I
332	MO		S	Iron	49	25.5 - 25.6			D	30000	YES	RO	EZZ	--	--	--	N	OEP	T	I
333	MO	X-190	S	Cedar	39	3			D	5400	NO	SC	BSCZ	M	--	--	N	SAS	N	I
334	MO		S	Cedar	K	4.9 - 5.1			D	4800	YES	RO	ENB	--	--	--	N	OEP	T	I
335	MO	N-349	S	Cedar	U	4.41			D	5600	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
336	MO		CY	Franklin					T	42000	NO	DT	O	--	--	--	N	K	T	I
337	MO		CY	St. Louis				W. Watson Cr.	D	9340	YES	RO	EFB	--	--	--	R	OP	S	I
338	MO		CO	St. Louis	Old Gravois Rd.			W. Watson Cr.	D	24500	YES	RO	ECBBC1	Z	Z	Z	N	OEP	S	I
339	MO		CY	St. Louis	I - 44, Yarnell Rd.			Meramec	D	142500	YES	RO	EFB	--	--	--	N	OEP	N	F
340	MO		CO	St. Charles			ER-5600,613		D	39655	YES	RO	EFB	--	--	--	R	OEP	T	M
341	MO		CO	St. Charles					D	76200	YES	RO	EFB	--	--	--	R	OEP	T	M
342	MO	A-3300	S	Madison	DD	2.149		Castor R.	D	7500	YES	RO	BZZZ	Z	--	--	N	OE	N	I
343	MO	S-694	S	Madison	J	5.139		Castor R.	D	8000	YES	RO	BZZZ	--	--	--	N	OE	N	I
344	MO	A-4569	S	Madison	D	3.26		St. Francis R.	D	8000	YES	RO	BZZZ	--	--	--	N	OE	N	I
345	MO	J-521	S	Madison	C	4.338		St. Francis R.	D	5000	YES	RO	BZZZ	--	--	--	N	OE	N	I
346	MO	T-113	S	Iron	143	0.2			D	60000	NO	SC	EAB	Z	--	--	N	SE	T	M
347	MO	P-633	S	St. Genevieve	M	5.512		River Aux vasses	D	42500	YES	RO	BZZZ	Z	--	--	N	OEP	T	I
348	MO	H-63	S	St. Genevieve	61	23.337		River Aux vasses	D	4500	YES	RO	BZZZ	Z	--	--	N	OEP	N	I
349	MO	G-878A	S	Iron	49	25.8			D	8000	NO	SC	BZZZ	M	--	--	N	SAS	N	I
350	MO		S	Wayne	143	6 - 6.2		Big Cr.	D	44800	YES	RO	EFB	--	--	--	N	OEP	N	I
351	MO		S	St. Francois	W	3.7			D	5400	YES	RO	ENB	--	--	--	N	OEP	N	I
352	MO		S	St. Francois	32	8.5			M	12000	YES	RO	ECBZZ1	--	--	--	C	K	N	I
353	MO	F-646R	S	Iron	49	19.4			D	10000	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
354	MO	J-989	S	Iron	21	28.8			D	3000	NO	SC	ECBBC	Z	Z	Z	N	SO	N	I
355	MO		S	DISTRICT 10	VAR				M	33000	Z	Z	Z	Z	Z	Z	N	Z	Z	Z
356	MO	T-222	S	Iron	E	7.8			D	4000	NO	SC	BZZZ	Z	--	--	N	SAS2	N	I
357	MO		S	Cape Girardeau	74	0 - 5		Mississippi R.	M	22830	YES	DRS	EFB	--	--	--	R	K	T	I

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358	MO		S	Cape Girardeau	25	9.4 - 10		Mississippi R.	M	3820	YES	DRS	EFB	--	--	--	R	K	T	I
359	MO		S	Cape Girardeau	A	9..5 - 11.5		Mississippi R.	M	6260	YES	DRS	EFB	--	--	--	R	K	T	I
360	MO		S	Perry	51	0 - 5		Mississippi R.	D	53025	YES	RO	EFC	--	--	--	R	OEP	S	M
361	MO		S	Perry	M	0 - 2		Mississippi R.	D	91260	YES	RO	EFB	--	--	--	N	H	L	M
362	MO		S	Cape Girardeau	177	17.9 - 18.1		Mississippi R.	D	12660	YES	RO	EFB	--	--	--	R	OEP	T	I
363	MO		S	St. Genevieve	61	20 - 28		Mississippi R.	D	45200	YES	RO	EFB	--	--	--	R	OEP	T	I
364	MO		S	DISTRICT 10	VAR				M	227929	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
365	MO	F-1046	S	Oregon	99	8			D	5000	NO	SC	BZZZ	Z	--	--	N	SP	N	I
366	MO	A-4211	S	Reynolds	K	8.9			D	70000	NO	SC	EAB	Z	--	--	N	SE	I	I
367	MO	A-2093	S	Mississippi	I - 57	18.77			D	720000	NO	SC	BZZZ	Z	--	--	N	SM	T	M
368	MO		S	Perry	US - 51				T	51882	NO	O	O	--	--	--	N	K	--	M
369	MO		S	Perry	C	0 - 10		Mississippi R.	D	685000	YES	RO	EFB	--	--	--	N	H	L	F
370	MO		S	Perry	H	2.6 - 6.6	ER-811, 4	Mississippi R.	D	182500	YES	RO	EFB	--	--	--	N	OEP	L	F
371	MO		S	Perry	E	0 - 3	ER-662, 7	Mississippi R.	D	136900	YES	RO	EFB	--	--	--	N	OEP	L	F
372	MO		S	Washington	A				D	17464	YES	RO	EZB	--	--	--	N	OE	T	I
373	MO	X-925	S	Washington	N				D	4013	YES	RO	EAB	--	--	--	P	OE	T	I
374	MO		S	Washington	185				D	3250	YES	RO	ECBCM	1	1.07	--	N	OEP	N	I
375	MO		S	Washington	U				D	4681	YES	RO	EZB	--	--	--	N	OE	N	I
376	MO		S	Washington	8				D	10924	YES	RO	EZB	--	--	--	N	OE	N	I
377	MO		S	Washington	8				D	41000	NO	S	SF	--	--	--	N	FF	T	I
378	MO		S	Washington	VAR				M	87483	NO	O	O	--	--	--	N	K	--	I
379	MO		S	Crawford	I - 44, N, C				D	432719	Z	Z	Z	Z	Z	Z	Z	K	Z	Z
380	MO	R-275	S	Crawford	CC				D	4255	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
381	MO	A-4725	S	Reynolds	21	8.4			D	20000	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
382	MO		S	Reynolds	U	3.5 - 3.6			D	10000	YES	RO	EZB	--	--	--	N	OEP	T	I
383	MO		S	Crawford	I - 44	213			D	34500	NO	S	SF	--	--	--	N	FF	T	I
384	MO		S	Reynolds	O	4.5 - 4.6			D	10000	YES	RO	ECBBC	3	Z	Z	N	OEP	T	I
385	MO		S	Shanon	19	21.6			D	25000	NO	S	SF	--	--	--	N	FF	N	I
386	MO		S	Shanon	H	6.7			D	5000	YES	RO	ECBZZ	Z	Z	--	N	OEP	N	I
387	MO	A-4565	S	Shanon	A	4.9			D	5000	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
388	MO	T-1000	S	Reynolds	K				D	20000	NO	SC	BZZZ	Z	--	--	N	SPA	N	I
389	MO	R-461	S	Reynolds	106	2.9			D	5000	YES	RO	ECBBC	Z	Z	Z	N	OEC	N	I
390	MO		S	Reynolds	21	12.4 - 12.5			D	5000	YES	RO	EFB	--	--	--	N	OEP	N	I
391	MO		S	DISTRICT 9			ER-94-1, 92		M	43000	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
392	MO		S	DISTRICT 9			ER-93-2, 91		M	315000	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
1	NE		S	Burt	N-51	20	N-51		T	26000	YES	P	EFB	--	--	--	N	Z	T	N

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1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER- TOPPING	13 APPROP- RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA- METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF- ICATION
1	ND		CY	Burleigh	Street # 32			Hay creek	D	14191	YES	RO	ECBCM	1	1.52	--	N	OEP	S	M
2	ND	WF11	CY	Cass	W. 7th Ave.			Sheyenne river	D	26191	NO	SC	BSTT	Z	--	--	N	SAS	L	F
3	ND	Z	CY	Cass	S 25th St.				D	5500	NO	SC	BZZZ	Z	--	--	N	SAS	T	I
4	ND		S	Barnes	I - 94	2-094-(018)294			D	6500	NO	L	L	--	--	--	N	B	N	I
5	ND		S	Barnes	I - 94	2-094(019)294			D	148511	NO	S	SF	--	--	--	N	FF	T	I
6	ND		S	Emmons	ND - 1804	56.1			D	254465	YES	RO	ECBCM	1	3.65	--	N	OEC	L	F
7	ND		CO	Cavalier			1004	Pembi -- river	M	22924	NO	SC	O	--	--	--	N	K	N	N
8	ND		CY	Burleigh	E.Main/19 Street				D	8139	YES	SU	U	--	--	--	N	Q	T	I
9	ND		S	Barnes	I - 94	2-094(020)290			D	415911	NO	S	SC	--	--	--	N	FC	T	I
10	ND		S	Barnes	ND - 1	2-001(029)087			D	24838	NO	S	SC	--	--	--	N	FC	T	I
11	ND		S	Barnes	ND - 1	2-001(031)078			D	4269	NO	S	SF	--	--	--	N	FF	N	I
12	ND		S	Barnes	ND - 32	2-032(014)087			D	13495	YES	RO	ECBCM	1	1.52	--	N	OC	N	I
13	ND		S	Barnes	I - 94	2-094(023)305			D	3884	YES	SU	U	--	--	--	N	K	T	I
14	ND		CO	Barnes		T140N-R58W,9,10	221		D	135979	NO	S	SC	--	--	--	R	FC	T	I
15	ND		CO	Barnes		T142N-R58W,22,23	221		D	55366	NO	S	SF	--	--	--	N	FF	N	I
16	ND		CO	Barnes		T142N-R58&59W,31.36	219		D	8845	YES	RO	ECBCM	1	1.52	--	N	OC	N	I
17	ND		CO	Barnes		T142N-R58W,5.6	219		M	4888	NO	SC	SF	--	--	--	N	FF	N	N
18	ND		CO	Barnes		T140N-R58W,5	219		D	3059	YES	RO	ECBCM	1	1.83	--	N	OC	N	I
19	ND		S	Burleigh		1-804(016)104	1804		D	18397	NO	SC	ENB	--	--	--	N	K	T	I
20	ND		CO	Burleigh					D	199602	NO	S	SC	--	--	--	R	FC	T	I
21	ND		S	Cass		8-94(22)350	94		D	5865	YES	RO	ECCCM	1	Z	--	N	OC	N	I
22	ND		CY	Burleigh					D	2667	YES	SU	U	--	--	--	N	Q	T	I
23	ND		CY	Burleigh					D	4558	YES	RO	PB	--	--	--	N	OP	L	F
24	ND		S	Burleigh	US - 83	1-083(046)056			D	2636	YES	RO	EFB	--	--	--	N	OP	N	I
25	ND		CO	Cass	County Rd.# 5		921	Maple river	D	1253	YES	RO	ECGCM	1	1.83	--	N	OC	N	I
26	ND		CO	Cass	County Rd.# 20		928	Sheyenne R.	D	9034	YES	RO	ENG	--	--	--	N	OP	S	M
27	ND	09-141.670	CO	Cass	County Rd.# 31		949		D	25857	NO	SC	BCSZ	Z	--	--	N	SAS	S	M
28	ND		CO	Cass	County Rd.# 19				T	5958	NO	P	U	--	--	--	N	Q	N	I
29	ND		CO	Cass	County Rd.# 1		901		D	3773	YES	RO	ECGCM	2	Z	--	N	OEP	T	I
30	ND		CO	Cass	County Rd.# 16		950		D	2635	YES	RO	EAB	--	--	--	N	SE	N	I
31	ND		S	Cass			81		T	11500	YES	P	U	--	--	--	N	Q	T	I
32	ND		S	Cass		8-029(012)65	29		T	3500	YES	P	U	--	--	--	N	Q	T	N
33	ND		S	Cass		8-094(016)337	94	Maple river	M	5462	YES	SU	U	--	--	--	R	K	T	I
34	ND		S	Cass		8-029(010)075	29	Sheyenne river	M	8809	YES	SU	U	--	--	--	R	K	T	I
36	ND		CO	Barnes		T140N-R59W,16.21	222		T	37580	YES	G	EFB	--	--	--	N	K	S	M
37	ND	Z	CO	Barnes			221		M	7475	NO	DRC	BZZZ	Z	--	--	C	K	N	N
38	ND		CO	Barnes			234		T	4405	YES	EM	ECBZZ	1	0.91	--	N	OEP	S	F
39	ND		CO	Barnes			221		D	8625	NO	S	SF	--	--	--	N	FF	T	I
40	ND	0094-349-584	S	Cass	I - 29				T	14835	YES	P	PB	--	--	--	N	K	T	N
41	ND	10-934.484	S	Cass	10		10	Sheyenne river	M	6250	NO	DRC	BCSZ	Z	--	--	C	K	N	N
42	ND		S	Benson	US - 2				T	11726	NO	EM	EFB	1	0.61	--	N	K	S	M
43	ND		CO	Burleigh	County Rd.# 10		836		D	29688	NO	SC	ECBCM	2	1.83	--	N	SI/SO	N	M
44	ND		S	Emmons	ND-1804	1-804(014)049	1804		D	33870	NO	SC	ECBCM	1	1.83	--	N	SI	S	M
45	ND		S	Emmons	ND - 34	1-034(006)005			D	13922	NO	SC	ECBCM	2	1.01	--	N	SI/SO	S	M
46	ND		CO	Grant		T135-R90	1905		D	10404	YES	RO	ECGCM	2	1.22	--	N	OEP	T	I
47	ND		S	Kidder	ND - 3	1-003(012)079.57	NH-1-03		D	7790	NO	SC	ENB	--	--	--	N	K	T	I
48	ND	Z	CO	McIntosh			2524		D	3358	NO	SC	BSNZ	S	--	--	N	SAS	N	I
49	ND		S	Mercer	ND-49	83.85	1049		D	7578	NO	SC	ECBBC	1	Z	--	N	SO	N	I
50	ND	19-115-05	CO	Grant			1906		D	11064	YES	RO	BSNZ	S	--	--	C	SAS	N	I
51	ND		S	Morton	I-94	911	1094		D	537319	NO	S	SF	--	--	--	N	FF	L	F
52	ND		S	Morton	ND-6	66	1006	Heart river	D	174285	NO	S	SF	--	--	--	N	FF	L	F

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53	ND		S	Morton	I-94	153.07	1094		D	8250	NO	S	SF	--	--	--	N	FF	N	I
54	ND	1806-078-809	S	Morton	ND-1806	1806-078.809	1806		D	107500	NO	SC	ECBCM	--	--	--	N	SI/SO	L	F
55	ND		CO	Morton	County Rd.# 137		3020	Heart river	D	39000	NO	SC	EFG	--	--	--	N	K	N	I
56	ND	30-113-11	CO	Morton			3013		D	17094	YES	RO	EAB	S	--	--	N	SE	N	I
57	ND		CO	Morton	County Rd.# 138		3020		D	33317	YES	RO	ENG	--	--	--	N	OEP	T	M
58	ND		CY	Morton	Ave. 6th.				D	28876	YES	RO	PB	--	--	--	N	K	S	M
59	ND		CO	Nelson		7151N-R60W,7	3205		D	38105	YES	RO	ECGAM	1	1.52	--	N	OEC	S	M
60	ND		S	Oliver	ND-31	95.7	1031		D	3622	NO	SO	ECBCM	3	1.52	--	N	SO	N	I
61	ND		S	Oliver	ND-25	12.2	1025		D	6500	NO	SO	ECBCM	1	Z	--	N	SO	N	I
62	ND		CO	Oliver		T142-R86,33-34,27-28	3307		D	9672	YES	RO	ECGCM	1	1.83	--	N	OEP	N	I
63	ND		S	Ramsey	ND - 17	3-017(40)080			T	3600	YES	EM	ECBCM	1	Z	--	N	K	T	I
64	ND		S	Ramsey	ND - 20	3-020(20)114			T	25375	YES	EM	ENB	--	--	--	N	K	T	M
65	ND		S	Ramsey	ND - 1	6-001( )191	ND-1		T	5847	YES	DT	ENB	--	--	--	N	K	T	I
66	ND		S	Ramsey		3-002( )252	US-2		D	11841	NO	SC	ECBCM	1	0.61	--	N	SI	T	I
67	ND		CO	Ramsey			3618		D	271800	NO	O	EFB	--	--	--	N	H	L	F
68	ND		CO	Ramsey		T153-N64W,18	3634		T	24375	NO	EM	ENB	--	--	--	N	K	T	M
69	ND		CO	Ramsey		T165N-R61W	3633		T	2404	YES	G	EFG	--	--	--	N	K	T	I
70	ND	32-036.894	S	Ransom	ND-32		32	Sheyenne R.	M	34500	NO	DRC	BSSZ	Z	Z	--	C	K	N	N
71	ND		S	Sioux	ND-6	1-006(009)027	1006		D	12190	YES	RO	ECBCM	1	Z	--	N	OEC	N	I
72	ND		S	Steele		6-200(018)360	200		D	15782	YES	RO	ECBCM	Z	Z	--	N	OEC	S	F
73	ND		S	Steele		6-032(023)109	32		D	31590	YES	RO	ECBCM	1	Z	--	N	OEC	N	I
74	ND		S	Steele		6-032(024)112	32		D	17508	YES	RO	ECBCM	1	Z	--	N	OEC	N	I
75	ND		S	Steele	ND - 32	2-032(013)101			D	22193	YES	RO	ECBBC	2	Z	Z	N	OEC	N	I
76	ND		CO	Steele	County Rd.# 6		4613		D	3015	YES	RO	ECBCM	1	Z	--	N	OEP	N	I
77	ND	46-112-16	CO	Steele	County Rd.# 11		4616		D	2577	YES	RO	BZZZ	Z•	--	--	N	SAS2	T	I
78	ND		CO	Steele	County Rd.# 11		4616		D	16021	YES	RO	ECBCM	1	1.22	--	N	OEC	T	I
79	ND	46-112-18	CO	Steele	County Rd.# 6		4613		D	13225	NO	SC	BSNZ	S	--	--	N	SAS	N	I
80	ND		S	Stutsman	I - 94	2-094(022)242	I-94		T	33041	YES	RO	EFB	--	--	--	N	K	T	I
81	ND		S	Stutsman	I - 94	2-094(024)260			D	123906	NO	S	SF	--	--	--	N	FF	N	M
82	ND		CO	Stutsman			4745		T	27600	YES	RO	EFB	--	--	--	N	K	T	I
83	ND	200-402.070	S	Traill	ND-200	402	200	Goose R.	M	17250	NO	DRC	BCSN	M	--	--	C	K	N	I
84	ND		S	Wells	ND - 3				T	12350	NO	EM	ENB	--	--	--	N	K	N	I
85	ND		S	Wells	ND - 15	3-015(5)001			T	3150	YES	P	PB	--	--	--	N	K	T	I
86	ND		S	Williams	ND-1804	294	7804		D	241975	NO	SC	ECBCM	Z	Z	--	N	SO	L	F
87	ND		S	Williams	ND-1804	301	7804		D	65875	YES	RO	ECBCM	1	1.83	--	N	OEP	S	F
88	ND		CO	Williams	County Rd.# 15		5333		D	106077	YES	RO	ENB	--	--	--	N	OEP	S	M
89	ND		CO	Williams	County Rd.# 15	35-184-98&2-153-98	5333		D	5668	YES	RO	ECBCM	1	0.91	--	N	OEC	N	I
90	ND	53-137-37	CO	Williams	County Rd.# 15		5333	Long creek	D	13144	NO	SC	BSNZ	S	--	--	N	SAS2	N	I
91	ND		CO	Williams	County Rd.# 15	2&3-153-98	5333		D	13201	YES	RO	ECBCM	1	1.83	--	N	OEC	T	I
92	ND		CO	Williams	County Rd.# 15	2,3,4	5333		T	5290	YES	DT	EFG	--	--	--	N	K	N	I
93	ND	46-107-24	CO	Steele	County Rd.# 5		4624		D	6631	YES	RO	EAB	S	--	--	N	SE	T	I
94	ND		CY	Burleigh	Street 19th.				D	8139	YES	S	U	--	--	--	ND	Q	N	I

Nebraska

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
1	NE		S	Burt	N-51	20	N-51		T	26000	YES	P	EFB	--	--	--	N	Z	T	N
2	NE		S	Cass	S-13K	1.4	S-13K		M	14480	NO	S	SC	--	--	--	R	FC	T	I
3	NE	o7655	S	Cass	N-50	76.55	N-50	Mill Cr.	D	13500	YES	RO	EAB	M	--	--	C	SE	T	I
4	NE	12173	S	Dodge	US-77	122.6	US-77/275	Maple Cr.	D	28000	YES	RO	EAB	M	--	--	P	SE	S	I
5	NE	156	S	Otoe	N-128	1.58	N-128	Little Nemaha	D	27000	YES	RO	BSCZ	S	--	--	N	SAS	L	M
6	NE	12578	S	Richardson	N-8	125.6	N-8	S.F.Big Nemaha R.	D	1509075	NO	SC	BSPZ	M	--	--	C	SM	L	F
7	NE	12972	S	Richardson	N-8	129.54	N-8	Four Mile Cr.	D	67075	YES	RO	EAB	M	--	--	P	SE	L	M
8	NE		S	Sarpy	N-31	3	N-31		D	21880	NO	S	SC	--	--	--	R	FC	T	I
9	NE		S	Washington	US-30	432.11	US-30	Elkhorn R.	D	84700	NO	L	L	--	--	--	C	B	N	N
10	NE	Z	CO	Cass	Fletcher Ave.		3340		D	219600	YES	RO	BSNS	S	--	--	C	SAS	L	F
11	NE		CO	Cass	Weeping Water Rd.		3340		D	14155	YES	RO	ECBBC	1	Z	Z	N	OC	N	M
12	NE		CO	Johnson		TGN-R11E	O-3635		D	13945	YES	RO	ECBCM	1	Z	Z	N	OEC	L	F
13	NE		CO	Nemaha		US75-Howe	3645		D	6390	YES	RO	ECBCM	1	1.22	--	N	OE	N	I
14	NE		CO	Nemaha		US75-6Mi.Rd.	3645		D	3060	YES	RO	ECBCM	1	1.52	--	N	OE	N	I
15	NE	Z	CO	Nemaha			3645	Honey Cr.	D	36262	NO	SC	BTNZ	S	--	--	N	SAS	T	I
16	NE		CO	Nemaha			3685	Honey Cr.	D	23843	YES	RO	ECBCM	1	1.22	--	N	OEC	S	F
17	NE		CO	Otoe	5 Mile Rd.	US75-N128	513	Slough	D	6200	YES	RO	ECBCM	1	1.22	--	N	OEC	S	M
18	NE	53845	CO	Otoe			511		D	16483	NO	SC	BSNS	S	--	--	N	SAS	N	I
20	NE		CO	Otoe		US75-N128	513	Slough	D	12125	YES	RO	ECBCM	1	1.22	--	N	OEC	L	F
21	NE		CO	Pawnee	Lewiston Rd.		O-3595	Turkey Cr.	D	8303	YES	RO	ECBBC	2	1.52	0.91	N	OEC	N	I
22	NE	Z	CO	Pawnee	Lewiston Rd.		O-3595	Wolf Cr.	D	3059	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
24	NE		S	Knox	N-84	11.3	N-84		D	53010	YES	RO	ECBCM	1	Z	Z	N	OE	T	M
25	NE		S	Pawnee	S-67B	0.25	S-67B		D	30285	YES	RO	ECBCM	1	Z	Z	N	OEC	L	F
26	NE		CO	Buffalo			O-1975,2025		M	15000	NO	W	ENB	NONE	--	--	R	Z	T	N
27	NE		CO	Hall			O-2070,2225		M	10000	NO	W	ENB	NONE	--	--	R	Z	T	N
28	NE		CO	Lancaster	SW 100 St.		3305		D	4422	YES	RO	ECBCC	1	0.61	--	N	OEC	S	I
29	NE	Z	CO	Saunders	Silver St.		3390	Salt Cr.	D	7550	YES	RO	EAB	M	--	--	P	SE	S	I
30	NE	Z	CO	Seward			3045	Indian Cr.	D	7720	NO	SC	BCSZ	S	--	--	N	SAS	N	I
31	NE		CO	Washington	Gary Owen Rd.		3840		D	18525	YES	RO	ECBCM	1	1.52	--	N	OEC	S	M
32	NE		CO	Washington	River Rd.		3840		D	6575	YES	RO	ENG	NONE	--	--	N	OP	T	I
33	NE		CO	Washington	County Rd. # 4	Herman-US75	3490		D	28500	NO	SC	ECBBC	1	6.71	7.62	N	SO	N	I
34	NE		S	District 1	VAR			Non-Interstates	D	8000	NO	W	U	--	--	--	N	K	N	N
35	NE		S	District 4	VAR			Non-Interstates	D	22000	NO	W	U	--	--	--	N	K	N	N
36	NE		S	District 4	I-80		I-80	Non-Interstates	D	57500	NO	W	U	--	--	--	N	K	N	N
37	NE		S	District 6	VAR			Non-Interstates	D	5000	NO	W	U	--	--	--	N	K	N	N
38	NE		S	District 6	I-80		I-80	Non-Interstates	D	5000	NO	W	U	--	--	--	N	K	N	N
39	NE		S	District 7	VAR			Non-Interstates	D	10000	NO	W	U	--	--	--	N	K	N	N
40	NE		CO	Adams		T5N-R11W	O-1840	Flat Cr.	D	43500	YES	RO	ECBCM	1	3.66	--	N	OEC	L	F
42	NE	Z	CO	Adams		T5N-R11W	O-1840	Sand Cr.	D	3600	NO	SC	BSSS	M	--	--	C	SAS	N	I
43	NE		CO	Adams	VAR		O-2050,2145		M	15000	NO	W	ENB	NONE	--	--	R	Z	T	N
44	NE		CO	Boyd			2330		D	6816	YES	RO	ECBCM	1	0.76	--	N	OE	T	I
46	NE		CO	Boyd			2330		D	5800	YES	RO	ECBBC	1	1.22	1.22	N	OEC	T	I
47	NE		CO	Boyd			2135		D	3680	NO	SC	ECBCM	1	0.76	--	N	SO	N	I
50	NE		CO	Boyd			2135		D	4209	YES	RO	ECBCM	1	0.91	--	N	OEC	N	I
58	NE		CO	Dodge		T20N-R6E	3490		D	4526	YES	RO	ENB	NONE	--	--	N	OP	T	I
59	NE		CO	Frontier			1470		D	10519	YES	RO	ECBCM	1	1.52	--	N	OEC	N	I
60	NE		CO	Kearney	Lincoln-910		1985	Sand Cr.	D	9665	YES	RO	ECBCM	2	1.98	--	N	OEC	L	F
64	NE		CO	--nce			O-2220	Cottonwood Cr.	D	77220	YES	RO	ECBCM	2	3.05	--	N	OEC	S	M

Nebraska

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
66	NE	Z	CY	Otoe	9 St.		6209	S.Table Cr.	D	4667	YES	RO	EAB	S	--	--	C	OP	T	I
67	NE	Z	CY	Otoe	Steinhart Park Rd.		6201	S.Table Cr.	M	10500	NO	DRC	BZZZ	Z	--	--	C	K	N	N
68	NE		CY	Otoe	19 St.		6203	S.Table Cr.	D	8400	YES	RO	ECBCM	1	0.61	--	N	OEC	N	I
70	NE	Z	CY	Otoe	3 St.		6213	S.Table Cr.	D	11559	NO	SC	BCCZ	M	--	--	P	SAS	N	I
72	NE	Z	CO	Richardson			3610		D	19638	YES	RO	EAB	M	--	--	P	SE	N	I
73	NE	Z	CO	Richardson			3645		D	40500	NO	SC	BSZZ	M	0.91	--	N	SAS	N	I
74	NE	Z	CO	Richardson			3647		D	60000	NO	SC	BCNS	S	--	--	N	SAS	L	F
75	NE		CO	Richardson			3590		D	4080	YES	RO	ECBCM	1	0.91	--	N	OEC	S	M
76	NE		CO	Richardson			3615		D	45000	YES	RO	ECBBC	1	1.22	1.22	N	OC	T	I
78	NE	Z	CO	Richardson			3655		D	22050	YES	RO	BSNS	S	--	--	N	SAS	L	F
79	NE	Z	CO	Richardson			3625	Winnebago	D	9320	NO	SC	BZZZ	Z	--	--	N	SM	N	I
80	NE	Z	CO	Richardson			3390		D	27720	YES	RO	BSNZ	S	--	--	C	SAS2	S	M
82	NE		CO	Saunders	Silver St.		O-3390	Salt Cr.	D	3188	YES	RO	EFB	NONE	--	--	N	OP	T	I
83	NE		CO	Sherman			O-1940		D	6000	YES	RO	SF	NONE	--	--	N	FF	N	I
84	NE		CO	Sherman		T16N-R13W	O-2065		D	3060	YES	RO	ECBCM	1	--	1.83	N	OEC	N	I

South Dakota

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
1	SD	55-093-190	S		SD 10	359.66	10		D	15950	NO	SC	BZZZ	Z	–	–	N	SU	N	I
2	SD	55-101-181	S		SD 127	214.9	127		D	7570	NO	SC	ENB	Z	–	–	N	OE	N	I
3	SD		S		SD 10	356.8	10		D	11715	YES	RO	ENB	–	–	–	N	OEP	T	I
4	SD	44-222-210	S		SD 42	344.16	42		D	7500	NO	SC	BCZZ	Z	–	–	N	SAS	N	I
5	SD	44-214-107	S		SD 38	343.19	38	Vermillion	M	6000	NO	DRC	BCZZ	Z	–	–	C	SM	N	I
6	SD	44-219-125&126	S		I 90	374.95	90		M	5000	NO	O	BCZZ	Z	–	–	N	SM	N	I
7	SD	40-142-144&145	S		SD 34	339.89	34		D	84200	NO	SC	BCCZ	Z	–	–	N	SPA	N	M
8	SD		S		SD 34	390	34		D	8930	NO	SC	ECBCM	1	7	–	N	SO	N	I
9	SD		S		SD 19	95.96	19		D	11960	Z	Z	ECBBC	Z	Z	Z	N	OE	N	I
10	SD		S		US 81	92.1	81		D	10880	NO	SC	ECBCM	1	1.82	–	N	SO	T	I
11	SD		S		US 81	85.2	81		D	7320	NO	SC	ECBCC	2	Z	–	N	SO	N	I
12	SD	50-308-101	S		SD 11	90.15	11		M	6702	NO	SC	EAB	Z	–	–	N	SE	N	I
13	SD	50-310-093	S		SD 11	91.03	11		D	5240	NO	SC	EAB	Z	–	–	N	SE	N	I
14	SD		S		I 229	2	229		D	2870	YES	O	O	–	–	–	R	K	T	I
15	SD		S		SD 38	363.5	38		D	5799	NO	SC	O	–	–	–	N	K	N	I
16	SD		S		SD 38	377.1	38		D	4658	NO	SC	ECZZZ	Z	–	–	N	SO	N	I
17	SD		S		I 90	408.69	90		D	2560	NO	SC	ECZZZ	3	–	–	N	SO	N	I
18	SD		S		I 29	113.9	29		D	8935	NO	SC	ECBBC	1	Z	Z	N	SO	N	I
19	SD		S		SD 46	307.6	46		D	4200	NO	SC	ECBCC	3	0.91	–	N	SO	N	I
20	SD		S		SD 37	VAR	37		D	21200	NO	SC	ECZZZ	4	Z	–	N	SO	N	I
21	SD	05-029-110	S		SD 50	343.63	50		D	3500	NO	SC	BCZZ	Z	–	–	N	SAS	N	I
22	SD		S		SD 37	11.3	37		D	3500	NO	SC	ECBBC	1	4.57	5.48	N	SO	N	I
23	SD	14-100-084	S		SD 19	VAR	19		M	134000	YES	O	E	–	–	–	R	OS	T	I
24	SD		S		SD 19	21.3 & 22.3	19		D	9900	YES	RO	ENB	–	–	–	N	OP	T	I
25	SD	14-100-001&019	S		SD 19	23.5 &25.5	19	VAR	D	38700	NO	SC	BZZZ	Z	–	–	N	SM	N	I
26	SD	14-102-000	S		SD 46	356.69	46		D	23100	NO	SC	BSZZ	Z	–	–	N	SM	N	I
27	SD	34-202-187	S		SD 25	26.18	25		D	84000	YES	SC	ECBBC	2	3.05	3.05	N	SO	N	I
28	SD		S		SD 48	383.9	48		D	7300	YES	RO	ENB	–	–	–	N	OS	N	I
29	SD		S		SD 46	381.6	46		D	20000	YES	RO	ENB	–	–	–	N	OS	N	I
30	SD		S		SD 46	340.85	46		D	6100	YES	RO	ECBCM	1	0.91	–	N	OEC	N	I
31	SD		S		SD 46	333.5	46		D	14000	NO	SC	ECBCM	1	1.52	–	C	OEC	N	I
32	SD	68-120-199&200	S		SD 50	390.08	50		D	20000	NO	SC	BSZZ	Z	–	–	N	SAS	N	I
33	SD		CO	Aurora	47G		6189		D	10700	NO	SC	ECGCM	2	2.74	–	N	SO	N	I
34	SD		CO	Aurora	47G		6189		D	7100	YES	RO	ECGCM	Z	1.22	–	N	OEC	N	I
35	SD	05-197-010	CO	Bon Homme	2		6208		D	2000	NO	SC	BSZZ	Z	–	–	N	SAS	N	I
36	SD		CO	Brookings	23B		6317		D	1546	YES	RO	ECZZZ	Z	Z	–	N	SO	N	I
37	SD		CO	Brookings	12B		6312		T	65932	YES	G	E	–	–	–	N	K	S	M
38	SD		CO	Brookings	1B		6321		T	143330	YES	G	ENB	–	–	–	N	K	L	F
39	SD		CO	Brookings			6312		T	23347	YES	G	E	–	–	–	N	K	T	I
40	SD		CO	Brookings			6321		T	24428	YES	G	E	–	–	–	N	K	T	I
41	SD		CO	Brown	12W		6576		D	4900	NO	S	EAB	–	–	–	N	SE	N	I
42	SD		CO	Brown	B13		6426		T	189200	YES	G	EZB	–	–	–	N	K	L	F
43	SD		CO	Brown	B18		6427		T	95794	YES	G	EZG	–	–	–	N	K	S	M
44	SD		CO	Campbell			6478		D	3922	YES	RO	ENG	–	–	–	N	OEP	T	I
45	SD		CO	Charles Mix	CC-5		6221		D	5000	YES	RO	ECBCM	1	2.74	–	N	OEC	T	I
46	SD	14-133-150	CO	Clay			6390		D	8250	YES	RO	EFB	–	–	–	R	OEP	T	I
47	SD	14-130-146	CO	Clay			6475		D	18500	YES	RO	EFB	–	–	–	R	OEP	T	I
48	SD	14-112-090&090	CO	Clay	D4		6370		D	9700	YES	RO	EFB	–	–	–	R	OEP	T	I
49	SD	14-081-050	CO	Clay	F2		6372		D	30300	YES	RO	EFB	–	–	–	N	OEP	T	I
50	SD		CO	Clay	S2		6534		D	11879	YES	RO	ECGCC	–	0.92	–	N	OEC	T	I
51	SD		CO	Davison	12		6704		D	2960	YES	RO	ENG	–	–	–	N	OP	T	I

South Dakota

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1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
52	SD	18-110-056	CO	Davison	12		6221		M	4200	NO	O	BCZZ	Z	--	--	N	K	N	I
53	SD		CO	Davison	10		6221		D	1500	YES	SC	ECBBC	1	4.92	1.82	N	SO	N	I
54	SD		CO	Davison	29		6374		D	1450	YES	RO	ECBCC	2	0.92	--	N	SO	N	I
55	SD	18-030-144	CO	Davison	4		6219		D	7500	NO	SC	BCZZ	Z	--	--	N	SAS	N	I
56	SD	18-120-209	CO	Davison	13		6351		D	37500	NO	SC	BCZZ	Z	--	--	N	SAS	T	I
57	SD		CO	Day			6126		D	84000	YES	RO	ECBBC	2	2.46	--	N	OC	S	M
58	SD		CO	Grant	19		6433		D	1738	YES	RO	ECZCM	1	1.82	--	N	OPC	T	I
59	SD		CO	Gregory	1806		1806		D	43750	YES	S	SF	--	--	--	C	FF	S	M
60	SD		CO	Hamlin	5		6240		D	17664	YES	RO	EFB	--	--	--	N	OS	T	I
61	SD		CO	Hamlin	M		6293		D	5250	YES	SC	EFB	--	--	--	N	K	N	I
62	SD		CO	Hamlin	C		6321		D	600	YES	SC	EZZZZ	--	--	--	N	OEP	N	I
63	SD		CO	Hamlin	B		6306		D	7524	NO	SC	ECZCM	1	1.52	--	N	SO	N	I
64	SD		CO	Hand			6275		D	6445	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
65	SD		CO	Hanson	4		6234		D	1800	YES	SC	ECBBC	1	2.46	2.46	N	OEC	N	I
66	SD		CO	Hanson	5		6223		D	4000	YES	RO	ENB	--	--	--	N	OP	T	I
67	SD	31-040-141	CO	Hanson	2		6229		D	2700	YES	RO	EAB	Z	--	--	C	OP	T	I
68	SD	31-049-130	CO	Hanson			6588		D	900	YES	RO	EZZ	--	--	--	N	OP	T	I
69	SD	34-202-072	CO	Hutchinson			6025		D	1000	YES	RO	EZZZZ	--	--	--	C	OP	T	I
70	SD		CO	Hutchinson			6516		D	5600	YES	RO	ECBBC	1	1.52	1.52	N	OC	T	I
71	SD		CO	Hutchinson	13		6213		D	30400	NO	SC	EZZZZ	--	--	--	N	SM	T	I
72	SD		CO	Kingsbury			6257		D	17250	NO	SC	EFZ	--	--	--	N	SM	T	I
73	SD		CO	Kingsbury	10G		6327		D	103006	YES	RO	EFZ	--	--	--	N	OEP	L	F
74	SD		CO	Kingsbury	10G		6327		D	74093	NO	S	SF	--	--	--	N	FF	T	M
75	SD		CO	Lake			6353		T	3000	YES	P	EFB	--	--	--	N	K	T	I
76	SD		CO	Lake			6353		D	13396	YES	RO	EFZ	--	--	--	N	OS	T	I
77	SD		CO	Lake			6334		D	22837	YES	RO	EFZ	--	--	--	N	OP	T	I
78	SD		CO	Lake			6473		D	4505	YES	RO	EAZ	--	--	--	N	OP	T	I
79	SD		CO	Lake			6328		D	10100	YES	RO	EFZ	--	--	--	N	OEP	T	I
80	SD		CO	Lincoln	135		6546		D	2620	YES	RO	ENB	--	--	--	N	OEP	T	I
81	SD	44-191-010	CO	McCook	2		6332		D	11000	YES	SC	EAB	Z	--	--	R	OEP	T	I
82	SD	44-199-040	CO	McCook	6		6166		D	10000	YES	SC	EAB	Z	--	--	N	SE	T	I
83	SD	44-212-100	CO	McCook	3 & 10		6149		D	11300	YES	RO	ECBCC	1	1.52	--	N	OPC	T	I
84	SD	44-010-067	CO	McCook	25		6341		D	20700	YES	RO	ECBCC	1	0.92	--	N	OPC	T	I
85	SD	44-137-040	CO	McCook	6		6166		D	8000	NO	SC	EAB	Z	--	--	N	SE	N	I
86	SD		CO	Miner	22		6242		D	72720	YES	RO	ECBBC	1	2.23	3.05	N	OEC	S	M
87	SD		CO	Miner	22		6242		D	2900	YES	RO	ENG	--	--	--	R	OEP	T	I
88	SD		CO	Miner	19		6113		D	1140	YES	EM	ECGCM	1	0.45	--	N	K	N	I
89	SD		CO	Miner	25		6400		D	1530	YES	RO	ECGCM	1	0.45	--	N	K	N	I
90	SD	50-240-113	CO	Minnehaha	121		6195		D	6168	NO	SC	BCZZ	Z	--	--	N	SAS	N	I
91	SD	50-240-069	CO	Minnehaha	121		6409		D	2760	NO	SC	BCZZ	Z	--	--	N	SAS2	N	I
92	SD	50-289-060	CO	Minnehaha	114		6298		D	2620	NO	SC	BSZZ	Z	--	--	N	SAS2	N	I
93	SD	50-330-183	CO	Minnehaha	105		6347		D	9330	NO	SC	BCZZ	Z	--	--	N	SAS	N	I
94	SD		CO	Minnehaha	136		1186		M	634	NO	DRC	ENG	--	--	--	N	K	N	I
95	SD	50-240-172	CO	Minnehaha	121		6195		M	864	NO	SC	BSZZ	Z	--	--	C	SAS	N	I
96	SD		CO	Minnehaha	114		6238		D	4600	NO	SC	BZZZ	Z	--	--	N	SU	N	I
97	SD		CO	Minnehaha	110		6166		D	2610	NO	SC	ECZCC	1	0.92	--	N	SO	N	I
98	SD	50-186-060	CO	Minnehaha	114		6238		D	10552	YES	SC	ECCCM	1	0.78	--	N	SO	N	I
99	SD		CO	Minnehaha	121		6195		D	180	YES	RO	EZZ	--	--	--	N	OS	N	I
100	SD	55-062-120	CO	Roberts	12		6202		D	3636	YES	SC	EAB	Z	--	--	N	SE	N	I
101	SD		CO	Roberts	28		6357		D	5460	NO	S	SF	--	--	--	N	FF	N	I
102	SD		CO	Sanborn	27		6318		D	7000	YES	RO	ENG	--	--	--	N	OEP	T	I

South Dakota

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
103	SD		CO	Sanborn	28	VAR	6232		D	3000	YES	RO	E	--	--	--	N	OP	N	I
104	SD	56-174-210	CO	Sanborn	2		6242	James R.	D	3200	YES	RO	EAB	Z	--	--	N	K	T	I
105	SD		CO	Turner	41		6353		D	67500	YES	RO	EFB	--	--	--	N	OEP	S	M
106	SD	63-165-070	CO	Turner			6100		D	7500	NO	SC	EAB	--	--	--	N	SE	N	I
107	SD		CO	Union	4		6157		D	332500	NO	SC	EFB	--	--	--	N	SM	L	F
108	SD	64-158-059	CO	Union	13		6372		D	22000	NO	SC	BSZZ	--	--	--	N	SB	N	I
109	SD	64-148-058	CO	Union	13		6372		M	3000	YES	DRR	BCZZ	--	--	--	R	K	T	I
110	SD		CO	Union	4		6157		D	12500	YES	RO	EFG	--	--	--	N	OEP	T	I
111	SD		CO	Union	7		6582		D	10200	YES	RO	E	--	--	--	N	OEP	T	I
112	SD		CO	Union	9		6285		D	6970	YES	RO	ECBCC	1	0.62	--	C	OEC	N	I
113	SD		CO	Union	3		6557		D	13000	YES	RO	EFB	--	--	--	R	K	T	I
114	SD	68-030-018	CO	Yankton			6213		D	32000	YES	RO	EAB	--	--	--	C	OEP	T	I
115	SD		CY	Lake	9th Street		M6284	Park Cr.	D	100360	NO	SC	BCZZ	S	--	--	N	SAS	L	F
116	SD		CY	Lake	5th Street		M6294	Park Cr.	M	4170	NO	SC	O	--	--	--	C	K	N	I
117	SD		CY	Lake	4th Street		M6312	Park Cr.	M	8160	NO	SC	O	--	--	--	N	K	N	I

Wisconsin

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
1	WI		S	Rock	81				D	7000	YES	RO	E	–	–	–	N	OS	N	I
2	WI		S	Rock	81				D	3000	YES	RO	E	–	–	–	N	OS	N	I
3	WI		S	Rock	213				D	1000	YES	RO	E	–	–	–	N	OS	N	I
4	WI		S	Rock	US-14				D	1000	YES	RO	E	–	–	–	N	OS	N	I
5	WI		S	Rock	11				D	1000	YES	RO	E	–	–	–	N	OS	N	I
6	WI		S	Rock	140				D	2000	YES	RO	E	–	–	–	N	OS	N	I
7	WI		S	Rock	140				D	2000	YES	RO	E	–	–	–	N	OS	N	I
8	WI		S	Rock	VAR				M	10000	YES	DRR	E	–	–	–	R	K	T	I
9	WI		S	Racine	75				M	3241	NO	DRR	Z	–	–	–	R	K	T	I
10	WI		S	Racine	11				M	3494	NO	DRR	Z	–	–	–	R	K	T	I
11	WI		S	Racine	38				M	1295	NO	DRR	Z	–	–	–	R	K	T	I
12	WI		S	Racine	VAR				M	4223	NO	DRR	Z	–	–	–	R	K	T	I
13	WI		S	Green Lake	49				D	500	YES	RO	E	–	–	–	N	OS	N	I
14	WI		S	Green Lake	73				D	1200	YES	RO	E	–	–	–	N	OS	N	I
15	WI		S	Green Lake	44				D	500	YES	RO	E	–	–	–	N	OS	N	I
16	WI		S	Green Lake	73				D	500	YES	RO	E	–	–	–	N	OS	N	I
17	WI		S	Winnebago	150				D	1000	YES	RO	Z	–	–	–	R	OE	N	I
18	WI		S	Winnebago	116				D	4368	YES	RO	E	–	–	–	N	OS	T	I
19	WI		CO	Rusk	I			Skunk R.	D	3500	YES	RO	ECZZZ	Z	Z	Z	N	OEC	N	I
20	WI		CO	Rusk	D			Chippewa R.	D	2400	YES	RO	ECZZZ	Z	Z	Z	N	OEC	N	I
21	WI		CO	Dunn	H			Chippewa R.	T	4290	YES	O	PZ	–	–	–	R	K	T	I
22	WI		S	Vernon	162				M	1500	NO	DRR	Z	–	–	–	R	K	N	I
23	WI		CO	Trempealeau	J				D	3000	NO	S	SF	–	–	–	N	FF	N	I
24	WI		CO	Trempealeau	J				D	10000	YES	RO	ECBZC	Z	Z	Z	N	OEC	T	I
25	WI		CO	Trempealeau	K				D	10000	YES	RO	E	–	–	–	N	OEP	T	I
26	WI		CO	Trempealeau	P				D	2000	NO	S	SF	–	–	–	N	FF	N	I
27	WI		S	Trempealeau	35			Tank Cr.	D	27000	NO	SC	E	–	–	–	N	OE	T	I
28	WI		S	Trempealeau	US-53				D	4300	NO	S	SF	–	–	–	N	FF	N	I
29	WI		S	Trempealeau	93				D	4900	NO	S	SF	–	–	–	N	FF	N	I
30	WI		S	Trempealeau	93				D	2000	NO	S	SF	–	–	–	N	FF	N	I
31	WI		S	Trempealeau	93				T	5000	YES	EM	PZ	–	–	–	N	K	T	I
32	WI		S	Trempealeau	95				D	44100	YES	SC	Z	–	–	–	N	OE	S	M
33	WI		S	Trempealeau	94				D	11600	NO	S	SF	–	–	–	N	FF	T	I
34	WI		S	Trempealeau	VAR				D	6000	YES	S	SF	–	–	–	N	FF	N	I
35	WI		CO	Columbia	M				M	1000	YES	DRR	Z	–	–	–	R	K	N	I
36	WI		CO	Columbia	P				M	1500	YES	DRS	E	–	–	–	R	K	N	I
37	WI		CO	Columbia	P				D	2000	YES	RO	PG	–	–	–	N	OP	N	I
38	WI		CO	Columbia	CS				D	1500	YES	RO	E	–	–	–	N	OS	N	I
39	WI		CO	Columbia	AA				M	1000	YES	DRR	Z	–	–	–	R	K	N	I
40	WI		CO	Columbia	F				M	500	YES	DRR	Z	–	–	–	R	K	N	I
41	WI		CO	Columbia	CS				D	1000	YES	RO	E	–	–	–	N	OS	N	I
42	WI		S	Columbia	US-51				D	2100	YES	RO	E	–	–	–	N	OS	N	I
43	WI		S	Columbia	60				D	3200	YES	RO	E	–	–	–	N	OS	N	I
44	WI		S	Columbia	60				D	2000	YES	RO	E	–	–	–	N	OS	N	I
45	WI		S	Columbia	60				D	2000	YES	RO	E	–	–	–	N	OS	N	I
46	WI		S	Columbia	16				D	2100	YES	RO	E	–	–	–	N	OS	N	I
47	WI		S	Columbia	16				D	1600	YES	RO	E	–	–	–	N	OS	N	I
48	WI		S	Columbia	44				D	3200	YES	RO	E	–	–	–	N	OS	N	I
49	WI		S	Columbia	33				D	1000	YES	RO	E	–	–	–	N	OS	N	I
50	WI		S	Columbia	33				D	1000	YES	RO	E	–	–	–	N	OS	N	I
51	WI		S	Columbia	33				D	1500	YES	RO	E	–	–	–	R	OS	N	I

Wisconsin

Highway Infrastructure Damage Classification

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52	WI		S	Columbia	22				D	2100	YES	RO	E	--	--	--	N	OS	N	I
53	WI		S	Columbia	I-90 & I-94				D	3000	YES	RO	E	--	--	--	N	OS	N	I
54	WI		S	Columbia	146				M	500	YES	DRR	E	--	--	--	R	K	N	I
55	WI		S	Columbia	78				D	5100	NO	SC	E	--	--	--	N	OSC	T	I
56	WI		S	Columbia	146				D	153000	YES	RO	ECNBC	Z	Z	Z	N	OEC	L	F
57	WI		S	Dane	73				D	1000	YES	RO	E	--	--	--	N	OS	N	I
58	WI		S	Dane	US-14				D	2100	YES	RO	E	--	--	--	N	OS	N	I
59	WI		S	Dane	69				D	1600	YES	RO	E	--	--	--	N	OS	N	I
60	WI		S	Dane	92				D	4500	YES	RO	E	--	--	--	N	OS	N	I
61	WI		S	Dane	US-18 /151				D	1600	YES	RO	E	--	--	--	N	OS	N	I
62	WI		S	Dane	78				D	1600	YES	RO	E	--	--	--	N	OS	N	I
63	WI		S	Dane	113				D	5200	YES	RO	E	--	--	--	R	OS	N	I
64	WI		S	Dane	US-12				D	5200	YES	RO	E	--	--	--	R	OS	N	I
65	WI		S	Dane	US-12				D	1000	YES	RO	E	--	--	--	N	OS	N	I
66	WI		S	Dane	19				D	1000	YES	RO	E	--	--	--	N	OS	N	I
67	WI		S	Dane	19				D	3100	YES	RO	E	--	--	--	R	OS	N	I
68	WI		S	Dane	138				M	500	YES	DRR	Z	--	--	--	R	K	N	I
69	WI		S	Dane	134				M	500	YES	DRR	Z	--	--	--	R	K	N	I
70	WI		S	Dane	19				M	1100	YES	DRR	Z	--	--	--	R	K	N	I
71	WI		CO	Dane	B				D	3000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
72	WI		CO	Dane	AB				D	3000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
73	WI		CO	Dane	PB				D	2000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
74	WI		CO	Dane	N				D	1000	YES	RO	E	--	--	--	N	OS	N	I
75	WI		CO	Dane	MN				D	2000	YES	RO	E	--	--	--	N	OS	N	I
76	WI		CO	Dane	MM				D	1000	YES	RO	E	--	--	--	N	OS	N	I
77	WI		CO	Dane	N				D	1000	YES	RO	E	--	--	--	N	OS	N	I
78	WI		CO	Dane	V				D	1000	YES	RO	E	--	--	--	N	OS	N	I
79	WI		CO	Dane	AB				D	1000	YES	RO	E	--	--	--	N	OS	N	I
80	WI		CO	Dane	P				D	2000	YES	RO	E	--	--	--	N	OS	N	I
81	WI		CO	Dane	A				D	1000	YES	RO	E	--	--	--	N	OS	N	I
82	WI		CO	Dane	V				D	1000	YES	RO	E	--	--	--	N	OS	N	I
83	WI		CO	Dane	I				D	1000	YES	RO	E	--	--	--	N	OS	N	I
84	WI		CO	Dane	P				D	1000	YES	RO	E	--	--	--	N	OS	N	I
85	WI		CO	Dane	KP				D	1000	YES	RO	E	--	--	--	N	OS	N	I
86	WI		CO	Dane	S				D	1000	YES	RO	E	--	--	--	N	OS	N	I
87	WI		CO	Dane	M				D	1000	YES	RO	E	--	--	--	N	OS	N	I
88	WI		CO	Dane	Q				D	1000	YES	RO	E	--	--	--	N	OS	N	I
89	WI		CO	Dane	AB				D	1000	YES	RO	E	--	--	--	N	OS	N	I
90	WI		S	Fond Du Lac	49				D	1131	YES	RO	E	--	--	--	N	OS	N	I
91	WI		S	Fond Du Lac	44				D	565	YES	RO	E	--	--	--	N	OS	N	I
92	WI		S	Fond Du Lac	44				D	2151	YES	RO	E	--	--	--	R	OS	N	I
93	WI		S	Fond Du Lac	US-151				D	1131	YES	RO	E	--	--	--	N	OS	N	I
94	WI		S	Fond Du Lac	175				D	565	YES	RO	E	--	--	--	N	OS	N	I
95	WI		S	Fond Du Lac	US-41				M	903	YES	O	Z	--	--	--	N	K	N	I
96	WI		S	Fond Du Lac	67				M	655	YES	DRR	Z	--	--	--	R	K	N	I
97	WI		S	Fond Du Lac	149				D	476	YES	RO	E	--	--	--	N	OE	N	I
98	WI		S	Fond Du Lac	US-41				T	1240	YES	DT	Z	--	--	--	N	K	N	I
99	WI		CO	Fond Du Lac	VAR				D	3962	YES	RO	ECZZZ	Z	Z	--	N	OSC	N	I
100	WI		CO	Fond Du Lac	V				D	8096	YES	RO	ECZZZ	1	2	--	N	OEC	T	I
101	WI		S	Iowa	23				D	18400	YES	RO	E	--	--	--	R	OSP	T	I
102	WI		S	Iowa	39				D	1450	YES	RO	E	--	--	--	R	OS	N	N

Wisconsin

Highway Infrastructure Damage Classification

1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
103	WI		S	Iowa	130			Wisconsin R.	D	1900	YES	RO	E	--	--	--	N	OS	N	N
104	WI		S	Iowa	130				D	3150	YES	RO	E	--	--	--	R	OS	N	N
105	WI		S	Iowa	191				D	5000	YES	RO	Z	--	--	--	R	Z	N	I
106	WI		S	Iowa	130				D	9650	YES	RO	E	Z	Z	--	N	OC	N	I
107	WI		S	Iowa	39				D	21450	YES	RO	E	--	--	--	R	OS	T	I
108	WI		S	Iowa	US-151				M	2800	NO	O	E	--	--	--	N	K	N	I
109	WI		CO	Iowa	ID				D	2000	YES	RO	ECNBC	Z	Z	Z	N	OC	N	I
110	WI		CO	Iowa	ID				D	2000	YES	RO	ECNBC	Z	Z	Z	N	OC	N	I
111	WI		CO	Iowa	E				D	2500	YES	RO	E	--	--	--	N	OS	N	I
112	WI		CO	Iowa	K				D	2500	YES	RO	E	--	--	--	N	OS	N	I
113	WI		CO	Iowa	K				D	5000	YES	RO	ECZZZ	Z	Z	--	N	OC	N	I
114	WI		CO	Lafayette	G				D	21000	YES	RO	E	--	--	--	N	OP	T	I
115	WI		CO	Lafayette	W				D	8500	YES	RO	E	--	--	--	N	OS	N	I
116	WI		CO	Lafayette	F				D	750	YES	RO	E	--	--	--	N	OS	N	I
117	WI		CO	Lafayette	N				D	2525	YES	RO	E	--	--	--	N	OS	N	I
118	WI		CO	Lafayette	G				D	1200	YES	RO	E	--	--	--	N	OS	N	I
119	WI		CO	Lafayette	H				D	5000	YES	RO	E	--	--	--	N	OS	N	I
120	WI		CO	Lafayette	I				D	3500	YES	RO	E	--	--	--	N	OE	N	I
121	WI		CO	Lafayette	G				D	1500	YES	RO	ECZZZ	Z	Z	--	N	OC	N	I
122	WI	P59	CO	Lafayette	H			Fever R.	D	2000	YES	SC	BZZZ	Z	--	--	N	OE	N	I
123	WI	P60	CO	Lafayette	I				D	3000	YES	SC	BZZZ	Z	--	--	N	OE	N	I
124	WI	P61	CO	Lafayette	I				D	800	YES	SC	BZZZ	Z	--	--	N	OE	N	I
125	WI	P68	CO	Lafayette	K				D	600	YES	SC	BZZZ	Z	--	--	N	OE	N	I
126	WI	B86	CO	Lafayette	F			Yellow R.	D	800	YES	SC	BZZZ	Z	--	--	N	OE	N	I
127	WI	B85	CO	Lafayette	F				D	800	YES	SC	BZZZ	Z	--	--	N	OE	N	I
128	WI		S	Lafayette	US-151				D	1000	YES	SC	E	--	--	--	R	OE	N	I
129	WI		S	Lafayette	81				D	2000	YES	RO	E	--	--	--	R	OE	N	I
130	WI		S	Lafayette	US-151				D	1000	YES	RO	E	--	--	--	N	OS	N	I
131	WI		S	Lafayette	US-151				D	1000	YES	RO	E	--	--	--	N	OS	N	I
132	WI		S	Lafayette	126				D	1000	YES	RO	E	--	--	--	R	OS	N	I
133	WI		S	Lafayette	126				D	1000	YES	RO	E	--	--	--	R	OS	N	I
134	WI		S	Lafayette	81				D	500	YES	RO	E	--	--	--	N	OS	N	I
135	WI		S	Lafayette	81				D	500	YES	RO	E	--	--	--	N	OS	N	I
136	WI		S	Lafayette	11				D	2100	YES	RO	E	--	--	--	N	OS	N	I
137	WI		S	Lafayette	11				D	600	YES	RO	E	--	--	--	N	OS	N	I
138	WI		S	Lafayette	81				D	700	YES	RO	E	--	--	--	R	OS	N	I
139	WI		S	Lafayette	78				D	700	YES	RO	E	--	--	--	R	OS	N	I
140	WI		S	Lafayette	176				D	1000	YES	RO	E	--	--	--	R	OS	N	I
141	WI		S	Lafayette	176				D	500	YES	RO	E	--	--	--	N	OS	N	I
142	WI		S	Lafayette	78				D	500	YES	RO	E	--	--	--	N	OS	N	I
143	WI		S	Lafayette	11				D	58000	YES	RO	E	--	--	--	R	OEP	S	M
144	WI		S	Sauk	113				D	286298	YES	RO	ECZZZ	Z	Z	Z	N	OEC	L	F
145	WI		S	Sauk	113				T	44484	NO	O	--	--	--	--	N	K	N	N
146	WI		S	Sauk	33				D	5624	YES	RO	E	--	--	--	N	OS	N	I
147	WI		S	Sauk	US-12				D	44922	NO	SC	ECZZZ	Z	Z	--	R	OEC	T	M
148	WI		S	Sauk	US-12			Baraboo R.	D	15000	NO	SC	BZZZ	Z	--	--	R	SAS	N	I
149	WI		S	Sauk	136				D	11479	YES	SC	ECZZZ	Z	Z	--	R	OEC	T	I
150	WI		S	Sauk	159				D	6722	YES	RO	E	Z	--	--	N	OE	N	I
151	WI		S	Sauk	60				M	5972	YES	DRS	PZ	--	--	--	R	OP	T	I
152	WI		S	Sauk	23				D	1482	YES	RO	E	--	--	--	R	OS	N	I
153	WI		CO	Sauk	DL				D	42116	YES	YES	ECZZZ	Z	Z	--	R	OEC	S	M

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154	WI		CO	Sauk	DL				T	3965	NO	O	E	--	--	--	N	K	N	N
155	WI		CO	Sauk	A				T	110000	YES	P/DT/G	E	--	--	--	N	K	S	M
156	WI		CO	Sauk	PF				D	5000	YES	RO	ECZZZ	Z	Z	--	N	OSC	N	I
157	WI		CO	Sauk	PF				D	10218	YES	RO	ECZZZ	Z	Z	--	N	OSC	T	I
158	WI		CO	Sauk	W				D	14787	YES	RO	E	--	--	--	N	OEP	T	I
159	WI		CO	Sauk	W				D	22073	YES	RO	ECZZZ	Z	Z	--	N	OEC	T	I
160	WI		CY	Sauk	123				D	80000	YES	RO	ECNCM	1	3	--	N	OEC	S	F
161	WI.		S	Calumet	US-151				D	1920	YES	RO	ECZZZ	Z	Z	--	N	OSC	N	I
162	WI		S	Calumet	US-151				D	1200	YES	O	O	--	--	--	N	K	N	I
163	WI		S	Calumet	55				D	450	YES	SC	ECZZZZ	Z	Z	--	N	OEC	N	I
164	WI		S	Calumet	US-151				D	255	YES	RO	E	--	--	--	N	OS	N	I
165	WI		S	Calumet	US-151				D	510	YES	RO	E	--	--	--	N	OS	N	I
166	WI		S	Calumet	55				D	3180	YES	RO	E	--	--	--	N	OS	N	I
167	WI		S	Calumet	32/ 57				D	360	YES	RO	E	--	--	--	N	OS	N	I
168	WI		S	Calumet	55				M	300	SC	DRC	ECZZZ	Z	Z	--	C	SC	N	I
169	WI		S	Calumet	114				D	2320	YES	RO	E	--	--	--	N	OS	N	I
170	WI		CO	Calumet	PP				D	3000	YES	RO	ECZZZ	3	Z	--	N	OEC	N	I
171	WI		CO	Calumet	PP				D	600	YES	RO	E	--	--	--	N	OS	N	I
172	WI		CO	Calumet	E				D	1400	YES	RO	E	--	--	--	N	OS	N	I
173	WI		CO	Calumet	E				D	1400	YES	RO	E	--	--	--	N	OS	N	I
174	WI		CO	Calumet	E				D	2400	YES	RO	E	--	--	--	N	OS	N	I
175	WI		CO	Calumet	E				D	3700	YES	RO	E	--	--	--	C	OS	N	I
176	WI		S	Waupaca	54				D	2800	YES	RO	E	--	--	--	N	OS	N	I
177	WI		CO	Waupaca	X				D	700	YES	RO	E	--	--	--	N	OS	N	I
178	WI		CO	Waupaca	C				D	900	YES	RO	E	--	--	--	N	OS	N	I
179	WI		CO	Waupaca	G				D	700	YES	RO	E	--	--	--	N	OS	N	I
180	WI		S	Jackson	US-10				D	12000	YES	RO	E	--	--	--	N	OEP	T	I
181	WI		S	Jackson	54				D	300	YES	RO	E	--	--	--	N	OP	N	I
182	WI		S	Jackson	27			Perry Cr.	D	22200	NO	SC	ECNBC	Z	Z	Z	C	SO	N	I
183	WI		S	Jackson	54				D	4000	NO	SC	ECNBC	Z	Z	Z	N	SO	N	I
184	WI		S	Jackson	54				D	10000	NO	SC	ECNCM	Z	Z	--	C	SO	N	I
185	WI		S	Jackson	I-94			Black R.	D	10500	NO	SC	E	Z	--	--	N	SAS	N	I
186	WI		S	Jackson	108			Black R.	D	4500	NO	SC	E	Z	--	--	N	SAS	N	I
187	WI		S	Jackson	54				D	2000	YES	RO	E	--	--	--	N	OE	N	I
188	WI		S	Jackson	US-10				D	500	NO	S	Z	--	--	--	N	Z	N	I
189	WI		S	Jackson	54				D	1500	NO	S	Z	--	--	--	R	Z	N	I
190	WI		S	Jackson	54				D	1500	NO	S	Z	--	--	--	R	Z	N	I
191	WI		S	Jackson	54			Black R.	D	3000	NO	S	SF	--	--	--	N	FF	N	I
192	WI		S	Jackson	54				D	7000	NO	S	SF	--	--	--	R	Z	N	I
193	WI		S	Jackson	54				D	4000	NO	S	SF	--	--	--	N	Z	N	I
194	WI		CO	Jackson	B				D	4500	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
195	WI		CO	Jackson	C				D	6000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
196	WI		CO	Jackson	W				D	6000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
197	WI		CO	Jackson	X				D	8000	YES	RO	ECZZZ	2	Z	--	N	OEC	N	I
198	WI		CO	Jackson	C				D	4600	NO	S	Z	--	--	--	N	Z	N	I
199	WI		CO	Jackson	D				D	2000	NO	S	Z	--	--	--	N	Z	N	I
200	WI		CO	Jackson	D				D	2000	NO	S	Z	--	--	--	N	Z	N	I
201	WI		CO	Jackson	D				D	2000	NO	S	Z	--	--	--	N	Z	N	I
202	WI		CO	Jackson	F				D	700	NO	S	Z	--	--	--	N	Z	N	I
203	WI		CO	Jackson	N				D	4000	NO	S	Z	--	--	--	N	Z	N	I
204	WI		CO	Jackson	P				D	2000	NO	S	Z	--	--	--	N	Z	N	I

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205	WI		CO	Jackson	P				D	1900	NO	S	Z	–	–	–	N	Z	N	I
206	WI		CO	Jackson	V				D	3000	NO	S	Z	–	–	–	N	Z	N	I
207	WI		CO	Jackson	E				D	700	YES	RO	Z	–	–	–	N	OP	N	I
208	WI		CO	Jackson	E				D	2700	YES	RO	Z	–	–	–	N	OP	N	I
209	WI		CO	Jackson	FF				D	2900	YES	RO	Z	–	–	–	N	OP	N	I
210	WI		CO	Jackson	N				D	2000	YES	RO	Z	–	–	–	N	OP	N	I
211	WI		CO	Jackson	O				D	5000	YES	RO	Z	–	–	–	N	OP	N	I
212	WI		CO	Jackson	P				D	8000	YES	RO	Z	–	–	–	N	OP	N	I
213	WI		CO	Jackson	P				D	2000	YES	RO	Z	–	–	–	N	OP	N	I
214	WI		CO	Jackson	V				D	2000	YES	RO	Z	–	–	–	N	OP	N	I
215	WI		CO	Jackson	X				D	4900	YES	RO	Z	–	–	–	N	OP	N	I
216	WI		CO	Jackson	VV				D	9000	YES	RO	Z	–	–	–	N	OP	N	I
217	WI		S	Crawford	35				D	35000	YES	RO	ECZZZ	Z	Z	–	C	OS	T	I
218	WI		S	Crawford	60				D	4000	YES	RO	E	–	–	–	N	OE	N	I
219	WI		S	Crawford	US-61				M	3500	NO	DRC	Z	Z	Z	–	C	K	N	I
220	WI		S	Crawford	131				D	3000	YES	RO	ECZZZ	Z	Z	–	C	OEC	N	I
221	WI		S	Crawford	79				M	1500	NO	DRC	ECZZZ	Z	Z	–	C	K	N	I
222	WI		CO	Crawford	K				D	150000	YES	RO	E	–	–	–	N	OP	S	M
223	WI		S	Buffalo	37				T	500	YES	EM	O	–	–	–	N	K	N	I
224	WI		S	Buffalo	37				D	15000	YES	RO	E	–	–	–	N	OE	N	I
225	WI		S	Buffalo	88				D	11000	YES	RO	E	–	–	–	N	OE	N	I
226	WI		S	Buffalo	95				D	2500	YES	RO	E	–	–	–	N	OE	N	I
227	WI		CO	Buffalo	N				D	1000	YES	RO	E	–	–	–	N	OE	N	I
228	WI		S	Juneau	US-12				M	2000	NO	DRR	E	–	–	–	R	K	N	I
229	WI		S	Juneau	33				M	200	NO	DRR	E	–	–	–	R	K	N	I
230	WI		CO	Juneau	HH				D	5000	YES	RO	E	–	–	–	N	OS	N	I
231	WI		S	Portage	US-51				D	50500	YES	RO	ECNCM	Z	Z	–	R	OEC	S	M
232	WI		S	Portage	66				M	1000	NO	DRR	E	–	–	–	R	K	N	I
233	WI		CO	Portage	C				D	15382	YES	RO	E	–	–	–	N	OP	T	I
234	WI		CY	Portage	W.River Dr.				D	26000	YES	RO	E	–	–	–	N	OP	T	I
235	WI		CY	Portage	W.River Dr.				D	3500	YES	RO	ECZZZ	Z	Z	–	N	OEC	N	I
236	WI		CY	Portage	Tommy's Turnpike				D	1000	YES	RO	E	–	–	–	N	OS	N	I
237	WI		CY	Portage	Hoover Ave.				D	2000	YES	RO	ECNBC	Z	Z	Z	N	OEC	N	I
238	WI		CO	Pierce	P				D	1651	YES	RO	E	–	–	–	N	OSP	N	I
239	WI		CO	Pierce	P				D	2404	YES	RO	E	–	–	–	N	OS	N	I
240	WI		CO	Pierce	CC				D	1000	YES	RO	E	–	–	–	N	OE	N	I
241	WI		CY	Pierce	VAR			Kinnickinnic R.	D	85000	YES	RO	E	–	–	–	C	OEP	T	M
242	WI		S	Eau Claire	US-12				D	3700	YES	RO	E	–	–	–	N	OSP	N	I
243	WI		S	Eau Claire	VAR				T	2100	NO	O	E	–	–	–	N	K	N	I
244	WI		CO	Eau Claire	H			Black Cr.	D	1000	NO	SC	BZZZ	Z	–	–	N	SAS	N	I
245	WI		CO	Eau Claire	H				D	3000	YES	RO	ECZZZ	Z	Z	–	N	OEC	N	I
246	WI		CO	Eau Claire	H			Eau Claire R.	D	3000	YES	RO	E	–	–	–	N	OSP	N	I
247	WI		CO	Eau Claire	Q			Nine Mile Cr.	D	3400	YES	RO	E	–	–	–	N	OE	N	I
248	WI		CO	Eau Claire	H				D	3000	YES	RO	ECZZZ	Z	Z	–	N	OPC	N	I
249	WI		CO	Eau Claire	H				D	3000	YES	RO	ECZZZ	Z	Z	–	N	OPC	N	I
250	WI		CO	Eau Claire	R			Thompson Valley Cr.	D	1000	YES	RO	E	–	–	–	N	OS	N	I
251	WI		CO	Eau Claire	D			Eau Claire Cr.	D	470	YES	RO	E	–	–	–	N	OS	N	I
252	WI		CO	Eau Claire	H			Horse Cr.	D	170965	YES	RO	ECNCC	1	1.83	–	N	OEC	L	F
253	WI		S	Clark	73				D	5920	YES	RO	E	–	–	–	N	OS	N	I
254	WI		S	Clark	95			Black Cr.	D	4200	YES	RO	E	–	–	–	N	OS	N	I
255	WI		S	Clark	US-10				D	2200	YES	RO	E	–	–	–	N	OS	N	I

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256	WI		CO	Clark	J				D	28626	YES	RO	E	2	1.06	--	N	OEC	T	I
257	WI		CO	Clark	I				D	758	YES	RO	E	--	--	--	N	OS	N	I
258	WI		CO	Clark	I				D	2102	YES	RO	E	--	--	--	N	OS	N	I
259	WI		CO	Clark	M				D	786	YES	RO	E	--	--	--	N	OS	N	I
260	WI		CO	Clark	GG				D	2838	YES	RO	E	--	--	--	N	OS	N	I
261	WI		CO	Clark	MM				D	610	YES	RO	E	--	--	--	N	OS	N	I
262	WI		CO	Clark	X				D	490	YES	RO	E	--	--	--	N	OS	N	I
263	WI		CO	Clark	X				D	258	YES	RO	E	--	--	--	N	OS	N	I
264	WI		CO	Clark	D				D	3417	YES	RO	E	--	--	--	N	OS	N	I
265	WI		CO	Clark	K				D	745	YES	RO	E	--	--	--	N	OS	N	I
266	WI		CO	Clark	J			Arnold Cr.	D	981	YES	RO	BZZZ	Z	--	--	N	Z	N	I
267	WI		CO	Clark	J				D	1553	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
268	WI		CO	Clark	J				D	3361	YES	RO	E	--	--	--	N	OSP	N	I
269	WI		CO	Clark	B				D	8224	YES	RO	PB	--	--	--	N	OSP	N	I
270	WI		CO	Clark	MM			Black R.	D	1034	YES	RO	B	--	--	--	N	OE	N	I
271	WI		CO	Clark	M			Scott Cr.	D	10848	YES	RO	E	--	--	--	N	OSP	T	I
272	WI		CO	Clark	H			Black Cr.	D	636	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
273	WI		CO	Clark	H				D	8846	YES	RO	ECZZZ	2	Z	--	N	OEC	N	I
274	WI		CO	Clark	K				D	2644	YES	RO	EC	2	Z	--	N	OEC	N	I
275	WI		CY	Clark	Butler Rd.			Hay Cr.	D	188000	YES	RO	ECZZZ	Z	Z	--	N	OEC	L	F
276	WI		CY	Clark	Camp Globe Rd.				D	8529	YES	RO	E	Z	Z	--	N	OEC	T	I
277	WI		CY	Clark	Butler Rd.				T	44323	NO	O	E	--	--	--	N	K	N	N
278	WI		CY	Clark	Butler Rd.				T	18980	YES	DT	E	--	--	--	N	K	T	I
279	WI		S	Green	11				M	700	Z	DRR	Z	--	--	--	R	K	N	I
280	WI		S	Green	11&81				D	2050	D	RO	E	--	--	--	N	OS	N	I
281	WI		S	Green	11				M	250	Z	DRR	Z	--	--	--	R	K	N	I
282	WI		S	Green	59				M	1200	Z	DRR	Z	--	--	--	R	K	N	I
283	WI		S	Green	69				M	900	Z	DRR	Z	--	--	--	R	K	N	I
284	WI		S	Green	78				D	2000	YES	RO	E	--	--	--	N	OS	N	I
285	WI		S	Green	11				D	300	NO	S	SF	--	--	--	N	Z	N	I
286	WI		S	Green	81				D	200	Z	O	O	--	--	--	N	OS	N	I
287	WI		CO	Green	Y				D	150	NO	S	Z	--	--	--	N	Z	N	I
288	WI		CO	Green	M				D	300	NO	S	Z	--	--	--	N	Z	N	I
289	WI		CO	Green	M				D	1000	NO	S	Z	--	--	--	N	Z	N	I
290	WI		CO	Green	Y				D	500	YES	RO	E	--	--	--	N	OS	N	I
291	WI		CO	Green	Y				D	100	YES	RO	E	--	--	--	N	OS	N	I
292	WI		CO	Green	M				D	200	YES	RO	E	--	--	--	N	OS	N	I
293	WI		CO	Green	M				D	300	YES	RO	E	--	--	--	N	OS	N	I
294	WI		CO	Green	M				D	1500	YES	RO	E	--	--	--	N	OS	N	I
295	WI		CO	Green	B				D	275	YES	RO	E	--	--	--	N	OS	N	I
296	WI	B-1	CO	Green	B			Honey Cr.	D	1000	YES	RO	BZZZ	Z	--	--	N	OE	N	I
297	WI		CO	Green	B				D	200	YES	RO	E	--	--	--	N	OS	N	I
298	WI		CO	Green	B				D	700	YES	RO	E	--	--	--	N	OS	N	I
299	WI		CO	Green	B				D	150	YES	RO	E	--	--	--	N	OS	N	I
300	WI		CO	Green	B				D	275	YES	RO	E	--	--	--	N	OS	N	I
301	WI		CO	Green	B				D	450	YES	RO	E	--	--	--	N	OS	N	I
302	WI		CO	Green	B				D	180	YES	RO	E	--	--	--	N	OS	N	I
303	WI		CO	Green	B				D	500	YES	SC	E	--	--	--	N	OE	N	I
304	WI		CO	Green	G				D	1000	YES	RO	E	--	--	--	N	OS	N	I
305	WI		CO	Green	G				D	800	YES	RO	E	--	--	--	N	OS	N	I
306	WI		CO	Green	G				D	550	YES	RO	E	--	--	--	N	OS	N	I

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1 D.A.F. #	2 STATE	3 STRUCTURE ID.#	4 APPLICANT	5 COUNTY	6 A.R. #	7 MILE POST #	8 F.A.S. #	9 STREAM	10 COST TYPE	11 COST $	12 ROADWAY OVER-TOPPING	13 APPROP-RIATION CAUSE	14 STRUCTURE/ FACILITY TYPE	15 SPANS/ NUMBER of BARRELS	16 CULVERT WIDTH/DIA-METER (m)	17 CULVERT HEIGHT (m)	18 DEBRIS LOCATION & TYPE	19 FAILURE MODES	20 TRAFFIC EFFECTS	21 DAMAGE CLASSIF-ICATION
307	WI	G-3	CO	Green	G				D	500	YES	SC	BZZZ	Z	--	--	N	OS	N	I
308	WI		CO	Green	T				D	2000	YES	RO	E	--	--	--	N	OS	N	I
309	WI		CO	Green	S				D	1100	YES	RO	E	--	--	--	N	OS	N	I
310	WI		CO	Green	F				D	350	YES	RO	E	--	--	--	N	OS	N	I
311	WI		CO	Green	F				D	750	YES	RO	E	--	--	--	N	OS	N	I
312	WI		CO	Green	F				D	1450	YES	RO	E	--	--	--	N	OS	N	I
313	WI		CO	Green	F				D	1600	YES	RO	E	--	--	--	N	OS	N	I
314	WI		CO	Green	E				D	350	YES	RO	E	--	--	--	N	OS	N	I
315	WI		CO	Green	E				D	300	YES	RO	E	--	--	--	N	OS	N	I
316	WI		CO	Green	E				D	400	YES	RO	E	--	--	--	N	OS	N	I
317	WI		CO	Green	E				D	500	YES	RO	E	--	--	--	N	OS	N	I
318	WI		CO	Green	K				D	300	YES	RO	E	--	--	--	N	OS	N	I
319	WI		CO	Green	K				D	300	YES	RO	E	--	--	--	N	OS	N	I
320	WI		CO	Green	K				D	300	YES	RO	E	--	--	--	N	OS	N	I
321	WI		CO	Green	EE				D	300	YES	RO	E	--	--	--	N	OS	N	I
322	WI		CO	Green	N				D	500	YES	RO	E	--	--	--	N	OS	N	I
323	WI		CO	Green	N				D	200	YES	RO	E	--	--	--	N	OS	N	I
324	WI		CO	Green	DR				D	200	YES	RO	E	--	--	--	N	OE	N	I
325	WI		S	Outagamie	55				D	306	YES	RO	E	--	--	--	N	OS	N	I
326	WI		S	Outagamie	55				D	163	YES	RO	E	--	--	--	N	OS	N	I
327	WI		S	Outagamie	55				D	191	YES	RO	E	--	--	--	N	OS	N	I
328	WI		S	Outagamie	55				T	57	YES	EM	Z	--	--	--	N	K	N	I
329	WI		S	Outagamie	54				T	3000	YES	P	O	--	--	--	N	K	N	I
330	WI		S	Outagamie	47				D	472	YES	RO	E	--	--	--	N	OS	N	I
331	WI		S	Outagamie	76				T	86	YES	EM	Z	--	--	--	N	K	N	I
332	WI		S	Outagamie	187				T	172	YES	DT	Z	--	--	--	N	K	N	I
333	WI		S	Outagamie	168				T	344	YES	DT	Z	--	--	--	N	K	N	I
334	WI		S	Outagamie	US-45				D	247	YES	RO	E	--	--	--	N	OS	N	I
335	WI		S	Outagamie	US-45				D	169	YES	RO	E	--	--	--	N	OS	N	I
336	WI		S	Outagamie	US-45				D	247	YES	RO	E	--	--	--	N	OS	N	I
337	WI		S	Outagamie	98				T	1200	YES	EM	Z	--	--	--	N	K	N	I
338	WI		S	Outagamie	96				T	1200	YES	EM	Z	--	--	--	N	K	N	I
339	WI		S	Outagamie	76				T	172	YES	EM	Z	--	--	--	N	K	N	I
340	WI		S	Outagamie	76				D	462	YES	RO	E	--	--	--	N	OS	N	I
341	WI		CO	Outagamie	KK			Konkapot Cr.	D	401	YES	RO	E	--	--	--	N	OS	N	I
342	WI		CO	Outagamie	Z				D	268	YES	RO	E	--	--	--	N	OS	N	I
343	WI		CO	Outagamie	C				D	268	YES	RO	E	--	--	--	N	OS	N	I
344	WI		CO	Outagamie	A				D	134	YES	RO	E	--	--	--	N	OS	N	I
345	WI		CO	Outagamie	JJ				D	1134	YES	RO	E	--	--	--	N	OS	N	I
346	WI		CO	Outagamie	T				D	112	YES	RO	E	--	--	--	N	OS	N	I
347	WI		CO	Outagamie	MM				D	112	YES	RO	E	--	--	--	N	OS	N	I
348	WI		CO	Outagamie	S				D	56	YES	RO	E	--	--	--	N	OS	N	I
349	WI		CO	Outagamie	D				D	190	YES	RO	E	--	--	--	N	OS	N	I
350	WI		CO	Outagamie	D				D	190	YES	RO	E	--	--	--	N	OS	N	I
351	WI		S	Dodge	16&60				D	7100	YES	RO	E	--	--	--	N	OS	N	I
352	WI		S	Dodge	26				D	7200	YES	RO	E	--	--	--	N	OS	N	I
353	WI		S	Dodge	49				D	1500	YES	RO	E	--	--	--	N	OS	N	I
354	WI		S	Dodge	67				D	2000	YES	RO	E	--	--	--	R	OS	N	I
355	WI		S	Dodge	68				D	1000	YES	RO	E	--	--	--	N	OS	N	I
356	WI		S	Dodge	109				D	2000	YES	RO	E	--	--	--	N	OS	N	I
357	WI		S	Dodge	151				D	3200	YES	RO	E	--	--	--	N	OS	N	I

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358	WI		S	Dodge	175				D	2000	YES	RO	E	--	--	--	N	OS	N	I
359	WI		CO	Dodge	AW				D	500	YES	RO	E	--	--	--	N	OS	N	I
360	WI		CO	Dodge	MM				D	1000	YES	RO	E	--	--	--	N	OS	N	I
361	WI		CO	Dodge	G				D	1000	YES	RO	E	--	--	--	N	OS	N	I
362	WI		CO	Dodge	E				D	300	YES	RO	E	--	--	--	N	OS	N	I
363	WI		CO	Dodge	H				D	200	YES	RO	E	--	--	--	N	OS	N	I
364	WI		CO	Dodge	M				D	400	YES	RO	E	--	--	--	N	OS	N	I
365	WI		CO	Dodge	P				D	100	YES	RO	E	--	--	--	N	OS	N	I
366	WI		CO	Dodge	V				D	200	YES	RO	E	--	--	--	N	OS	N	I
367	WI		CO	Dodge	Y				D	1000	YES	RO	E	--	--	--	N	OS	N	I
368	WI		CO	Dodge	YY				D	300	YES	RO	E	--	--	--	N	OS	N	I
369	WI		S	Dodge	33				D	80000	NO	SC	E	--	--	--	N	K	S	M
370	WI		S	Grant	35				D	700	YES	RO	E	--	--	--	N	OS	N	I
371	WI		S	Grant	35				D	900	YES	RO	ECZZZ	Z	Z	--	C	OS	N	I
372	WI		S	Grant	US-18				D	1500	YES	RO	E	--	--	--	N	OS	N	I
373	WI		S	Grant	133				D	400	YES	RO	E	--	--	--	N	OS	N	I
374	WI		S	Grant	133				D	800	YES	RO	E	--	--	--	N	OS	N	I
375	WI		S	Grant	80				D	3000	YES	RO	ECZZZ	Z	Z	--	N	OS	N	I
376	WI		S	Grant	80				D	500	YES	RO	E	--	--	--	N	OS	N	I
377	WI		S	Grant	US-151				D	5000	YES	RO	E	--	--	--	N	OS	N	I
378	WI		S	Grant	81				D	1000	YES	RO	ECZZZ	--	--	--	C	OS	N	I
379	WI		S	Grant	35				D	225	NO	SC	ECZZZ	Z	Z	--	N	SO	N	I
380	WI		S	Grant	129				D	300	NO	SC	ECZZZ	Z	Z	--	N	SO	N	I
381	WI		S	Grant	80				D	1000	NO	SC	ECZZZ	Z	Z	--	N	SI	N	I
382	WI		S	Grant	35				M	300	NO	DRC	ECZZZ	Z	Z	--	C	K	N	I
383	WI		S	Grant	35				M	300	NO	DRS	O	--	--	--	C	K	N	I
384	WI		S	Grant	35				M	500	NO	DRC	ECNBC	Z	Z	--	C	K	N	I
385	WI		S	Grant	35				M	600	NO	DRC	ECNBC	Z	Z	--	C	K	N	I
386	WI		S	Grant	133				M	1000	YES	DRR	Z	--	--	--	R	K	N	I
387	WI		S	Grant	US-151				D	3000	YES	RO	O	--	--	--	N	OS	N	I
388	WI		S	Grant	US-151				D	4000	YES	RO	E	--	--	--	N	OS	N	I
389	WI		S	Grant	81				D	500	YES	RO	E	--	--	--	N	OS	N	I
390	WI	B564	S	Grant	US-151				D	3500	NO	SC	BZZZ	Z	--	--	C	Z	N	I
391	WI	B565	S	Grant	US-151				D	500	NO	SC	BZZZ	Z	--	--	C	Z	N	I
392	WI	B617	S	Grant	11				D	3500	NO	SC	BZZZ	Z	--	--	N	Z	N	I
393	WI	B616, 615	S	Grant	11				D	2500	NO	SC	BZZZ	Z	--	--	C	Z	N	I
394	WI	B347	S	Grant	US-151				D	2000	NO	SC	BZZZ	Z	--	--	N	Z	N	I
395	WI	B28	CO	Grant	B				D	942	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
396	WI	B62	CO	Grant	A				D	2985	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
397	WI	B51	CO	Grant	N				M	111	NO	DRC	BZZZ	Z	--	--	C	K	N	I
398	WI	B54	CO	Grant	D				M	65	NO	DRC	BZZZ	Z	--	--	C	K	N	I
399	WI		CO	Grant	X				M	144	YES	DRR	E	--	--	--	R	K	N	I
400	WI		CO	Grant	X				M	91	YES	DRR	E	--	--	--	R	K	N	I
401	WI		CO	Grant	X				M	127	YES	DRR	E	--	--	--	R	K	N	I
402	WI	B350	CO	Grant	D				D	2302	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
403	WI	B91	CO	Grant	K				D	2021	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
404	WI	B74	CO	Grant	Z				D	1000	NO	SC	BZZZ	Z	--	--	N	SAS	N	I
405	WI		CO	Grant	B				D	1000	NO	SC	E	--	--	--	N	OE	N	I
406	WI	B916	CO	Grant	A				D	1000	NO	SC	BZZZ	Z	--	--	N	Z	N	I
407	WI		CO	Grant	O				D	465	YES	RO	E	--	--	--	N	OS	N	I
408	WI		CO	Grant	H				D	857	YES	RO	E	--	--	--	N	OS	N	I

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409	WI		CO	Grant	D				D	519	YES	RO	E	--	--	--	N	OS	N	I
410	WI		CO	Grant	D				D	347	YES	RO	E	--	--	--	N	OS	N	I
411	WI		CO	Grant	A				D	2815	YES	RO	E	--	--	--	N	OS	N	I
412	WI		CO	Grant	C				D	942	YES	RO	E	--	--	--	N	OS	N	I
413	WI		CO	Grant	Q				D	808	YES	RO	E	--	--	--	N	OEP	N	I
414	WI		CO	Grant	Q				D	829	YES	RO	E	--	--	--	R	OEP	N	I
415	WI		CO	Grant	E				D	576	YES	RO	E	--	--	--	N	OSE	N	I
416	WI		CO	Grant	U				D	492	YES	RO	E	--	--	--	N	OSE	N	I
417	WI		CO	Grant	O				D	493	NO	S	Z	--	--	--	N	Z	N	I
418	WI		CO	Grant	Z				D	500	NO	S	Z	--	--	--	N	Z	N	I
419	WI		CO	Grant	Z				D	500	NO	S	Z	--	--	--	N	Z	N	I
420	WI		CO	Grant	Q				D	4574	NO	SC	ECNBC	6	Z	Z	N	SC	N	I
421	WI		CO	Grant	W				D	116	Z	Z	Z	--	--	--	N	Z	N	I
422	WI		CO	Grant	A				D	1646	YES	SC	ECNCM	1	2.5	--	N	SC	N	I
423	WI		CO	Grant	O				D	560	YES	SC	ECNCM	1	2	--	N	SC	N	I
424	WI		CO	Grant	HH				D	1000	YES	RO	E	--	--	--	N	OS	N	I
425	WI		CO	Grant	O				D	616	YES	RO	E	--	--	--	N	OS	N	I
426	WI		S	Wood	34				D	500	YES	RO	E	--	--	--	N	OS	N	I
427	WI		S	Wood	10				D	1000	YES	RO	E	--	--	--	N	OS	N	I
428	WI		S	Wood	173				D	800	YES	RO	E	--	--	--	N	OS	N	I
429	WI		S	Wood	54				D	700	YES	RO	E	--	--	--	N	OS	N	I
430	WI		S	Wood	34				D	4000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
431	WI		CO	Wood	P				D	35000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
432	WI		CO	Wood	E				D	4000	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
433	WI		S	Price	US-8				D	4900	YES	RO	E	--	--	--	N	OS	N	I
434	WI		S	Price	US-8				D	2300	YES	RO	E	--	--	--	N	OS	N	I
435	WI		S	Price	111				D	3500	YES	RO	E	--	--	--	N	OE	N	I
436	WI		S	Price	13				D	250	YES	RO	E	--	--	--	N	OS	N	I
437	WI		S	Price	102				D	200	YES	RO	E	--	--	--	N	OS	N	I
438	WI		S	Price	86				D	1800	YES	RO	E	--	--	--	N	OS	N	I
439	WI		S	Price	70			6 Mile Cr.	D	650	YES	RO	E	--	--	--	N	OS	N	I
440	WI		CO	Price	B				D	70	YES	RO	E	--	--	--	N	OS	N	I
441	WI		CO	Price	C				D	1700	YES	RO	E	--	--	--	R	OS	N	I
442	WI		CO	Price	D				D	800	YES	RO	E	--	--	--	N	OS	N	I
443	WI		CO	Price	E				D	70	YES	RO	E	--	--	--	N	OS	N	I
444	WI		CO	Price	F				D	110	YES	RO	E	--	--	--	N	OS	N	I
445	WI		CO	Price	N				D	800	YES	RO	E	--	--	--	N	OS	N	I
446	WI		CO	Price	O				D	4600	YES	RO	E	--	--	--	N	OS	N	I
447	WI		CO	Price	W				D	875	YES	RO	E	--	--	--	N	OS	N	I
448	WI		CO	Price	O				D	3700	YES	RO	ECZZZ	Z	Z	--	N	OEC	N	I
449	WI		CO	Sauk	W				T	8754	NO	O	--	--	--	--	N	K	N	N