MISSISSIPPI RIVER AND TRIBUTARIES WATERWAYS ACTION PLAN

MISSOURI RIVER ANNEX
March 14, 2008

MISSOURI RIVER ANNEX

Introduction

This appendix provides general information and target gages to be used as a guideline for a crisis on the Missouri River. Like a crisis on the Upper Mississippi River (UMR), it is the responsibility of the United States Coast Guard (USCG), Army Corps of Engineers (ACOE), and River Industry representatives to meet and discuss conditions on the Missouri River and to *annually* review the actions specified in the plan. *This annex will normally be reviewed in conjunction with the winter navigation meeting.* In Section 4 of this annex, the Missouri River has Action Plan Tables for High Water, Low Water and High Current. An Action Plan Table for ice conditions is not included as navigation does not normally occur during the ice period mid December to mid March of each year. The tables are divided by river reaches with three action phases (e.g., *Watch, Action, and Recovery Phases*) described in the plan. Support tables of historical river flow discharges and river stage references, including recommended close and open watch stages, are included.

Section 1 – Geographic Description

The Missouri River Basin drains 529,000 square miles, including about 9,700 square miles located in Canada. The basin spans 10 states, including all of Nebraska, most of Montana, Wyoming, North Dakota, and South Dakota; about half of Kansas and Missouri; and smaller parts of Iowa, Colorado, and Minnesota. The Missouri is fed from several major tributaries, the Yellowstone, Platte, Kansas, Grand, and Osage Rivers.

The Missouri River extends 2,619 miles from its utmost source at Hell Roaring Creek and 2,321 miles from Three Forks, Montana where the Jefferson, Madison, and Gallatin Rivers converge. The Missouri River is the longest river in the United States, draining one sixth of the country. The Missouri River Mainstem System (System) consists of six dams and reservoirs on the Missouri River located in Montana, North Dakota, South Dakota, and Nebraska. The six are Ft. Peck Dam in Montana, Garrison Dam in North Dakota, Oahe Dam, Big Bend Dam and Ft. Randall Dam in South Dakota and Gavins Point Dam in South Dakota and Nebraska. The System has a capacity to store 73.4 million acre-ft of water, which makes it the largest reservoir system in North America. The ACOE regulates the System to serve the congressionally authorized project purposes of flood control, navigation, irrigation, hydropower, water supply, water quality, recreation, and fish and wildlife. The ACOE considers all of the congressionally authorized project purposes when making decisions to optimize the development and utilization of the water resources of the Missouri River Basin to best serve the needs of the people. The System is regulated as a hydraulically and electrically integrated system. Runoff from above the System is stored in the six reservoirs. Water is released from the System as needed for downstream flow support. Released water from the lowest dam in the System, Gavins Point Dam, flows down the Missouri River, which includes the Bank Stabilization and Navigation Project from Sioux City, Iowa to the mouth near St. Louis, Missouri.

The Missouri River Bank Stabilization and Navigation Project was first authorized in 1912 with six subsequent authorizations that changed channel dimensions and extended channel reaches. The most recent authorization was by the March 2, 1945 Rivers and Harbors Act. This act authorized a 9 foot deep by minimum 300 foot wide navigation channel from Sioux City, Iowa to the mouth. The 734.8 mile navigation channel is continuous and free flowing without the use of locks or dams. A sinuous course of reverse bends and controlled river width was managed by constructing rock or piling structures called dikes and revetments. Dikes were constructed perpendicular to the flow and revetments were constructed parallel to the flow. This arrangement manages the constant movement of sediment to minimize channel shoaling providing a consistent and reliable navigation channel without the need for maintenance dredging.

Acronym List for Upper Missouri River Annex

ACOE = ARMY CORPS OF ENGINEERS
AWO = AMERICAN WATERWAYS OPERATORS
BNM = BROADCAST NOTICE TO MARINERS
CFS = CUBIC FEET PER SECOND
CRP = CONSTRUCTION REFERENCE PLANE
dwb = DISTRICT WESTERN BRIDGES
ICP = INCIDENT COMMAND POST
JIC = JOINT INFORMATION CENTER
MOR = MISSOURI RIVER
NOAA = NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION
NWO = ACOE OMAHA DISTRICT
NWD = ACOE NORTHWESTERN DIVISION
NWK = ACOE KANSAS CITY DISTRICT
NWS = NATIONAL WEATHER SERVICE
O&M = OPERATION AND MAINTENANCE
PMV = PERMANENTLY MOORED VESSEL
RIAC = RIVER INDUSTRY ACTION COMMITTEE
RIBB = RIVER INFORMATION BULLETIN BOARD
RM = RIVER MILE
UMIB = URGENT MARINE INFORMATION BROADCAST
UMR = UPPER MISSISSIPPI RIVER
USCG = UNITED STATES COAST GUARD
USGS = UNITED STATES GEOLOGICAL SURVEY
WAP = WATERWAYS ACTION PLAN

Section 2 – Parties and Roles

U.S. Coast Guard (USCG)
The USCG Sector Commander Upper Mississippi River, with its principal office in St Louis, MO is responsible for safety of navigation, security, and law enforcement along the Missouri River. The USCG Sector Upper Mississippi River Prevention Department, using the cutters Gasconade, stationed in Omaha, and the Cheyenne, stationed in St. Louis, is responsible for maintaining and setting buoys and shore aids along the Missouri River. The Prevention Department also focuses on licensed mariners issues, permits, casualty investigations, and security verifications. The USCG Sector Upper Mississippi River Response Department uses USCG small boats, other law enforcement partnerships and first responders to patrol and respond to emergencies or incidents on the Missouri River.

U.S. Army Corps of Engineers (ACOE)
The day to day operation and maintenance (O&M) for the Missouri River Bank Stabilization and Navigation Project, Sioux City, IA to the Mouth is managed by two river field offices. The Missouri River Project Office, located in north Omaha, at river mile 627.0, is responsible for the O&M from Sioux City, Iowa to Rulo, Nebraska. The Missouri River Area Office, located at Napoleon, Missouri, at river mile 328.7, is responsible for the O&M from Rulo to the mouth and has a satellite floating plant facility at Gasconade Harbor at river mile 104.5. These offices report to Omaha District (NWO) and Kansas City District (NWK) respectively. NWO and NWK report to the Northwestern Division (NWD), Portland, Oregon. There is a Division Regional Office in Omaha, Nebraska that provides the day to day support for both Districts concerning the Missouri River. NWK and NWO have Water Management functions for the regulation of tributary dams in the Missouri River basin dividing their responsibilities at Rulo, Nebraska. The NWD Missouri River Basin Regional Office located in Omaha has the Water Management responsibilities for the Missouri River Mainstem System and coordinating responsibilities on tributary reservoir regulation.

U.S. Coast Guard District Eight Bridge Branch (dwb)
The Bridge Administration Program has a mandated responsibility to protect the public right of navigation. Activities include determining location of navigation channel piers and issuing bridge permits. They establish, revise and monitor drawbridge regulations and prescribe bridge lighting. Also, Truman-Hobbs studies of unreasonable obstructive bridges are conducted on a nationwide basis.

RIAC & AWO
The River Industry Action Committee (RIAC) is an association of companies and organizations who are stakeholders in the commercial industry on the inland rivers. As the name suggests, they act in an advisory capacity on a wide range of issues affecting the activities of the industry on the rivers. They provide an industry perspective to the USCG and the ACOE on matters such as high and low water, ice conditions, shoaling, marine accidents, etc. There is no specific Missouri River organization that represents the commercial industry stakeholders. RIAC and AWO may provide limited support to the Missouri River for crisis events. It is the representation of individual river users or those impacted by the river that the ACOE and USCG will interact with to coordinate emergency response.

Missouri River Ice Team (MRIT)
The Missouri River Ice Team is made up of private and industry volunteers who make regular observations and reports to the ACOE on the ice conditions of the Missouri River during winter operations. These observations are reported to the basin. Although the Missouri River navigation industry avoids operating during ice conditions on the Missouri River, they often use the information to enter the river in the spring early in advance of reservoir support or leave the river late in the fall after the end of reservoir support. They will do this if during those years the reservoir system is releasing flood storage or tributary conditions provide adequate navigation flows. Reservoir flow support for navigation under normal conditions is from April 1 to December 1. This period is outside the normal ice build up.

Designated Waterfront Facilities
The commercial interests of the designated waterfront facilities are directly impacted by navigation conditions on the Missouri River, and any actions taken by the USCG or ACOE of Engineers in response to hazardous conditions that develop on the river. These facilities can play a valuable role in providing feedback to other parties on both river conditions and impact of proposed actions of the USCG and ACOE.

State Emergency Managers
Hazardous conditions on the Missouri River, particularly high water/flooding conditions, frequently involve state emergency managers, as they become involved in responding to affected communities, and take a direct interest in conditions or activities that can affect the levee systems that protect those communities. State emergency management offices coordinate state, private and federal support to local and tribal governments. It's important to provide timely risk assessment information and incident briefings to the state emergency management offices. Risk assessments and incident briefings will then be shared by the appropriate state emergency management office with local/tribal emergency managers and other appropriate agencies through Situation Reports and other forms of notification. Requests for assistance by a local/tribal government must be coordinated through state emergency management. Emergency contact information follows.

ACOE POSITION Kansas City District RM 498.4 – 0.0	**DUTIES & RESPONSIBILITIES**	**EQUALS**	**USCG POSITION**	**DUTIES & RESPONSIBILITIES**
Assistant Operations Manager, Missouri River Area Office, Napoleon, MO	Day to day O&M Missouri River, Rulo, NE to the mouth		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
Operations Manager, Missouri River Area Office, Napoleon, MO	Supervises Missouri River Area Office		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
REPORTS TO:				
Chief of Operations, Kansas City District	Supervises Operations Manager		Sector Upper Mississippi River Chief of Response	Supervises operational response issues
Chief, Water Control for Tributaries	Supports Chief of Operations		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
REPORTS TO:				
Chief, Reservoir Control Center Northwestern Div	Coordinates with Chief of Water Control & Supports Division Engineer		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
District Engineer, Kansas City District	Supervises Chief of Operations		Commander Sector Upper Mississippi River	Senior USCG officer in area
REPORTS TO:				
Division Engineer, Northwestern Division	Supervises District Engineer		Commander USCG Eighth District - d8	Senior USCG officer in District

ACOE POSITION Omaha District RM 734.8 – 498.4	**DUTIES & RESPONSIBILITIES**	**EQUALS**	**USCG POSITION**	**DUTIES & RESPONSIBILITIES**
River Foreman, Missouri River Project Office, Omaha, NE	Day to day O&M Missouri River, Sioux City, IA to Rulo, NE		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
Operations Manager, Missouri River Project Office, Omaha, NE	Day to day O&M Missouri River, Sioux City, IA to Rulo, NE		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
REPORTS TO:				
Chief of Operations, Omaha District	Supervises Operations Manager		Sector Upper Mississippi River Chief of Response	Supervises operational response issues
Chief, Water Control for Tributaries	Supports Chief of Operations		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
REPORTS TO:				
Chief, Reservoir Control Center Northwestern Div	Coordinates with Chief of Water Control & Supports Division Engineer		Sector Upper Mississippi River Chief of Prevention	Manages daily waterway management and casualty operations
District Engineer, Omaha District	Supervises Chief of Operations		Commander Sector Upper Mississippi River	Senior USCG officer in area
REPORTS TO:				
Division Engineer, Northwestern Division	Supervises District Engineer		Commander USCG Eighth District - d8	Senior USCG officer in District

Section 3 - Communications

Initiation of Communications Plan

This section provides guidance on the methods of communicating and receiving information. The USCG and maritime industry all carefully monitor river conditions and levels. When any of the conditions warrant attention, (rising water, falling water, high current, or any other hazardous condition), any Missouri River stakeholder can request a conference call by contacting the USCG Sector UMR Chief of Response. The USCG will discuss the concerns with the appropriate ACOE contacts to decide if a phone conference is necessary. If further discussion is needed, the members listed on the following pages of this section, to include Industry and State personnel, will be contacted via email or phone call. The RIAC chair will contact those members of their respective organizations. A teleconference will be set up to confer with all parties on possible measures to take and joint courses of action using the guidance from this annex as a basis to make a determination. By conferring frequently with all Missouri River stakeholders a joint action plan to safely navigate during the condition that warranted initiating the communications plan will be developed. The action plan will then be communicated to all Missouri River stakeholders and the public using Broadcast Notice to Mariners, posting on the River Industry Bulletin Board (www.RIBB.com), press releases if appropriate, and, if time permits, Local Notice to Mariners.

In the event of an unexpected river closure, the following steps will be considered to reopen the river: Conduct test tows if necessary for potential problem areas. Develop and initiate recovery plan to clear the queue. Issue advisory or establish safety zone if deemed necessary that indicates extreme low water, high water, or high current. USCG will reset buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Consider draft limits, tow sizes, and helper boats. Evaluate fleet dimensions. Be aware of shifting channels, emergency dredging may be required at some locations. Consider restrictions on single skin barge movement. Continue communications. (e-mails, conference calls or others) – consider establishing notices, advisories and/or safety zones as needed using standard communication links between ACOE, USCG and Industry.

Phone Conference Call Agenda:

I. Roll Call by Phone Conference Host
II. Protocol for Conference Call
III. Open Statement by Chairman or Co-Chairman of RIAC on Issues
IV. Weather Forecast by NWS or ACOE
V. River Stage Forecast by ACOE
VI. Channel Report for Area Of Concern by ACOE
VII. Status of Dredging and Next Scheduled Locations
VIII. USCG Report on Advisories and Remarks
IX. USCG Buoy Tender Report on Channel Conditions
X. River Condition Report and Issues of Conference Call by Industry
XI. Discussion of Issues on Current Situations
XII. Assessment, Actions to Be Taken
XIII. Closing

All Agencies & Organizations
To ensure effective interagency cooperation during periods of coordinated response to rising water, falling water, very high current or other hazardous river conditions, stakeholder organizations are advised to **maintain active and ongoing communications with one another during normal river conditions and while planning together for joint response activities**. This will greatly facilitate speedy and effective communications under the pressure of responding to an event. These communications will be facilitated by the contact listing on the following pages of this section. As an aid to those looking to better understand USCG and ACOE internal notification procedures, a description of these procedures is provided in paragraph "Notifications" that follows.

Vessel to Vessel and Vessel to Shore Communications
VHF communications on the Missouri River are handled by the communications center at USCG Sector Upper Mississippi River in St. Louis, MO. Primary contact is made on channel 16 then; generally, you will be instructed to switch to another channel to continue discussion.

Notifications

U. S. Coast Guard
The USCG maintains a 24 x 7 live watch at Sector Upper Mississippi River Command Center in St. Louis, MO. Hazardous river conditions are monitored by Sector personnel and reported as appropriate to the Commander, Sector Upper Mississippi River. As conditions dictate, the Commander, Sector Upper Mississippi River, will release Broadcast Notices to Mariners (BNM) or Urgent Marine Information Broadcasts (UMIB) with safety advisories, safety zones, or river closures. This information will also be posted on the River Industry Bulletin Board (www.RIBB.com). As noted above, these waterways control measures are determined in consultation with the ACOE and representative of the river industry.

Sector Upper Mississippi River Contact: 314-539-3091
Sector 24 Hour Contact Number: 319-524-7511 Ext 0

Corps of Engineers
During Normal Work Hours
During periods of hazardous river conditions the ACOE field offices work closely with river users and the basin river communities. The field office staff reports the river conditions and impacts to their respective District Office and NWD Point of Contact. The ACOE has two district offices responsible for the Missouri River; the Omaha District and the Kansas City District. The District boundaries split at Rulo, Nebraska (RM 498.4). The field staff report to district staff persons within Operations Division and Emergency Management Division. Operations Division staff will inform the District Water Control or Water Management Offices, the district leadership and the District Commander. They will also notify Division Water Management. They will then contact appropriate staff person in the Division Office, who will notify, the appropriate Division leadership and the Division Commander. The District Operations staff will coordinate with the USCG throughout the hazardous period. When river conditions become too hazardous for safe navigation or if continuing navigation causes an unsafe

condition such as causing levee erosion or interfering with flood fighting, etc, the ACOE through the appropriate District Commander will make recommendations to the USCG to issue safety zone restrictions or river closures. Likewise as river conditions improve the ACOE through the appropriate District Commander will make recommendations to the USCG to remove the safety zone restrictions or reopen the river to navigation.

Corps of Engineers
After Normal Work Hours, Weekends and Holidays
Any ACOE staff person, field office, District or Division who becomes knowledgeable of a hazardous river condition will contact the Kansas City District or Omaha District Emergency Management Office 24 hour phone number. Here the most up-to-date contact list with home and cell phone numbers are maintained of ACOE staff responsible for emergency response to hazardous river conditions.

Kansas City Emergency Management Office:	Paul Flamm (816) 426-6320
Omaha District Emergency Management Office:	Kimberly Thomas (402) 995-2448

Iowa Homeland Security & Emergency Management (HLSEM)

HLSEM is responsible for coordinating emergency preparedness activities across the State of Iowa. Iowa Homeland Security supports asset protection initiatives and promotes security awareness among all citizens. When an emergency of state or regional significance occurs, HLSEM coordinates response and recovery assistance. HLSEM engage all state response capabilities and facilitate emergency aid across local and state political boundaries. When it is needed, HLSEM is responsible for requesting and coordinating assistance from partner states and the federal government.

HLSEM believes that productive information sharing relationships are critical to homeland security and emergency preparedness. When information concerning the safety and security of Iowa's citizens and communities becomes available, please contact the HLSEM Duty Officer at 515-979-2200 or 515-281-3231. The Duty Officer can put you in contact with Jeff McKinney, Operations Officer (MARSEC POC), or Jerry Ostendorf, Chief of Operations.

Missouri State Emergency Management Agency

The Missouri State Emergency Management Agency (SEMA) coordinates and develops the State Emergency Operations Plan, oversees Missouri’s disaster preparedness, floodplain management, hazard mitigation and public assistance programs as well as coordinates the state’s response operations for all types of large-scale emergencies anywhere in the state.

SEMA and the State Emergency Operations Center (SEOC) are located at the Missouri Army National Guard Ike Skelton Training Site, east of Jefferson City. SEMA has a state-of-the-art facility and technical equipment to direct Missouri’s disaster emergency response and recovery operations. The SEOC enables all state agencies to come together during an emergency, gather information from local jurisdictions and quickly respond to the disaster. The EOC has fully

functional workstations, access to communication resources that include radio, telephone, satellite and wireless computer links.

The State EOC is designed to support 24/7 operations with kitchen facilities, showers, security, and lodging capability. The Missouri Information Analysis Center is located directly adjacent to SEMA offices and is an integral part of Missouri's response team.

SEMA has direct coordination and support for local emergency managers through nine area coordinators, one assigned to each region of the state. These SEMA employees have vehicles equipped with the latest in radio, satellite and mobile data terminal technology, most recently used during a dam failure in rural Missouri.

SEMA has a 24-hour duty officer who can be reached at (573) 751-2748; SEMA's agency toll-free number is (800) 298-6289. The State Communications Officer is Richard Stump (573) 526-9201; the State EOC Manager is Steve Sloan (573) 526-9144; the Operations Chief is Steve Moody (573) 526-9145; Area Coordinator Supervisor is Chuck May (573) 526-9112.

SEMA's Director is Mr. Ron Reynolds (573) 526-9104 and Deputy Director is Mr. Duane Nichols (573) 526-9100.

Nebraska State Emergency Management Agency

The State Emergency Management Agency mission is to provide for the coordination and implementation of measures and procedures designed to meet the danger to the citizens and communities of Nebraska caused by natural, man-made or technological disasters, civil disturbances, or hostile military or paramilitary action. To prepare for a prompt and efficient response protects lives and prevents the loss of property from all hazards. To ensure that the public is served in a timely and efficient manner, to provide for effective utilization of resources to support local political subdivisions in disaster recovery activities and to establish and implement a management system for coordinating State agencies', Federal agencies', private and non-governmental agencies' respond using the mutli-agency coordination structure in the National Response Plan (NRP) and in accordance with the National Incident Management System (NIMS). The Nebraska State Emergency Management Agency can be contacted 24 hours a day all year at 402-471-7421.

Kansas Emergency Management

The mission of the Division of Emergency Management is to provide a 24-hour operation to reduce loss of life and property, protect Kansans from all hazards by providing and coordinating resources, expertise, leadership and advocacy through a comprehensive, risk-based emergency management program of mitigation, preparedness, response and recovery.

The current Emergency Management Program in Kansas stems from two major legislative initiatives: the Federal Robert T. Stafford Disaster Relief Act, as amended, and Chapter 48, Article 9 of the Kansas Statutes Annotated. The Division of Emergency Management is the arm of the Adjutant General's Department that provides mitigation advocacy, planning requirements

and guidance, response coordination, and administration of recovery programs for the civil sector of the State, regardless of the type of hazards.

The Kansas Statutes Annotated requires that each county maintain a disaster agency responsible for emergency preparedness and coordination of response to disasters. The Statutes also require each county to maintain an Emergency Operations Plan that has been approved by the Division of Emergency Management. These statutes are the basis for the State/local relationship, which is solidified by continued contacts and mutual assistance on day-to-day operations, and during times of disasters. The State and local governments work together to provide training to local emergency management and response personnel. The same is true for the conduct of periodic exercises to test the State and local emergency management systems. Kansas Emergency Management can be contacted 24 hours a day all year at 785-296-3176

South Dakota Emergency Management

The Office of Emergency Management is charged with the overall mission of protecting South Dakota's citizens and their property from the effects of natural, manmade, and technological disasters. To fulfill this mission, the Office recognizes and utilizes the four phases of emergency management:

Preparedness: Actions taken in advance of an emergency/disaster to develop operational capabilities and facilitate response operations. Such measures may include the development of plans, procedures, warning and communications systems, and mutual aid agreements and emergency public information.

Response: Actions taken during or after an emergency/disaster to save lives, minimize damages and enhance recovery operations. These measures include activation of emergency operation centers, plans, emergency communications system, public warning, mass care, shelter, search and rescue, and security measures.

Recovery: Actions taken over the short or long term to return vital life support systems to minimum standards or to return life to normal or improved levels. Such measures include damage assessment, supplemental assistance, economic impact studies, and mitigation of damages sustained.

Mitigation: Actions that can be taken to eliminate or reduce the degree of long term risk. Such measures include building codes, public education, hazard vulnerability analysis and zoning laws and resolutions.

South Dakota Emergency Management can be contacted 24 hours a day all year at 605-773-3231.

Contact Information
In order to facilitate communications between Missouri River stakeholders, a contact list is provided on the following pages. This contact list is for internal use only and shall not be provided to non-plan users without permission by the contactee.

INTERNET SITE PURPOSE	ADDRESS
USCG Sector Upper Mississippi River	http://www.uscg.mil/d8/mso/stlouis/index.html
ACOE Northwestern Division Water Management – Missouri River Mainstem	http://www.nwd-mr.usace.army.mil/rcc/index.html
ACOE Kansas City District Water Management – Missouri River Tributaries	http://www.nwk.usace.army.mil/eppc.html
ACOE Omaha District Water Control – Missouri River Tributaries	http://www.nwo.usace.army.mil/hydro/water_control/index.html
NWS – National Weather Service	http://www.nws.noaa.gov/
USGS – Missouri River Gage, Sioux City, Iowa (RM 732.2)	http://waterdata.usgs.gov/ne/nwis/uv?06486000
USGS – Missouri River Gage, Decatur, Nebraska (RM 691.0)	http://waterdata.usgs.gov/ne/nwis/uv?06601200
USGS – Missouri River Gage, Omaha, Nebraska (RM 615.9)	http://waterdata.usgs.gov/ne/nwis/uv?06610000
USGS – Missouri River Gage, Nebraska City, NE (RM 562.6)	http://waterdata.usgs.gov/ne/nwis/uv?06807000
USGS – Missouri River Gage, Rulo, Nebraska (RM 498.1)	http://waterdata.usgs.gov/ne/nwis/uv?06813500
USGS – Missouri River Gage, St. Joseph, Missouri (RM 448.2)	http://waterdata.usgs.gov/mo/nwis/uv?06818000
USGS – Missouri River Gage, Kansas City, Missouri (RM366.1)	http://waterdata.usgs.gov/mo/nwis/uv?06893000
USGS – Missouri River Gage, Waverly, Missouri (RM293.4)	http://waterdata.usgs.gov/mo/nwis/uv?06895500
USGS – Missouri River Gage, Glasgow, Missouri (RM226.3)	http://waterdata.usgs.gov/mo/nwis/uv?06906500
USGS – Missouri River Gage, Boonville, Missouri (RM197.1)	http://waterdata.usgs.gov/mo/nwis/uv?06909000
USGS – Missouri River Gage, Jefferson City, MO (RM 143.9)	http://waterdata.usgs.gov/mo/nwis/uv?06910450
USGS – Missouri River Gage, Hermann, Missouri (RM 97.9)	http://waterdata.usgs.gov/mo/nwis/uv?06934500
USGS – Missouri River Gage, St. Charles, Missouri (RM 28.2)	http://waterdata.usgs.gov/mo/nwis/uv?06935965
USGS – Mississippi River Gage, St. Louis, Missouri (RM 190.2 or 1044)	http://waterdata.usgs.gov/mo/nwis/uv?07010000
ACOE Rock Island District – Navigation Information Connection	http://www2.mvr.usace.army.mil/NIC2/default.cfm
River Industry Bulletin Board	http://www.ribb.com/index.php

Section 4 – Action Plan

The actions to be taken during High Water, Low Water and High Current conditions are described in the following Action Plan Tables. The Action Plan Tables are supplemented by Tables 1, 2 and 3. The supplemental tables provide specific Missouri River flood information and various stage and discharge information to provide a basis for use of the Action Plan Tables as well as an understanding of how the hazardous event compares historically. An Action Plan Table for Ice conditions is not provided since the Missouri River is not used by the navigation industry when ice forms, normally mid December thru mid March. In addition to the discussions on Tables 1, 2 and 3, there are discussions of Project Operations for the Missouri River Master Water Control Manual and Annual Operating Plan, and Project Operations for Buoying Recommendations for Minimum Service Flow Support.

Table 1

This table shows the US Geological Survey (USGS) historical maximum discharges from the reservoirs since the Missouri River System was fully operational in 1967. The maximum design discharge capacity of the dams as well as the USGS maximum recorded discharge near the dams is listed. In addition the USGS maximum discharge of record with the dams in place since 1967 and the USGS maximum discharge of record for the downstream gaging stations from Sioux City downstream are shown.

Table 2

This table shows the Construction Reference Plane (CRP) stages and USGS discharges for the gaging stations from Sioux City to near the mouth at St. Charles. The CRP is a design profile used for constructing and maintaining the revetment and dike system. See glossary in the main report for detailed definition of CRP. Revisions to the CRP are required to reflect periodic changes within the basin due to flood events, channel degradation and aggradation and other river related circumstances. The Kansas City District updated the CRP for the Rulo to mouth reach in 2005. Omaha District updated the CRP for Sioux City to Rulo reach in 2006. Revisions impacting this Action Plan will be reflected in future updates. The CRP provides river users an approximate baseline for full service navigation stages for the entire navigable river reach. Table 2 also shows the full service navigation discharges at the four gage locations that serve as flow targets. These targets are met by releasing appropriate flows from the reservoir system so that the discharge at each gaging station at least meets the flow target. One gaging station may just meet the target while the others may equal or exceed the target. Full service navigation discharges provides for the 9 feet deep by minimum of 300 feet wide navigation channel. Minimum service navigation discharges are also listed for the same gages. Minimum service navigation discharges provide for an 8 feet deep by minimum of 200 feet wide navigation channel. Below Kansas City there are no navigation discharge flow targets established. Tributary flows generally supplement the flows downstream below Kansas City providing the required navigation flow support. Below Kansas City the ACOE, USCG and towing industry use the CRP stages as an approximation of full service navigation support as a comparison baseline. However, it must be noted that the discharges corresponding to the CRP stages are

slightly higher than the full service target discharge with the addition of normal tributary inflows from Kansas City to the mouth.

Table 3

This table shows the flood stages with discharges at the gaging stations from Sioux City to near the mouth at St. Charles. Also shown are the "extreme high water watch stages" at specific gaging stations. These watch stages are used as guidelines by the ACOE in coordinated discussions with the USCG. The watch stages represent historic river levels where continuing river navigation would have impacted flood fighting activities, threatened levee integrity or caused significant infrastructure damage along the river. Because of development activity along the floodway, accretion in the floodway, and levee crest changes, these watch stages can change. However, these stages provide a reasonable reference to begin necessary actions to consider river safety zones or closings and openings. Field observations and experience will be used to update the stages.

PROJECT OPERATIONS – MISSOURI RIVER MASTER WATER CONTROL MANUAL AND ANNUAL OPERATING PLAN

Navigation support flows are initiated from Gavins Point Dam (rm 811.1) on or about March 20th each year. There is about a 10 day lead time for releases from Gavins Point Dam to reach the mouth. These flows provide flow support for the calendar year navigation season, which normally runs from 1 April to 1 December at the mouth of the Missouri River. To meet downstream flow support requirements navigation flow targets have been established at Sioux City, IA, Omaha & Nebraska City, NE and Kansas City, MO. Depending on the available system water supply these targets vary from 31,000 to 25,000 cfs at Sioux City, 31,000 to 25,000 cfs at Omaha, 37,000 to 31,000 cfs at Nebraska City and 41,000 to 35,000 cfs at Kansas City. The upper range is used when the system has normal to above normal water supply and the lower range, less 6000 cfs, is used during periods of low upstream system water supply during an extended drought. The full service flow support level refers to the upper range and the minimum service flow support refers to the lowest range. Service between full and minimum is called intermediate service. The Missouri River Water Management team runs daily Missouri River forecasts and makes daily release changes if required to meet the required flow targets during the navigation season. From early to mid-May to mid-August releases are scheduled steady to accommodate the Endangered Least Tern and Threatened Piping Plover nesting on the Missouri River. Releases are scheduled at a higher rate than required early in the nesting season to keep birds nesting high on sandbars so that the necessary amount of flow will most likely be at the navigation target later in the season when downstream tributary flows recede in July or August. The season length is variable based on system water supply conditions as determined by the reservoir storage check on 1 July. The season length can be reduced no greater than two months. If an extended drought and usage of the system causes the system storage to be less than or equal to 31 million acre feet, navigation for that year will not be supported by system releases. During years of above normal water supply the season is often extended to December 10th to provide

additional floodwater evacuation to prepare the system for the following runoff season prior to winter freeze in.

PROJECT OPERATIONS – BUOYING RECOMMENDATIONS FOR MINIMUM SERVICE FLOW SUPPORT

Since the reservoir system was fully operational in 1967 there have been two major droughts, 1988-1993 and 2000 – Present (2007). The first drought period, 1988-1993, provided the first opportunity to understand the performance of the navigation channel design during minimum service flow support. An ACOE memo to the USCG, dated February 14, 1990, recommended buoying the river to provide an 8 feet deep channel within the widths available. During the March 26, 1990 Joint ACOE and USCG Meeting, it was agreed that the USCG buoy to 8 feet deep, but it was also agreed that the USCG would consider issuing a Notice to Mariners of any areas with channel dimensions that were less than 8 feet x 200 feet. If the channel conditions could only support dimensions less than 8 feet x 150 feet the USCG would consider establishing a Safety Zone for those reaches on a case by case basis. During the drought of 2000 – Present (2007) for minimum service flow support the same buoying and notification operations were implemented.

ACTION PLAN TABLE – High Water, Sioux City, IA to the Mouth RM 734.8 – 0.0

The Action Plan Table consists of seven tables that consider High Water for the seven reaches that divide up the navigation channel from Sioux City to the mouth. These reaches are the Sioux City Reach from river mile 734.8 to 630, the Omaha Reach from 630 to 500, the St. Joseph Reach from 500 to 400, the Kansas City Reach from river mile 400 to 300, the Brunswick Reach from river mile 300 to 200, the Jefferson Reach from river mile 200 to 100 and the Washington Reach from river mile 100 to 0.0. The tables show Trigger Readings for making decisions. These readings include flood stages and extreme high water watch stages that are also shown on Table 3.

In addition to the standard Action Plan Tables for High Water, a High Water Stage Trigger Table is provided to help simplify the comparison between discharge, stage and the action decisions.

ACTION PLAN TABLE – Low Water, Kansas City, MO to the Mouth RM 366.1 – 0.0

Low water is a significant issue for the reach from Kansas City to the mouth. River reaches upstream are supported by reservoir releases that provide the minimum required navigation flows. Low water is generally not an issue for the upstream reaches. However sometimes navigation target flows are slightly missed as a result of flow regulation for endangered species or unexpected reductions from tributary flows. Missing the target flow at the Kansas City gage

or low tributary drought influenced inflows impacts the reach downstream the most. Therefore Action Plan Tables for Low Water include only the four reaches within Kansas City to the mouth. These reaches are the Kansas City Reach from river mile 366.1 to 300, the Brunswick Reach from river mile 300 to 200, the Jefferson Reach from river mile 200 to 100 and the Washington Reach from river mile 100 to 0.0. The Kansas City Reach begins at river mile 366.1 as this is the most downstream target gage location for supporting navigation flows from the reservoir system. The lowest discharge Trigger Reading indicated for the Kansas City gage for normal operations corresponds with minimum service navigation flows of 35,000 cubic feet per second (cfs). The falling water discharges at the Kansas City gage corresponds to a missed target situation. The falling water discharges downstream are a result of a missed target at Kansas City and/or drought conditions on the tributaries. Mainstem river gages that have locations that correspond to the upstream and downstream river mile positions for each river reach are used for Trigger Reading discharges.

The Action Plan Tables for Low Water include both discharge and gage information. Although discharge is what maintains the channel, stage is most often used as a river flow benchmark. For any given river discharge the stage can fluctuate due to river sediment bed forms moving downstream. The stages provided for the low water table are the best average stage for the discharges indicated.

In addition to the standard Action Plan Tables for Low Water, a Low Water Trigger Table is provided to help simplify the comparison between discharge, stage and the action decisions.

ACTION PLAN TABLE – High Current, Sioux City, IA to the Mouth RM 734.8 – 0.0

The seven tables provided consider high current using high discharges caused by basin or regional flood events for the entire navigable river reach. These reaches are the Sioux City Reach from river mile 734.8 to 630, the Omaha Reach from 630 to 500, the St. Joseph Reach from 500 to 400, the Kansas City Reach from river mile 400 to 300, the Brunswick Reach from river mile 300 to 200, the Jefferson Reach from river mile 200 to 100 and the Washington Reach from river mile 100 to 0.0. The greatest concerns for the high and very high currents are those created by flood waters carried by the river. Experience indicates that although the greatest of these flows can be navigated against it will be other factors that make the decision to issue advisories or establish safety zones or river closures.

Individual tributaries can receive significant rain events that have currents reaching the confluence of the Missouri River that penetrate well into the channel. These situations provide high current navigation challenges for tows that pass a flooding tributary confluence. However these are infrequent and short lived events and the majority of tows safely pass on the opposite side of the river to avoid the side energy.

Dam/Reservoir	State	Maximum Discharge Of Record With Dams 1967- Present (cfs)	Maximum Design Discharge Capacity (cfs)	Maximum Discharge Of Record Near Dams (cfs)
Fort Peck Dam - Fort Peck Lake	MT	35,000 (Jul 1975)	275,000	137,000 (Jun 1953)
Garrison Dam - Lake Sakakawea	ND	65,200 (Jul 1975)	827,000	348,000 (Apr 1952)
Oahe Dam - Lake Oahe	SD	59,300 (Jul 1997)	304,000	440,000 (Apr 1952)
Big Bend Dam - Lake Sharpe	SD	74,300 (Jul 1997)	390,000	440,000 (Apr 1952)
Fort Randall Dam - Lake Francis Case	SD	67,500 (Nov 1997)	620,000	447,000 (Apr 1952)
Gavins Point Dam - Lewis and Clark Lake	SD & NE	70,100 (Oct/Nov 1997)	584,000	480,000 (Apr 1952)
Gage Location	**River Mile**	**Maximum Discharge Of Record With Dams 1967- Present (cfs)**		**Maximum Discharge Of Record (cfs)**
Sioux City, IA	732.3	100,000 (Apr 1997)		441,000 (Apr 1952)
Decatur, NE	691.0	100,000 (Apr 1997)		NA*
Omaha, NE	615.9	118,000 (Jun 1996)		396,000 (Apr 1952)
Nebraska City, NE	562.6	196,000 (Jul 1993)		414,000 (Apr 1952)
Rulo, NE	498.1	307,000 (Jul 1993)		358,000 (Apr 1952)
St. Joseph, MO	448.2	335,000 (Jul 1993)		397,000 (Apr 1952)
Kansas City, MO	366.1	541,000 (Jul 1993)		625,000 (Jun 1844)
Waverly, MO	293.2	633,000 (Jul 1993)		549,000 (Jul 1951)
Boonville, MO	196.6	755,000 (Jul 1993)		710,000 (Jun 1844)
Hermann, MO	97.9	750,000 (Jul 1993)		700,000 (Jun 1844)
* NA – Not Applicable as there is not enough historic record				

TABLE 1 – Reservoir and Channel Flood Discharge Records

Gage Location	River Mile	2006 CRP Stage (ft)	Approximate Discharge at 2006 CRP Stage (cfs)	Full Service Navigation Discharge (cfs)	Minimum Service Navigation Discharge (cfs)
Sioux City, IA	732.3	14.9	30,500	31,000	25,000
Decatur, NE	691.0	22.1	31,000		
Blair, NE	648.3	15.6	NA*		
Omaha, NE	615.9	16.7	33,400	31,000	25,000
Plattsmouth, NE	591.5	16.7	NA		
Nebraska City, NE	562.6	9.7	37,500	37,000	31,000
Brownville, NE	535.3	24.9	NA		
Rulo, NE	498.0	9.3	38,900		
		2005 CRP Stage (ft)	**Approximate Discharge at 2005 CRP Stage (cfs)**		
St. Joseph, MO	448.2	8.8	40,600		
Atchison, KS	422.6	12.0	NA		
Kansas City, MO	366.1	10.4	44,200	41,000	35,000
Napoleon, MO	328.7	7.6	NA		
Lexington, MO	317.3	14.4	NA		
Waverly, MO	293.2	11.1	45,100		
Miami, MO	262.6	7.9	NA		
Glasgow, MO	226.3	12.7	NA		
Boonville, MO	196.6	8.2	48,300		
Jefferson City, MO	143.9	7.5	NA		
Gasconade Harbor	104.5	9.5	NA		
Hermann, MO	97.9	7.1	55,900		
Washington, MO	67.6	4.6	NA		
St. Charles, MO	28.2	10.9	NA		

* NA – Not Applicable

TABLE 2 – Construction Reference Plane Stage & Discharge and Navigation Service Discharge

Gage Location	River Mile	Flood Stage (ft)	Approximate Flood Stage Discharge (cfs)	Extreme High Water Watch Stages (ft)	Extreme High Water Watch Discharge (cfs)
Sioux City, IA	732.3	30	134,000	27 & Above	114,000+
Decatur, NE	691.0	35	101,000	35	101,000
Blair, NE *	648.3	29	NA	29	NA
Omaha, NE	615.9	29	139,000	26 & Above	94,000+
Plattsmouth, NE *	591.5	26	NA	26	NA
Nebraska City, NE	562.6	18	80,700	17 & Above	74,000+
Brownville, NE *	535.3	32	NA	31 & Above	NA
Rulo, NE	498.0	17	84,000	16 & Above	76,400+
St. Joseph, MO	448.2	17	88,000	20 & Above	118,000+
Atchison, KS**	422.6	22	108,000	26 & Above	------
Kansas City, MO	366.1	32	231,000	35 & Above	274,000+
Napoleon, MO	328.7	17	107,000	------	------
Lexington, MO	317.3	22	110,000	------	------
Waverly, MO	293.2	20	114,000	25 & Above	167,000+
Miami, MO	262.6	18	128,000	25 & Above	185,000+
Glasgow, MO	226.3	25	147,000	27 & Above	204,000+
Boonville, MO	196.6	21	160,000	25 & Above	214,000+
Jefferson City, MO	143.9	23	182,000	26 & Above	238,000+
Gasconade Harbor	104.5	22	197,000	------	------
Hermann, MO	97.9	21	200,000	25 & Above	255,000+
Washington, MO	67.6	20	238,000	26 & Above	268,000+
St. Charles, MO	28.2	25	214,000	27 & Above	280,000+

* This Gage is not rated

** The bridge tender for the Union Pacific RR Bridge at Atchison, KS may close the swingspan section when the Atchison river gage reaches a stage of 26 feet with a rising river predicted. The concern is drift lodging into the bull gear of the center pier preventing the closing of the bridge to railroad traffic. The bridge tender checks for any nearby towboat traffic to coordinate the closing. See contact list for bridge tender information.

TABLE 3 – Flood Stages and Extreme High Water Watch Stages

ACTION PLAN TABLE
HIGH WATER
Sioux City, IA to the Mouth
RM 734.8 – 0.0

ACTION PLAN TABLE – HIGH WATER, Sioux City Reach RM 734.8 – 630.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING (Feet)	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Sioux City 28.0 Omaha 21.0	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Sioux City 29.0 Omaha 26.0	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 734.8 - 630.0 **SIOUX CITY REACH** **Missouri River Gages** **Sioux City – RM 732.3** **Omaha - RM 615.9**	Sioux City 30.0 Omaha 29.0	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Sioux City 29.0 Omaha 26.0	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Sioux City 28.0 Omaha 21.0	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – HIGH WATER, Omaha Reach RM 630.0 – 500.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING (Feet)	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Omaha 21.0 Rulo 11.0	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Omaha 26.0 Rulo 16.0	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 630.0-500.0 **OMAHA REACH** **Missouri River Gages** **Omaha – RM 615.9** **Rulo – RM 498.0**	Omaha 29.0 Rulo 17.0	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Omaha 26.0 Rulo 16.0	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Omaha 21.0 Rulo 11.0	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – HIGH WATER, St. Joseph Reach RM 500.0 – 400.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING (Feet)	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Rulo 11.0 St. Joseph 15.0 Atchison 21.0 Kansas City 30	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Rulo 16.0 St. Joseph 17.0 Atchison 22.0 Kansas City 32	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 500.0-400.0 **ST. JOSEPH REACH** **Missouri River Gages** **Rulo – RM 498.0** **St. Joseph – RM 448.2** **Atchison – RM 422.6** **Kansas City – RM 366.1**	Rulo 17.0 St. Joseph 20.0 Atchison 26.0 RR Bridge (RM 422.6) may close span Kansas City 35	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Rulo 16.0 St. Joseph 17.0 Atchison 22.0 Kansas City 32	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Rulo 11.0 St. Joseph 15.0 Atchison 21.0 Kansas City 30	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – HIGH WATER, Kansas City Reach RM 400.0 – 300.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING (Feet)	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Kansas City 30 Waverly 20.0	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Kansas City 32 Waverly 22.0	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 400.0-300.0 **KANSAS CITY REACH** **Missouri River Gages** **Kansas City – RM 366.1** **Waverly – RM 293.2**	Kansas City 35 Waverly 25.0	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Kansas City 32 Waverly 22.0	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Kansas City 30 Waverly 20.0	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – HIGH WATER, Brunswick Reach RM 300.0 – 200.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING (Feet)	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Waverly 20.0 Miami 18.0 Glasgow 22.0 Boonville 20.0	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Waverly 22.0 Miami 21.0 Glasgow 25.0 Boonville 21.0	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 300.0-200.0 **BRUNSWICK REACH** **Missouri River Gages** **Waverly – RM 293.2** **Miami – RM 262.6** **Glasgow – RM 226.3** **Boonville – RM 196.6**	Waverly 25.0 Miami 25.0 Glasgow 27.0 Boonville 25.0	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Waverly 22.0 Miami 21.0 Glasgow 25.0 Boonville 21.0	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Waverly 20.0 Miami 18.0 Glasgow 22.0 Boonville 20.0	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – HIGH WATER, Jefferson Reach RM 200.0 – 100.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING (Feet)	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Boonville 20.0 Jeff. City 22.0 Hermann 20.0	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Boonville 21.0 Jefferson City 23.0 Hermann 21.0	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 200.0-100.0 **JEFFERSON REACH** **Missouri River Gages** **Boonville – RM 196.6** **Jefferson City – RM 143.9** **Hermann – RM 97.9**	Boonville 25.0 Jefferson City 26.0 Hermann 25.0	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Boonville 21.0 Jefferson City 23.0 Hermann 21.0	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Boonville 20.0 Jeff. City 22.0 Hermann 20.0	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – HIGH WATER, Washington Reach RM 100.0 – 0.0

CRITICAL LOCATION DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
	Hermann 20.0 Washington 19 St. Charles 22.0	Rising		Normal Operations		As stage rises at gages listed or series of gage locations at other reaches consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gage frequently.
	Hermann 21.0 Washington 20 St. Charles 25.0	Rising		High Water	Watch	Initiate communication plan. Issue advisory that indicates high water and drift potential. All tow boat operators should be experienced in high water operations. Advise the use of caution and minimize wake. Consider tow restrictions, hp requirements, dangers of down streaming, discuss mooring arrangements, and bridge clearance issues.
River Mile 100.0-0.0 **WASHINGTON REACH** **Missouri River Gages** **Hermann – RM 97.9** **Washington – RM 67.6** **St. Charles – RM 28.2**	Hermann 25.0 Washington 26 St. Charles 27.0	Rising		Extreme High Water	Action	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions to determine the need to establish a safety zone/river closure. Discourage/prohibit recreational vessel transit, assess bridge clearances in advance, minimize speed to avoid wake damage, favor center of channel, prohibit laying up on levees, caution in passing/meeting situations, monitor fleeting areas and mooring lines/arrangements, review anchoring req, have towboat attend fleets at all times, coordinate with adjacent facilities/fleeters for assistance in event of breakaway, pre-identify lay-up areas in event of river closure, allow fleeting to continue, advise swift current caution. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Hermann 21.0 Washington 20 St. Charles 25.0	Falling		High Water	Recovery	Use stage along with high current reports, impacted river reach, towboat positions and levee conditions if and when to reopen the river (if a safety zone or closure was established). Determine what action advisories need to be removed or remain depending on river conditions. Issue advisory that indicates high water and to exercise caution. Users to report hazardous conditions to USCG. Initiate communications plan if river level begins rising.
	Hermann 20.0 Washington 19 St. Charles 22.0	Falling		Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

MISSOURI RIVER WAP ANNEX HIGH WATER STAGE TRIGGER TABLE

RISING GAGE READING

Reach	Gage Location	No Action	Trigger Stage Reading (ft)* Normal Operations	High Water	Extreme High Water
SIOUX CITY REACH	Sioux City	< 28	28 - 29	29 - 30	> 30
RM 734.8 - 630	Omaha	< 21	21 - 26	26 - 29	> 29
OMAHA REACH	Omaha	< 21	21 - 26	26 - 29	> 29
RM 630 - 500	Rulo	< 11	11 - 16	16 - 17	> 17
ST JOSEPH REACH	Rulo	< 11	11 - 16	16 - 17	> 17
RM 500 - 400	St. Joseph	< 15	15 - 17	17 - 20	> 20
	Atchison	< 21	21 - 22	22 - 26	> 26
	Kansas City	< 30	30 - 32	32 - 35	> 35
KANSAS CITY REACH	Kansas City	< 30	30 - 32	32 - 35	> 35
RM 400 - 300	Waverly	< 20	20 - 22	22 - 25	> 25
BRUNSWICK REACH	Waverly	< 20	20 - 22	22 - 25	> 25
RM 300 - 200	Miami	< 18	18 - 21	21 - 25	> 25
	Glasgow	< 22	22 - 25	25 - 27	> 27
	Boonville	< 20	20 - 21	21 - 25	> 25
JEFFERSON REACH	Boonville	< 20	20 - 21	21 - 25	> 25
RM 200 - 100	Jefferson City	< 22	22 - 23	23 - 26	> 26
	Hermann	< 20	20 - 21	21 - 25	> 25
HERMANN REACH	Hermann	< 20	20 - 21	21 - 25	> 25
RM 100 - 0	Washington	< 19	19 - 20	20 - 26	> 26
	St. Charles	< 22	22 - 25	25 - 27	> 27

Gage Stage Today (ft) date	Gage Stage Forecast (ft) date	Gage Stage Forecast (ft) date	Gage Stage Forecast (ft) date	Gage Stage Forecast (ft) date	Gage Stage Forecast (ft) date

Normal Operations**

High Water**

Extreme High Water**

No Action

* NOTE: For Falling Gage Reading Review the Table Columns from Right to Left

**NOTE: Color Code the today and forecasted stage readings for Visual Display

ACTION PLAN TABLES
LOW WATER
Kansas City, MO to the Mouth
RM 366.1 – 0.0

ACTION PLAN TABLE – LOW WATER, Kansas City Reach 366.1 - 300

CRITICAL REACH DESCRIPTION	TRIGGER READING DISCHARGE	TRIGGER READING STAGE	TREND	DESCRIPTION	PHASE	ACTION
	Kansas City 35,000 cfs Waverly 36,000 cfs	Kansas City 8.0 feet Waverly 9.8 feet	Falling	Normal Operations		As discharge falls or series of gage locations fall consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gauges frequently. ACOE to plan additional channel reconnaissance surveys.
	Kansas City 34,000 cfs Waverly 34,000 cfs	Kansas City 7.8 feet Waverly 9.3 feet	Falling	Low Water	Watch	Initiate communication plan. Issue advisory that indicates low water. Advise the use of caution. Consider tow restrictions. ACOE initiates increased channel reconnaissance surveys.
River Mile 366.1 - 300 **KANSAS CITY REACH** **Missouri River Gages** **KC - RM 366.1** **Waverly - RM 293.2**	Kansas City < 34,000 cfs Waverly < 34,000 cfs	Kansas City < 7.8 feet Waverly < 9.3 feet	Falling	Extreme Low Water	Action	Issue advisory that indicates extreme low water. USCG will reset buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency Dredging may be required at some locations. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Kansas City < 34,000 cfs Waverly < 34,000 cfs	Kansas City < 7.8 feet Waverly < 9.3 feet	Rising	Extreme Low Water	Recovery	Continue advisory that indicates extreme low water. USCG will monitor buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency dredging may be required at some locations.
	Kansas City 34,000 cfs Waverly 34,000 cfs	Kansas City 7.8 feet Waverly 9.3 feet	Rising	Low Water	Recovery	Issue advisory that indicates changes from extreme low water to low water. ACOE reconnaissance to continue.
	Kansas City 35,000 cfs Waverly 36,000 cfs	Kansas City 8.0 feet Waverly 9.8 feet	Rising	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – LOW WATER, Brunswick Reach 300 - 200

CRITICAL REACH DESCRIPTION	TRIGGER READING DISCHARGE	TRIGGER READING STAGE	TREND	DESCRIPTION	PHASE	ACTION
	Waverly 36,000 cfs Boonville 39,000 cfs	Waverly 9.8 feet Boonville 6.5 feet	Falling	Normal Operations		As discharge falls or series of gage locations fall consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gauges frequently. ACOE to plan additional channel reconnaissance surveys.
	Waverly 34,000 cfs Boonville 37,000 cfs	Waverly 9.3 feet Boonville 6.0 feet	Falling	Low Water	Watch	Initiate communication plan. Issue advisory that indicates low water. Advise the use of caution. Consider tow restrictions. ACOE initiates increased channel reconnaissance surveys.
River Mile 300 - 200 **BRUNSWICK REACH** **Missouri River Gages** **Waverly - RM 293.2** **Boonville - RM 196.6**	Waverly < 34,000 cfs Boonville < 37,000 cfs	Waverly < 9.3 feet Boonville < 6.0 feet	Falling	Extreme Low Water	Action	Issue advisory that indicates extreme low water. USCG will reset buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency Dredging may be required at some locations. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Waverly < 34,000 cfs Boonville < 37,000 cfs	Waverly < 9.3 feet Boonville < 6.0 feet	Rising	Extreme Low Water	Recovery	Continue advisory that indicates extreme low water. USCG will monitor buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency dredging may be required at some locations.
	Waverly 34,000 cfs Boonville 37,000 cfs	Waverly 9.3 feet Boonville 6.0 feet	Rising	Low Water	Recovery	Issue advisory that indicates changes from extreme low water to low water. ACOE reconnaissance to continue.
	Waverly 36,000 cfs Boonville 39,000 cfs	Waverly 9.8 feet Boonville 6.5 feet	Rising	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – LOW WATER, Jefferson Reach 200 - 100

CRITICAL REACH DESCRIPTION	TRIGGER READING DISCHARGE	TRIGGER READING STAGE	TREND	DESCRIPTION	PHASE	ACTION
	Boonville 39,000 cfs Hermann 45,000 cfs	Boonville 6.5 feet Hermann 6.0 feet	Falling	Normal Operations		As discharge falls or series of gage locations fall consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gauges frequently. ACOE to plan additional channel reconnaissance surveys.
	Boonville 37,000 cfs Hermann 43,000 cfs	Boonville 6.0 feet Hermann 5.7 feet	Falling	Low Water	Watch	Initiate communication plan. Issue advisory that indicates low water. Advise the use of caution. Consider tow restrictions. ACOE initiates increased channel reconnaissance surveys.
River Mile 200 - 100 JEFFERSON REACH Missouri River Gages Boonville - RM 196.6 Hermann - RM 97.9	Boonville < 37,000 cfs Hermann < 43,000 cfs	Boonville < 6.0 feet Hermann < 5.7 feet	Falling	Extreme Low Water	Action	Issue advisory that indicates extreme low water. USCG will reset buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency Dredging may be required at some locations. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Boonville < 37,000 cfs Hermann < 43,000 cfs	Boonville < 6.0 feet Hermann < 5.7 feet	Rising	Extreme Low Water	Recovery	Continue advisory that indicates extreme low water. USCG will monitor buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency dredging may be required at some locations.
	Boonville 37,000 cfs Hermann 43,000 cfs	Boonville 6.0 feet Hermann 5.7 feet	Rising	Low Water	Recovery	Issue advisory that indicates changes from extreme low water to low water. ACOE reconnaissance to continue.
	Boonville 39,000 cfs Hermann 45,000 cfs	Boonville 6.5 feet Hermann 6.0 feet	Rising	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

ACTION PLAN TABLE – LOW WATER, Washington Reach 100 – 0.0

CRITICAL REACH DESCRIPTION	TRIGGER READING DISCHARGE	TRIGGER READING STAGE	TREND	DESCRIPTION	PHASE	ACTION
	Hermann 45,000 cfs	Hermann 6.0 feet	Falling	Normal Operations		As discharge falls or series of gage locations fall consider the need to initiate communications plan with ACOE, RIAC, and USCG. Monitor river gauges frequently. ACOE to plan additional channel reconnaissance surveys.
	Hermann 43,000 cfs	Hermann 5.7 feet	Falling	Low Water	Watch	Initiate communication plan. Issue advisory that indicates low water. Advise the use of caution. Consider tow restrictions. ACOE initiates increased channel reconnaissance surveys.
River Mile 100 - 0.0 WASHINGTON REACH Missouri River Gage Hermann - RM 97.9	Hermann < 43,000 cfs	Hermann < 5.7 feet	Falling	Extreme Low Water	Action	Issue advisory that indicates extreme low water. USCG will reset buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency Dredging may be required at some locations. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
	Hermann < 43,000 cfs	Hermann < 5.7 feet	Rising	Extreme Low Water	Recovery	Continue advisory that indicates extreme low water. USCG will monitor buoys in those narrow channel locations within reach. ACOE will continue increased level of channel reconnaissance. Emergency dredging may be required at some locations.
	Hermann 43,000 cfs	Hermann 5.7 feet	Rising	Low Water	Recovery	Issue advisory that indicates changes from extreme low water to low water. ACOE reconnaissance to continue.
	Hermann 45,000 cfs	Hermann 6.0 feet	Rising	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Users to report hazardous conditions to the USCG. Cease all advisories if conditions allow.

MISSOURI RIVER WAP ANNEX LOW WATER DISCHARGE & STAGE TRIGGER TABLE

FALLING GAGE READING

Gage Location	Minimum Service Navigation Discharge & Stage**		Normal Operations		WATCH PHASE Low Water		ACTION PHASE Extreme Low Water	
	(cfs)	(ft)	(cfs)	(ft)	(cfs)	(ft)	(cfs)	(ft)
Kansas City (RM 366.1)	35,000*	8.0	35,000 +	8.0 +	35,000 - 34,000	8.0 - 7.8	< 34,000	< 7.8
Waverly (RM 293.2)	NA	NA	36,000 +	9.8 +	36,000 - 34,000	9.8 - 9.3	< 34,000	< 9.3
Boonville (RM 196.6)	NA	NA	39,000 +	6.5 +	39,000 - 37,000	6.5 - 6.0	< 37,000	< 6.0
Hermann (RM 97.9)	NA	NA	45,000 +	6.0 +	45,000 - 43,000	6.0 - 5.7	< 43,000	< 5.7

RISING GAGE READING

Gage Location	RECOVERY PHASES Extreme Low Water		RECOVERY PHASES Low Water		RECOVERY PHASES Normal Operations		Minimum Service Navigation Discharge & Stage	
	(cfs)	(ft)	(cfs)	(ft)	(cfs)	(ft)	(cfs)	(ft)
Kansas City (RM 366.1)	< 34,000	< 7.8	34,000 - 35,000	7.8 - 8.0	35,000 +	8.0 +	35,000*	8.0
Waverly (RM 293.2)	< 34,000	< 9.3	34,000 - 36,000	9.3 - 9.8	36,000 +	9.8 +	NA	NA
Boonville (RM 196.6)	< 37,000	< 6.0	37,000 - 39,000	6.0 - 6.5	39,000 +	6.5 +	NA	NA
Hermann (RM 97.9)	< 43,000	< 5.7	43,000 - 45,000	5.7 - 6.0	45,000 +	6.0 +	NA	NA

*NOTE: The minimum navigation service flow target for Kansas City is 35,000 cubic feet per second. This flow is usually met throughout the navigation season. However during the nesting season for the endangered shore birds, the piping plover and the interior least tern, constant Gavins Point Dam releases are made. These flows are usually high enough to provide the necessary flow targets. Occasionally drought conditions in the lower basin cause the target to be missed. If water is available in the Kansas state reservoirs, they can be used to assist in meeting the necessary target flow at Kansas City.

**NOTE: River stages fluctuate for the same river discharge. The stages listed for the discharges shown are based on analysis of the river stage discharge relationships during the 2007 Navigation year.

MISSOURI RIVER WAP ANNEX LOW WATER DISCHARGE & STAGE TRIGGER FORECAST TABLE

Gage Location	Gage Discharge Today's date	Gage Discharge Forecast date	Gage Discharge Forecast date	Gage Discharge Forecast date	Gage Discharge Forecast date	Gage Discharge Forecast date	Gage Discharge Forecast date	Gage Discharge Forecast date
Kansas City (RM 366.1)								
Waverly (RM 293.4)								
Boonville (RM 197.1)								
Hermann (RM 97.9)								

Gage Location	Gage Stage Today's date	Gage Stage Forecast date	Gage Stage Forecast date	Gage Stage Forecast date	Gage Stage Forecast date	Gage Stage Forecast date	Gage Stage Forecast date	Gage Stage Forecast date
Kansas City (RM 366.1)								
Waverly (RM 293.4)								
Boonville (RM 197.1)								
Hermann (RM 97.9)								

	Normal Operations
	Low Water
	Extreme Low Water

ACTION PLAN TABLES
HIGH CURRENT
Sioux City, IA to the Mouth
RM 734.8 – 0.0

ACTION PLAN TABLE – HIGH CURRENT, Sioux City Reach RM 734.8 – 630.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Sioux City 31,000 cfs Omaha 31,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Sioux City 70,000 cfs Omaha 75,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 734.8-630.0 SIOUX CITY REACH Missouri River Gages Sioux City - RM 732.3 Omaha - RM 615.9		Rising	Sioux City 90,000 cfs Omaha 100,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Sioux City 90,000 cfs Omaha 100,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Sioux City 70,000 cfs Omaha 75,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Sioux City 31,000 cfs Omaha 31,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

ACTION PLAN TABLE – HIGH CURRENT, Omaha Reach RM 630.0 – 500.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Omaha 31,000 cfs Rulo 39,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Omaha 75,000 cfs Rulo 84,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 630.0-500.0 OMAHA REACH Missouri River Gages Omaha - RM 615.9 Rulo – RM 498.0		Rising	Omaha 100,000 cfs Rulo 110,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Omaha 100,000 cfs Rulo 110,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Omaha 75,000 cfs Rulo 84,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Omaha 31,000 cfs Rulo 39,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

ACTION PLAN TABLE – HIGH CURRENT, St. Joseph Reach RM 500.0 – 400.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Rulo 39,000 cfs Kansas City 41,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Rulo 84,000 cfs Kansas City 110,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 500.0-400.0 ST. JOSEPH REACH Missouri River Gages Rulo – RM 498.0 Kansas City – RM 366.1		Rising	Rulo 110,000 cfs Kansas City 160,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Rulo 110,000 cfs Kansas City 160,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Rulo 84,000 cfs Kansas City 110,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Rulo 39,000 cfs Kansas City 41,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

ACTION PLAN TABLE – HIGH CURRENT, Kansas City Reach RM 400.0 – 300.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Kansas City 41,000 cfs Waverly 45,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Kansas City 110,000 cfs Waverly 114,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 400.0-300.0 KANSAS CITY REACH Missouri River Gages Kansas City – RM 366.1 Waverly – RM 293.2		Rising	Kansas City 160,000 cfs Waverly 167,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Kansas City 160,000 cfs Waverly 167,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Kansas City 110,000 cfs Waverly 114,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Kansas City 41,000 cfs Waverly 45,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

ACTION PLAN TABLE – HIGH CURRENT, Brunswick Reach RM 300.0 – 200.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Waverly 45,000 cfs Boonville 48,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Waverly 114,000 cfs Boonville 160,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 300.0-200.0 BRUNSWICK REACH Missouri River Gages Waverly – RM 293.2 Boonville – RM 196.6		Rising	Waverly 167,000 cfs Boonville 214,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Waverly 167,000 cfs Boonville 214,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Waverly 114,000 cfs Boonville 160,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Waverly 45,000 cfs Boonville 48,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

ACTION PLAN TABLE – HIGH CURRENT, Jefferson Reach RM 200.0 – 100.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Boonville 48,000 cfs Hermann 56,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Boonville 160,000 cfs Hermann 200,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 200.0-100.0 JEFFERSON REACH Missouri River Gages Boonville – RM 196.6 Hermann – RM 97.9		Rising	Boonville 214,000 cfs Hermann 255,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Boonville 214,000 cfs Hermann 255,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Boonville 160,000 cfs Hermann 200,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Boonville 48,000 cfs Hermann 56,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

ACTION PLAN TABLE – HIGH CURRENT, Washington Reach RM 100.0 – 0.0

CRITICAL REACH DESCRIPTION	TRIGGER READING	TREND	TRIGGER CURRENT	DESCRIPTION	PHASE	ACTION
		Rising	Hermann 56,000 cfs St. Charles 57,000 cfs	Normal Operations		As current rises towards trigger current, consider need to initiate communications plan
		Rising	Hermann 200,000 cfs St. Charles 214,000 cfs	High Current	Watch	Initiate communication plan, consider a safety advisory; Begin assessments of hazardous condition. Discuss voluntary horsepower and tow size restrictions. Cautious of accessibility terminals. Consider safety advisory for UMR fleet due to drift. Consider standing up ICP.
River Mile 100.0-0.0 WASHINGTON REACH Missouri River Gages Hermann – RM 97.9 St. Charles – RM 28.2		Rising	Hermann 255,000 cfs St. Charles 280,000 cfs	Very High Current	Action	Use high current information along with extreme high water, flood fighting reports, impacted river reach, towboat positions and levee conditions to determine the need to revise the safety advisory, establish a safety zone, or river closure. Consider press release, and/or JIC, and formation of Incident Command Post if needed.
		Falling	Hermann 255,000 cfs St. Charles 280,000 cfs	Very High Current	Recovery	Consider revisions to advisory on safety zone restrictions or closure. Continue to report hazardous conditions.
		Falling	Hermann 200,000 cfs St. Charles 214,000 cfs	High Current	Recovery	Consider revisions to safety advisory that indicates swift currents. Report hazardous condition. Discuss voluntary horsepower and tow size restrictions.
		Falling	Hermann 56,000 cfs St. Charles 57,000 cfs	Normal Operations	Recovery	Issue final advisory that indicates return to normal operations. Report any hazardous conditions to the USCG.

Sector Upper Mississippi River Marine Casualty Risk Assessment Tool Assumptions for Data

1. In the WAP process USCG Marine Casualty Data is used for two of the three risk factors. There were only two risk factors listed in the Casualty Data records used, low water and high flow. Analysis of the data plus the best judgment by experienced USCG, ACOE and Industry river users were combined to finalize the rankings. For high flow the best judgment by experienced USCG, ACOE and Industry river users was used.
2. The Casualty Data for the Missouri River was only available since 1998. Data used is from May 1998 to May 2005. There were only 24 USCG investigation data records for Sector Upper Mississippi River's area of responsibility on the Missouri River.
3. It is important to note that the WAP guidelines did not provide any definition for the risk factors.
4. USCG and ACOE staff reviewed the Casualty Data and made decisions concerning each record.
5. As the data was reviewed, individuals conducting the reviews noted several important issues:
    a. Shoaling could occur at any stage. In light of this, groundings occurring during a low river level condition were sought to populate the low water risk assessment.
    b. Vessel drafts were not considered, or are they included in the records.
    c. High flow rate could have several different affect on vessels. High flow main channel current poses timing challenges on pilots to maneuver the river bends. High flows from a flood swollen tributary can force a tow closer to the opposite bank increasing navigation risks.
    d. Cubic feet per second (cfs) is a best determination of high flow rate rather than some velocity measurement. Velocity varies across the channel and throughout the depth of the river. As water flows down river, the differentiating depths and widths of the river constantly change velocities. Velocity measurements are not normally taken on the river except at the gage locations to calibrate the stage discharge rating curves. Unless a casualty happens at one of the gage locations, velocity measurements will not be available at the casualty location. Using the cfs of the river simplifies the high flow rate analysis.
6. Initial review of the records relied on the incident narrative to make a determination risk factor contribution.
7. Where information was incomplete, a review of river stage, discharge, and other casualties at the same time were viewed for clues to determine if one of two factors contributed to the casualty.

8. Experience data for the three risk factors was also collected from USCG, ACOE and Industry river users. These were made up of the USCG's two buoy tenders the Gasconade and Cheyenne, the ACOE river fleet vessel operators and towing company captains and pilots.
9. All the ACOE, USCG and industry rankings were consolidated into a spreadsheet for comparison and averaging. Once the casualty data was screened and the experience data considered and averaged among the participants the Risk Assessment Tools were populated.
10. For WAP uniformity, High Medium, Low definitions for each of the five formula elements (obstructions to navigation, channel width, bend radius, congestion, and casualty history count) and their corresponding point value could not be changed. Also, the format of the tool could not be altered.
11. Variables that could be changed in the Risk Assessment Tool are:
    a. The length of river sections. The river segments used were 100 mile reaches except for the 130 mile Omaha reach and the 104.8 mile Sioux City reach.
    b. Additional specific river locations could be added. The Platte River Confluence and the Kansas River confluence locations were specifically included because they are historically known to have chronic navigation challenges, delays or grounding events. Several others were added and included in the risk ranking.
    c. The Acceptable Risk Score
12. The casualty data is the starting point. The working group was not bound to the tool when determining appropriate operational protocols.
13. Dissection of data may have masked problem areas which could be more visible by looking at geographic points with all casualty data available. If parties are interested in further casualty data analysis or discussions apart from the WAP forum they may contact LCDR Jesse Stevenson of the Sector Upper Mississippi River's Response Department.

How Sector Upper Mississippi River obtained Data for the Risk Assessment

	Action Description	Approximate Incident Count /Personnel Hours
1	USCG HQ provided a download of every investigation from 1990 till present filed by Sector Upper Mississippi River.	5000/9 Hours
2	Data was refined to included only marine casualties for the last seven years ending May 2005.	N/A
3	Review of each record and eliminated all marine casualties that were plainly not the result of ice, high water, low water, or high flow (i.e. fire, mechanical failure, pollution, etc…) and did not occur on one of the three rivers included in the Waterway's Action Plan.	N/A
4	Every narrative was read to determine if the incidents were plainly stated as being the result of ice, high water, low water, or high flow.	N/A
5	River levels and flow rates (when and where available from ACOE and NOAA records) were assigned to each remaining record. Then, a common sense approach was made with regard to river characteristics in place at the time of the incident in order to either eliminate or include each record in a particular assessment: • If the river level was not relatively low for the locality then the record was eliminated from the low water assessment. Groundings that occurred during high water or out of the channel (i.e. pushed in to allow other vessel to transit) were eliminated from the low water assessment. This included a thoughtful look at groundings due to shoaling (which is capable of occurring regardless of river stage). • Allisions occurring during low water were eliminated from high water or high flow assessments. • Groundings on submerged objects (dikes, timbers, unknown items) were eliminated. A close look at each casualty to ensure that ice, high water, low water, or high flow was a direct contributor to the casualty. (I.e. a bridge allision during high water may have been caused by high winds and had nothing to do with river stage.) * Steps 1-5 completed for zones 1-30	400/200 Hours
6	The risk assessment was completed and validated with extensive participation from members of industry and Coast Guard Sector Upper Mississippi River. In addition to the data described above, the Coast Guard Cutter Officer in Charge summaries based on buoy placement, and a compilation of pilot data from several industries were extensively used. The Midland (April 2001) document did not contain information for the Upper Mississippi River.	NA/unkown Hours

	RISK FACTORS				
Need for Precise Control	Navigational Complexity			Congestion	Casualty History (7 yr period)
	Obstructions to Navigation	Channel Width (Full Banks)	Bend Radius		
High	Multiple Obstructions	Narrow (single passage)	Sharp bend(>180 deg)	Traffic always present	>10
Medium	Single Obstruction	Medium (dual passage possible/likely)	Gradual bend (between 90 and 180 or	Traffic sometimes present	6>x>10
Low	No Obstructions	Wide (more than 2 vessel passage possible)	No bend (>90 deg) or no river crossing	Traffic rarely present	>6

Casualty Count Summary from USCG Casualty Analysis Data, May 1998 – May 2005

River Reach	Description	Low Water Casualties	High Flow Casualties	High Water Casualties
100-0.0	Washington Reach	14	1	0
200-100	Jefferson Reach	5	0	0
300-200	Brunswick Reach	2	1	0
400-300	Kansas City Reach	0	0	0
500-400	St. Joseph Reach	0	0	0
630-500	Omaha Reach	1	0	0
734.8-630	Sioux City Reach	0	0	0

High Water Marine Casualty Data

Casualty Count

River Reach	Description	Casualties
100-0.0	Washington Reach	0
200-100	Jefferson Reach	0
300-200	Brunswick Reach	0
400-300	Kansas City Reach	0
500-400	St. Joseph Reach	0
630-500	Omaha Reach	0
734.8-630	Sioux City Reach	0

Risk Assessment

River Reach	Calculate Risk Score	Factors to Increase Likelihood of Casualty								Score
		Obstructions to Navigation	Channel Width	Bend Radius	Congestion	Casualty History	Risk Score			
100-0.0 Washington Reach		Medium	Medium	Medium	Low	Low	**33**			
200-100 Jefferson Reach		Medium	Medium	Medium	Low	Low	**33**		High	100
300-200 Brunswick Reach		Medium	Low	High	Medium	Low	**123**		Medium	10
400-300 Kansas City Reach		High	Low	Medium	Medium	Low	**123**		Low	1
500-400 St. Joseph Reach		Medium	Low	Medium	Medium	Low	**33**			
630-500 Omaha Reach		Medium	Low	Medium	Medium	Low	**33**		Casualty	2X Rate
734.8-630 Sioux City Reach		Low	Medium	Medium	Low	Low	**24**			
Specific Locations										
218.0 - 211.0 (Saline City and Salt Creek Bends)		High	Medium	Medium	Medium	Low	**132**			
228.0 (Glasgow Bend)		High	Low	Low	Low	Low	**105**			
336.0 (Sibley Bend)		High	Low	Low	Low	Low	**105**			
368.0 - 366.0 (Kansas R. Confluence – Kansas R Bend)		Medium	High	High	Low	Low	**213**			
423.0 (Atchison Bend)		High	Low	Low	Low	Low	**105**			
448.0 (St. Joseph Bend)		High	Low	Low	Low	Low	**105**			
555.0 - 551.0 (Upper & Lower Hamburg Bends)		Medium	Medium	Medium	Low	Low	**34**			
594.5 (Platte River Confluence - Papillion Bend)		Medium	Medium	Medium	Low	Low	**33**			
710 - 706 (Thalweg Meander - Winnebago Bend)		High	High	Medium	Low	Low	**213**			

Low Water Marine Casualty Data

Casualty Count

River Reach	Description	Casualties
100-0.0	Washington Reach	14
200-100	Jefferson Reach	5
300-200	Brunswick Reach	2
400-300	Kansas City Reach	0
500-400	St. Joseph Reach	0
630-500	Omaha Reach	1
734.8-630	Sioux City Reach	0

Risk Assessment

River Reach	Factors to Increase Likelihood of Casualty								Score
	Obstructions to Navigation	Channel Width	Bend Radius	Congestion	Casualty History	Risk Score			
100-0.0 Washington Reach	High	Medium	Medium	Low	High	**321**			
200-100 Jefferson Reach	High	Medium	Medium	Medium	Low	**132**		High	100
300-200 Brunswick Reach	High	Medium	High	Medium	Low	**222**		Medium	10
400-300 Kansas City Reach	High	Medium	High	Medium	Low	**222**		Low	1
500-400 St. Joseph Reach	Medium	Medium	Medium	Medium	Low	**42**			
630-500 Omaha Reach	Low	Medium	Medium	Low	Low	**24**		Casualty	2X Rate
734.8-630 Sioux City Reach	Medium	Medium	Medium	Low	Low	**33**			
Specific Locations									
218.0 - 211.0 (Saline City and Salt Creek Bends)	High	High	High	Low	Low	**303**			
368.0 - 366.0 (Kansas R. Confluence – Kansas R Bend)	Medium	High	High	Low	Low	**213**			
555.0 - 551.0 (Upper & Lower Hamburg Bends)	Medium	Medium	Medium	Low	Low	**33**			
594.5 (Platte River Confluence - Papillion Bend)	Medium	High	Medium	Low	Low	**123**			
653.0 - 651.0 (Tysons Bend)	High	Medium	High	Low	Low	**213**			
710 - 706 (Thalweg Meander - Winnebago Bend)	High	High	Medium	Low	Low	**213**			

High Current Marine Casualty Data

Casualty Count

River Reach	Description	Casualties
100-0.0	Washington Reach	1
200-100	Jefferson Reach	0
300-200	Brunswick Reach	1
400-300	Kansas City Reach	0
500-400	St. Joseph Reach	0
630-500	Omaha Reach	0
734.8-630	Sioux City Reach	0

Risk Assessment

River Reach	Factors to Increase Likelihood of Casualty								Score
	Obstructions to Navigation	Channel Width	Bend Radius	Congestion	Casualty History	Risk Score			
100-0.0 Washington Reach	Medium	Medium	Medium	Low	Low	**33**			
200-100 Jefferson Reach	Medium	Medium	High	Low	Low	**123**		High	100
300-200 Brunswick Reach	High	Medium	High	Medium	Low	**222**		Medium	10
400-300 Kansas City Reach	High	Medium	High	Medium	Low	**222**		Low	1
500-400 St. Joseph Reach	Medium	Medium	Medium	Medium	Low	**42**			
630-500 Omaha Reach	Medium	Medium	Medium	Medium	Low	**42**		Casualty	2X Rate
734.8-630 Sioux City Reach	Low	Medium	Medium	Low	Low	**24**			
Specific Locations									
218.0 - 211.0 (Saline City and Salt Creek Bends)	High	Medium	High	Low	Low	**213**			
228.0 (Glasgow Bend)	High	Low	Medium	Low	Low	**114**			
336.0 (Sibley Bend)	High	Low	Medium	Low	Low	**114**			
368.0 - 366.0 (Kansas R. Confluence – Kansas R Bend)	Medium	High	High	Low	Low	**213**			
423.0 (Atchison Bend)	High	Low	Medium	Low	Low	**114**			
555.0 - 551.0 (Upper & Lower Hamburg Bends)	Medium	Medium	Medium	Low	Low	**33**			
594.5 (Platte River Confluence - Papillion Bend)	Medium	High	Medium	Low	Low	**123**			
710 - 706 (Thalweg Meander - Winnebago Bend)	High	High	Medium	Low	Low	**213**			

USCG Casualty Analysis Data, May 1998 – May 2005

Activity Date	Activity Title	River	Mile	Contributing Factor	Source Of CF Info	Initial Event Type	Notes
08/15/2000	MC00010353-LAUREN D. 90 MOR SLMMS	MOR	0.9	Low Water	MISLE/MSIS	Grounding	THE M/V LAUREN D. WAS S/B WITH A TOW OF 7 LOADED AND 1 EMPTY BARGES, THE TOW RAN AGROUND IN THE MIDDLE OF THE MARKED CHANNEL, MISSOURI RIVER. UNABLE TO DETERMINE WHICH BARGE BUMPED THE BOTTOM. NO APPARENT DAMAGE TO ANY BARGE IN THE TOW. SLMMS.
09/10/2000	MC00011818-LESLIE B. 8.7 MOR SLMMS	MOR	8.7	Low Water	MISLE/MSIS	Grounding	M/V LESLIE B. was proceeding southbound with two (2) loaded barges. Tow ran aground in channel because of low water conditions. No damage could be found to the tow as a result of the grounding.
09/22/2000	MC00012616-OMAHA GROUNDING	MOR	9	Low Water	MISLE/MSIS	Grounding	VESSEL WAS SOUTHBOUND MOR M9 W/TWO LOADED BARGES. BARGE JOE III 213 BUMPED BOTTOM DUE TO LOW WATER. NO DAMAGE.
04/20/2000	MC00007746-M/V DEETTE ANDERSON GROUNDING	MOR	19	Low Water	MISLE/MSIS	Grounding	M/V DEETTE ANDERSON sailing NB on MOR in vicinity of mile 19.0 started to rub bottom. When tow was stopped, Coastal 2518 was aground. The current pinned the tow to the right descending bank, it was determined to wait till daylight to attempt to refloat the tow. The next morning the tow was refloated and Coastal 2518 was determined to have suffered damage to the bilge knuckle and taken on water. The grounding was caused by low water and lack of nav aids.
03/27/2000	MC00007224-M/V HAL D. MILLER, GROUNDING	MOR	28.5	Low Water	MISLE/MSIS	Grounding	M/V HAL D. MILLER was N/B pushing 2 loaded tank barges on the MOR. Tow boat grounded at mile 28.5. No apparent damage to tow boat or barges.

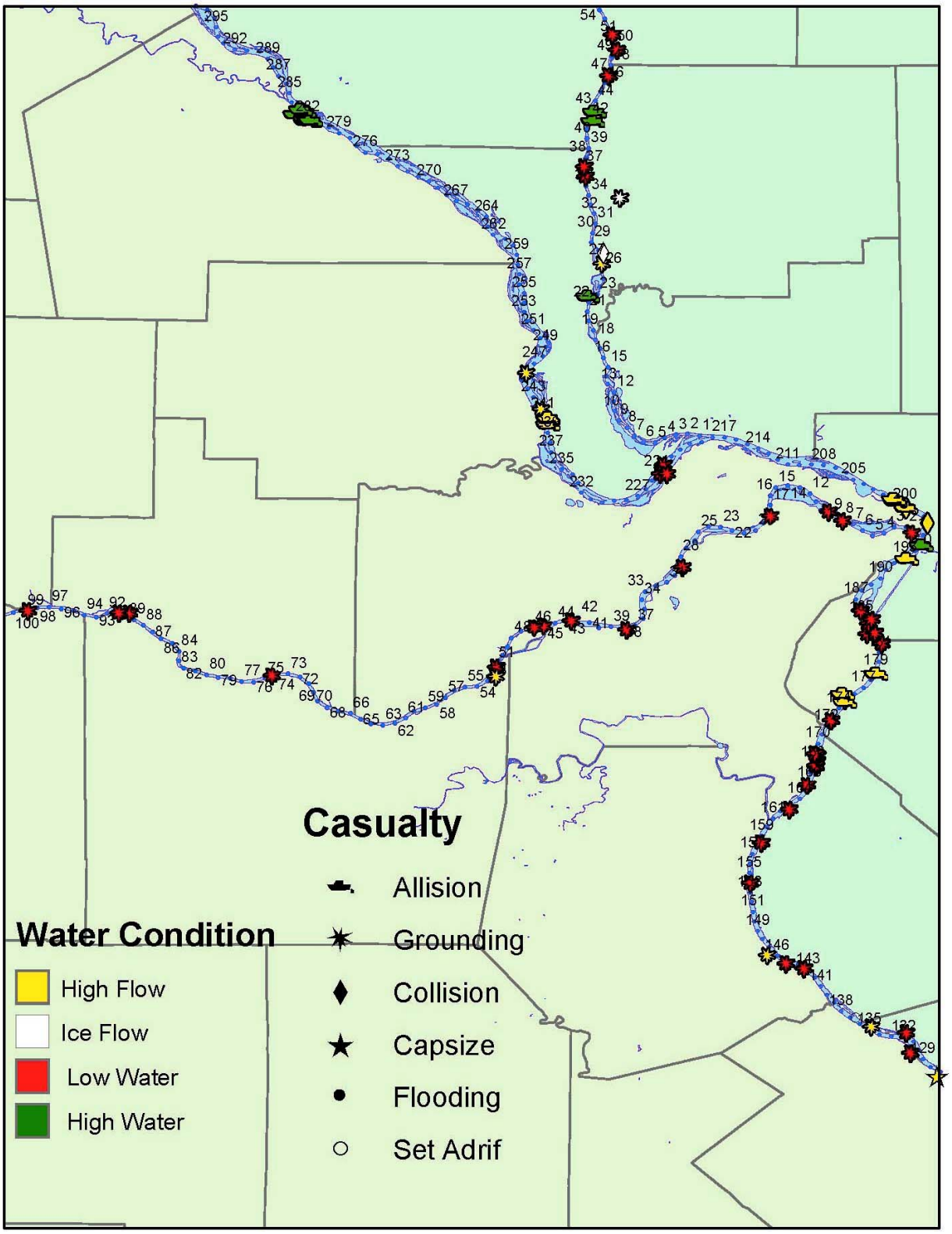
Activity Date	Activity Title	River	Mile	Contributing Factor	Source Of CF Info	Initial Event Type	Notes
09/11/2000	MC00011893-M/V LAUREN D GROUNDING SLMMS	MOR	39.1	Low Water	MISLE/MSIS	Grounding	M/V LAUREN D. was north bound at mile 39.1 Missouri River. The stern of the tow grounded in the channel. This caused the tow to top around with the lead two barges alliding with the left descending bank. The topping action caused the stern of the tow to break loose and the two was refloated.
04/20/2000	MC00004924-JAMIE LEIGH 43.1 MOR SLMMS	MOR	43.1	Low Water	MISLE/MSIS	Grounding	M/V JAMIE LEIGH WESTBOUND MISSOURI RIVER. PORT LEAD BARGE OF A TOW CONSISTING OF 2 PORT AND 3 STARBORD STRUCK AN OBJECT IN CHANNEL APPROX. 200' OUT FROM L HEAD DIKE, MILE 43.1 LEFT DESCENDING BANK.
05/12/2000	MC00006111-M/V EVELYN RUSHING	MOR	46.5	Low Water	MISLE/MSIS	Grounding	M/V Evelyn Rushing proceeding NB at MI 46.5 Missouri River w/ 8 loaded barges. Starboard head barge TRS128 touched bottom. River stage 6.7 at Hermann, Mo. Barge draft 8.6. Barge sustained 3" crack in the starboard side bow compartment. Estimated repair cost $ 1000.00.
09/22/2000	MC00012615-OMAHA GROUNDING	MOR	47	Low Water	MISLE/MSIS	Grounding	VESSEL WAS SOUTHBOUND MOR M47 W/TWO LOADED BARGES. BARGE JOE III 213 BUMPED BOTTOM IN SHALLOW UNBARKED CHANNEL. PORT BOWTANK RAKE & PORT #1 WING TANK SUFFERED CRACKS APPROXIMATLY 6 INCHES BY 1/4 INCH.
03/17/2000	MC00004088-OMAHA MI MOR, SLMMS	MOR	51.5	Low Water	MISLE/MSIS	Grounding	M/V OMAHA WAS PROCEEDING UPBOUND MISSOURI RIVER ON MARCH 17, 2000. THE RIVER MEASURED 5.7' AT HERMANN, MISSOURI. AT 0500 HOURS THE VESSEL RAN A GROUND IN THE CHANNEL AT MILE 51.5. NO DAMAGE TO VESSEL OR TOW REPORTED.

Activity Date	Activity Title	River	Mile	Contributing Factor	Source Of CF Info	Initial Event Type	Notes
08/19/2001	MC01011693-LAUREN D MI 51.8 MOR GRNDING	MOR	51.8	High Flow Rate	MISLE/MSIS	Grounding	Subj vessel was transiting N/B when tow grounded mid-channel. No buoys marking channel at location of grounding. Shoaling existed across entire channel at location. Vessel was able to float tow off bottom and was able to tie off tow to bank. Vessel proceeded to sound area and found location to transit tow in multiple trips. Channel was sounded by M/V STRAUB on 8/17/01, but heavy currents caused silt to form across channel since then.
05/02/2000	MC00005560-M/V LAUREN D	MOR	75.5	Low Water	MISLE/MSIS	Grounding	M/V LAUREN D was n/b pushing eight loaded barges when tank barge OCC 122 loaded with CAUSTIC SODA grounded approx. 150 ft. off RDB at mile 75.5 on the MOR. T/B OCC 122 had damage to the bow rake (three holes) and port wing tank (one hole). MSO St. Louis investigators responded to scene of grounding. Marine surveyors shingled all holes stopping the flooding. Issued T/B OCC122 a CG-835 allowing vessel to transit to Kansas City, Mo (Chem Tech) to off load product.
09/05/2000	MC00012612-M/V JAMIE LEIGH GRDING SLMMS	MOR	90	Low Water	MISLE/MSIS	Grounding	M/V JAMIE LEIGH was N/B with 3 loaded barges. Tow grounded and started swinging to the port. Steered tow to prevent swinging and M/V grounded. Tow again grounded and stopped. The tow was refloated one barge at a time. No damage reported to M/V or tow. Mile 90 Mo. river has been shallow crossing since Hermann Gage has been less than 7". Northbound with three tows. Barges were straight out. Barge next to boat started bumping & head of tow started topping around until it hit sand & shallow water. All three barges were aground. Removed barges one at a time. No damage.
10/28/2000	MC00014124-OMAHA 90.6 MOR BUMPED BOTTOM	MOR	90.6	Low Water	MISLE/MSIS	Grounding	VESSEL DOWNBOUND ON MOR AT MILE 90.6 WITH TWO LOADED BARGES. BUMPED BOTTOM WITH NO DAMAGE AND CONTINUED VOYAGE.

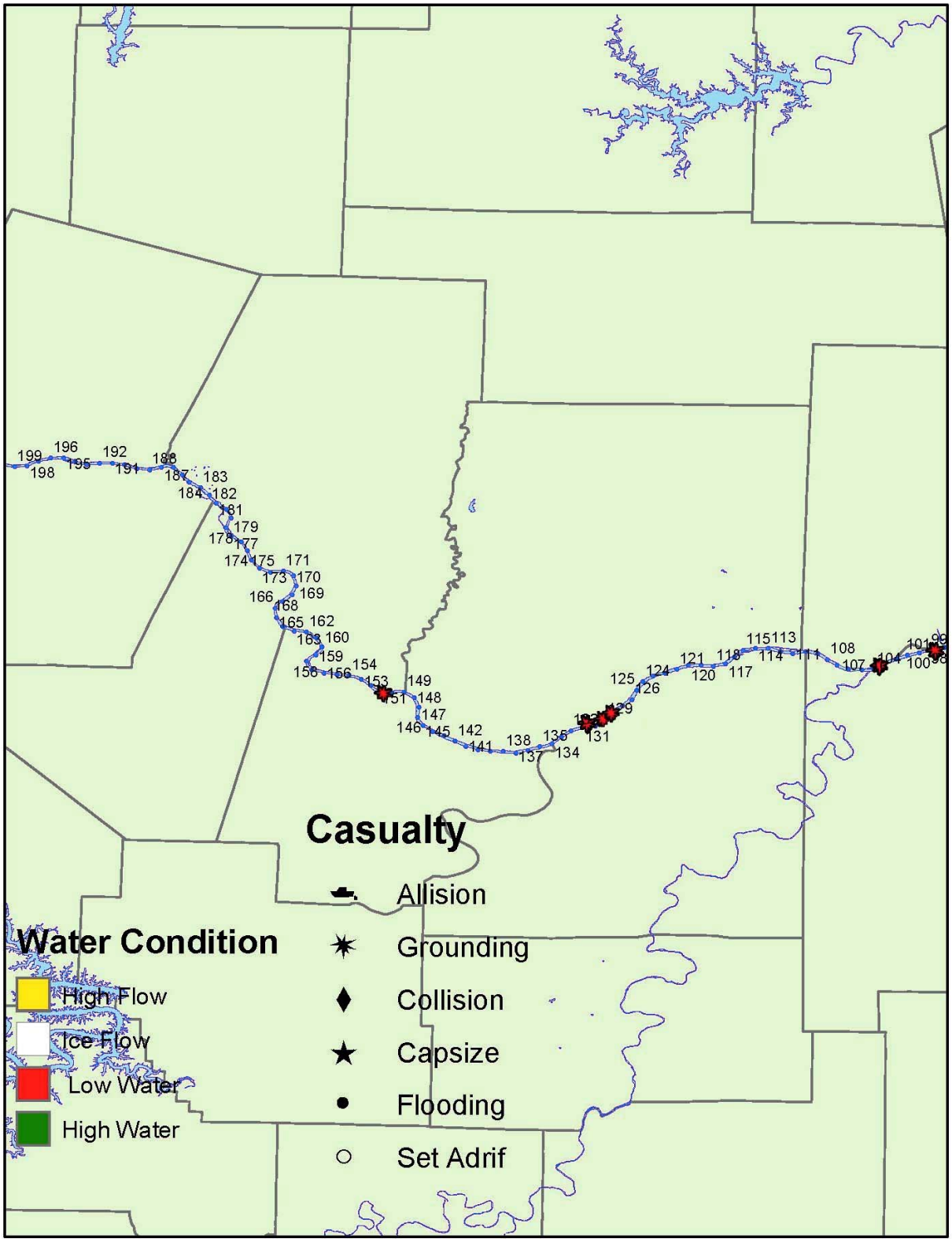
Activity Date	Activity Title	River	Mile	Contributing Factor	Source Of CF Info	Initial Event Type	Notes
04/29/2000	MC00005559-EVELYN RUSHING 99 MOR SLMMS	MOR	99	Low Water	MISLE/MSIS	Grounding	M/V EVELYN RUSHING WAS NORTHBOUND AT MILE 99 MISSIOURI RIVER NO TOW. LOW RIVER CONDITION. 6.2' AT HERMANN, MISSOURI. VESSEL RAN AGROUND IN CHANNEL. $5,000.00 DAMAGE AMID SHIPS.
08/10/2000	MC00010204-M/V LAUREN D GROUNDING	MOR	105.5	Low Water	MISLE/MSIS	Grounding	M/V LAUREN D. was N/B at Mile 105.5 Missouri River. Center lead barge, CBY 402 ran aground in the channel. Herman Gage reading 9.4 feet and falling. Draft 8.5 Feet. Load, Dry Bulk Fertilizer. Broke seam in center of barge CBY 402. Hole was shingled, flooding stopped. SLMMS.
09/30/2002	M/V JACK FLAHAUT-GROUNDING	MOR	130	Low Water	MISLE/MSIS	Grounding	REPORTING PARTY STATES: AT 1130H 093002 THE M/V JACK FLAHAUT WITH 4 LOADED BARGES WAS SB ON MOR AT M130. THE TOW GROUNDED IN THE CHANNEL. WHILE BREAKING THE TOW SOME WIRES WERE BROKEN. THE BARGES WILL BE INSPECTED AT DESTINATION.
11/11/2002	LAUREN D	MOR	130	Low Water	MISLE/MSIS	Grounding	REPORTING PARTY STATES: AT 07:00 11NOV02 M/V LAUREN D W/6 LDS WAS SB ON MI130 MOR. THE HEAD OF THE TOW GROUNDED 125 FT. INSIDE RED BOUY LINE. STERN OF TOW THEN GROUNDED 230 FT. OFF OF RED BOUY LINE. CHANNEL IS SILTED IN. NO DAMAGE TO TOW OR BOAT.
07/05/2002	M/V JAMIE LEIGH GROUNDING MISSOURI RIVER MILE 132	MOR	132	Low Water	MISLE/MSIS	Grounding	On the 5th of July at approximately 1000 hrs the M/V Jamie Leigh was underway with 3 unidentified loaded barges north bound on the Missouri River. At mile 132 the barges grounded in shallow water. M/V Jamie Leigh freed the barges one at a time and continued on.
09/30/2002	LAUREN D.-GROUNDING MI51.8 MOR	MOR	151.8	Low Water	MISLE/MSIS	Grounding	REPORTING PARTY STATES: AT 13:15 30SEP02 M/V LAUREN D W/2 LDS WAS SB ON MI51.8 MOR. LEAD BARGE, MAC611, GROUNDED CAUSING A SMALL HOLE IN BOTTOM OF STBD SIDE OF RAKE END.

Activity Date	Activity Title	River	Mile	Contributing Factor	Source Of CF Info	Initial Event Type	Notes
03/30/2002	M/V HARRY WADDINGTON Grounding MI 207 Missouri R	MOR	207	Low Water	MISLE/MSIS	Grounding	On 30 March 2002, the M/V HARRY WADDINGTON was northbound on the Missouri River (MI 207) with six loaded barges and two empty barges in tow. The company reported that the Captain of the tug was moving cautiously through the area to avoid an incident when the head of the tow grounded on the river bottom. The company stated that the tow and tow were in the channel when the incident occurred.
11/29/1998	MC98016651-RENEE G./257MOR (SLMMS)	MOR	257	High Flow Rate	MISLE/MSIS	Grounding	The M/V RENEE G. (D530987) with 7 barges in tow ahead (6 loaded and 1 empty) was southbound near mile 257.0 on the Missouri River when it failed complete a turn around a bend. This caused the port lead barge, BUNGE 771(D1032796), to ground on the left descending bank, halting the tow. The current then set the tow's stern to starboard, causing the starboard stern barge, CBL 331(D640898), to ground on a sand bar in the crossing. Damage: $300 in broken wires.
07/16/1999	MC99009213-M/V RENEE G,(GROUNDING)	MOR	272	Low Water	MISLE/MSIS	Grounding	The M/V RENEE G. was N/B on the MOR at mile 272.0 pushing five empty and two loaded barges. The stern end of the lead barge CBC 365 grounded on a sand bar in the channel. The freight barge CBC 365 was aground for approx. one hour. The M/V RENEE G. was assisted by a helper boat to refloat barge. No apparent damage to towboat or barges.
10/20/2004	M/V KANESVILLE QUEEN GROUNDING MOR MI 615.2	MOR	615.2	Low Water	MISLE/MSIS	Grounding	REPORTING PARTY STATES: Due to continued sedimentation of the vessel's berth and the drop in river levels, the M/V Kanesville Queen is resting on bottom at various points along the ships hull. We are unable to ascertain the date and time the vessel started touching ground due to the gradual process. The vessel's watertight integrity has not been compromised at this time and all systems are properly functioning.

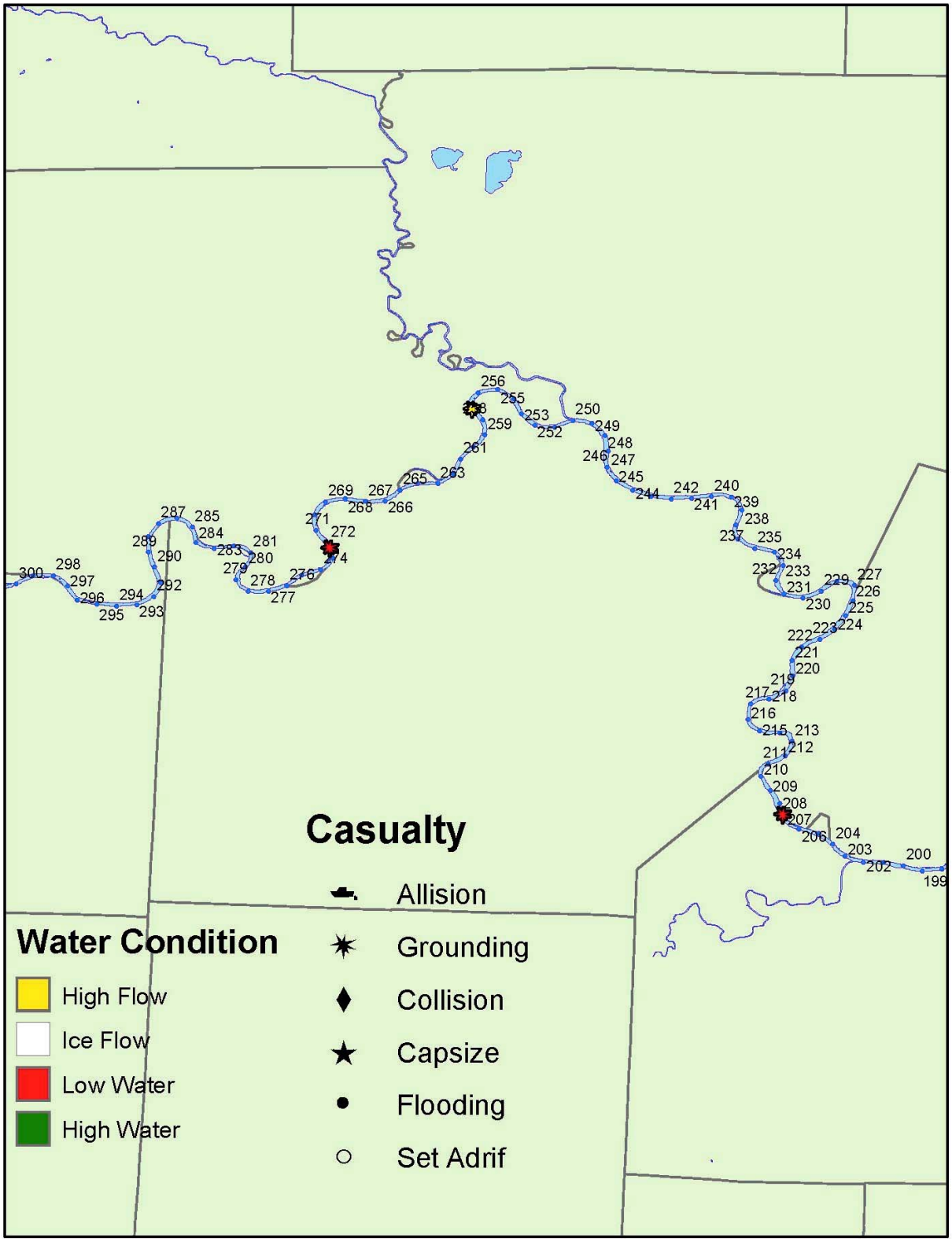
Missouri River Miles 0 to 100
Washington Reach



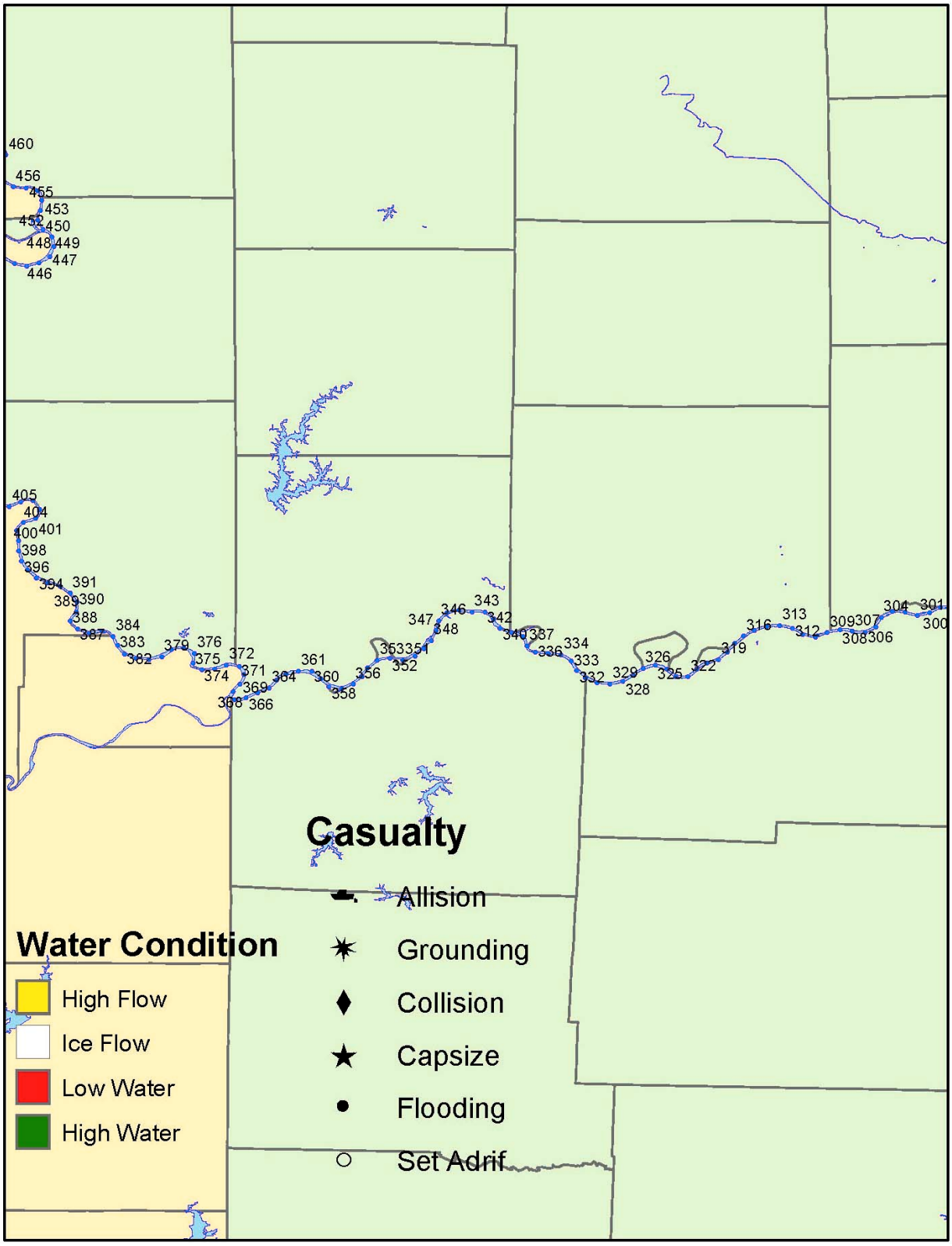
Missouri River Miles 100 to 200
Jefferson Reach



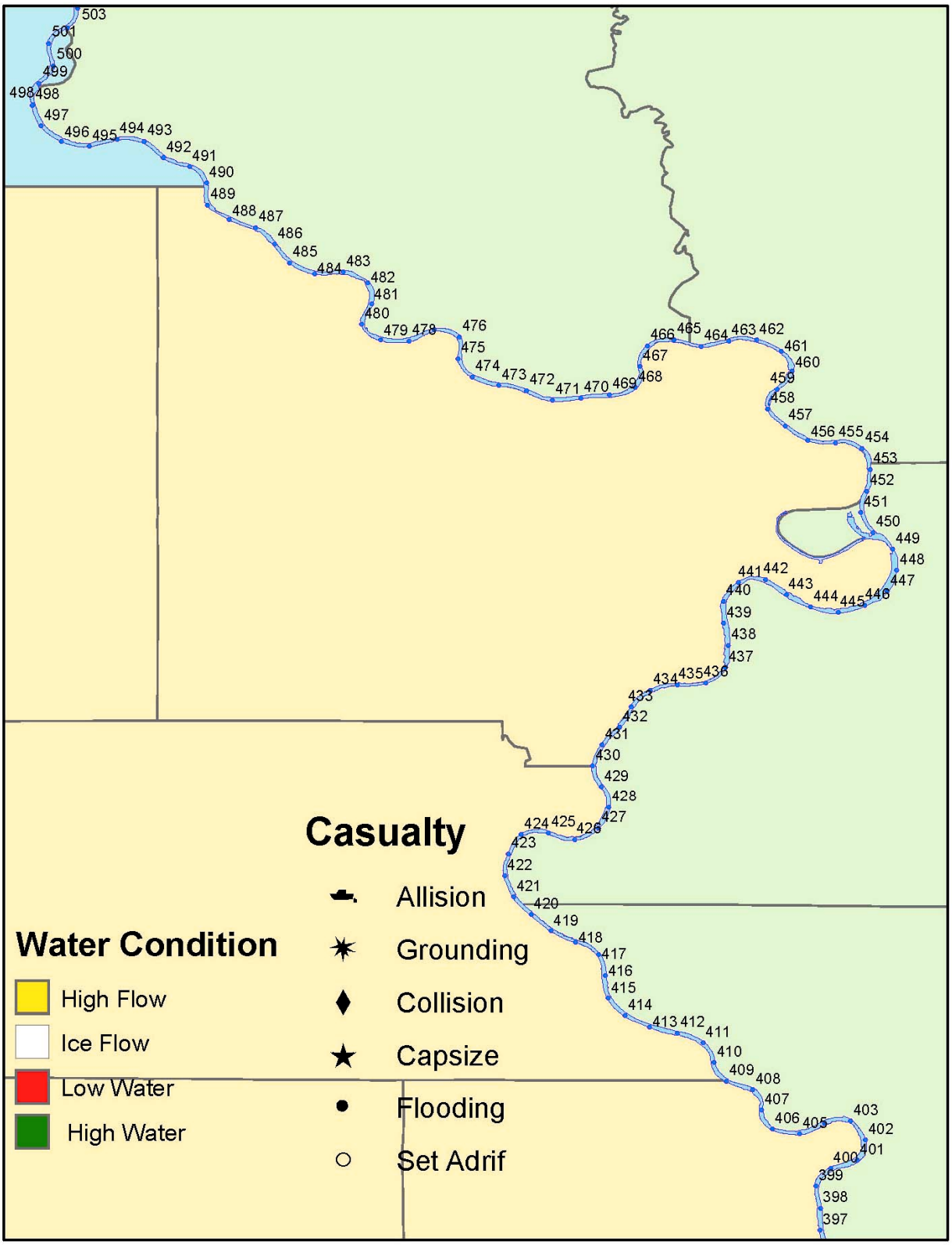
Missouri River Miles 200 to 300
Brunswick Reach



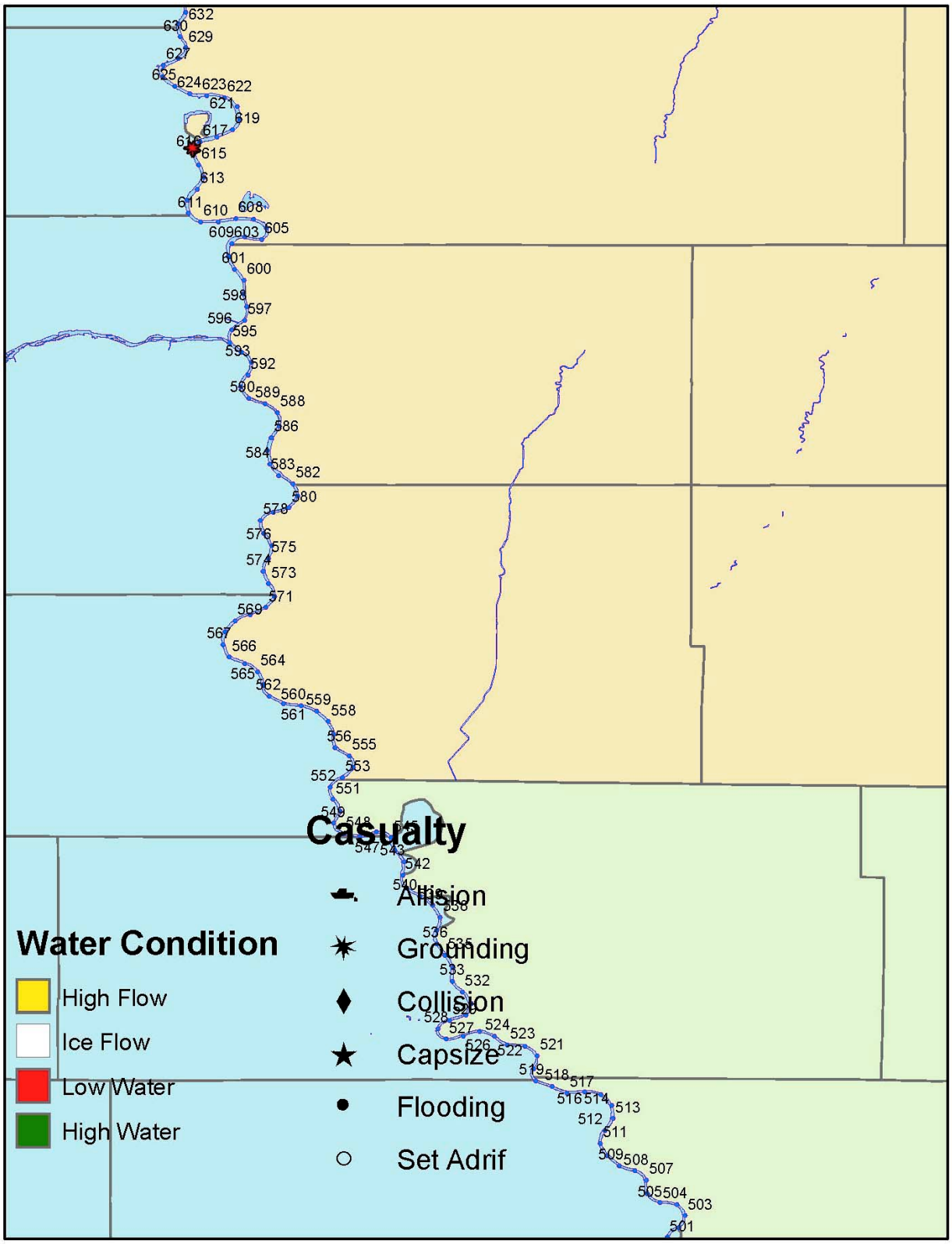
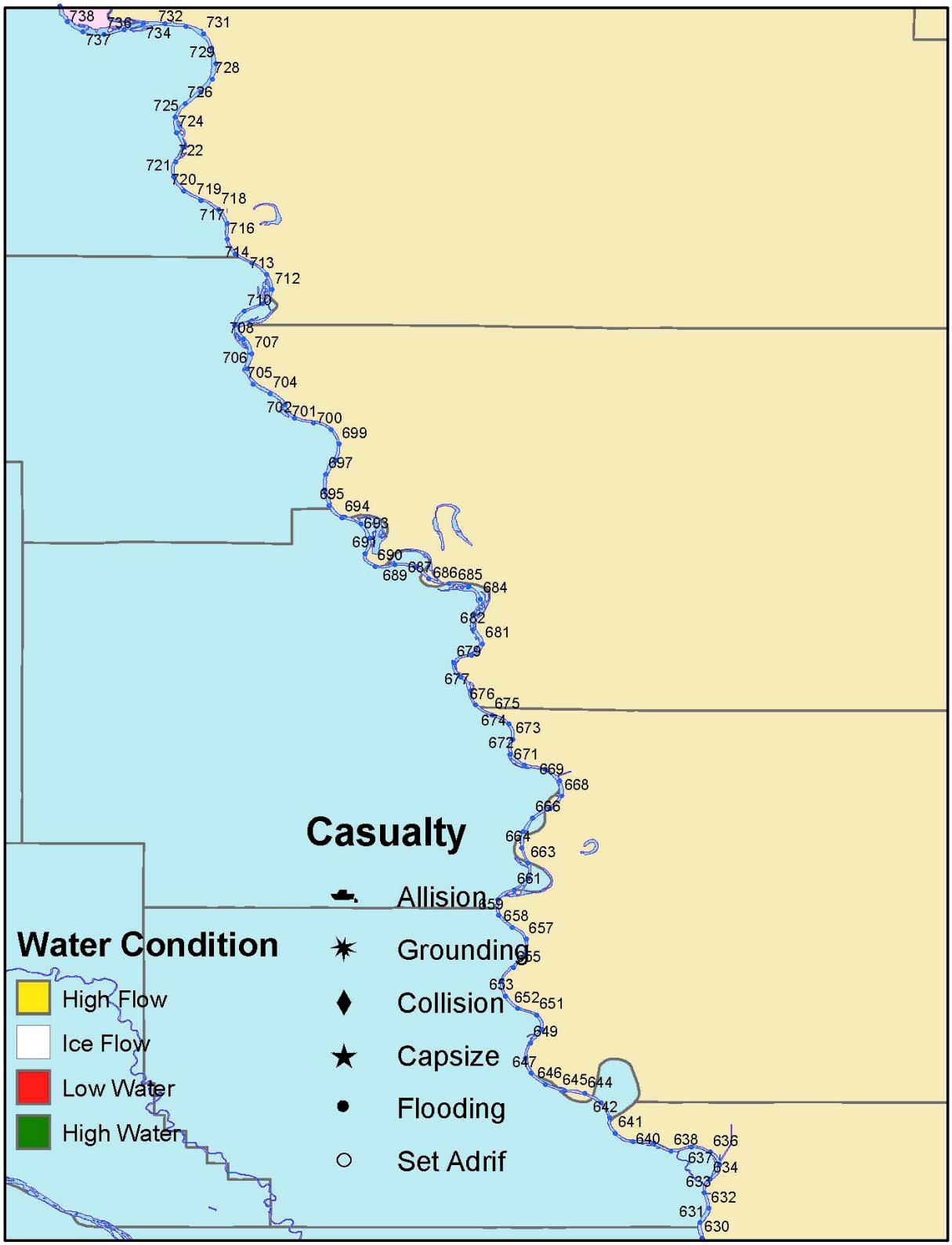
Missouri River Miles 300 to 400
Kansas City Reach



Missouri River Miles 400 to 500
St. Joseph Reach



Missouri River Miles 500 to 630
Omaha Reach



Missouri River Miles 630 to 734.8
Sioux City Reach