STUDY 12.0 ICE JAM FLOODING ON THE LOUP RIVER

The Project is located in Nance and Platte counties, where water is diverted from the Loup River and routed through the 35-mile-long Loup Power Canal, which empties into the Platte River near Columbus. The Project includes various hydraulic structures, two powerhouses, and two regulating reservoirs. The portion of the Loup River from the Diversion Weir to the confluence with the Platte River is called the Loup River bypass reach.

District procedures require that Project operators stop admitting water to the Loup Power Canal when frazil ice is observed upstream of the Diversion Weir. According to the U.S. Army Corps of Engineers (USACE), frazil ice, also known as slush ice because of its appearance, is formed only in turbulent supercooled water. Frazil ice is most often seen in early to mid-winter and can accumulate to form an ice cover or an ice jam (USACE, July 1994). When frazil ice is no longer observed near the Intake Gates, the District resumes flow diversion to the Loup Power Canal.

An ice jam formation that caused severe flooding at Columbus in the winter of 1993 prompted a USACE study of ice jam formation in the Lower Platte River. The report states that "a recommended future study would be to evaluate the effect, if any, that Project operations have on ice conditions downstream" (USACE, July 1994). In a letter dated February 9, 2009, the Nebraska Department of Natural Resources (NDNR) submitted a study request to investigate the possible effect of Project operations on ice jam flooding in the Platte River basin (a copy of this request is provided in Attachment A). The requested scope also included predictive modeling of ice events and identification of methods for prevention and mitigation of ice jam flooding.

The proposed study is to evaluate the data gathered since the report was completed and to compare it to the flow records to determine qualitatively if a correlation exists between Project operations and ice jam formation in the Loup River bypass reach. Further explanation of deviations from the NDNR's request are noted as appropriate in the following sections.

1. GOALS AND OBJECTIVES OF STUDY

"Describe the goals and objectives of each study proposal and the information to be obtained;" 18 CFR §5.11(d)(1)

The goal of the study of ice jam flooding on the Loup River is to qualitatively determine if the operation of the Loup Power Canal has a material effect on the formation of ice jams or a material effect on the severity of flooding caused by ice jams in the Loup River bypass reach.

The objectives of the study of ice jam flooding on the Loup River are as follows:

1. To collect and organize ice observation reports, associated atmospheric temperature data, and associated gage flow data.
2. To characterize the available information and its relevance to performing a qualitative analysis.
3. To perform a qualitative analysis to determine if a relationship can be found between Project operations and ice jam flooding or the severity of flooding caused by ice jams in the Loup River bypass reach.

2. RELEVANT RESOURCE MANAGEMENT GOALS

"Address any known resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;" 18 CFR §5.11(d)(2)

NDNR is the official state agency for all matters pertaining to floodplain management, maintains the statewide Nebraska Ice Reporting database through its website (http://dnrdata.dnr.ne.gov/Icejam/index.asp), and has jurisdiction over all matters pertaining to surface water rights. A goal of NDNR is to prevent recurring destruction to roads, structures, residences, and businesses from ice jam flooding (NDNR, February 9, 2009).

3. BACKGROUND AND EXISTING INFORMATION

"Describe existing information concerning the subject of the study proposal, and the need for additional information;" 18 CFR §5.11(d)(3)

In early winter, frazil ice begins to form in the Loup River and the Settling Basin, generally in the early morning hours. A small amount of frazil ice can normally be diverted into the Settling Basin without causing problems. As winter progresses and temperatures drop, the frazil ice forms earlier in the evening and in heavier concentrations. At this point, the frazil ice must be bypassed down the Loup River. If too much heavy frazil ice is diverted from the Loup River into the much slower-flowing Settling Basin, an ice plug can form in the basin. If this should happen, there can be no further flow diversion until the ice plug melts or dissipates. The ice plug could remain in place for the remainder of the winter.

As air temperature gets colder, an ice cap forms both on the Loup River and in the Loup Power Canal. Once a solid ice cap exists, a steady winter diversion rate of about 2,000 cfs can be established. This rate can be maintained fairly well through the winter provided that the ice cap remains intact. Abrupt flow increases must be avoided when there is an ice cap in the canal. The entire 35-mile length of the Project must be monitored for heavy slush ice, frazil ice formation, ice floes, and ice jams. Any of these conditions may create an emergency situation where flow diversion must be quickly adjusted or curtailed completely.

Two USACE reports that are relevant to this study of ice jam flooding on the Loup River have been published. The first report is titled "Lower Platte River Ice Jam

Flooding" (USACE, July 1994), and the second report is titled "Ice Jam Flooding and Mitigation: Lower Platte River Basin, Nebraska" (USACE, January 1996).

The 1994 report states that local residents have expressed the opinion that Project operations cause or exacerbate ice jams in the Loup River bypass reach. In addition, the report states that it would be very difficult to perform a quantitative analysis given the lack of data. However, a qualitative analysis could address such issues as the potential effects of rising and lowering water levels in the Loup River bypass reach on border ice formation, frazil ice production, frazil ice transport, and ice movement. For the purposes of this study, border ice, also known as sheet ice, is defined as the smooth ice that grows along slow-moving water, lakes, reservoirs, and the edges of rivers.

A Lower Platte River predictive model was developed at the USGS gage station at North Bend as part of the study reported in 1994. The North Bend gage station is located approximately 31 miles downstream of the confluence of the Loup and Platte rivers. The North Bend site was chosen because it contained "the best combination of ice data, and long term stage, discharge, and meteorological records" (USACE, July 1994). The predictive model created for the report used flow and a variable calculated from atmospheric temperature to predict possible ice jam formation. The resultant predictive model consisted of a graph relating discharge to Julian day. In the 1994 report, October 1 is Julian day 1, and September 30 is Julian day 365 (or day 366 in a leap year). If the atmospheric temperature variable is exceeded and the forecast discharge is greater than the discharge on the plot, there is "a high probability that an ice jam will occur in at least one location in the study area" (USACE, July 1994). The study area included the Loup River from Genoa to its confluence with the Platte River and the Platte River from its confluence with the Loup River to its confluence with the Elkhorn River. In addition to atmospheric temperature and flow, channel slope and channel restrictions at bridges and sharp bends were also identified as important factors in ice jam formation (USACE, July 1994).

As a result of the 1994 report, NDNR has been collecting ice observation data from approximately 1995 to present. This data is collected on a standard reporting form. The 1994 report speculates that based on additional ice data collected as part of the ice data collection program, the predictive model at North Bend can be refined and can lead to the development of predictive models at other locations within the study area.

3.1 Flow and Gage Data

Flow data from USGS and NDNR gage stations will be used for this study of ice jam flooding on the Loup River. Each gage station is accompanied by the associated rating curves and velocity and cross-sectional data used to create the rating curves. Flow data that will be used for this study include:

- USGS Gage 06793000, Loup River near Genoa, NE – Available discharge and gage height data from April 1, 1929, to current includes daily and 30-minute interval data.
- USGS Gage 06792500, Loup River Power Canal near Genoa, NE – Available discharge and gage height data from January 1, 1937, to current includes daily and 30-minute interval data.

3.2 Atmospheric Data

Atmospheric data is an important factor exerting influence on ice formation. Atmospheric data will be collected from the National Weather Service (NWS) station at Genoa during the proposed period of analysis. Daily mean, maximum, and minimum ambient atmospheric temperature data is available at this station and can be found at http://www.ncdc.noaa.gov/oa/climate/stationlocator.html.

3.3 Nebraska Ice Reports

NDNR maintains the Nebraska Ice Reporting database which includes reports on statewide ice observations, as discussed in Section 2, Relevant Resource Management Goals. There are seven Nebraska Ice Report observation sites in the study area, as listed in Table 12-1.

Table 12-1. Nebraska Ice Report Observation Sites

Site Name	Description
L1	Hwy 14 at Fullerton
L2	Hwy 39 at Genoa
L3	Headgate of Loup Power Canal
L4	Loup Bridge at Palmer, 4 Mile North
NR2	Fullerton to Genoa
PC1	Monroe Bridge
WR1	Hwy 81 Columbus Bridge

Source: NDNR, *Listing of Nebraska Ice Report Sites*, retrieved on March 17, 2009, http://dnrdata.dnr.ne.gov/Icejam/listing.asp.

4. PROJECT NEXUS

"Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied;" 18 CFR §5.11(d)(4)

USACE, NDNR, and local residents have suggested that Project operations may affect ice jam formations or may increase the severity of ice-jam-related flooding in the Loup River bypass reach.

5. STUDY AREA AND STUDY SITES

The proposed study area includes the Loup River bypass reach and the Loup Power Canal. The study sites are the locations of the two USGS gages listed in Section 3.1, Flow and Gage Data, and the seven Nebraska Ice Report observation sites listed in Table 12-1, above. Figure 12-1 shows the extent of the study area and the study sites.

In its February 9, 2009, study request, NDNR requested that the study area include the Platte River Basin from the Project diversion to the confluence of the Platte and Missouri rivers (see Attachment A). The District's proposed study area is limited to the Loup River bypass reach and the Loup Power Canal for the following reason:

- This area can be readily analyzed because it experiences maximum Project operational changes, and only a limited number of "external" influences (tributaries, confluences, and bridges). If a definitive relationship is discovered between Project operations and ice jam flooding in this area, then an expanded study area may be appropriate.

Primrose
Cedar Rapids
Boone Co
St Edward
Tarnov
Platte Center
Greeley Co
Platte Co
Colfax Co
Belgrade
Monroe
PC1
Genoa
06792500
Loup River Power Canal
near Genoa, NE
Loup River
Columbus
Richland
06793000
Loup River
near Genoa, NE
WR1
L2
L3
Nance Co
Duncan
Fullerton
L1
NR2
Bellwood
Silver Creek
L4
Howard Co
Butler Co
Palmer
Merrick Co
Clarks
Platte River
Polk Co
Rising City
Shelby
Osceola
Garrison
Hamilton Co
Central City
Stromsburg

Project Location
Nance & Platte Counties, Nebraska

4 2 0 4
Miles

Legend

- Ice Observation Report Location
- USGS Gaging Station
- Rivers/Streams
- Loup Power Canal
- Corporate Limits
- County Line

Loup Power District Hydro Project

Ice Jam Study Area

Loup River Hydroelectric Project
FERC Project No. 1256
Proposed Study Plan

DATE
March 2009

FIGURE
12-1

Z:\Projects\Loup_Power_District\37104_LPD_FERC_Relicensing\map_docs\mxd\Ice_Study_Plan.mxd\march09\jcm

6. PROPOSED METHODOLOGY

"A detailed description of the study and the methodology to be used;" 18 CFR §5.11(b)(1)

"Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers any known tribal interests;" 18 CFR §5.11(d)(5)

The methodology for the study of ice jam flooding on the Loup River includes three tasks, described below.

Task 1 Data Collection and Evaluation

The Nebraska ice reports for the Loup River that are available in the NDNR database will be collected. The spatial and temporal extent of the data will be characterized by cataloging and describing the dates, times, and locations of ice observations in the collected reports.

Flow data from the USGS and NDNR gages and atmospheric temperature data will also be collected.

Task 2 USACE Report Update

Tabulated data from the July 1994 USACE report will be extended to include current information. The tables of winter high stage events will be updated. Flow graphs that correlated temperature and flow in the Loup Power Canal and flow in the Loup River bypass reach will also be updated.

Task 3 Qualitative Analysis

The NDNR ice observation records and data from Task 2, USACE Report Update, will be evaluated qualitatively to determine if a correlation can be made between Project operations and ice jam flooding. Flow in the Loup Power Canal and Loup River bypass reach will be compared to the collected ice observation records as well as to information in the updated 1994 USACE report. The period of record for the qualitative analysis will be from 1995 to present. Flows in the Loup Power Canal and Loup River bypass reach will be plotted from November to April of each year. Instances of observed flooding and ice-jam-related observations will be flagged on the plots. If no definitive correlation exists based on the accumulated ice observation records, it can be concluded that Project operations do not materially contribute to ice jam formation or subsequent flooding. If a definitive correlation exists, the District will work with NDNR to evaluate the extent of Project contribution to ice jam formation and related flooding.

In its February 9, 2009, study request, NDNR outlined a scope that included predictive modeling of ice events and identification of methods for prevention and mitigation of ice jam flooding. In addition, the request specified that the study should be funded by the District, but performed by the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL). Explanation of why the District's study methodology differs from this request follows:

- The District is proposing to review and update portions of the CRREL report using the most recent available information, including the ice data and observation reports collected by the NDNR since 1994 as detailed in Tasks 2 and 3. The District would complete the proposed study and the results would be available for review by others as appropriate.
- The proposed study does not include refinement of the existing predictive model nor does it include development of a new predictive model for ice events in the Platte River basin. The District believes that development of such a model is the responsibility of the NDNR as the state agency responsible for all matters pertaining to floodplain management.
- The proposed study does not include identification of methods for prevention or possible mitigation of ice jam flooding through operational changes or responses to ice formation. The District believes that identification of mitigation is premature prior to establishing that a definitive relationship exists between Project operation and ice jam flooding in the study area.

7. CONSULTATION WITH AGENCIES, TRIBES, AND OTHER STAKEHOLDERS

This study plan was developed based on discussions with agencies prior to submittal of the PAD. The District will work with agencies to resolve any issues or concerns during the course of the study plan meetings prior to preparation of the revised study plan.

8. WORK PRODUCTS

"Provisions for periodic progress reports, including the manner and extent to which information will be shared; and sufficient time for technical review of the analysis and results;" 18 CFR §5.11(b)(3)

The intended work product for the study of ice jam flooding on the Loup River is a study report. The study report will document the ice conditions in the Loup River bypass reach. Along with the study report, a database of the data gathered and used in the analysis will be available.

Updates regarding the study of ice jam flooding on the Loup River will be included in the study progress reports to be submitted to FERC in December 2009, March 2010, and June 2010.

9. LEVEL OF EFFORT AND COST

"Describe considerations of level of effort and cost, as applicable." 18 CFR §5.11(d)(6)

It is estimated that the study of ice jam flooding on the Loup River will require approximately 360 person-hours of effort at a cost of approximately $90,000. This work will be completed by qualified water resources engineers.

10. SCHEDULE

"A schedule for conducting the study;" 18 CFR §5.11(b)(2)

"The potential applicant's proposed study plan must also include provisions for the initial and updated study reports and meetings provided for in §5.15." 18 CFR §5.11(c)

The study of ice jam flooding on the Loup River is scheduled to begin in the fourth quarter of 2009, and the final study report is to be submitted in the third quarter of 2010.

11. REFERENCES

NDNR. *Listing of Nebraska Ice Report Sites*. Retrieved on March 17, 2009. http://dnrdata.dnr.ne.gov/Icejam/listing.asp.

NDNR. February 9, 2009. Letter from Brian P. Dunnigan, Director, to Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, regarding a study request.

USACE. July 1994. "Lower Platte River Ice Jam Flooding." U.S. Army Corps of Engineers, Omaha District.

USACE. January 1996. "Ice Jam Flooding and Mitigation: Lower Platte River Basin, Nebraska. U.S. Army Corps of Engineers, Omaha District.

Attachment A – NDNR Ice Jam Flooding Study Request

STATE OF NEBRASKA

Dave Heineman
Governor

DEPARTMENT OF NATURAL RESOURCES
Brian P. Dunnigan, P.E.
[redacted] *Director*

February 9, 2009

IN REPLY TO·

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, DC 20426

Re: Relicensing of Loup River Hydroelectric Project (P1256-029)

Dear Secretary Bose:

The Nebraska Department of Natural Resources (NDNR) is requesting a study: (1) of the effects the Loup River Hydroelectric Project has on ice jam flooding, (2) a predictive model of the Projects effects on ice jam flooding, and (3) prevention, alleviation and mitigation of ice jam flooding caused by the Project. The NDNR is the official state agency for all matters pertaining to floodplain management.

In March of 1993, severe flooding due to the combination of ice jams and rapid snowmelt occurred within the Lower Platte River basin in Nebraska. One of the areas most affected was along the Loup River at Columbus, NE, between the diversion by the Loup Public Power District (LPPD) and its tail race into the Platte River. The event caused many millions of dollars worth of damage, including road closures; destruction of a major highway, weigh station, motel and farm implement dealership; flooding of residential, agricultural, industrial, and commercial areas; and damage to bridge abutments, levees, dikes, and other river training structures.

In response to the 1993 flooding event, the Federal Emergency Management Agency formed an Interagency Hazard Mitigation Team to review the event and suggest measures which might be implemented to mitigate similar future events. The United States Army Corps of Engineers (USACE) completed a comprehensive Section 22 Study of ice jam flooding in the Lower Platte River Basin. (A copy of the July 1994 Section 22 report is attached.)

The USACE gathered and analyzed historical data relating to ice jams, intending to develop guidance in mitigating or alleviating ice jam flooding in the area. Information was obtained through searches of state and federal agency records, a literature search, weather and river discharge records, and public meetings. The USACE Cold Regions Research and Engineering Laboratory developed a model to predict the occurrence of ice events. It was noted that little specific data was available for jams occurring in the area where the LPPD diverts and discharges into the river and that the model cannot be applied with confidence without obtaining this additional data. A data collection program for future field observations was recommended and developed. NDNR has the data that has been collected.

301 Centennial Mall South, 4th Floor • PO. Box 94676 • Lincoln, Nebraska 68509-4676 • Phone (402) 471-2363 • Telefax (402) 471-2900

The USACE report detailed the LPPD's hydropower operation, including: diversion of the Loup River and outflow into the Platte River; the fluctuation of diversions, and response to the formation of frazil ice. Local residents opined that the fluctuations in water level cause or exacerbate ice jams in the Loup River downstream from the canal diversion. The report suggested that a future "qualitative study could address such issues as the potential effects of raising and lowering water levels on the formation of border ice, frazil production, frazil ice transport, and the effects of sudden decreases in river flow on ice movement (e.g., stranding ice blocks, increased frazil deposition). In addition, it was noted that "[c]hanges in the sediment regime of the river resulting from canal operations may also have impacted ice formation and transport processes." The USACE recommended that after collection of data, a study be done to evaluate the impact of the operation of the Loup Power Canal on downstream ice conditions.

It is this USACE-recommended study that the NDNR is requesting be done prior to LPPD being allowed to relicense its project. Such study of the effects of the LPPD operation on ice jam flooding was requested by the NDNR at a meeting with LPPD on August 19, 2008. Copies of the USACE report containing their recommendation for a study were distributed. Aerial photographs showing a three mile ice jam were displayed. It was noted that the levee holding back the Platte River from the City of Columbus was nearly overtopped and that a levee surrounding a housing development had nearly failed.

In a letter to LPPD on August 29, 2008, the NDNR again requested that a study on the effect the LPPD operation has on ice jam flooding be studied. Our request is attached.

The October 16, 2008, Pre-Application document (PAD) included the NDNR's statement that the LPPD operation may cause ice jam flooding, NDNR's request for a study, several paragraphs regarding the USCE study, and the statement, "The Nebraska Department of Natural resources asks that studies be conducted on what contributions the operation of the LPPD canal have on ice jam flooding as well as what measures could be taken to mitigate ice jam flooding and resulting damages." (See PAD Volume 2 – Appendices.) LPPD responded to the NDNR concern by stating on page 6-22 of the PAD, "The NDNR request for a study does not provide enough information to define the goal, reasons for study, and methodology for the District to conduct a study; therefore, no formal studies are proposed at this time. The District will continue to discuss this issue with NDNR to determine study needs." This issue has not been discussed further other than LPPD's reference to a conversation with the Nebraska Emergency Management Agency in which the Agency didn't remember the USACE report.

The NDNR is confounded by LPPD's response to our request for a study. NDNR has provided to LPPD: a history of ice jam flooding in the project area; the USACE report suggesting a connection between LPPD operations and ice jam flooding and that a study be conducted; and our concern for the residents, business people and travelers in the area, and the economic effects of the flooding on the State Treasury.

Again, the NDNR requests that a study be conducted on the effect of the LPPD project on ice jam flooding, additional modeling to predict future flooding events, and any possible mitigation and or ways to alleviate damage.

Sincerely,

Brian P. Dunnigan, P.E.
Director

Enclosures
cc: Loup Public Power District

Re: Loup River Nebraska Project No. 1256-029

TITLE OF PROPOSED STUDY

Study by the U.S. Army Cold Regions Research and Engineering Laboratory of the possible effect of the operation of the Loup Public Power District hydroelectric operation on ice jam flooding in the Platte River Basin; additional predictive modeling of ice events; and methods for prevention and mitigation of ice jam flooding.

REQUESTER OF PROPOSED STUDY

Nebraska Department of Natural Resources
300 Centennial Mall South
P.O. Box 94677
Lincoln, NE 68509-4676

STUDY GOALS, OBJECTIVES, AND RESULTING INFORMATION

The goal of the requested study is to discover the effect the operation of the Loup Public Power District hydroelectric operation has on ice jam flooding in the Platte River Basin, refinement of predictive modeling of ice events in the Platte River Basin, and possible prevention and mitigations of ice jam flooding through operation changes or responses to ice formation.

STUDY AREA

The geographic scope of the proposed study is the Platte River Basin between the diversion of the Loup River at a point 34 miles upstream of the confluence of the Loup and Platte Rivers into the Loup Public Power Canal, downstream to the confluence of the Platter and Missouri Rivers.

RELEVANT RESOURCE MANAGEMENT GOALS OR PUBLIC INTEREST CONSIDERATIONS

The requester Nebraska Department of Natural Resources (NDNR) is the official state agency for all matters pertaining to floodplain management, is the home of the Nebraska Ice Report data base, and has jurisdiction over all matters pertaining to surface water rights. The Department wishes to prevent recurring destruction to roads, structures, residences and businesses from ice jam flooding.

Nebraska Revised Statute 61-206

Department of Natural Resources; jurisdiction; rules; hearings; orders; powers and duties.

Department of Natural Resources; jurisdiction; rules; hearings; orders; powers and duties. (1) The Department of Natural Resources is given jurisdiction over all matters pertaining to water rights for irrigation, power, or other useful purposes except as such jurisdiction is specifically limited by statute. Such department shall adopt and promulgate rules and regulations governing matters coming before it. It may refuse to allow any water to be used by claimants until their rights have been determined and made of record. It may request information relative to irrigation

and water power works from any county, irrigation, or power officers and from any other persons. It may have hearings on complaints, petitions, or applications in connection with any of such matters. Such hearings shall be had at the time and place designated by the department. The department shall have power to certify official acts, compel attendance of witnesses, take testimony by deposition as in suits at law, and examine books, papers, documents, and records of any county, party, or parties interested in any of the matters mentioned in this section or have such examinations made by its qualified representative and shall make and preserve a true and complete transcript of its proceedings and hearings. If a final decision is made without a hearing, a hearing shall be held at the request of any party to the proceeding if the request is made within thirty days after the decision is rendered. If a hearing is held at the request of one or more parties, the department may require each such requesting party and each person who requests to be made a party to such hearing to pay the proportional share of the cost of such transcript. Upon any hearing, the department shall receive any evidence relevant to the matter under investigation and the burden of proof shall be upon the person making the complaint, petition, and application. After such hearing and investigation, the department shall render a decision in the premises in writing and shall issue such order or orders duly certified as it may deem necessary.

(2) The department shall serve as the official agency of the state in connection with water resources development, soil and water conservation, flood prevention, watershed protection, and flood control.

(3) The department shall:

(a) Offer assistance as appropriate to the supervisors or directors of any subdivision of government with responsibilities in the area of natural resources conservation, development, and use in the carrying out of any of their powers and programs;

(b) Keep the supervisors or directors of each such subdivision informed of the activities and experience of all other such subdivisions and facilitate cooperation and an interchange of advice and experience between such subdivisions;

(c) Coordinate the programs of such subdivisions so far as this may be done by advice and consultation;

(d) Secure the cooperation and assistance of the United States, any of its agencies, and agencies of this state in the work of such subdivisions;

(e) Disseminate information throughout the state concerning the activities and programs of such subdivisions;

(f) Plan, develop, and promote the implementation of a comprehensive program of resource development, conservation, and utilization for the soil and water resources of this state in cooperation with other local, state, and federal agencies and organizations;

(g) When necessary for the proper administration of the functions of the department, rent or lease space outside the State Capitol; and

(h) Assist such local governmental organizations as villages, cities, counties, and natural resources districts in securing, planning, and developing information on flood plains to be used in developing regulations and ordinances on proper use of these flood plains.

Nebraska Revised Statute 31-1017

Department; flood plain management; powers and duties.

31-1017 Department; flood plain management; powers and duties. The department shall be the official state agency for all matters pertaining to flood plain management. In carrying out that function, the department shall have the power and authority to:

(1) Coordinate flood plain management activities of local, state, and federal agencies;

(2) Receive federal funds intended to accomplish flood plain management objectives;

(3) Prepare and distribute information and conduct educational activities which will aid the public and local units of government in complying with the purposes of sections 31-1001 to 31-1023;

(4) Provide local governments having jurisdiction over flood-prone lands with technical data and maps adequate to develop or support reasonable flood plain management regulation;

(5) Adopt and promulgate rules and regulations establishing minimum standards for local flood plain management regulation. In addition to the public notice requirement in the Administrative Procedure Act, the department shall, at least twenty days in advance, notify by mail the clerks of all cities, villages, and counties which might be affected of any hearing to consider the adoption, amendment, or repeal of such minimum standards. Such minimum standards shall be designed to protect human life, health, and property and to preserve the capacity of the flood plain to discharge the waters of the base flood and shall take into consideration (a) the danger to life and property by water which may be backed up or diverted by proposed obstructions and land uses, (b) the danger that proposed obstructions or land uses will be swept downstream to the injury of others, (c) the availability of alternate locations for proposed obstructions and land uses, (d) the opportunities for construction or alteration of proposed obstructions in such a manner as to lessen the danger, (e) the permanence of proposed obstructions or land uses, (f) the anticipated development in the foreseeable future of areas which may be affected by proposed obstructions or land uses, (g) hardship factors which may result from approval or denial of proposed obstructions or land uses, and (h) such other factors as are in harmony with the purposes of sections 31-1001 to 31-1023. Such minimum standards may, when required by law, distinguish between farm and nonfarm activities and shall provide for anticipated developments and gradations in flood hazards. If deemed necessary by the department to adequately accomplish the purposes of such sections, such standards may be more restrictive than those contained in the national flood insurance program standards, except that the department shall not adopt standards which conflict with those of the national flood insurance program in such a way that compliance with both sets of standards is not possible;

(6) Provide local governments and other state and local agencies with technical assistance, engineering assistance, model ordinances, assistance in evaluating permit applications and possible violations of flood plain management regulations, assistance in personnel training, and assistance in monitoring administration and enforcement activities;

(7) Serve as a repository for all known flood data within the state;

(8) Assist federal, state, or local agencies in the planning and implementation of flood plain management activities, such as flood warning systems, land acquisition programs, and relocation programs;

(9) Enter upon any lands and waters in the state for the purpose of making any investigation or survey or as otherwise necessary to carry out the purposes of such sections. Such right of entry shall extend to all employees, surveyors, or other agents of the department in the official performance of their duties, and such persons shall not be liable to prosecution for trespass when performing their official duties;

(10) Enter into contracts or other arrangements with any state or federal agency or person as defined in section 49-801 as necessary to carry out the purposes of sections 31-1001 to 31-1023; and

(11) Adopt and enforce such rules and regulations as are necessary to carry out the duties and responsibilities of such sections.

NEED FOR PROPOSED STUDY

In 1994 the U.S. Army Corps of Engineers created a simple model of ice jam events in the Platte River valley, noted the lack of specific data needed to refine the model, created an ice data collection system, and suggested that a study be done upon the collection of such ice data. Without such study it can only be surmised by the USACE, NDNR, other agencies and citizens that the operation of the Loup Public Power District project contributes to ice jam flooding. Wihtout an accurate model the State has no tools to predict, prevent or mitigate ice jam flooding. Many ice jam events have occurred in the project area, causing millions of dollars worth of damage. The NDNR is not capable of conducting a study but recognizes that the Army Cold Regions Research and Engineering Laboratory is capable of such study and cooperated with the USACE Section 22 study on Lower Platter River Ice Jam Flooding. NDNR has the data CRREL requested. LPPD should pay CRREL to perform the study to find out how its operations can be changed to prevent future flooding.

NEXUS TO PROJECT

Direct effects:
The operation of the Loup Public Power District project may directly affect ice jam flooding through the winter time changes in diversion of the Loup River at the time of frazil ice formation.

Indirect and cumulative effects:
The operation of the Loup Public Power District project may change the river contours, cause channel degradation, allow vegetative encroachment and otherwise impact the river's ability to carry the entire flow during those infrequent times when diversion is interrupted.

STUDY METHODOLOGY

The U.S. Army Cold Regions Research and Engineering Laboratory will gather ice data, including that data collected since the March 1993 ice jam flood, refine the predictive model for ice events, and study possible preventions and mitigations of ice jam flooding.

LEVEL OF EFFORT AND COST

The NDNR does not know the level of effort and cost the study would require. The NDNR believes only the U.S. Army Cold Regions Research and Engineering Laboratory is capable of conducting the study.

LITERATURE CITED

Loup River Hydroelectric Project
FERC Project N. 1256
Pre-Application Document
Volumes 1 and 2

Lower Platte River Ice Jam Flooding (attached)
Section 22
July 1994
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